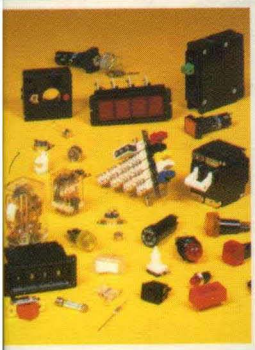
eem 85 86
electronic engineers master catalog

VOLUME B

eem 85 86

electronic engineers master catalog

VOLUME B



components
electromechanical
electro-optical

electromechanical, electro-optical, and military components

28th EDITION

2440 Military Components
2450 Displays, Readouts, Lamps & Lights
2475 Fiber Optic Equipment & Accessories
3500 Motors, Drives, & Rotating Equipment
3700 Electro-optical Equipment (Excl. Fiber Optics)
4300 Protective Components (Fuses, Circuit Breakers, etc.)
4500 Relays
4550 Solenoids
5100 Switches
5150 Keyboards & Keypads
5300 Thermal Components
5500 Transducers & Encoders

volume A Electronic components
volume C Interconnections, packaging, and hardware
volume D Power sources, instrumentation, computer products, and equipment

mci
TRANSFORMERS

BUY DIRECT
BIG SAVINGS
- HORIZONTAL PC
- VERTICAL PC
- LOW PROFILE PC
- QUICK CONNECT
- ENCAPSULATED

TOLL FREE
1-800-MCI-TRAN
For more details see pages A • 2168—A • 2183

ADVERTISEMENT

BPA Hearst HEARST BUSINESS COMMUNICATIONS, INC.

Printed in U.S.A.

publisher
WILLIAM F. MULLIN

associate publisher
ARMAND VILLIGER

editor/data base manager
ASTRID M. SPECTOR

editorial research
MARK LOTITO

directory coordinator
FAY CHEVANNES

sales administration
BETSEY EIDENOFF
AUDREY WOODALL

corporate director of manufacturing
DAN CHILLAK

manager/catalog production
LANNY LEVIN

catalog design director
MICHELLE ARNOLD

assistant catalog design director
BILL HENNESSEY

art/production supervisor
CHARLOTTE NEWMAN

art staff
GEOFFREY BARTER
DEBRA BIANCULLI
CAROL HANSEN
MARIE SANTONASTASO

assistant production manager
BRENDA BUFF

production assistant
LYNN GIARDINA

typography consultant
DON BURCHELL

group editorial director
JOHN B. CAMPBELL

director of research
DONALD R. SENTER

corporate director of circulation
BARRY J. GREEN

director of circulation
GEORGEANN JOHNSON

circulation manager
KARIN WEBER

sales billing supervisor
ALINE LEWIN

Hearst Business Communications, Inc./ UTP Division

vice president and general manager
RICHARD C. MARSHALL

Hearst Business Communications, Inc.

president
GORDON L. JONES, JR.

vice president
CHARLES H. TOWNSEND

treasurer
NELSON J. MAIONE

EEM

contents

How to use EEM ..... B•2
Alphabetical Index of Manufacturers' Catalog Data Pages ..... B•4
Alphabetical Index of Distributors' Advertisements ..... B•8
Product Index & Directory ..... B•9
Manufacturers & Sales Offices Directory ..... Yellow Pages 601
Trademark and Logofinder Directories ..... B•901
Manufacturers' Catalog Data Pages ..... B•1002

product sections

2440 Military Components ..... B•1002
2450 Displays, Readouts, Lamps & Lights ..... B•1014
2475 Fiber Optic Equipment & Accessories ..... B•1118
3500 Motors, Drives, & Rotating Equipment ..... B•1128
3700 Electro-optical Equipment (Excl. Fiber Optics) ..... B•1203
4300 Protective Components (Fuses, Circuit Breakers, etc.) ..... B•1224
4500 Relays ..... B•1260
4550 Solenoids ..... B•1462
5100 Switches ..... B•1476
5150 Keyboards & Keypads ..... B•1704
5300 Thermal Components ..... B•1740
5500 Transducers & Encoders ..... B•1776

Hearst

Published annually by
Hearst Business Communications, Inc.
645 Stewart Ave., Garden City, NY 11530
(516) 222-2500—TWX 510-222-1673 (UTP GRCY)
© Hearst Business Communications, Inc./UTP Division 1985 BPA

CIRCULATION POLICY

EEM/Electronic Engineers Master is distributed on a controlled basis to qualified electronic product specifiers in the United States. An official subscription form is available upon request. Electronic Engineers Master is available to non-qualified personnel in the United States at $65.00 per four-volume set.

Important Notice

Some manufacturers supply pricing information in Electronic Engineers Master. Any such pricing is included solely as a guide and is not intended to be a quotation. All participating manufacturers reserve the right to change specifications and/or prices or to discontinue items without prior notice. While every precaution has been taken to ensure accuracy in content, the publisher cannot be responsible for manufacturers' claims or representations. Nor, can any guarantee be made against the possiblity of error or omission. No portion of EEM may be reproduced by any means without the prior written permission of the publisher.

Cover Photographs Courtesy of

DIALIGHT CORP.	TRW MOTOR DIV.	INTEROPTICS	LEACH CORP.	AUGAT/ ALCOSWITCH	ELMWOOD SENSORS	CHERRY ELECTRICAL PRODUCTS CORP.
INDUSTRIAL DEVICES, INC.		HEINEMANN ELECTRIC CO.	LEDEX			OHIO SEMITRONICS

how to use eem

The 28th edition of EEM is arranged in four volumes, each composed of related Product Sections. For user convenience, each volume contains its own Product Index and Directory (green pages) and its own Manufacturers and Sales Offices Directory (yellow pages). Every Product Heading and every Manufacturer of electronic products is listed in each volume. Where, however, the Product Section is assigned to a volume other than that in use, a cross reference is made to the appropriate volume for further information.

To locate a specific product. Start by choosing the volume whose title describes the class of electronic product you are seeking. If you are not sure which volume is appropriate, pick up the first one at hand and find the product heading in the green pages. There you will find either a list of that product's manufacturers or you will be referred to the proper volume. All products are identified by their generic terms. Please read the detailed instructions on the first page of this section. Manufacturers with catalog data in this edition of EEM appear in bold face type and page numbers are shown. Manufacturers appearing in light face type have submitted verifying evidence that they supply the products shown. When you have located a product of interest, turn to the page(s) shown for further information. You will find these pages in each volume in the appropriate sections.

product selection guides

There are 34 Product Selection Guides included in this edition of EEM! They are located on the first pages of the Product Section to which they apply. Use these guides for basic selection parameters and then go to the EEM pages shown in the guide for more detailed information.

product selection index

Product Selection Index		Vol. A	Vol. B	Vol. C	Vol. D
1100	Amplifier Assemblies, Instrumentation				D•1002
1300	Audio Equipment & Accessories				D•1023
1400*	Cabinets, Enclosures, Racks & Chassis			C•1002	
1500*	Capacitors	A•1002			
1600	Chemical Compounds (Adhesives, Cleaners, Coatings)			C•1096	
1700*	Circuit Boards (Printed), Materials & Accessories			C•1098	
1800*	Coils, Chokes, & Inductors	A•1204			
1850	Cores, Magnets, & Ferrites	A•1298			
1900	Communications & Telemetry Equipment				D•1049
2000	Computer Peripheral Equipment				D•1057
2025	Computers (Mini/Micro)				D•1083
2050	Computer Software				D•1106
2100*	Connectors, Terminals, & Sockets			C•1104	
2200	Control Systems & Components				D•1109
2300*	Crystals, Oscillators, Crystal & Piezoelectric Filters	A•1308			
2325	Data Acquisition/Handling Systems & Accessories				D•1135
2350*	Delay Lines	A•1458			
2400*	Panel Hardware (Bezels, Dials, Knobs, etc.)			C•1588	
2440*	Military Components		B•1002		
2450*	Displays, Readouts, Lamps, & Lights		B•1014		
2475	Fiber Optic Equipment & Accessories		B•1118		
2500	Mechanical Components			C•1617	
2550	Environmental Test Equipment				D•1165
2600*	Fans, Blowers, Cooling Equipment, & Heat Exchangers			C•1622	
2700*	Filters	A•1582			
2800	Hardware (Electrical/Electronic)			C•1683	
2825	Hardware (Mechanical)			C•1694	
2900*	Instruments, Test & Measuring				D•1174
2950*	Panel Meters (Analog & Digital)				D•1328
2975*	Instruments, Oscilloscopes				D•1384
3000*	Instruments, Graphic Recording				D•1400
3100	Insulators & Insulating Materials			C•1697	
3130	Integrated Circuits, Hybrid Circuits, & Function Modules	A•1659			
3200*	Interconnection Systems (Backpanels, Card Holders, Packaging Systems)			C•1698	
3400	Microwave Systems & Subsystems				D•1408
3450*	Microwave Components	A•1684			
3475	Military Systems & Equipment				D•1410
3500*	Motors, Drives, & Rotating Components		B•1128		
3700	Electro-optical Equipment		B•1203		
3800	Packing, Shipping, & Storage Containers & Materials			C•1716	
3900*	Batteries				D•1412
4000*	Power Supplies, DC				D•1446
4050*	Power Supplies, AC				D•1876
4100	Production Equipment, & Manufacturing Services				D•1977
4200	Prototype Boards, Kits & Design Aids			C•1718	
4300*	Protective Components (Fuses, Circuit Breakers, etc.)		B•1224		
4500*	Relays		B•1260		
4525	Shields & Shielding			C•1720	
4550*	Solenoids		B•1462		
4600	Soldering & Desoldering Equipment			C•1738	
4700*	Resistors	A•1784			
4750*	Potentiometers, Trimmers, Controls, & Rheostats	A•1990			
4800*	Discrete Semiconductors	A•2066			
4900	Servomechanisms & Robotic Equipment				D•1985
5100*	Switches		B•1476		
5150*	Keyboards & Keypads		B•1704		
5300*	Thermal Components		B•1740		
5400	Tools (Manual & Power)			C•1741	
5500*	Transducers & Encoders		B•1776		
5600*	Transformers	A•2098			
5700	Electron Tubes (Including CRT)	A•2342			
6000*	Wire & Cable			C•1742	

eem sales offices

Main Sales Office
Hearst Business Communications, Inc.
645 Stewart Avenue
Garden City, New York 11530
(516) 222-2500
TWX: 510-222-1673
CABLE: UNITECH GARDENCITYNY

New England
Hearst Business Communications, Inc.
20 William Street G80
Wellesley, MA 02181
(617) 239-1333

New York, New Jersey & Southern Connecticut
The Druker Company
1101 State Road, Building N
Princeton, New Jersey 08540
(609) 921-3686

Pennsylvania & Southeast
The Gittelman Company
Summit Office Centre
7266 Summit Avenue
Philadelphia Suburb
Fort Washington, PA 19034
(215) 646-5700 Atlanta Office (404) 523-1252

Midwest and Canada
The Pattis Group
4761 W. Touhy Avenue
Lincolnwood, IL 60646
(312) 679-1100
TWX: 910-223-0736

Southern California/ Nevada, Arizona & Utah
Media West
202 Fashion Lane
Suite 207
Tustin, California 92680
(714) 832-5005
TWX: 910-595-1581

Northern California/ Pacific Northwest/Colorado
Hearst Business Communications, Inc.
1333 Lawrence Expressway
Santa Clara, CA 95051
(408) 249-6800

*Product Selection Guide

advertisers' index

To find a specific manufacturer's data pages, an alphabetical index of EEM participants appears in EEM starting on page A•4 of Volume A and on pages B•4, C•4 and D•4 of the other volumes.

trademark and logofinder directories

A comprehensive trademark directory is included at the end of the EEM green pages in Volume B. NEW in this edition, the EEM logofinder shows the symbols and graphics used by manufacturers as identifiers on their products. Use these pages to locate manufacturers of specific trademarks and logos.

manufacturers' index

In the EEM yellow pages you will find pertinent details on all manufacturers listed in EEM including local sales offices and/or distributors. Please refer to the detailed instructions on the first page of the EEM yellow pages for additional information.

to order a product found in eem

When you have located the product that suits your needs, call the manufacturer or the local sales rep or distributor as shown in the EEM yellow pages. Give the EEM data page number and specs from that page. You and the supplier will be talking on the same wave length which should simplify your ordering and buying.

to file manufacturers' catalogs and data

The EEM File System has been revised and updated. The new EEM File System contains a complete Product Index. This Index tells you where to file which catalog. It also contains a cross-reference so you'll know where catalogs are filed.

In order to use the new EEM File System all you need is a supply of standard letter size, third-cut, manila file folders which are available locally. You then use the pressure sensitive labels which are supplied with the File System to go into as much detail as you want (or need).

Each label fits the third-cut file folder exactly. There are over 300 of these labels in one System: 1 for the index, 1 each for the 62 EEM Product Sections, 24 for the alphabetical file of multiproduct catalogs, plus more than 200 additional labels for System expansion. The System also includes 62 Cross Reference Cards so you can quickly and easily find multiproduct catalogs. The EEM File System is complete and can save you countless hours of time and thousands of dollars. The price? Only $25.00. Send a check to: EEM File System, 645 Stewart Ave., Garden City, NY 11530 and we'll absorb postage and handling. Send a purchase order and add $2.00 for postage and handling. NY and CA residents, please add sales tax.

technical information: codes . . . miniglossaries . . . charts . . .

Abbreviations/Acronyms ..... A•1166, B•1012, C•1028, D•1016
ASCII Code ..... D•1087
Batteries & Fuel Cells ..... D•1430
Capacitors ..... A•1066
Capacitor Formulas ..... A•1093
Conductors, Maximum Current Capacity ..... C•1863
Connectors ..... C•1129
EBCDIC Code ..... D•1092
Encapsulation ..... C•1086
Opto Semiconductors ..... B•1214
Power Supplies ..... D•1462
Relays ..... B•1308
Relay Contact Forms ..... B•1317
Resistor Color Codes ..... A•1828
Servo Components ..... D•1985
Thermal Conductivity of Dielectrics ..... B•1744
Thyristors & High Power Diodes ..... A•2076
Wire Gauges ..... C•1844

85
86 Alphabetical Index of Manufacturers Catalog Pages

This index provides an alphabetical listing of manufacturers pages and where to find them

A

Abacus Controls Inc. ..... D•1880-1882
Abbott Transistor Labs., Industrial Products Div. ..... D•1449, 1884-1885
Abbott Transistor Labs., Power Supply Div. ..... D•1449-1461
Abbott Transistor Labs., Transformer Div. ..... A•2102-2108
ACC Electronics ..... A•1659
Acopian ..... D•1463-1497
Active Control Instrmn. ..... D•1109
ADAC Corp. ..... D•1135
Adtech Power Inc. ..... D•1499
Advance Conversion Devices Co. ...D•1886-1887
Advanced Detector Corp., Applied Solar Energy Corp. ..... B•1203
Advanced Sys. Concepts ..... D•1137
Ad-Vance Magnetics, Inc. ..... C•1720
Aeroflex Labs., Magnetic Prods. Div., ... B•1131, 1779
Aeroflex Labs., Microelctrns. Div. ..... A•1660
AirBorn, Inc. ..... C•1111-1118
Airflyte Elctrns. Co. ..... B•1128, 1132-1137
Airpax Corp. ..... B•1226
Airpax Corp., Cheshire Div. ..... B•1138; D•1110
Airpax Corp., Frederick Div., A North American Philips Co. ..... B•1263, 1742
Alberox ..... C•1617
Alco Elctrn. Prods., Inc. ..... B•1481-1483
Alden Products Co. ..... C•1119-1124
Allen Avionics .... A•1460-1463, 1584-1589, 2109
Allen-Bradley Co., Electronics Group, Rockwell Corporation .....A•1298-1301, 1784, 1787-1799, 1993-1995, 2068-2069
Allen-Bradley Co., Electronics Group, Div. of Rockwell Corp., Magnetic Products Div. ..... A•1298-1301
Allen-Bradley Co., Electronics Group, Div.of Rockwell Corp., Microelectronic Products Div. ..... A•2068-2069
Allen-Bradley Co., Electronics Group, Div. of Rockwell Corp., Resistive Products Div. ..... A•1993-1995
Alps Electric (USA), Inc. ..... D•1057
Amco Engrg. ..... C•1006-1007, 1625
Amecon, Inc. ..... A•2110-2117
AME Corp. ..... B•1485
Amerace Corp., Elastimold Div. ..... D•1111
American Aerospace Controls ..... B•1780-1781
American Automation ..... D•1179
American Insulated Wire Corp., Leviton Mfg. Co. ..... C•1747
American Microsemiconductor, Inc. ..... A•1661, 2070-2071
American Research & Engineering ..B•1486-1487
American Switch Corp. ..... B•1488-1491
American Technical Ceramics Corporation ..... A•1007-1009
American Zettler ..... B•1264-1274
Amlan, Inc. ..... C•1125-1128
AMP Incorporated .....A•1590; B•1118-1120, 1492-1493, 1706; C•1131-1152, 1748
AMP Distributor Marketing Div, A Division of AMP Products Corporation ... B•1495; C•1130, 1683, 1749
Amplifier Research ..... D•1002-1003
Amuneal Mfg. ..... C•1721
Analogic Corp. ..... D•1138-1139
Analogic Corp., Data Conversion Prods. Grp. ..... D•1138-1139
Analog Modules, Inc. ..... D•1004
Andersen Labs. ..... A•1591
Anderson Elctrns. ..... A•1313
Ango Electronics Corp. ..... C•1008
A. P. Circuit Corp. ..... A•1592
Apex Microtechnology Corp. ..... D•1005
Apollo Magnetics Corp. ..... D•1058
Appleton Papers Inc. ..... D•1059
Applied Electro Technlg., Int., STI Company ..... B•1275
Applied Power Conversion, Technology Dynamics, Inc. ..... D•1500-1507
Applied Research, Inc. ..... A•1702-1703
Arcolectric Corp. ..... B•1018-1020, 1496-1501; C•1153
Aries Elctrns. ..... C•1155-1158
Armtec Industries, Inc., Daven Components Grp. ..... B•1502
Arnold Magnetics ..... D•1508-1511
Aromat Corp. ..... B•1276-1295, 1503
Arra Inc. ..... A•1705
Arrow Hart Div., Cooper Inds. ..... B•1504-1509
Arstan Products Intl. Ltd. ..... A•2118-2121
Asmann Components, Div. of ebm Industries, Inc. ..... C•1160-1161
Assembly Specialists ..... C•1700
Associated Research, Inc. ..... D•1181-1182
Astec USA, Ltd., A BSR Intl. Co. ..... D•1512-1514
Astro-Med, Inc. ..... D•1402
Astron Corp. ..... D•1515
Astrosystems ..... D•1183, 1517, 1888
Atlee Inc. ..... B•1229; C•1009, 1684, 1701, 1722
ATR Elctrns., Inc. ..... D•1889
Augat Inc. ..... C•1702-1703
Ault, Incorporated ..... D•1518-1519
Austron, Inc. ..... A•1314-1315
Automatic Coil Corp., Sub. Designatronics, Inc. ..... A•1207-1209, 1464-1467
Automatic Timing & Controls Co. ..... D•1112
Auto-Swage Prods. ..... C•1685
Avex Elctrns. ..... D•1416
Avionic Instrs. ..... D•1890-1893
Avtel Div., Unitron Inc. ..... D•1895-1897
AVX Corporation ..... A•1010-1011
Axial Magnetics ..... B•1139

B

Ballantine Labs. ..... D•1185
B & K Precision, Industrial Electronics Product Group, Dynascan Corporation ..... D•1186-1190, 1386-1388, 1521
Barnes Engrg. ..... C•1010-1024
BBC-Metrawatt/Goerz ..... D•1192-1193
Bead Electronic Connectors, Bead Chain Manufacturing Co. ..... C•1162-1167
Bead Elctrns., Div. Bead Chain Mfg. Co. ..... C•1686-1688
Beau Products Div., Vernitron Corp. ..C•1168-1170
Behlman Engineering ..... D•1898-1905
BEI Motion Systems Co., Corporate Off. ..... B•1782-1783
BEI Motion Sys. Co., Computer Prod. Div. ..B•1783
BEI Motion Sys. Co., Digital Prods. Div. ... B•1782
BEI Motion Sys. Co., General Control Systems Div. ..... B•1783
BEI Motion Sys. Co., Industrial Encoder Div. ..... B•1782
BEI Motion System Company, Kimco Division ..... B•1783
BEI Motion Sys. Co., Position Controls Div. ..... B•1782
Belden, Electronic Wire & Cable ..... C•1742, 1750-1789
Bel Fuse ..... A•1468-1486; B•1230-1232
Bell, Floyd, Assocs., Inc. ..... D•1023
Bell, F. W., Inc. .....B•1784-1785; D•1113, 1194-1195, 1977
Bell Inds., J. W. Miller Div. ..... A•1210-1217
Berkeley Nucleonics Corp. ..... D•1196
Bertan Assocs. ..... D•1522-1535
Best Electrics Div. ..... B•1743
B-G Instruments ..... D•1060
B. H. Elctrns. ..... A•2122-2123
Bikor ..... D•1536
Bivar, Inc. ..... C•1025
Blatek Inds., Inc. ..... B•1787
Bliley Elec. Co. ..... A•1316-1323
Blue M, A Unit of General Signal ..... D•1165
Bodine Elec. Co. ..... B•1140
Boonton Elctrns. Corp. ..... D•1197
Bopla Enclosures ..... C•1026
Bosch, Robert, Corp. ..... B•1296-1297
Boschert Inc. ..... D•1537-1540
Bourns, Inc., Resistive Components Group ..... A•1800-1803, 1996-2008
Bowmar/ALI, Bowmar Instr. Corp. ...D•1331-1333
Bowmar Instrument Corp., Aerospace Div. ..... B•1707
Breeze-Illinois, TransTechnology Corp. ..... C•1171, 1790-1792
Brevel Motors, Inc., Sub. Vernitron Corp. ...B•1141
Brim Elctrns. ..... C•1793-1800
Buckeye Stamping Co. ..... C•1027
Buehler Products, Inc. ..... B•1142
Bulbtronics, Inc. ..... B•1021
Bumper Products Corp. ..... C•1694
Burgess Switch Co., Inc. ..... B•1510-1512

C

Cabtron Sys., Inc. ..... C•1029
Caddell-Burns Mfg. ..... A•1218-1229
Caddock Electronics, Inc. ..... A•1804-1827
Calex Mfg. Co., Inc. ..... D•1006, 1542-1545
California Avionics Labs. ..... D•1198
California DC ..... D•1546
California Instruments, A Div. of Amstar Tech. Prods. Co., Inc. ..... D•1907
Calmark Corp. ..... C•1030-1044
Cal-R, Inc. ..... A•1829-1831; B•1745-1747
Cambridge Aero Instruments, Inc. ..... D•1116
C & K Components, Inc. ..... B•1513
Canon U.S.A., Elctrn. Comps. Div. ..... B•1143
Canyon Elctrns. ..... B•1022
Capacitor Technology, Inc. ..... A•1012
Capar Components Corp., Div. of Diplomat Electronics ..... A•1013
Carlingswitch, Inc. ..... B•1514-1515
Carol Cable Co., Inc., Columbia Elctrn. Cables Div. ..... C•1801-1819
Catalyst Research, ... D•1417
Caton Connector Corp. ..... C•1172
Celesco Transducer Prods., Inc. .... B•1788-1789
Centronic Inc. ..... B•1204-1205
Ceramaseal ..... C•1173
CES Elctrns. ..... D•1606
Chassis-Trak, General Devices Co., Inc. ..... C•1062-1063
Chatsworth Data Corp, Cablemaster Div. ..D•1199
Cherry Electrical Prods. Corp. ..... B•1024, 1521-1533, 1708-1712
Chessell Corp. ..... D•1403
Chesterfield Prods. ..... A•1593
Chicago Lock Co. ..... B•1534
Christie Elec. Corp. ..... D•1547-1549
Chrono-log Corp. ..... D•1061
Cincinnati Sub-Zero Prods. ..... D•1166
Ciprico Inc. ..... D•1062
Clairex Electronics ..... B•1206-1209
Clare Division, General Instrument Corp. ..... B•1260, 1302-1306
Clarke-Hess Comm. Resch. Corp. ...D•1200-1201
Clifton Precision, Litton Systems, Inc. ..... B•1144
CML MACARR Div., Marine Electric RPD, Inc. ..... D•1908-1909
Coaxial Dynamics ..... D•1203
COBA, Inc. ..... B•1535-1537
Colber Corp. ..... A•1832
Cole Instr. ..... B•1538
Colorado Crystal Corp. ..... A•1324
Comclok, Inc. ..... A•1325

Communications Instrs., Inc. ..... B•1298-1301
Compac ..... A•1594, 1706-1707; C•1046-1049
Component Research Co. Inc. ..... A•1014-1063
Compower Div., Computer Prods., Inc. ..... D•1446, 1552-1558, 1584-1585
Computer Components, Inc. ..... B•1307
Computer Conversions Corp. ..... D•1140-1141
Computer Devices Corp. ..... A•1487
Computer Prods. Inc., Power Conversion Grp. ..... D•1446, 1551-1585
Comstron Corp. ..... A•1327-1329, 1595; D•1204-1205
Concept Industries, App-Rep, Inc. ..... A•1064-1065, 1833
Concord Elctrns. ..... C•1174-1175
Condor D.C. Power Supplies, Inc. ... D•1587-1599
Connector Corp. ..... C•1176-1177
Connor-Winfield Corp. ..... A•1331-1334
Control Concepts Corp. ..... B•1233
Control Elctrns. Co., Inc. ..... A•1488
Controlled Power Co. ..... D•1876, 1910-1915
Control Sciences, Inc. ..... D•1142-1146
Control Technology Co. ..... D•1986-1987
Converter Concepts, Inc. ..... D•1600-1603
Cooner Wire Co. ..... C•1820-1826
Corcom, Inc. ..... A•1596
Cord Electronics, Inc. ....A•2009; B•1023; C•1827; D•1024, 1605
Cornell-Dubilier Elctrns. .... A•1067, 1597; B•1309
Corning Glass Works, Corning Elctrns. ..... A•1068-1069, 1835
Coto Corporation ..... B•1310-1311
CPS Inc. ..... D•1607
Crestronics Div., Applied Electro Technlg., Int. ..... D•1609
Crosspoint, Div. of Info-Lite ..... B•1539
Crouzet Controls, Inc. ... B•1145, 1315-1316, 1541
Croven Crystals ..... A•1335
Crydom Division, Int'l. Rectifier ..... B•1312-1314
CSI Capacitors, CSI Technlgs. ..... A•1070
C-Tek Inc. ..... D•1114-1115
CTS Corporation ..... A•1336-1357, 1663-1667; B•1542-1546
CTS Corporation, Berne Division ..... A•1836-1844, 2011
CTS Electronics Corp., Paso Robles Div., Electromechanical Gp. ..... B•1542-1546
CTS Electronics Corp., Knights Division ..... A•1336-1357
CTS Corporation, Microelectronics Div. ..... A•1662-1667
CTS Electronics Corp., Halex Division ..... A•1662-1667
Curtis Inds. ..... A•1599; C•1178; D•1978
Curtis Instrs., Inc. ..... D•1117
CYTEC Corp. ..... D•1207

D

Daburn Elctrns. & Cable ..... C•1828-1837
Daico Inds., Inc. ..... A•1708-1709
Dai-Ichi Shoji of Amer., Inc. ..... A•1071; B•1548-1549; C•1179
Dale Electronics, Inc., Columbus Div. ..... B•1025-1027
Dale Electronics, Inc., El Paso Div. ... A•1845-1863
Dale Electronics, Inc., Norfolk Div. ... B•1748-1749
Dale Electronics, Inc., Tempe Div. ... A•1358-1359
Dale Electronics, Inc., Yankton Div. ..... A•1231-1237, 2125-2132; C•1180-1183
Damon/Elctrns. Div. ..... A•1360
D & B Power, Inc. ..... D•1610-1611
Daniels Mfg. Corp. ..... C•1741
DataCon, Inc. ..... C•1705
Data Delay Devices ..... A•1489-1501
Data Instruments, Inc. ..... B•1790
Datak Corp. ..... C•1100, 1590, 1838
Datamax Electronics, Inc. ..... A•1502-1507
Datametrics • Dresser Inds., Inc. ..... B•1791
Data Tech, Div. of Penril Corp. ..... D•1328, 1334-1345
Datawrap, Inc. ..... D•1979
Datec, Inc. ..... D•1049
Datel, General Electric Co. .... D•1083, 1147, 1346
Datum Inc., Timing/Aacom Divisions ..... D•1050, 1148
DCI Inc. ..... D•1347
Deak Technology, Inc. ..... D•1208-1210
Dearborn Wire & Cable Co. ..... C•1839
Del Elctrns. Corp. ..... A•2133; D•1614-1615
Delevan Div., American Precision Inds. Inc. ..... A•1238
Delta Electronic Ind. USA, Delta Elctrn. Ind. Co. Ltd. ..... A•1600-1601; D•1616-1617
Deltrol Controls ..... B•1320-1321, 1464-1465
Densitron Corp. ..... B•1029-1031
Dialight Corp. ..... B•1032-1038, 1550-1551
Diego Power ..... D•1916
Digital Equipment Corp. ..... D•1063-1065
Digitec Corp. ..... D•1066, 1149, 1348
Dio-Rey, Div. of Info-Lite ..... B•1040-1046
Displex, Inc. ..... D•1619, 1917
Diversified Elctrns., Inc., Indl. Controls Div. ..... B•1322
Dixson, Inc., Instrument Div. ..... D•1349
Douglas Randall ..... B•1323-1331
Dow-Key Microwave Corporation ..... A•1710
Dranetz Technologies, Inc, Computer Products Division ..... D•1167
Dreefs Switch, Inc. ..... B•1553-1555
Duncan Electronics, Inc. ..... A•2012-2013
DVE/Caltronic Co., Ltd., A Sub. of Dee Van Entrp. Co., Ltd. ..... D•1613
Dynamics Research Corp., Encoder Division ..... B•1793

E

Eagle Magnetic Company, Inc. ..... C•1723
EAO Switch Corp. ..... B•1557
E-A-R Div., Cabot Corp. ..... C•1695
Eastern Air Devices Motor Div. ..... B•1146
ebm Inds., Inc. ..... C•1626-1628
Eby Co. ..... C•1184-1185
Ectron Corp. ..... D•1007
EECO Incorporated ..... B•1558-1561
EFRATOM, a division of Ball Corp. ..... A•1361
EG & G Almond Instruments ..... D•1620-1621
EG & G Birtcher ..... C•1051-1053
EG & G Rotron, Commercial Div. ... C•1630-1636 ..... B•1210
EG & G Vactec ..... B•1210
Elcom Systems, Inc. ..... A•1711
Electric Switches, Inc. ..... B•1516-1517
Electro Comp., Inc. ..... A•1864-1865
Electro-Craft ..... B•1147-1149
Electrodynamics, Inc., A Talley Inds. Co. ...D•1119
Electro-Films, Inc. ..... A•1866-1867
Electro Impulse ..... C•1637; D•1211
Electro Industries, Div. E.I. Elctrns., Inc. ..... D•1350-1351
Elec-Trol, Inc. ..... B•1332-1342
Electromech, Inc. ..... A•2134
Electro-Mechanisms ..... B•1466-1467
Electro-Mech Comps. ..... B•1562-1563
Electronic Components Groupe, Stein Industries, Inc. ..... B•1566
Electronic Concepts, Inc. ..... A•1072-1077
Electronic Dev. Corp. ..... D•1213-1215
Electronic Enclosures, Div. Wyle Labs .... C•1056
Electronic Instr. & Specialty Corp. ... B•1344-1345
Electronic Measurements ..... D•1622-1625
Elctrn. Molding Corp. ..... C•1186-1188, 1698, 1706-1709
Electronic Navigation Inds, Emerson Electric Co. ..... D•1008-1009
Elect. Prec. Comp. Corp. ... A•1603, 1868; D•1217
Electronic Research Co. ..... A•1362
Electronic Solutions ..... D•1084-1086
Electronic Specialty Div., ElecSpec Corp. ..... B•1346-1347
Electro Space Fabricators ..... C•1054-1055
Electro Switch ..... B•1564-1565
Elfab Corp. ..... C•1190-1191
Elgar Corp, An Onan McGraw Edison Co. ..... D•1918-1922
Elgenco, Inc. ..... D•1218-1223
Elmwood Sensors ..... B•1750
Elpac Comps. ..... A•1078-1079
Elpac Power Sys. ..... D•1626-1631
Elpower ..... D•1418-1420
EMCO High Voltage Co. ..... D•1632
Emcor Products, Crenlo, Inc. ..... C•1057
EMICO Inc. ..... D•1352-1353
Empro Mfg. Co., Inc. ..... D•1224
Endicott Coil ..... A•1239, 2135
Endicott Resch. Grp., Inc. .. B•1047-1049; D•1633
Energy, Ltd. ..... D•1923
Entran Devices ..... B•1794-1795
Epsco ..... D•1634
Equipto Elctrns. Corp. ..... C•1059
ERA Transpac Div., Sub. Elctrn. Research Assocs. ..... D•1635-1637
ESC Elctrns. Corp. ..... A•1508-1521, 1604-1605
E-Systems, Memcor Div. ..... A•1869, 2015
ETI Systems, Polaris Indl. Entprs. ... A•2016-2017; B•1150-1152; D•1120-1121
ETM Electromatic ..... D•1226-1227, 1638
ETRI, Inc. ..... C•1638-1640
EVI, Inc. ..... D•1639
EWC, Inc. ..... A•2136-2148
Exar Corp. ..... A•1668-1669
Excel Technology Intl. Corp. ..... B•1050-1052

F

Fabricast ..... B•1154-1159
Fairchild Weston, Data Recorders ..... D•1228
Farrand Controls, Div. of Farrand Industries, Inc. ..... B•1796
Fenwal Elctrns. ..... B•1751
Ferrotran Elctrns. Co., Inc. ..... D•1640-1641
FIC Corp. ..... B•1235
Fifth Dimension, Inc. ..... B•1348, 1567
Filter Concepts Inc. ..... A•1606-1607
Filtron Co., Inc., Div. of Aeroflex Labs., Inc. ..... A•1608
Fischer-America, Inc., Div. of Technographics, Inc. ..... C•1193
Flex-Core Div., Morlan & Assocs., Inc. ..... A•2149
Flex-Key Division, Rogers Corp. .... B•1714-1715
Fox Elctrns. ..... A•1363
Franek, John, Co., Inc. ..... D•1924-1927
Frederick Components Intl. .....B•1717; C•1194, 1641; D•1643
Freed Transformer ..... A•2150-2153; D•1229
Frequency and Time Systems, Inc., DATUM, INC. ..... A•1364-1365; D•1230
Frequency Devices, Inc. ..... A•1609; D•1231
Frequency Elctrns. ..... A•1366-1367
Frequency Selective Networks, Inc. ..... A•1369
Fujitsu America, Inc. .....B•1349-1368; C•1104, 1195-1224
Fuses Unlimited ..... B•1234

G

Gamma High Voltage Resch. Inc. ... D•1644-1645
Gardiner Solder Co., Div. of Gardiner Metal Co. ..... C•1738
Gemini ..... C•1060-1061
General Devices ..... C•1062-1065
General Digital Corp. ..... D•1067
General Microwave Corp. ..... A•1712; D•1232
General Power Sys. ..... D•1929
General Resistance, Inc., A Prime Technology Company ..... A•1870; D•1233
Genicom Corp. ..... B•1370-1373
Gerator Corp. ..... D•1930-1932
GFC/Hammond Elctrns., Inc. ..... D•1647
Gilway Technical Lamp ..... B•1053-1055
Glassman High Voltage Inc. ..... D•1234-1235, 1648-1651
Gordos Corporation, Gordos International Corp. ..... B•1375-1379, 1568-1570
Gordos Arkansas, Gordos International Corp. ..... B•1380-1383
Gould Inc., Design & Test Sys. Div. ..... D•1237
Gould Inc., Recording Systems Div. ..... D•1400, 1404
Gowanda Elctrns. ..... A•1240
Gralex Inds. ..... D•1354-1356
Graphite Metallizing Corp. ..... B•1160
Grayhill Inc. .....B•1384-1385, 1571-1587, 1704, 1718-1725; C•1225
GRIM Corporation ..... D•1051
GSI Corp. ..... C•1840
Guardian Elec. Mfg. Co. ..... B•1386-1387
G W Three Incorporated ..... D•1088-1090

H

Hafstrom Technical Products, Inc. ..... D•1169
Hamilton Standard Controls ..... B•1447
Hamlin ..... B•1389, 1588
Hammond Mfg. Co. ..... C•1066-1067
H&T Components Inc., H&T Components Ltd. ..... C•1226
Harrel, Inc. ..... D•1122
Hasco Components, Inc. .....B•1390-1396, 1589-1591
HEI, Inc. ..... B•1211
Heinemann Elec. Co. ..... B•1236-1237
Hermetic Switch ..... B•1592
Heurikon Corporation ..... D•1091
Hewlett-Packard Co. ..... D•1653-1656
Hexacon Elec. ..... C•1739
Heyco Molded Products ..... C•1227
Hi-G Company, A Subsidiary of Nytronics Inc. ..... B•1398-1407
Hipotronics .....A•2154-2156; D•1238-1240, 1658-1659, 1934-1935
Hiram Jones Elctrns. ..... C•1228-1231
Richard Hirschmann of America .... C•1232-1237
Hisonic, Inc. ..... A•1610, 2157
Hi-Tech Components, Mitsubishi International Corp. ..... A•2018-2019; B•1239
Hi-Tech, Inc. ..... C•1642
Hitran Corp., Agex ... A•2158; D•1660, 1936-1937
Holmberg Elctrns. ..... C•1239-1270
Hughes Solid State Products ..... A•1370-1373
Huntington Electric Inc. ..... A•1871
Hybricon Corp. ..... C•1710
HyComp Inc. ..... A•1670, 1872-1873
Hypertronics Corp. ..... C•1271
Hytek Microsystems ..... A•1522-1527, 1671

I

IDEC Systems & Controls Corp. ..... B•1056. 1408-1412
IEI-ISKRA Electronics, Inc. ..A•1080-1081, 1875, 2020, 2072-2073; B•1413;
IERC ..... C•1643

INDEX OF MANUFACTURER'S CATALOG PAGES

IET Labs, Inc. ..... D•1242-1245
ILC Data Device Corp. ..... D•1150-1151
Illinois Capacitor, Inc. ..... A•1084-1085
Illinois Lock Co., The Eastern Co. ... B•1593-1595
IMC Magnetics Corp., Exec. Off. ..... B•1161; C•1644-1645, 1647
IMC Magnetics Corp., Eastern Div. ..... B•1161; C•1644-1645
IMC Magnetics Corp., New Hampshire Div. ..... C•1647
Inductive Prods., Inc. ..... A•1230
Industrial Control Co. ..... D•1988
Industrial Devices, Inc. ..... B•1014, 1017, 1057-1077
Industrial Elctrn. Engrs., Inc. ... B•1078-1079, 1726
Industrial Elctrn. Hardware Corp. ..... C•1272
Industrial Test Equip. ..... D•1247, 1938-1941
Infodex, Inc. ..... B•1080-1081; D•1410
Information Transfer Indl. ..... D•1152-1154, 1248-1249
Injectorall Elctrns. ..... C•1101
Instrumentation & Control Sys. ..... B•1318-1319; D•1933
The Instrument Mart ..... D•1246, 1364, 1389
Instruments for Industry, Inc. ..... D•1010
Instrument Specialties Co. ..... C•1724-1725
Intech, Microcircuits Div. ..... A•1672
Integrated Circuits, Inc. .... A•1673; D•1661-1665
Interconnection Technology, Inc. ..... C•1711
Interelectronics Corp. ..... D•1667
Interface Engrg. ..... D•1156-1157
Inter-Market ..... B•1082, 1597
International Comps. Corp. ....A•1086, 1876, 2074; C•1273; D•1025
International Electro Magnetics, Inc. ..... D•1026
International High Voltage Elctrns., Inc. ..... D•1668-1669
International Instruments, General Resistance, Inc. ..... D•1357
International Microelectronic Prods. ..A•1674-1676
International Power ..... D•1670-1674
International Sensor Systems, Inc. ..... A•1677
Inter-Technical Grp. ..... A•1087-1092
Intronics, Inc. ..... D•1676-1677
Ion Physics Co. ..... D•1123
ISL Products Int'l, Ltd. ..... A•1094-1095, 1877, 2075, 2159
Isotemp Research, Inc ..... A•1374-1375
Itek Measurement Sys., Div. Litton Inds. ... B•1797
ITT Cannon ..... C•1274-1288
ITT Components Electromechanical Grp. ..... B•1414-1417, 1419, 1422, 1471
ITT Components Passive Grp. .....A•1096-1101, 1377; B•1418, 1420-1421, 1423
ITT Pomona Electronics ..... C•1289-1407
ITT Schadow ..... B•1598-1602
IVO Inds., Inc. ..... B•1603
Iwatsu Instruments, Inc. ..... D•1390-1392

J

JAE ..... B•1604-1607
Janco Corp. ..... B•1608-1609
Jan Hardware Mfg. Co. ..... C•1588, 1591-1611
JBM Electronics, Inc. ..... A•1528-1529
J-B-T Instrs. ..... D•1358
JDK Controls, Inc. ..... A•2021
Jennings ..... A•1102-1103; B•1424-1425, 1610; D•1251
Jerome Industries Corp. ..... D•1678-1679
Jettron Prods. ..... C•1408-1410
Jewell Electrical Instrs. ..... D•1359
JMJ Technical Prods. ..... C•1613
JMK, Inc. ..... A•1611
JM Transformer Co., Inc. ..... A•2160-2163
Jobmaster Corp. ..... A•1303
Johanson Dielectrics ..... A•1104
Johanson Mfg. Corp. ..... A•1105
JSC Wire & Cable ..... C•1841
Judco Mfg. Inc. ..... B•1611
Judd Wire, High Voltage Engrg. ..... C•1842-1843
Judd Wire, High Voltage Engrg. ..... C•1842-1843
Julie Resch. Labs. ..... A•1878; D•1252-1256

K

Kaiser Systems, Inc. ..... D•1680-1683
Kalamazoo Technical Furniture ..... C•1068
K & M Elctrns. ..... A•1879
Kappa Networks, Inc. ..... A•1530-1545
Kavlico Corp. ..... B•1798
Kay Elemetrics Corp. ..... A•1713
KDI Electronics, Inc., Engelmann & Pyrofilm Divisions ..... A•1881
KEC Elctrns., Inc. ..... D•1685-1687
Kel-Am ..... C•1412-1423
Keltec Florida ..... D•1688
Kelvin ..... A•1882-1883
Kemet, Union Carbide Corporation, Elctrns. Div., Components Dept. ..... A•1106-1107
Kepco, Inc. ..... D•1689-1714
Kessler-Ellis Prods. ..... D•1124-1125
Kester Solder Div. ..... C•1096, 1740
Keystone Carbon, Thermistor Div. ...B•1752-1755
KGS Electronics, Inc., GAR Entprs. ..... D•1715, 1942-1943
Kikusui Intl. Corp. ..... D•1393, 1652
Kilovac Corp. ..... B•1426-1427
KOA Speer Elctrns. ..... A•1108, 1884-1886
Koep Precision Standards, Inc. ..... D•1257
Kollmorgen Corp., Industrial Drives Div. ..... B•1163-1165; C•1483
KR Electronics, Inc. ..... A•1613
Krohn-Hite Corp. ..... D•1258-1259
Krystinel Corp. ..... A•1304-1306
Kulite Semiconductor Prods., Inc. ..... B•1799
Kulka Smith, Inc. ..... C•1424-1429
Kurz Instruments, Inc. ..... B•1800

L

Lamtech Electronics ..... C•1845
Lansing Research Corp. ..... C•1069
LaserSonics Power Supply Operation .... D•1719
L-Com Inc. ..... C•1846-1847
LDJ Incorporated ..... D•1260
Leach Corp., Control Prods. Div. ..... A•1378-1379, 1678-1679; B•1428-1429
Leach Corp., Relay Div. ..... B•1430-1435
Lear Siegler, Inc., Elctrn. Instr. Div. ..... C•1430
Ledex Inc. ..... B•1462, 1468-1470, 1612-1614
Ledtronics, Inc. ..... B•1083
Leecraft Mfg. ..... B•1085-1087
LEMO U.S.A., Inc. ..... C•1431-1439
Lenco Elctrns., Inc. ..... A•2164-2165
Liberty Controls ..... B•1472-1473
Liberty Mirror, Libbey-Owens-Ford Co. .... B•1212
Lincoln Instrs. ..... D•1361
Lindgren RF Enclosures, Inc. ..... C•1726
Linseis, Inc. ..... D•1405
Littelfuse, Inc., Sub. of Tracor, Inc. ..... B•1088, 1224, 1240-1246, 1616-1617
Litton Encoder Div. ..... B•1801
Logitek, Inc. ..... B•1436-1437
LVC Inds., Inc., CO-ORD Switch Div. ..... B•1619-1621
LZR Electronics, Inc. ..... D•1716-1718

M

Mabuchi Motor America Corp. ..... B•1167
M/A-Com. Cable/Home Communicatios Comm/Scope Coaxial Cable, M/A-Com Inc. ..... C•1849-1857
Mac Panel Co. ..... C•1712-1713; D•1411
Magnecraft Elec. Co. ..... B•1438
Magnetic Instrumentation ..... D•1261
Magnetico Inc. ..... A•2167
Magnetic Shield Div., Perfection Mica Co. ..... C•1727-1729
Magnetic Technology ..... B•1168-1169
Magnet Sales & Mfg. Co. Inc. ..... A•1307
Magnum Elec. ..... C•1440-1444
Magnum Opus Custom Elctrn. Engrg. ..... D•1093
Maida Development Co. ..... A•1109-1113
Malco, Div. Microdot Electronic Components Group ..... C•1446-1449, 1859
Mallory Capacitor Co., Mallory Comps. Grp. ..... A•1114-1115
Mallory Components Division, Emhart Elec./Elctrn. Grp. ..... A•2022
Mantex Corp. ..... B•1727
Marcon America Corp. ..... A•1116-1117, 1887
MARCONI INSTRUMENTS ..... D•1262-1264
Markel Corp. ..... C•1689
Marquardt Switches Inc. ..... B•1622
Marway Prods. Inc. ..... D•1944-1945
Math Assocs. ..... B•1124
Matrix Corp. ..... D•1158
Matrix Sys. Corp. ..... A•1715
Matsuo Electronics ..... A•1118-1123
Maurey Instr. Corp. ..... A•2023-2027; B•1170
Maxon Precision Motors, Inc. ..... B•1171
McCoy Electronics Co., Sub. Oak Technology Inc. ..... A•1380-1383
MCG Elctrns. ..... B•1248-1253
McGill Mfg. Co., Inc., Electrical Div. ..... B•1623 ..... D•1929
MCI Transformer Corporation ..... A•2168-2175, 2177-2183
MCL, Inc. ..... D•1408-1409
McLean Engrg., Div. of Zero Corp. ...C•1648-1649
McLean Midwest ..... C•1650-1651
3M Co., Static Control Sys. Div. ..... D•1980-1981
MDF Products Inc. ..... D•1265
Measurement Sys., Inc. ..... D•1126
Mechanical Entprs. ..... B•1624, 1728-1729
Mechanized Electronic Assembly Div., Universal Instrs. Corp. ..... D•1982
Meissner Inds. ..... A•1889
Melcor/Materials Elctrn. Prods. ..... C•1652-1653
Memodyne ..... D•1068
Mepco//Electra, Inc., North American Philips Corp., Corpo. .....A•1124-1126, 1890-1891, 2029; B•1008
Mepco//Electra, Inc., North American Philips Corp. ..... A•2029; B•1008
Mepco//Electra, Inc., North American Philips Corp. ..... A•1124; B•1009
Mepco//Electra, Inc., North American Philips Corp. ..... A•1126, 1890-1891
Mepco//Electra, Inc., North American Philips Corp. ..... A•1124-1126; B•1009
Mepco//Electra, Inc. ..... A•1890
MERET, Inc. ..... B•1121
Metuchen Capacitors, Inc. ..... A•1128-1134, 1614-1615; C•1454-1457
MF Elctrns. Corp. ..... A•1384-1385
MG Electronics ..... D•1027
Mhotronics., Inc. ..... C•1459-1461
Microcomputer Power ..... D•1721-1723
Micro Devices Product Group, Therm-O-Disc, Inc. ..... B•1775
Microelectronic Relays, Inc. ..... B•1439
Micro Mo Electronics, Inc. ..... B•1172-1175
Micronel U.S. ..... C•1622, 1654-1673
Micro-Ohm Corp. ..... A•1892-1897
Microsonics Inc. ..... A•1386
Micro Switch, A Honeywell Div. .....B•1476, 1625-1670, 1732-1733, 1757, 1802-1804
Micro Technical Inds., Micro-Ohm Corp. ..... D•1170-1171
Microtran Co. Inc. ..... A•1241, 2098, 2184-2197
Mid-Eastern Industries ..... D•1724-1726
Midland-Ross Corp., NEL Unit ..... A•1387
Midwest Comps. ..... B•1740, 1758-1765
Mil-Comm Distributors, Inc. ..... D•1421
Millivac Instrs. ..... D•1266
Mills Resistor Co. ..... A•1899
Milwaukee Resistor Corp. ..... A•1900-1905
Mini-Circuits Lab. ..... A•1700, 1716-1779
Mini-Systems, Inc. ..... A•1906
Mini-Systems, Inc., Electronic Package Div. ..... A•1681
Mizar, Inc. ..... D•1094-1096, 1106
Modular Devices ..... D•1011, 1727
Modutec ..... D•1362-1363
Molecu-Wire ..... C•1860-1862
MOLEX, Inc. ..... B•1671; C•1463-1467
Monitor Prods. Co., Inc. ..... A•1388-1391
Motorola, Inc., Compt. Divs. Clock Oscillator Dept. ..... A•1392-1393
Motorola Semiconductor Prods. Sector .. A•1682-1692, 2066, 2077-2087; D•1098-1101
Motor-Tronics, Inc. ..... B•1176-1177
Moxness Products, Inc., Versa Technologies ..... B•1734
MTE Corp. ..... A•2199
M-Tron Inds. ..... A•1395
Mueller Elec. Co. ..... C•1468-1472
Multi Prods. Intl. ..... A•1135, 2202-2203; D•1728
Murata Erie North America, Inc. .....A•1002, 1136-1139, 1396-1397, 1582, 1616-1617, 1907-1909, 1990, 2030-2031, 2089, 2205; D•1028, 1729
MVP Elctrns. ..... D•1012
MWS Wire Inds. ..... C•1864-1865

N

Nano Pulse Industries ...A•1546-1549, 2206-2207
Natel Engrg. Co., Inc. ..... A•1694-1695
National Capacitor ..... A•1127
National Electric Cable ..... C•1866-1867
National Power Technlg. ..... D•1730-1732
National Tel-Tronics ..... C•1473
National Wire & Cable Corp. ..... C•1868-1884
N.C.E. ..... D•1428-1429
NES, Inc. (Nationwide Electronic Systems) ..... B•1089; D•1069, 1127, 1159, 1365-1368
Newman, M. M., Corp., Heli-Tube Div. ..... C•1885
Newport Electronics ..... D•1370-1371
NIC Components Corp. ..... A•1140-1141, 1910
NJE Corporation ..... D•1733
NKK Switches of America, Inc. ..... B•1673-1681
North American Soar Corp. ..... D•1174, 1267-1281, 1394-1396
North Atlantic Inds., Instrument Div. ..... D•1283, 1373
North Hills Elctrns. .....A•1243, 1780, 2208-2210; D•1734
Nova Elec., Hobart Bros. Co. ..... D•1946
NRD, Mark IV Ind., Inc. ..... D•1983
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc. ..... A•1398-1399; B•1805; D•1029
NWL Transformers ..... A•2211; D•1735
NWL Transformers ..... D•1735
Nytronics Components Grp., Inc. .....A•1142-1155, 1204, 1244-1263, 1550-1554, 1911

O

Oaktron Inds. ..... D•1030
Ocean Marine Instrument ..... D•1947
Ohio Semitronics, Inc. ..... B•1776, 1806-1819; D•1284-1289
Ohmite Mfg. Co. ..... A•1912-1921, 2032-2033
Ohmtek, Inc. ..... A•1923-1925
Omega Engrg. ....B•1683, 1766-1767, 1820-1821; C•1887; D•1013, 1070, 1128, 1160, 1290, 1374-1375, 1407
Opamp Labs, Inc. ..... D•1014
OPT Inds. Inc. ..... A•1401, 2212; D•1736-1739
Opto 22 ..... B•1440-1441
Oram Electronics ..... D•1740
Orbit Instrument Corp. ..... B•1735; D•1129
Oscillatek Corp. ..... A•1402-1407
Oshino Electric Lamp Works, Ltd. ..... B•1090
Oslo Controls ..... B•1684-1685
Otto Engrg. ..... B•1686-1687
Ovenaire, Electronic Technologies Inc. ..... A•1408-1411

P

Pacific Instrs. Inc. ..... D•1015
Pacific Power Source Corp. ..... D•1949-1953
Pacific Resistor Co. ..... A•1926-1927
PacTec Div., LaFrance Corp. ...C•1002, 1070-1071
Paine Instrs. ..... B•1823
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div. ..... D•1422-1427
Panduit Corp. ..... C•1474-1476, 1888-1891
Panel Components Corp. ..... B•1254-1255; C•1478-1482, 1892-1893
Pan-Magnetics Intl., Inc. ..... A•1265, 2213-2220; D•1742-1743
Paraline Transformer Corp. ..... A•2221-2225
PCA Elctrns. ..... A•1556-1566
PCK Elastomerics, Inc., Kollmorgen Corporation ..... C•1483
PC Transformer Corp. ..... A•2226-2229
Pearson Elctrns. ..... A•2230
Penn-Tran Corp. ..... A•1266, 2231; D•1741
Performance Controls Inc. ..... B•1178
Perkin-Elmer Corp., Elctrn. Prods. Dept. ... A•2232
Perma Power Elctrns. ..... B•1256; C•1690-1691
Phi Technologies, Inc. ..... D•1052-1054
Phoenix Contact ..... C•1484-1488
Photodyne ..... B•1122-1123
Pico Elctrns. ..... A•1267-1271, 2233-2255; D•1744-1751
Piconics ..... A•1273, 1618, 1696
Piezo Elec. Prods., Inc. ..... B•1768-1769
Piezo Technology Inc. ..... A•1308, 1413-1418
Pioneer Magnetics ..... D•1752-1753
PITTMAN, Penn Engrg. & Mfg. Corp. ..... B•1179
Polyphase Instr. ..... A•1619-1622, 2257-2264
PolyPhaser Corporation ..... B•1257
Portescap U.S. ..... B•1181
Potter Co. ..... A•1623
Power Designs, Inc. ..... D•1755-1759
Power Dynamics .... A•1628; B•1258-1259, 1689; C•1489-1493, 1615
Power General, Unitrode ..... D•1760-1767
Power Group International ..... D•1428-1429
Powermark ..... D•1955
Power-One, Inc., Power-One Linear Products ..... D•1768-1773
Power Pac ..... D•1774-1778
Power Products Div., Computer Products, Inc. .... D•1446, 1552-1553, 1559-1572, 1584-1585
Power-Sonic ..... D•1431
Power Systems ..... D•1780-1781
Powertec, Inc. ..... D•1782-1799
Power Technology, Inc. ..... B•1125
Power Ten, Inc. ..... D•1779
POWR-UPS Corp. ..... B•1182-1183
PPD, Inc. ..... A•1157-1165
PPM, Inc. ..... D•1291
Precicontact, Inc. ..... C•1494-1495
Precision Filters ..... A•1624-1627; D•1017
Precision Resistive Prods., Inc. ..... A•1929
Precision Resistor Co., Inc. ..... A•1930-1933; B•1770-1771
Preh Electronics Industries, Inc. ...A•2034; B•1736; C•1497
Premier Metal Prods. Co. ..... C•1072-1073
Premier Microwave ..... A•1781
Prem Magnetics ..... A•2265-2267
Pres-Air-Trol Corp. ..... B•1690
Preston Scientific ..... D•1161
Prime Power, Inc., Prime Technology Co. ..D•1801
Probe Master, Inc. ..... D•1397
Production Industries, Inc. ..... C•1075-1077; D•1384
Programmed Test Sources ..... D•1292
Prototek, Inc. ..... C•1714
Pulizzi Engineering, Inc. ..... D•1956-1958

Q

Q-Tech Corp. ..... A•1420-1422
Qualidyne Sys., Unitech Ltd. ..... D•1803-1809
Quam-Nichols Co. ..... D•1032-1033
Quantum Data, Inc. ..... D•1293

R

Radio Switch Corp. ..... B•1691
RCD Components, Inc. ..... A•1934-1935
RCL Electronics, Inc. ..... A•1936-1941
Shallcross, Inc. ..... A•1936-1941
RDI/Reed Devices, Inc. ..... C•1498-1501
Reeves-Hoffman Div. ..... A•1423-1427; C•1619-1621
Refac Elctrns. Corp. ..... B•1091
Regdon Corp. ..... B•1475
Rehlander Assocs. ..... B•1213
RE Instruments Corp. ..... D•1295
Renco ..... B•1824-1825; D•1131
Renco Elctrns. ..... A•1274-1276, 2268-2269
Reproduction Technologies Inc. ..... D•1034
Republic Elctrns. Corp. ..... A•1167
Resistors, Inc. ..... A•1942
Res-Net ..... A•1943
RFI Corporation ..... A•1629
Rhombus Inds. ..... A•1568-1573
RIFA, Inc. ..... D•1810-1811
Risk, George, Inds. ..... B•1737
RMF Prods., Inc. ..... C•1616
RO Assocs. ..... D•1812-1814
Robbins & Meyers, Inc., Motor & Control Sys. Div. ..... B•1184
ROD-L Electronics, Inc. ..... D•1296-1301
Rogers Corp. ..... C•1715
Rose Enclosures Sys., Inc. ..... C•1078-1079
Ross Engrg. Corp. ..... B•1443
Rowe Industries, Inc. ..... C•1502-1504, 1895
RTE Deltec Corp. ..... D•1959
RTE, Power/Mate Co. ..... D•1816-1827
RTS Systems, Inc., Compact Video, Inc. ... D•1055
Ryan Intl. Corp. ..... D•1303

S

SAFT America, Inc., Portable Battery Division ..... D•1412, 1432-1437
Samarius, Inc. ..... A•2035
S & H Inds. ..... D•1829, 1984
Sangano Weston-Sangamo Components Div., Fairchild Semiconductor ..... A•2056-2064
SaRonix ..... A•1428-1431
Sawtek Inc. ..... A•1432
Saxton Wire and Cable ..... C•1896-1903
Schrack North America Corp. ..... B•1444-1446
Schroff Inc. ..... C•1080
Secoinsa/Digi Power ..... D•1830-1832
Seiko Instrs. U.S.A., Inc. .. A•1433; B•1092; D•1071
Semiconductor Packaging Matls. Co. Inc. ..C•1097
Sencore ..... D•1399
Sensitive Research Instrs. ..... D•1304-1306
Servo-Tek Prods. Co. ..... B•1185
Setra Systems, Inc. ..... B•1826
SFE Technologies ..... A•1168-1171, 1277, 1434, 1630-1631
Shallco ..... B•1692-1695; D•1036-1037
Shalltronix Corp. ..... D•1307
Shape Magnetronics, Inc. ..... D•1960-1961
Shelly Associates, Inc. ..... B•1093
Shinano Kenshi Corp. (SKC) ..... B•1187
Shogyo Intl. Corp. ..... A•2037, 2270-2271; B•1094-1096; C•1506-1508, 1905; D•1038, 1376
Shokai Far East, Ltd. ..... D•1039
SIDAC Enclosures, Div. of Triac Electronic Systems, Inc. ..... C•1082
Sierracin/Magnedyne ..... B•1188-1189
Sierracin/Power Systems ..... D•1834-1836
Sigma Systems Corp. ..... D•1172
Signal Transformer ..... A•1632-1633, 2272-2287
Silonex Inc. ..... B•1215
Simpson Elec. Co. ..... D•1308, 1377
Skydyne Division, AAR/Brooks & Perkins ..C•1081
Slaughter Co. ..... D•1309
Sloan Co. ..... B•1098-1101
SL Waber ..... C•1692; D•1963
Kulka Smith, Inc. ..... C•1509, 1693
Sohio Engineered Materials Co., Unit of Sohio ..... A•1172, 1944-1947; B•1772
Sokol Crystal Prods., Inc. ..... A•1435-1437
Sola, A Unit of General Sign. ..... D•1838-1839, 1964-1967
Sonnenschein Batteries Inc. ..... D•1438
Sorenson Lighted Controls ..... B•1102-1103
SP America Inc., Shin-Etsu Polymer ..... B•1739; C•1510-1511
Spectrol Elctrns. ..... A•2039-2047
Spectrum Control, Inc. ..... A•1635-1637; C•1513-1517
Spectrum Technology, Inc. ..... A•1438-1439
Spellman High Voltage Elctrns. Corp. ..... D•1840-1842
Sprague-Goodman Elctrns., Inc. ..... A•1173
Staco Transpower ..... A•2288
Stancor/Hamilton Standard Controls ..... A•2289-2297; B•1447
Standard Energy, Div. WBH Scientific, Inc. ..... D•1844-1845
Standard Grigsby, Inc., Gordos International Corp. ..... B•1568-1570
Standex Elctrns. ..... A•1638-1639; B•1448
Stantron Div. ..... C•1083
Star Micronics, Inc., Components Div. ..... D•1040-1044, 1072
Statek Corp. ..... A•1441-1445
State of the Art, Inc. ..... A•1949-1951
Staver Co., Inc. ..... B•1105-1107
Sterling Transformer Corp. ..... A•2299-2303
Stettner Elctrns. ..... A•1175
Stevens-Arnold Div., Computer Prods., Inc. ..... D•1446, 1552-1553, 1573-1585
Stock Drive Prods., Div. of Designatronics, Inc. ..... B•1191; C•1674
STRONGBOX ..... C•1084-1085
Struthers-Dunn, Inc. ..... B•1449
Sullins Elctrns. Corp. ..... C•1518-1521
Summit Elctrns. ..... D•1846-1847
Sunshine Sci. Instr. ..... D•1302
Superior Elec. Co. ....A•2304-2305; B•1192-1193; C•1523; D•1968
Switchcraft, Inc. ..... B•1696-1697; C•1524-1527
Switches Unlimited, Inc. ..... B•1682
Sylvania GTE Control Devices ..... B•1773
Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co. ..... A•2090-2091
Sylvania Miniature Lighting, GTE Corporation ..... B•1109-1111
Symbex Corp. ..... C•1528-1529
Syntest Corp. ..... D•1073

T

TA Instr. Case Co. ..... C•1087
Tape Concepts, Inc. ..... D•1035
Tapeswitch Corp. of America ..... B•1699
Tauber Elctrns. Inc. ..... D•1439
Taurus Corp. ..... D•1074
Taylor Electronics, Inc. ..... D•1848
TDJ Co., Inc. ..... C•1088-1089
TDK Corporation of America .. A•1176-1178, 1278, 1640-1641; D•1046-1047, 1849
TECA, ThermoElectric Cooling America Corp. ..... C•1675-1677
Teccor Elctrns. ..... A•2092-2093
Tech Labs., Inc. ..... B•1700-1701
Techmar Corp. ..... C•1090-1091
Technipower, A Penril Co. ..... A•2306; D•1850
Technitrol ..... A•1458, 1574-1579, 2307; B•1002, 1010
Technology Dynamics ..... D•1851
Techtrol Cyclonetics, Inc. ..... A•1446-1449
Tecknit (Eastern Facility) ..... C•1530-1535, 1730-1737
Tecron Industrial Prods., Crown Intl., Inc. ..... D•1018-1021, 1310-1311
Tedea USA ..... B•1827
Telemecanique, Inc., Allied Control Products ..... B•1450-1459
Tel Labs, Inc. ..... A•1952-1953
Telpar, Inc. ..... D•1075
Tenney Engrg. ..... D•1173
Tettex Instruments, Inc. ..... D•1312
Texas Instruments Optoelectronics ..B•1216-1219
Texmate, Inc. ..... D•1378-1379
Textro ..... C•1906-1908
Thermalloy, Inc. ..... C•1679
Therm-O-Disc, Inc., Sub. Emerson Elec. Co. ..... B•1775
Thordarson Meissner, Components Corp. of Amer. ..... A•2308-2313
THORN EMI Gencom Inc. ..... A•2342-2343
THORN EMI Technology Inc. ..... D•1313
TII Electronics, Inc., Div. TII Industries ..... D•1852-1853
Todd Prods. Corp. ..... D•1854-1855
Todd Systems, Inc. ..... A•2314-2317
Toko America, Inc. ...A•1279, 1581, 1643; D•1856, 1989
Toroid Corp. of Maryland ..... A•2318-2319
Torotel Prods. Inc. ..... A•1280-1295, 2320-2325
Torotron Corp. ..... D•1315
Torwico Elctrns. Inc. ..... A•2328-2329
Tracewell Enclosures ..... C•1092-1093
TRAK Microwave Corp. ..... A•1782-1783
TRAK Microwave, Western Division ..... A•1782-1783
TRAK Systems, Div. TRAK Microwave Corp. ..... D•1076-1081
Transducers and Systems Inc., A Prime Technology Company ..... B•1828
Transformation Elctrns. Corp. ..... D•1857
Transistor Devices ..... D•1316-1317
Transmagnetics ..... D•1162-1163

Triac Electronic Systems, Inc. ..... D•1132-1133
Triad-Utrad ..... A•2330-2337; D•1970-1971
Triplett Corp.-A Penril Co. ..... D•1318-1321, 1380-1381
TRW Capacitor Div. ..... A•1179-1185
TRW Connector Div., TRW Electronic Components Grp. ..... B•1126-1127; C•1536-1565
TRW Cylindrical Connector Div., TRW Electronic Components Grp. ..... C•1566
TRW Motor Division, Industrial/Commerical Products ..... B•1194
TRW Motor Div. (Military) ..... B•1195
TRW Optoelectronics Div. ..... A•2094; B•1221-1223
TRW Resistive Products Div., TRW Electronic Components Grp. ..... A•1954-1957
TS Products, Inc. ..... D•1990
TTE, Inc. ..... A•1644-1655
Tusonix, Inc. ..... A•1187-1193, 1656-1657

U

Ultronix, Inc. ..... A•1958-1965
Ulveco, Inc. ..... A•2338-2339
Unicorp ..... C•1696
Unimax Switch Corp. ..... B•1702
Union Carbide Corporation, Battery Prods. Div. ..... D•1440-1441
Union Carbide Corp., Elctrns. Div., Component Dept. ..... A•1106-1107
United Chemi-Con Inc. ..... A•1194-1197
UNITRACK Div., Calabro Inds., Inc. ..... C•1094
Unitrode Corp. ..... A•1697-1699
Unitron Inc. ..... D•1895-1897
Universal Voltronics ..... D•1858
UPSystems, Inc. ..... D•1973
U.S. Digital ..... B•1829
U.S. Instr. Rentals ..... D•1322-1323
U.S. Toyo Fan Corp. ..... C•1680-1681

V

Validyne Engrg. Corp. ..... D•1164
Varistor Corp. ..... A•1967
Varian Canada, Inc., Microwave Div. ..... D•1859-1862
Varo Semiconductor, Inc. ..... A•2095
Varta Batteries, Inc. ..... D•1442
Vector Electronic Co., Inc. ..... C•1095, 1098, 1102-1103; D•1103-1104
Vectron Labs. ..... A•1450-1454
Veetronix, Inc., Sub. Reach Electronics .... B•1703
Velonex ..... D•1324-1325, 1383
Vent-Rak Div. ..... C•1064-1065
Venus Scientific, Inc. ..... D•1863
Vernitech .....A•2048-2049; B•1011, 1196-1197, 1830-1831; D•1991
Vernitron Corp., Control Comps. Div. ..... B•1199-1202
Vernitron Piezoelectric Div. ..... A•1455
Vibra-Metrics ..... B•1832
Victoreen, Inc., Component Div. ..... A•1968-1971
Viking Labs/Honeywell, Operation of Test Instruments Div. of Honeywell, Inc. ..... B•1013; D•1327
Virginia Plastics Co. .... C•1567-1569, 1909-1911
Vishay Resistive Sys. Grp. .....A•1972-1985, 2051-2053
Visual Communications Co., Inc. .... B•1113-1115
VIZ Test Equipment, Div. VIZ Mfg. ..... D•1864
VL Electronics ..... B•1117
Voltage Multipliers, Inc. ..... A•2097
Voltex ..... D•1865
VRN International, Div. Vernitron .... A•2054-2055; D•1056

W

Wabash Relay & Elctrns. ..... B•1460-1461
Wall-Able Manufacturing Corp. ..... C•1570-1571
Ward Leonard Elec. ..... A•1986-1988
Wayne Transformer Co., Inc. ..... A•2340-2341
WECO Electrical Connectors, Inc. ... C•1572-1578
Wells Elctrns. ..... C•1580-1587
Wesco Electrical Co. ..... A•1198-1203
Wes-Garde Components Group, Inc. ..... B•1698
Wilco Corp. ..... A•1296-1297
Wilmore Elctrns. Co. .... D•1867-1869, 1974-1975
Wintek Corp. ..... D•1105, 1107

X

Xentek, Inc. ..... D•1870-1873
Xico, Inc. ..... D•1082
Xsis Electronics, Inc. ..... A•1457
Xylog Corp. ..... D•1875, 1976

Y

Yardney Battery Div., Yardney Corp. ..... D•1443
Yuasa Battery (America), Inc. ..... D•1445

Z

Zeus ..... C•1697

85
86 Index To Distributors Advertisements

Alpha Distributor Corp. ..... pgs. 624, 643, 702, 713, 815
Distributor Specialists ..... pgs. 708, 775, 786
Electric Switches, Inc. ..... **B**•1516, 1517, pgs. 605, 614, 616, 632, 635, 637, 638, 639, 651, 657, 669, 672, 675, 676, 688, 689, 701, 709, 711, 719, 724, 726, 731, 736, 747, 751, 753, 766, 767, 768, 781, 786, 789, 794, 801, 803, 816
Fuses Unlimited ..... **B**•1234
Inductive Products Inc. ..... **A**•1230
Inductor Supply ..... p. 700
The Instrument Mart ..... **D**•1246, **D**•1364, **D**•1389
Logicomp Electronics, Inc. ..... pgs. 614, 635, 651, 661, 684, 702, 736, 761, 789
Metermaster ..... pgs. 612, 680, 701, 781, 805, 824
Mil-Comm Distributors, Inc. ..... **D**•1421
Mouser Electronics ..... p. 742
National Capacitor ..... **A**•1127
PoCo Sales ..... pgs. 691, 705
RAG Electronics, Inc. ..... pgs. 618, 622, 623, 654, 687, 690, 695, 710, 715, 723, 750, 759, 761, 764, 765, 781, 785, 819
Sunshine Sci. Instr. ..... pgs. 612, 618, 622, 624, 680, 690, 695, 701, 715, 723, 760, 781, 789, 805, 824
Switches Unlimited, Inc. ..... **B**•1682
TNR Technical, Inc. ..... pgs. 686, 773
Wes-Garde Components Group, Inc. ..... **B**•1698

85 86 Product Index and Directory

All products are listed alphabetically by their generic names and then by subclassification. For example, look for "Fiber Optic Connectors" under "Connectors, Fiber Optic" or for "Digital Panel Meters" under "Meters, Panel (Digital)."

Following each product heading is a four-digit number directing you to the Product Section where these products are usually cataloged. If that Product Section is not in the EEM volume you are using, a "See Vol. A, B, C, or D" will direct you to the proper volume for your product classification. No numbers appear with cross-reference headings.

Under each product heading whose Product Section appears in the volume you are using, the names of the manufacturers who supply the product are shown in alphabetical order with EEM catalogers shown first in boldface type with appropriate page numbers. Other manufacturers are shown in light face type. The symbol (§) indicates that these products are available from local distributors. The symbol (†) indicates that the product is available to MIL specifications.

Abrasive Belts, Compounds, Cords, Powders, etc.-5400 — *See Vol. C*

Absorbers, Microwave-3400 — *See Vol. D*

Accelerometers-5500

Chatsworth Data Corp, Cablemaster Div., 20710 Lassen St., Chatsworth, CA 91311, 818-341-9200 ..... B•1199
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006, 201-227-1002 ..... B•1794
Setra Systems, Inc., 45 Nagog Park, Acton, MA 01720, 617-263-1400 .... B•1826
A. L. Design, Inc., 4232 Ridge Lea Rd., Amherst, NY 14226 716-833-6272
Alpha-M Corp., 3009 Wildflower Dr., Dallas, TX 75229 214-620-0021
† Astronautics Corporation of America, P.O. Box 523, Milwaukee, WI 53201-0523 414-447-8200
Bell & Howell/CEC Div., 360 Sierra Madre Villa, Pasadena, CA 91109 ... 213-796-9381
Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611
§† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
§ Bourns Instrs., Inc., Industrial Div., 1960 Chicago Ave., Unit F, Riverside, CA 92503 714-781-5147
Bruel & Kjaer Instrs. Inc., 185 Forest St, Marlboro, MA 01752 617-481-7000
Chatsworth Data Corp, Impact-o-Graph Div., 20710 Lassen St., Chatsworth, CA 91311 213-341-3000
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 215-532-9464
Daytronic Corp., 2589 Corporate Pl, Miamisburg, OH 45342 513-866-3300
§ Endevco, 30700 Rancho Viejo Rd., San Juan Capistrano, CA 92675 714-493-8181
† Genisco Technlg. Corp., Transducers Prods. Div., 650 Easy St., Simi Valley, CA 93065 805-581-3985
§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511
† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 ..... 714-642-2400;800-854-4066
† Honeywell Inc., Aerospace & Defense Grp., Honeywell Plaza, Minneapolis, MN 55408 612-870-5186
§ Hottinger Baldwin Measurements, 139 Newbury St., Framingham, MA 01701 617-875-8282
† Humphrey, Inc., 9212 Balboa Ave., San Diego, CA 92123 619-565-6631
Kinemetrics, Inc., 222 Vista Ave., Pasadena, CA 91107 818-795-2220
† Kulite Semiconductor Prods., Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000
§ Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131
† PCB Piezotronics, 3425 Walden Ave., Depew, NY 14043-2495 716-684-0001
† Raymond Engrg. Inc., Raycorder Prods. Div., 217 Smith St., Middletown, CT 06457 203-632-1000
Sanders Assocs., Flexprint Prods. Div., Grenier Fld., Manchester, NH 03103 603-669-4615
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Spectral Dynamics, Scientific-Atlanta, Inc., 4255 Ruffin Rd., San Diego, CA 92123-0575 619-268-7100
Sensotec, Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Shure Bros., 222 Hartrey Ave., Evanston, IL 60204 312-866-2200
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
§ Spanta, Inc., Box 193, Franklin Lakes, NJ 07417 201-337-0044
† Sundstrand Data Control, Overlake Ind'l. Pk., Redmond, WA 98052 206-885-3711
§† Systron-Donner Inertial Div., 2700 Systron Dr., Concord, CA 94518 415-682-6161
Terra Technlg. Corp., 3860 148th Ave. N.E., Redmond, WA 98052 206-883-7300
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471 203-481-5721
Unholtz-Dickie Corp., 6 Brookside Dr., Wallingford, CT 06492 203-265-3929
§† Vibra-Metrics, 1014 Sherman Ave., Hamden, CT 06514 ..... 203-288-6158; 1-800-352-2001
† Vibration Instrs. Co., 1614 Orangethorpe Way, Anaheim, CA 92801 714-879-6085
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01822-5058 617-663-7600
Wilcoxon Resch., P.O. Box 5798, Bethesda, MD 20814 301-770-3790

Acoustic CM Equipment (MIL), Airborne-3475 — *See Vol. D*

Acoustic Systems (MIL)-3475 — *See Vol. D*

AC Power Protection Equipment — See Line Conditioners (Vol. D)

Actuators, Satellite Antennas-1900 — *See Vol. D*

Actuators, Servo, Linear-4900 — *See Vol. D*

Actuators, Servo, Rotary-4900 — *See Vol. D*

Adapters — See Connector Adapters (Vol. C), Plug Adapters (Vol. C), Socket Adapters (Vol. C), etc.

Adapters/Connectors, T.V. to Peripheral Equipment-2100 — *See Vol. C*

Adapters, Fiber Optic-2475

Photodyne, 1175 Tourmaline Dr., Newbury Park, CA 91320, 818-889-8770 ..... B•1123
General Fiber Optics, Inc., 98 Commerce Rd., Cedar Grove, NJ 07009 .. 201-239-3400
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
Incom, Inc., 205 Chapin St., P.O. Drawer G, Southbridge, MA 01550 617-765-9151

Adapters, Meter, Current Measurement-2900 — *See Vol. D*

Adapters, Modular Telephone-2100 — *See Vol. C*

Adapters, US to European Power-2100 — *See Vol. C*

Adapters, Wall Plug-in — See Power Supplies, Plug-in (Vol. D)

Adapters, Waveguide-3450 — ***See Vol. A***

Adapters, RF (MIL)-2440

Brady Co., 574A Somerset St., N. Plainfield, NJ 07060 201-753-7988
§ ITT Pomona Electronics, 1500 E. 9th St., P.O. Box 2767, Pomona, CA 91766 714-623-3463

Adhesives, Conducting-1600 — ***See Vol. C***

Adhesives, General Purpose-1600 — ***See Vol. C***

Adhesives, Insulating-1600 — ***See Vol. C***

Adhesives, Liquid Spray-1600 — ***See Vol. C***

Adhesives, Optical-1600 — ***See Vol. C***

Adhesives, UV Curing-1600 — ***See Vol. C***

Adhesives, Wire Tacking-1600 — ***See Vol. C***

Air Cleaners & Filters (Shielded & Unshielded)-2600 — ***See Vol. C***

Air Conditioners (For Equipment)-2600 — ***See Vol. C***

Alarms & Alarm Systems-2200 — ***See Vol. D***

Alarms, Controls, Photoelectric-3700

AES Corp., 285 Newbury St., P.O. Box 2093, Peabody, MA 01960 617-535-7310
† Alarm Controls, 19 Brandywine Dr., Deer Park, NY 11729 516-586-4220
Applied Control, 1275 Bloomfield Ave., Fairfield, NJ 07006-2828 201-227-5454
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092 201-233-7200
Cherry Semiconductor Corp, 2000 S. County Trail, East Greenwich, RI 02818 401-885-3600
† Electron-Machine Corp., Box M, Umatilla, FL 32784 904-669-3101
Enerco, Inc., 9615 W. Marginal Way S., Seattle, WA 98108 206-762-1422
§ Heath Co., Benton Harbor, MI 49022 616-982-3886
§ WALTER KIDDE, Div. of Kidde, Inc., Fire Sys. Operations, P.O. Box 1147, Wake Forest, NC 27587 919-556-6811
Lark Electronics, Inc., Box 390, New York, NY 10040 212-569-0430
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
§ Philmore Mfg., 40 Inip Dr., Inwood, NY 11696 516-239-6161
Photobell, 26 Just Rd., Fairfield, NJ 07006 201-227-3613
Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961
Star Micronics, Inc., Components Div., 70-D Ethel Rd. W., Piscataway, NJ 08854 201-572-9512
Tri-Tronics Co. Inc., 13420 Wright Cir., Tampa, FL 33624 813-855-4453

Alarms, Static — See Alarms & Alarm Systems

Alloys, Brazing-5400 — ***See Vol. C***

Alloys, Metal/Ceramic-1600 — ***See Vol. C***

Alphanumeric Readouts — See Tubes, Readout (Vol. A)

Alternators-4050 — ***See Vol. D***

Altimeters-2900 — ***See Vol. D***

Aluminizers, Vacuum — See Deposition Equip. (Vol. D), Evaporation Equipment, Electronic Beam (Vol. D)

Amplifiers, AF-1300 — ***See Vol. D***

Amplifiers, Antenna-1900 — ***See Vol. D***

Amplifiers, Compressor-1100 — ***See Vol. D***

Amplifiers, Current, AC-1100 — ***See Vol. D***

Amplifiers, DC-1100 — ***See Vol. D***

Amplifiers, Data — See Amplifiers, Instrumentation (Vol. D)

Amplifiers, Decade-1100 — ***See Vol. D***

Amplifiers, Deflection-Also See Yokes, Deflection, Oscilloscopes, etc.-1100 — ***See Vol. D***

Amplifiers, Differential-1100 — ***See Vol. D***

Amplifiers, Distribution-1100 — ***See Vol. D***

Amplifiers, Equalization-1300 — ***See Vol. D***

Amplifiers, Fiber Optic-1100 — ***See Vol. D***

Amplifiers, IF-1100 — ***See Vol. D***

Amplifiers, Instrumentation-1100 — ***See Vol. D***

Amplifiers, Integrating-Also See Amplifiers, Operational; Integrators, Electronic-1100 — ***See Vol. D***

Amplifiers, Isolation-1100 — ***See Vol. D***

Amplifiers, Klystron-3400 — ***See Vol. D***

Amplifiers, Limiting-1100 — ***See Vol. D***

Amplifiers, Line-1100 — ***See Vol. D***

Amplifiers, Lock-in-1100 — ***See Vol. D***

Amplifiers, Logarithmic-1100 — ***See Vol. D***

Amplifiers, Magnetic-1100 — ***See Vol. D***

Amplifiers, Master Antenna — See Amplifiers, Distribution (Vol. D)

Amplifiers, Microphone — See Amplifiers, AF (Vol. D)

Amplifiers, Microwave-3400 — ***See Vol. D***

Amplifiers, Mixing-1300 — ***See Vol. D***

Amplifiers, Multichannel-1100 — ***See Vol. D***

Amplifiers, Narrow Band-1100 — ***See Vol. D***

Amplifiers, Null-1100 — ***See Vol. D***

Amplifiers, Operational-1100 — ***See Vol. D***

Amplifiers, Parametric-3400 — ***See Vol. D***

Amplifiers, Peak Limiting-1100 — ***See Vol. D***

Amplifiers, Peak Sense & Hold-1100 — ***See Vol. D***

Amplifiers, Phase-Lock Loop-1100 — ***See Vol. D***

Amplifiers, Photocell — See Amplifiers, Transducer (Vol. D)

Amplifiers, Power-1100 — ***See Vol. D***

Amplifiers, Programmable Gain-1100 — ***See Vol. D***

Amplifiers, Public Address — See Amplifiers, AF (Vol. D)

Amplifiers, Pulse-1100 — ***See Vol. D***

Amplifiers, Pulse Limiting-1100 — ***See Vol. D***

Amplifiers, Recording — See Amplifiers, AF (Vol. D)

Amplifiers, Resolver — See Amplifiers, Servo (Vol. D)

Amplifiers, RF-1100 — ***See Vol. D***

Amplifiers, Sample & Hold-1100 — ***See Vol. D***

Amplifiers, Servo-4900 — ***See Vol. D***

Amplifiers, Single Sideband-1900 — ***See Vol. D***

Amplifiers, Strain Gauge — See Amplifiers, Transducer (Vol. D)

Amplifiers, Sweep-1100 — ***See Vol. D***

Amplifiers, Synchro-4900 — ***See Vol. D***

Amplifiers, Telemetering-1900 — ***See Vol. D***

Amplifiers, Thermocouple — See Amplifiers, Transducer (Vol. D)

Amplifiers, Track & Hold-1100 — ***See Vol. D***

Amplifiers, Transducer-Also See Signal Conditioners-1100 — ***See Vol. D***

Amplifiers, Travelling Wave Tube-1100 — ***See Vol. D***

Amplifiers, Ultrasonic-1100 — ***See Vol. D***

Amplifiers, Video-1100 — ***See Vol. D***

Amplifiers, Voltage Reference-1100 — ***See Vol. D***

Amplifiers, Wideband-1100 — ***See Vol. D***

Analyzers, AF-2900 — ***See Vol. D***

Analyzers, Air Pollution-2550 — ***See Vol. D***

Analyzers, Antenna Pattern-2900 — ***See Vol. D***

Analyzers, Dielectric Constant-2900 — *See Vol. D*

Analyzers, Differential — See Analyzers, Phase & Voltage (Vol. D)

Analyzers, Digital Signal-2900 — *See Vol. D*

Analyzers, Distortion — See Analyzers, AF (Vol. D)

Analyzers, Disturbance (Power, Volt, Humidity, Temperature)-2900 — *See Vol. D*

Analyzers, Frequency — See Analyzers, Spectrum (Vol. D)

Analyzers, Frequency Stability — See Meters, Frequency Deviation (Vol. D)

Analyzers, Harmonic-2900 — *See Vol. D*

Analyzers, Impedance-2900 — *See Vol. D*

Analyzers, Interference-2900 — *See Vol. D*

Analyzers, Intermodulation-2900 — *See Vol. D*

Analyzers, Logic-2900 — *See Vol. D*

Analyzers, Magnetic-2900 — *See Vol. D*

Analyzers, Microwave-3400 — *See Vol. D*

Analyzers, Modulation-2900 — *See Vol. D*

Analyzers, Network-2900 — *See Vol. D*

Analyzers, Noise-2900 — *See Vol. D*

Analyzers, Phase & Voltage-2900 — *See Vol. D*

Analyzers, Protocol-2900 — *See Vol. D*

Analyzers, Pulse-2900 — *See Vol. D*

Analyzers, Servo-4900 — *See Vol. D*

Analyzers, Signature-2900 — *See Vol. D*

Analyzers, Sonic & Subsonic-2900 — *See Vol. D*

Analyzers, Spectrum-2900 — *See Vol. D*

Analyzers, Transfer Function-2900 — *See Vol. D*

Analyzers, Transient-2900 — *See Vol. D*

Analyzers, Ultrasonic-2900 — *See Vol. D*

Analyzers, Vibration-2900 — *See Vol. D*

Analyzers, Video — See Analyzers, Spectrum (Vol. D)

Analyzers, Waveform-2900 — *See Vol. D*

Analyzers, Wow & Flutter-2900 — *See Vol. D*

Analyzers (MIL), Antenna Pattern-3475 — *See Vol. D*

Analyzers (MIL), Pulse-3475 — *See Vol. D*

Analyzers (MIL), Spectrum-3475 — *See Vol. D*

Anemometers-2900 — *See Vol. D*

Annunciators-2200 — *See Vol. D*

Antenna Dummy Loads — See Dummy Loads (Vol. D)

Antenna Feed Systems-3450 — *See Vol. A*

Antenna Groups (MIL)-3475 — *See Vol. D*

Antenna Groups (MIL), Elint-3475 — *See Vol. D*

Antenna Rotators-1900 — *See Vol. D*

Antenna Sets (MIL), DF-3475 — *See Vol. D*

Antenna Switching Matrices-1900 — *See Vol. D*

Antenna Towers-1900 — *See Vol. D*

Antennas, Airborne-1900 — *See Vol. D*

Antennas, Citizens Band — See Antennas, Whip & Accessories (Incl. Marine & Mobile Types) (Vol. D)

Antennas, Direction Finding-1900 — *See Vol. D*

Antennas, Ground Plane-1900 — *See Vol. D*

Antennas, Helical-1900 — *See Vol. D*

Antennas, Log Periodic-1900 — *See Vol. D*

Antennas, Loop-1900 — *See Vol. D*

Antennas, Microwave-1900 — *See Vol. D*

Antennas, Multiband, UHF/VHF-1900 — *See Vol. D*

Antennas, Phased Array-1900 — *See Vol. D*

Antennas, Rhombic-1900 — *See Vol. D*

Antennas, Satellite-1900 — *See Vol. D*

Antennas, Spiral-1900 — *See Vol. D*

Antennas, Telescopic-1900 — *See Vol. D*

Antennas, Whip & Accessories (Incl. Marine & Mobile Types-1900 — *See Vol. D*

Antennas (MIL)-2440

† Adams-Russell, Antenna & Microwave Div., Haverhill Rd., Amesbury, MA 01913 617-388-5210
American Elctrn. Labs., Inc., Antenna Div., P.O. Box 552, Lansdale, PA 19446
† Cincinnati Elctrns., 2630 Glendale Milford Rd., Cincinnati, OH 45241 513-733-6100
† Collins Avionics Divisions, Rockwell Intl., 400 Collins Rd. NE, Cedar Rapids, IA 52498 319-395-1000
† Electro-Magnetic Processes, Inc., 9616 Owensmouth Ave., Chatsworth, CA 91311 818-882-6333
§† Electro-Metrics, Penril Corp., 100 Church St., Amsterdam, NY 12010 518-843-2600
† Electrospace Sys., Inc., P. O. Box 831359, Richardson, TX 75083-1359 214-783-2004
† Hazeltine Corp., 500 Commack Rd., Commack, NY 11725 516-462-5100
† Microwave Applications Grp., 3030 Industrial Pkwy., Santa Maria, CA 93455 805-928-5711
† Nurad, Inc., 2165 Druid Pk. Dr., Baltimore, MD 21211 301-462-1700
† Radio Resch. Instr. Co., Inc., Two Lake Ave. Extension, Danbury, CT 06811-5295 203-792-6666
† Sabre Comms. Corp., 117 Main St, Soiux City, IA 51102 712-258-6690
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
† Tecom Inds., 9324 Topanga Canyon Blvd., Chatsworth, CA 91311 818-341-4010
† Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, CA 92120 .. 619-583-3525
† Transco Products, Inc., 4241 Glencoe Ave., Marina del Rey, CA 90295 .. 213-822-0800
† Watkins-Johnson Co., 3333 Hillview Ave., Palo Alto, CA 94304 415-493-4141

Antennas (MIL), DF-3475 — *See Vol. D*

Antennas (MIL), ECM-3475 — *See Vol. D*

Antennas (MIL), EW-3475 — *See Vol. D*

Antennas (MIL), Multibeam-3475 — *See Vol. D*

Antennas (MIL), Phased Array-3475 — *See Vol. D*

Antenna Systems (MIL)-3475 — *See Vol. D*

Antenna Systems (MIL), DF-3475 — *See Vol. D*

Antistatic Devices, Blowers, Guns, etc.-4100 — *See Vol. D*

Antistatic Packaging Materials — See Packaging Materials, Antistatic (Vol. C)

Antitheft Devices — See Alarms & Alarm Systems (Vol. D)

Armatures — See Motor & Generator Armatures, Rotors, Stators (Vol. B)

Arms & Manipulators, Robotic-4900 — *See Vol. D*

Array Processors-2025 — *See Vol. D*

Array Sockets — See Sockets, Array

Arresters, Electrical Surge — See Suppressors, Transient Voltage (Vol. B)

Arresters, Electrical Surge/Lightning (MIL)-2440

Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ..... B•1304,1306
MCG Elctrns., 12 Burt Dr., Deer Park, NY 11729, 516-586-5125 ..... B•1248
§ PolyPhaser Corporation, 1425 Industrial Way, P.O. Box 1237, Gardnerville, NV 89410-1237, 702-782-2511;800-325-7170 ..... B•1257
§ Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078 605-665-9301
Electrostatic Consltg. Assocs., 556 Lowell Rd., Groton, MA 01450 617-448-5485
§† General Semiconductor Ind., Inc., Square D Company, 2001 W. 10 Pl., Tempe, AZ 85281 602-968-3101
§ Lea Dynatech, Inc., 12516 Lakeland Rd., Santa Fe Springs, CA 90670-9990 213-944-0916
§† Noble U.S.A., Inc., 151 Stanley St., Elk Grove Village, IL 60007 312-364-6038
§† Power Integrity Corp., 1840 Pembroke Rd., P.O. Box 9682, Greensboro, NC 27408 919-379-9773

Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
§ RMS Electronics Inc, 50 Antin Pl, Bronx, NY 10462 212-892-6700

Artificial Loads — See Dummy Loads (Vol. D)

Assembly & Fabrication Services (Incl. R & D) — See Services, Assembly & Fabrication (Vol. D)

Attenuators, Audio-1300 — *See Vol. D*

Attenuators, Audio (T, L, LL Pads)-4750 — *See Vol. A*

Attenuators, Coaxial-3450 — *See Vol. A*

Attenuators, Decade-3450 — *See Vol. A*

Attenuators, Fiber Optic-2475
Photodyne, 1175 Tourmaline Dr., Newbury Park, CA 91320, 818-889-8770 ..... B•1122
AT&T, 1 Oak Way, Berkeley Heights, NJ 07922 1-800-372-2447
Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
General Fiber Optics, Inc., 98 Commerce Rd., Cedar Grove, NJ 07009 .. 201-239-3400
Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

Attenuators, Fixed-3450 — *See Vol. A*

Attenuators, IF-1900 — *See Vol. D*

Attenuators, Impedance Matching-3450 — *See Vol. A*

Attenuators, Logarithmic-3450 — *See Vol. A*

Attenuators, Microwave-3450 — *See Vol. A*

Attenuators, Programmable-3450 — *See Vol. A*

Attenuators, RF-1900 — *See Vol. D*

Attenuators, Step-3450 — *See Vol. A*

Attenuators, Switch Operated-3450 — *See Vol. A*

Attenuators, Switchable-3450 — *See Vol. A*

Attenuators, Turret-3450 — *See Vol. A*

Attenuators, Variable-3450 — *See Vol. A*

Attenuators, Voltage Controlled-3450 — *See Vol. A*

Attenuators (MIL)-2440
Arra Inc., 15 Harold Ct., Bay Shore, NY 11706, 516-231-8400 ..... A•1705
† Daico Inds., Inc., Box 5225, Compton, CA 90224, 213-631-1143 ..... A•1708
† Elcom Systems, Inc., 932 Clint Moore Rd., Boca Raton, FL 33431, 305-994-1774 ..... A•1711
† General Microwave Corp., 155 Marine St., Farmingdale, NY 11735, 516-694-3600 ..... A•1712
Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1574
† Alan Inds., P.O. Box 1203, Columbus, IN 47201 812-372-8869
§† Allen-Bradley Co., Electronics Group, Rockwell Corporation, 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
Allen-Bradley Co., Electronics Group, Div. of Rockwell Corp., Resistive Products Div., 1414 Allen-Bradley Dr., El Paso, TX 79935 915-592-4888
Alpha Inds., Inc., Microwave Comp. Div., 90 Glenn St., Lawrence, MA 01843 617-681-8520
† Engelmann Microwave Co., KDI Pyrofilm, 60 S. Jefferson Rd., Whippany, NJ 07981 201-887-5700
§† JFW Inds., Inc., 2719 E. Troy Ave., Indianapolis, IN 46203 317-783-9875
† KDI Electronics, Inc., Engelmann & Pyrofilm Divisions, 60 S. Jefferson Rd., Whippany, NJ 07981 201-887-8100
§† M/A-COM Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054 603-424-4111
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650 201-944-2221
Weinschel Engrg., One Weinschel La., Gaithersburg, MD 20877 ..... 301-948-3434; 800-638-2048

Attenuators (MIL), Inductive-2440
§† JFW Inds., Inc., 2719 E. Troy Ave., Indianapolis, IN 46203 317-783-9875

Audible Alarms & Transducers-Also see Piezoelectric Ceramics; Transducers, Audio-1300 — *See Vol. D*

Audio Equipment — See Amplifiers (Vol. D), Microphones (Vol. D), Speakers (Vol. D), etc.

Autoclaves-2550 — *See Vol. D*

Awls-5400 — *See Vol. C*

Backpanel Interconnect Systems-3200 — *See Vol. C*

Backplane Wiring Services — See Services, Backplane Wiring (Vol. D)

Baffles, Speaker-1300 — *See Vol. D*

Ballasts — See Resistors, Ballast (Vol. A)

Baluns — See Transformers, Matching (Vol. A)

Barrier Blocks & Strips — See Terminal Blocks (Vol. C), Terminal Strips (Vol. C)

Bargraphs — See Meters, Bargraph (Vol. D)

Bars, Shorting-3200 — *See Vol. C*

Baths, Controlled Temperature (Air & Liquid)-4100 — *See Vol. D*

Baths, Ultrasonic — See Cleaners, Ultrasonic (Vol. D)

Batteries, Alkaline Manganese-3900 — *See Vol. D*

Batteries, Carbon Zinc-3900 — *See Vol. D*

Batteries, Gelled Electrolyte-3900 — *See Vol. D*

Batteries, Lead Acid-3900 — *See Vol. D*

Batteries, Lead Dioxide-3900 — *See Vol. D*

Batteries, Lithium-3900 — *See Vol. D*

Batteries, Lithium Manganese Dioxide-3900 — *See Vol. D*

Batteries, Lithium Thionyl Chloride-3900 — *See Vol. D*

Batteries, Mercury-3900 — *See Vol. D*

Batteries, Mercury Oxide-3900 — *See Vol. D*

Batteries, Nickel Cadmium-3900 — *See Vol. D*

Batteries, Rechargeable-3900 — *See Vol. D*

Batteries, Silver Cadmium-3900 — *See Vol. D*

Batteries, Silver Oxide-3900 — *See Vol. D*

Batteries, Silver Zinc-3900 — *See Vol. D*

Batteries, Solar — See Cells, Photovoltaic (Vol. B)

Batteries, Standard Cell-3900 — *See Vol. D*

Batteries, Thermal-3900 — *See Vol. D*

Batteries, Zinc Air-3900 — *See Vol. D*

Batteries, Zinc Carbon-3900 — *See Vol. D*

Batteries, Zinc Chloride-3900 — *See Vol. D*

Batteries (MIL)-2440
Yardney Battery Div., Yardney Corp., 82 Mechanic St., Pawcatuck, CT 02891, 203-599-1100 ..... D•1443
† EDMAN Corp., Subsidiary of Rospatch, 7500 Main St., P.O. Box 750, Fishers, NY 14453-0750 716-924-4000
† General Electric Co., 333 W. Seymour Ave., Cincinnati, OH 45216 513-948-5050

Battery Chargers — See Chargers, Battery (Vol. D), Power Supplies, Plug-in (Vol. D)

Battery Holders — See Connectors, Battery (Vol. C), Retainers, Battery (Vol. C)

Battery Plugs — See Connectors, Battery (Vol. C)

Bearings-2500 — *See Vol. C*

Beepers — See Bells, Buzzers, Gongs, Sirens & Aural Warning Devices (Vol. D)

Bells, Buzzers, Gongs, Sirens & Aural Warning Devices-2200 — *See Vol. D*

Belts, Dial Drive — See Cords & Cable, Dial Drive (Vol. C)

Belts, Drive-2500 — *See Vol. C*

Benches, Consoles, Tables (Work Stations, Lab & Shop)-Also See Enclosures, Equipment and Panel Mounting-1400 — *See Vol. C*

Bends & Twists, Microwave-3450 — *See Vol. A*

Bezels, Shielded & Unshielded-2400 — *See Vol. C*

Bimetals, Thermostatic-5300
Alpha-Tek, 7286 Murdy Circle, Huntington Beach, CA 92647 714-847-7515

American Etching & Mfg., 13730 Desmond St., Pacoima, CA 91331 213-896-1187
Inter-Technical Grp., Box 23, Irvington, NY 10533 914-591-8822
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800

Bins, Part Storage-3900 — *See Vol. C*

Blackbody Radiation Sources-2900 — *See Vol. D*

Blowers, Centrifugal-2600 — *See Vol. C*

Blowers, Scroll (Squirrel Cage)-2600 — *See Vol. C*

Blowers, Tangential-2600 — *See Vol. C*

Board Computers & Subassemblies, Multibus Compatible-2025 — *See Vol. D*

Board Computers & Subassemblies, PC Bus Compatible-2025 — *See Vol. D*

Board Computers & Subassemblies, Q Bus/Unibus Compatible-2025 — *See Vol. D*

Board Computers & Subassemblies, S100 Bus Compatible-2025 — *See Vol. D*

Board Computers & Subassemblies, STD Bus Compatible-2025 — *See Vol. D*

Board Computers & Subassemblies, VME Bus Compatible-2025 — *See Vol. D*

Boards, Circuit, Clad-1700 — *See Vol. C*

Boards, Circuit, Unclad-1700 — *See Vol. C*

Boards, Display, Graphic-2450

Amtek Digital Systems, Inc., 12740 28th N.E., Seattle, WA 98125 206-363-0217
§† Analog Technology Corp., 15859 E. Edna Pl., Irwindale, CA 91706 213-960-4004
Applied Micro Technlg., A Burr Brown Co., 3669 E. 44th Street, Tucson, AZ 85713 602-622-8605
Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54703 715-834-9595
Aydin Corp., 700 Dresher Rd., Horsham, PA 19044 215-657-7510
§ California Computer Systems, 740 S. Milpitas Blvd., Milpitas, CA 95035 408-945-0500
Colorgraphic Communications Corp., 2379 John Glenn Dr. Ste. 105, P.O. Box 80448, Atlanta, GA 30366 404-455-3921
Control Systems, 2855 Anthony Lane, Minneapolis, MN 55418 612-789-2421
§ Cromemco, 280 Bernardo Ave., Mountain View, CA 94043 415-964-7400
Digital Equip., One Iron Way, Marlborough, MA 01752
Dymec, 8 Lowell Ave., Winchester, MA 01890 617-729-7870
† Eastern Elctrns. Mfg. Corp., 180 Roberts St., East Hartford, CT 06108 ... 203-528-9821
G B Instruments Inc., 2030 Coolidge St., Hollywood, FL 33020 305-920-0225
General Digital Corp., 700 Burnside Ave., E. Hartford, CT 06108 203-528-9041
GraphTec Services, Inc., 1600 N.W. Madrid Way, Boca Raton, FL 33432 305-392-3373
Heurikon Corporation, 3201 Latham Dr., Madison, WI 53713 ..... 800-356-9602; 608-271-8700
IDE Associates, Inc., 35 Dunham Rd., Billerica, MA 01821 617-663-6878
KMC Systems, Inc., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432 201-447-0007
Kole Ind., 3553 N.W. 50th St., Miami, FL 33102-0152 ..... 305-633-2556; 800-327-6085
K-Systems, Inc., 3902 Lilac, Las Cruces, NM 88005 505-526-3209
Matrox Elctrn. Sys., 1055 St. Regis Blvd., Dorval, QU, CANADA H9P 2T4 514-685-2630
† Methods Research, 54D Asbury Ave., Farmingdale, NJ 07727 201-938-6000
§ Quam Corporation, 900 W. 128th St. Ste 208, Burnsville, MN 55337 612-894-2360
Raster Graphics, Inc., P. O. Box 5157, Bend, OR 97701 503-388-2584
Tegam, 7230 N. Ridge Rd., Madison, OH 44057 216-428-7505
TL Industries, Inc., 2541 Tracy Road, Toledo, OH 43619 1-419-666-8144
§ Trilog, 17391 Murphy Ave., Irvine, CA 92714 714-549-4079
§ Videx Inc., 1105 NW Circle Blvd., Corvallis, OR 97330 503-758-0521
Xycom, 750 N. Maple Rd., Saline, MI 48176 313-429-4971

Boards, Integrated Circuit — See Boards, Plug-in (Vol. C)

Boards, Plug-in-3200 — *See Vol. C*

Boards, Plug-in, Extender-3200 — *See Vol. C*

Boards, Plug-in, Interface-3200 — *See Vol. C*

Boards, Plug-in, Memory-3200 — *See Vol. C*

Boards, Plug-in Processor-1900 — *See Vol. C*

Boards, Plug-in, Prototype-4200 — *See Vol. C*

Boards, Prewired, High Density-3200 — *See Vol. C*

Boards, Printed Circuit — See Circuits, Printed, Rigid (Vol. C)

Boards, Programming-3200 — *See Vol. C*

Bobbins, Winding, Coil & Transformer-Also See Coil Assemblies & Forms-2500 — *See Vol. C*

Bolometers, Infrared-2900 — *See Vol. D*

Bolometers, Microwave-2900 — *See Vol. D*

Bolts-2825 — *See Vol. C*

Books — See Technical Books (Vol. D)

Boosters, Low Line Voltage, Automatic — See Regulators & Stabilizers, Voltage (Vol. D)

Boxes, Decade — See Decade Boxes (Vol. D)

Boxes, Junction, Outlets & Wall Plates-1400 — *See Vol. C*

Boxes, Metal & Plastic — See Enclosures (Various types) (Vol. C)

Boxes, Power Outlet — See Boxes, Junction, Outlets & Wall Plates (Vol. C)

Boxes, Shipping (Reusable) — See Enclosures, Shipping (Vol. C)

Brackets, Antenna — See Mounts, Antenna (Vol. D)

Braid, Cable-Also See Wire Shielding-6000 — *See Vol. C*

Brakes, Magnetic-3500

† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1011,1196,1197
Ambi-Tech Inds., 319 Knickerbocker Ave., Hillsdale, NJ 07642 201-666-0504
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
† Dial Prods. Co., 19-21 Cottage St., Bayonne, NJ 07002 ..... 201-HE7-0720
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§† Facet Enterprises, Inc., Elmira, NY 14903 607-737-8011
General Electro-Mechanical Corp., 785 Hertel Ave., Buffalo, NY 14207 .. 716-876-9685
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
† Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 ... 813-822-2529
† Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
† Perfect Gear & Instr., 2101 Jericho Tpk., New Hyde Park, NY 11040 516-328-3300
† PIC Design, P.O. Box 1004, Middlebury, CT 06762 203-758-8272
Regdon Corp., 3713 Grand Blvd., Brookfield, IL 60513 312-485-5152
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
† SR Engineering, Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Sterling Instr., Div. Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 516-328-3300

Brakes, Mechanical-3500

§† Facet Enterprises, Inc., Elmira, NY 14903 607-737-8011
General Electro-Mechanical Corp., 785 Hertel Ave., Buffalo, NY 14207 .. 716-876-9685
Jan Hardware Mfg. Co., 47-27 36th St., Long Island City, NY 11101 212-361-0800
§† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
PIC Design, P.O. Box 1004, Middlebury, CT 06762 203-758-8272
Sterling Instr., Div. Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 516-328-3300
† Stock Drive Prods., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 ..... 516-328-0200; 328-3300
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100

Breadboard Assemblies-4200 — *See Vol. C*

Breadboards & Breadboard Kits — See Kits, Breadboarding (Vol. C)

Bridge Rectifiers, Silicon-Also See Rectifiers, Bridges & Assemblies-4800 — *See Vol. A*

Bridges, Admittance-2900 — *See Vol. D*

Bridges, Antenna — See Bridges, RF (Vol. D)

Bridges, Audio-2900 — *See Vol. D*

Bridges, Calorimeter-2900 — *See Vol. D*

Bridges, Capacitance-2900 — *See Vol. D*

Bridges, Deviation-2900 — *See Vol. D*

Bridges, Dissipation Factor-2900 — *See Vol. D*

Bridges, Impedance-2900 — *See Vol. D*

Bridges, Inductance-2900 — *See Vol. D*

Bridges, Kelvin-2900 — *See Vol. D*

Bridges, LCR-2900 — *See Vol. D*

Bridges, Limit — See Bridges (Specific Types) (Vol. D)

Bridges, Megohm — See Bridges, Resistance (Vol. D)

Bridges, Power, RF-2900 — ***See Vol. D***

Bridges, Programmable — See Bridges (Specific Types) (Vol. D)

Bridges, Q-2900 — ***See Vol. D***

Bridges, Ratio — See Meters, Ratio (Vol. D)

Bridges, Resistance-2900 — ***See Vol. D***

Bridges, RF-2900 — ***See Vol. D***

Bridges, Silicon Cell-4800 — ***See Vol. A***

Bridges, Strain Gauge-2900 — ***See Vol. D***

Bridges, Synchro & Resolver-2900 — ***See Vol. D***

Bridges, Telephone/Data-1900 — ***See Vol. D***

Bridges, Temperature-2900 — ***See Vol. D***

Bridges, Wheatstone-2900 — ***See Vol. D***

Brushes & Brush Assemblies-3500

† **Fabricast, 2517 Seaman Ave., P.O. Box 3176, S. El Monte, CA 91733, 818-443-3247** ..... **B•1155**
† **Graphite Metallizing Corp., 1036 Nepperhan Ave., P.O. Box 110, Yonkers, NY 10702, 914-968-8400** ..... **B•1160**
† Maurey Instr. Corp., 4555 W. 60th St., Chicago, IL 60629, 312-581-4555 .. B•1170
§ Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002 201-436-2230
Carbone Lorraine Inds., 400 Myrtle Ave., Boonton, NJ 07005 ..... 201-DE4-0700
Carbone USA Corp., Carbone Lorraine Inds. Corp., 402 Myrtle Ave., Boonton, NJ 07005 201-334-0700
§ Chapman Corp., P.O. Box 10700, Portland, ME 04104 207-773-4726
† Danmar Inds., 9705 Lurline Ave., Chatsworth, CA 91311 ..... 818-882-7979/5280
† Engelhard Corp., 70 Wood Ave. S., Iselin, NJ 08830 201-321-5900
§† Eraser Co., Box 4961, Syracuse, NY 13221 315-454-3237
§† Facet Enterprises, Inc., Elmira, NY 14903 607-737-8011
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
ITT Thermotech, Div. IT & T, 1203 S. 5th St., Hopkins, MN 55343 612-933-9400
Jonard Industries Corp., 134 Marbledale Rd., Tuckahoe, NY 10707 914-793-0700
Litton Potentiometer Div., 750 So. Fulton Ave., Mt. Vernon, NY 10551 ... 914-664-7733
† Micro-Products Engrg. Co., 230 Ridgewood Ave., Newark, NJ 07108 201-824-8467
† Poly-Scientific, Litton Inds., 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
Stackpole, Carbon Div., 201 Stackpole St., St. Marys, PA 15857 814-781-1234
§† Superior Carbon Prods., Inc., 9115 George Ave., Cleveland, OH 44105 .. 216-883-4880
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 215-825-4990
† Unit Inds., 1140 E. Valencia Dr., Fullerton, CA 92631 714-871-4161

Buffers, Data — See Spoolers, Printer Buffers (Vol. D)

Bulbs — See Lamps, Miniature & Subminiature (Vol. B)

Bumpers-2825 — ***See Vol. C***

Burnishers, Contact-5400 — ***See Vol. C***

Bus Bars & Systems-3200 — ***See Vol. C***

Bus Compatible Instruments — See Instruments, Test and Measuring, GPIB Compatible (Vol. D)

Bushings, Glass, Plastic, Metal, Rubber, etc.-2500 — ***See Vol. C***

Busses, Multibus, Q Bus, S100 Bus, STD Bus — See Board Computers & Subassemblies (Vol. D)

Buzzers, Electronic — See Bells, Buzzers, Gongs, Sirens & Aural Warning Devices (Vol. D)

Cabinets, Plastic — See Enclosures, Nonmetallic (Vol. C)

Cabinets & Accessories, Metal — See Enclosures, Equipment & Panel Mounting (Vol. C)

Cable, Audio-6000 — ***See Vol. C***

Cable, Battery Booster-6000 — ***See Vol. C***

Cable, Coaxial-6000 — ***See Vol. C***

Cable, Communication-6000 — ***See Vol. C***

Cable, Computer-6000 — ***See Vol. C***

Cable, Data Transmission-6000 — ***See Vol. C***

Cable, Dial — See Cords & Cable, Dial Drive (Vol. C)

Cable, FEP Insulated-6000 — ***See Vol. C***

Cable, Fiber Optic-2475

§ **Math Assocs., 2200 Shames Dr., Westbury, NY 11590, 516-334-6800** .... **B•1124**
† **MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496** ..... **B•1121**
Rehlander Assocs., 118A Bridge St., Beverly, MA 01915, 617-922-5961 .. **B•1213**
AT&T, 1 Oak Way, Berkeley Heights, NJ 07922 1-800-372-2447
§ Augat Fiberoptics, 710 Narragansett Park Dr., Pawtucket, RI 02861 401-724-4400
§ Banner Engrg. Corp., 9714 - 10th Ave. N., Minneapolis, MN 55441 612-544-3164
§ BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420
§† Belden, Electronic Wire & Cable, P.O. Box 1980, Richmond, IN 47375 ... 317-983-5200
Belden, Fiber Optics, 2000 S. Batavia Ave., Geneva, IL 60134 312-232-8900
Berk Tek, Inc., Box 60, RD 1, Reading, PA 19607 215-376-8071
§† BIW Cable Sys., Inc., 65 Bay St., Dorchester, MA 02125 617-265-2102
BLACK BOX Corp., Micom Sys., P.O. Box 12800, Pittsburgh, PA 15241 .. 412-746-5500
§ Brand-Rex, Electronic & Indl. Cable Div., Box 498, Willimantic, CT 06226 203-456-8000
Breeze-Illinois, TransTechnology Corp., 401 S. Main Street, P.O. Box 368, Wyoming, IL 61491 309-695-2511
Cablex, Inc., 14 Inverness Dr. E. H-136, Englewood, CO 80112 303-792-5760
§ Clifford, Inc., 83 Main Street, Bethel, VT 05032 800-451-4381
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
§ Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
Computer Systems Products, 740 Washington Ave N, Minneapolis, MN 55401 ..... 612-338-0995;800-422-2537
Dolan-Jenner Inds., Box 1020, Woburn, MA 01801 617-935-7444
† Electro Weave, 425 Shrewsbury St., Worcester, MA 01604 617-752-8932
EOTec Corp., 420 Frontage Road, W. Haven, CT 06516 203-934-7961
EOTec Corporation, Fiber Optic Interconnect Group, 420 Frontage Road, West Haven, CT 06516 203-934-7961
Fiberguide Industries Inc., 33 Poplar Dr., Stirling, NJ 07980 201-647-6601
Fiberoptics Technlg., Inc., Quassett Rd., Pomfret, CT 06258 203-928-0443
† Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
Galileo Electro-Optics Corp., Galileo Pk., Sturbridge, MA 01518 617-347-9191
† Galite, 2 Tower Dr., Wallingford, CT 06492 203-265-7126
Gandalf Data, Inc., 1019 S. Noel Ave., Wheeling, IL 60090 312-541-6060
§† General Cable Co., Fiber Optics Div., 160 Fieldcrest Ave., Raritan Ctr., Edison, NJ 08818 201-225-4780
General Fiber Optics, Inc., 98 Commerce Rd., Cedar Grove, NJ 07009 .. 201-239-3400
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Incom, Inc., 205 Chapin St., P.O. Drawer G, Southbridge, MA 01550 617-765-9151
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
Malco, Div. Microdot Electronic Components Group, 12 Progress Dr., Montgomeryville, PA 18936 215-699-5373
Manage, Inc., Fibre Optics Elctrns. Sys. Grp., P.O. Box 175, 40 Nichols Rd., Chicopee, MA 01014 ..... 413-598-8204;592-3834
Micro-Coax Components, Inc., a UTI Company, Box E, Collegeville, PA 19426 215-489-3700
§ Olympic Wire & Cable, 1 Madison Rd., Fairfield, NJ 07006 201-227-7996
† Optelecom, 15940 Luanne Dr., Gaithersburg, MD 20877 301-840-2121
Phalo Corp., Transitron Elctrn. Corp., 2 Friberg Parkway, Westborough, MA 01581 617-366-0830
Philadelphia Insulated Wire Co. Inc., 333 New Albany Rd., Moorestown, NJ 08057 609-235-6700
Pirelli Cable Corp., Special Cable Div., P.O. Box 50, Wallingford, CT 06492 ..... 203-265-5533;800-243-3959
Plainview Elctrns., 28 Cain Dr., Plainview, NY 11803 516-249-6677
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
§† Remee Prods. Corp., 41 Bridge St., Florida, NY 10921 914-651-4431
Siecor Corp., Box 489, Hickory, NC 28603 704-328-2171
§ SpecTran Corp., 50 Hall Road, Sturbridge, MA 01566 617-347-2261
Storm Products Co., 116 Shore Drive, Hinsdale, IL 60521 312-323-9121
Textro, P.O. Box 381, Greer, SC 29652 803-879-0752
† United Wire & Cable, 425 Shrewsbury St., Worcester, MA 01604 617-757-3872
§† Whitmor Wire & Cable, 13161 Sherman Way, Bldg. B, N. Hollywood, CA 91605 818-764-6296

Cable, Flame Retardant-6000 — ***See Vol. C***

Cable, Flat-6000 — ***See Vol. C***

Cable, Heater-6000 — ***See Vol. C***

Cable, High Temperature (Over 125°C)-6000 — ***See Vol. C***

Cable, High Voltage (1,000 Volts & Over)-6000 — ***See Vol. C***

Cable, Instrumentation & Control-6000 — ***See Vol. C***

Cable, Intercommunication & Sound System — See Cable, Audio (Vol. C)

Cable, Irradiated-6000 — ***See Vol. C***

Cable, Low Capacitance-6000 — ***See Vol. C***

Cable, Microphone-6000 — ***See Vol. C***

Cable, Multiconductor-6000 — ***See Vol. C***

Cable, Plenum-6000 — ***See Vol. C***

Cable, Power-6000 — *See Vol. C*

Cable, Retractile — See Cords, Retractile (Vol. C)

Cable, Ribbon — See Cable, Flat (Vol. C)

Cable, Rotator Antenna — See Cable, Multiconductor (Vol. C)

Cable, Satellite-6000 — *See Vol. C*

Cable, Security-6000 — *See Vol. C*

Cable, Shielded-6000 — *See Vol. C*

Cable, Speaker-6000 — *See Vol. C*

Cable, Telephone-6000 — *See Vol. C*

Cable, TFE Insulated-6000 — *See Vol. C*

Cable, Thermocouple-6000 — *See Vol. C*

Cable, Transmission Line, Power-6000 — *See Vol. C*

Transmission Line, Data — See Cable, Data Transmission

Cable, Triaxial-6000 — *See Vol. C*

Cable, TV (Incl. Camera)-6000 — *See Vol. C*

Cable, Twisted Pair-6000 — *See Vol. C*

Cable, Woven Conductor-6000 — *See Vol. C*

Cable & Assemblies (MIL)-2440

Belden, Electronic Wire & Cable, P.O. Box 1980, Richmond, IN 47375, 317-983-5200 ..... C•1776
Breeze-Illinois, TransTechnology Corp., 401 S. Main Street, P.O. Box 368, Wyoming, IL 61491, 309-695-2511 ..... C•1790
§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644, 201-796-2886 ..... C•1793-1794,1796,1797
Concord Elctrns., 30 Great Jones St., Dept. JE, New York, NY 10012, 212-777-6571 ..... C•1175
§† Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648, 201-768-5400 ..... C•1832,1834
Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018, 312-696-1000 ..... C•1839
† GSI Corp., 1917 Greenspring Dr., Timonium, MD 21093, 301-252-1768 ... C•1840
† Jettron Prods., P.O. Box 337, E. Hanover, NJ 07936, 201-887-0571 ..... C•1409
§† Judd Wire, High Voltage Engrg., 57 Turnpike Rd., Turners Falls, MA 01376, 413-863-4357 ..... C•1842
Judd Wire, High Voltage Engrg., 870 Los Vallecitos Blvd., San Marcos, CA 92069, 619-744-7720 ..... C•1842
§† Malco, Div. Microdot Electronic Components Group, 12 Progress Dr., Montgomeryville, PA 18936, 215-699-5373 ..... C•1446,1449
Markel Corp., P.O. Box 752, Norristown, PA 19404, 215-272-8960 ..... C•1689
† National Electric Cable, 16566 S.W. 72nd Ave., Portland, OR 97224, 503-620-9400 ..... C•1866
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, CA 90031-1780, 213-225-5611 ..... C•1871
Rowe Industries, Inc., 6225 Benore Rd., P.O. Box 6877, Toledo, OH 43612, 419-729-9761 ..... C•1504
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911 ..... C•1905
† Textro, P.O. Box 381, Greer, SC 29652, 803-879-0752 ..... C•1908
† Accurate Elctrns., 169 S. Abbe Rd., P.O. Box 1287, Elyria, OH 44036 216-365-1211
Adirondack Wire & Cable Co., Inc., 1451 New Britain Ave., Farmington, CT 06032 1-203-677-2657
Advanced Techn. Research Labs., 5645 K General Washington Dr., Alexandria, VA 22312 703-750-2920
† Arco Cable, 7361 Ethel Ave., North Hollywood, CA 91605 818-982-2832
Atlantic Research, 5390 Cherokee Ave., Alexandria, VA 22312 703-642-4000
§† Aura Mfg., 50 McDermott Rd., North Haven, CT 06473 203-777-2541
Burton Electrical Engineering, Wyle Laboratories, 111 Maryland Street, P.O. Box 217, El Segundo, CA 90245-0217 213-772-1406
† Cable Systems, Inc., 210 Broadway, Everett, MA 02149 617-389-7080
§† Cablex, Inc., 14 Inverness Dr. E. H-136, Englewood, CO 80112 303-792-5760
† Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
† Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
Computer Systems Products, 740 Washington Ave N, Minneapolis, MN 55401 ..... 612-338-0995;800-422-2537
Consolidated Electronic Wire & Cable, 11044 King St., Franklin Park, IL 60131 312-455-8830
Cooner Wire Co., 9186 Independence Ave., Chatsworth, CA 91311 818-882-8311
† Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
† Excel Specialty Corp., 6335 N. Broadway, Chicago, IL 60660 312-262-4781
† Flexco Microwave, Inc., P.O. Box 174, Karrville Rd., Port Murray, NJ 07865 201-689-3020
† Gavitt Wire & Cable, Brookfield, MA 01506 617-867-6476
† W. L. Gore & Assocs., Inc., 1505 N. Fourth St, P.O. Box 1389, Flagstaff, AZ 86002 602-526-1290
† W. L. Gore & Assocs., 555 Paper Mill Rd., Newark, DE 19714 302-738-4880
† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
† Hollex, Inc., 81 W. Wyoming Ave., Melrose, MA 02176 617-665-2413
§ ITT Pomona Electronics, 1500 E. 9th St., P.O. Box 2767, Pomona, CA 91766 714-623-3463
† Lamtech Electronics, 620 Easy Street, Garland, TX 75042 214-272-3504
† Lance Wire & Cable, Inc., 1010 Sherman Ave., Hamden, CT 06514 203-288-5571
† Lynn Elctrns., 915 Pennsylvania Blvd., Feasterville, PA 19047 215-677-6700
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
National Telephone & Elctrns. Inc., 2350 N.W. 96 Avenue, Miami, FL 33172 305-592-0551
† Olympic Wire & Cable, 1 Madison Rd., Fairfield, NJ 07006 201-227-7996
† Parlex Corp., 145 Milk St., Methuen, MA 01844 ..... 617-685-4341, ext. 325
§† Precision Tube, Church Rd. & Wissahickon, N. Wales, PA 19454 215-699-5801
† Reactel, Inc., 687-D Lofstrand La., Rockville, MD 20850 301-279-5535
Sealectro, 225 Hoyt St, Mamaroneck, NY 10543 914-698-5600
† Spectra-Strip Operations, Ampheral Prods., 7100 Lampson Ave., Garden Grove, CA 92642-0415 714-892-3361
Storm Products Co., 116 Shore Drive, Hinsdale, IL 60521 312-323-9121
§ Support Systems Intl. Corp., 150 South Second St., Richmond, CA 94804 415-234-9090
§ Symbex Corp., 72 Corwin Dr., Box 938, Painesville, OH 44077 216-354-0925
† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020
† Victor Elec. Wire & Cable, 618 Main St., W. Warwick, RI 02893 ....401-821-1700;SALES 401-821-7800
V.I.P. Inds., Inc., 246 Knickerbocker Ave., Paterson, NJ 07503 201-345-5800
† Western Reserve Elctrns., 2150 Highland Rd., Twinsburg, OH 44087 216-425-4951
Whitmor Wire & Cable, 13161 Sherman Way, Bldg. B, N. Hollywood, CA 91605 818-764-6296
§† Wilco Wire & Cable Co., Inc., 1921 Las Plumas Ave., San Jose, CA 95133 408-926-8880
† Zippertubing Co., P.O. Box 61129, Los Angeles, CA 90061 213-321-3901

Cable & Connectors, Satellite Antennas-1900 — *See Vol. D*

Cable Assemblies & Harnesses-6000 — *See Vol. C*

Cable Assemblies, Microwave-6000 — *See Vol. C*

Cable Fault Locators-2900 — *See Vol. D*

Cable (MIL), Flat-2440

† Advanced Circuit Technlg., 118 N. Eastern Blvd., Nashua, NH 03062 603-880-6000
Alpha Wire Corp., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207 201-925-8000
§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644 201-796-2886
§† Cablex, Inc., 14 Inverness Dr. E. H-136, Englewood, CO 80112 303-792-5760
§† Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018 312-696-1000
† W. L. Gore & Assocs., Inc., 1505 N. Fourth St., P.O. Box 1389, Flagstaff, AZ 86002 602-526-1290
† W. L. Gore & Assocs., 555 Paper Mill Rd., Newark, DE 19714 302-738-4880
† GSI Corp., 1917 Greenspring Dr., Timonium, MD 21093 301-252-1768
§† King Wire & Cable Corp., 179-45 110 Ave., Jamaica, NY 11433 .....212-657-4422; 800-221-0144
† National Electric Cable, 16566 S.W. 72nd Ave., Portland, OR 97224 503-620-9400
Phalo Corp., Transitron Elctrn. Corp., 2 Friberg Parkway, Westborough, MA 01581 617-366-0830
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
§† Spectra-Strip Operations, Ampheral Prods., 7100 Lampson Ave., Garden Grove, CA 92642-0415 714-892-3361
§ Support Systems Intl. Corp., 150 South Second St., Richmond, CA 94804 415-234-9090
Symbex Corp., 72 Corwin Dr., Box 938, Painesville, OH 44077 216-354-0925
§† Textro, P.O. Box 381, Greer, SC 29652 803-879-0752
§ Wilco Wire & Cable Co., Inc., 1921 Las Plumas Ave., San Jose, CA 95133 408-926-8880

Cable (MIL), RF-2440

§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644, 201-796-2886 ..... C•1796
Malco, Div. Microdot Electronic Components Group, 12 Progress Dr., Montgomeryville, PA 18936, 215-699-5373 ..... C•1446,1449
Brady Co., 574A Somerset St., N. Plainfield, NJ 07060 201-753-7988
Carol Cable Co., Inc., Columbia Elctrn. Cables Div., 249 Roosevelt Ave., Pawtucket, RI 02862 401-724-9605
§† Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018 312-696-1000
† Flexco Microwave, Inc., P.O. Box 174, Karrville Rd., Port Murray, NJ 07865 201-689-3020
† W. L. Gore & Assocs., Inc., 1505 N. Fourth St., P.O. Box 1389, Flagstaff, AZ 86002 602-526-1290
† W. L. Gore & Assocs., 555 Paper Mill Rd., Newark, DE 19714 302-738-4880
† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
§† ITT Surprenant Division, 172 Sterling St., Clinton, MA 01510 617-368-1401
† M/A-Com. Cable/Home Communicatios Comm/Scope Coaxial Cable, M/A-Com Inc., P.O. Box 1729, Hickory, NC 28603 ..... 704-324-2200;800-438-3331
Pirelli Cable Corp., Special Cable Div., P.O. Box 50, Wallingford, CT 06492 ..... 203-265-5533;800-243-3959
† Plastoid Corporation, 45 Gingerbread Castle Rd., Hamburg, NJ 07419 .. 201-827-7141
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
Remee Prods. Corp., 41 Bridge St., Florida, NY 10921 914-651-4431
† Spectra-Strip Operations, Ampheral Prods., 7100 Lampson Ave., Garden Grove, CA 92642-0415 714-892-3361
Storm Products Co., 116 Shore Drive, Hinsdale, IL 60521 312-323-9121
§ Support Systems Intl. Corp., 150 South Second St., Richmond, CA 94804 415-234-9090

† Whittaker Corp., Electronic Resources Div., 100 E. Tujunga Ave., Burbank, CA 91502 818-843-5770
§ Wilco Wire & Cable Co., Inc., 1921 Las Plumas Ave., San Jose, CA 95133 408-926-8880

Cable Retractors-1400 — *See Vol. C*

Cages, Card — See Enclosures, Circuit Board, Module, & Relay Mounting (Vol. C)

Calculators, Electronic, Desk Top-4200 — *See Vol. C*

Calculators, Electronic, Hand Held-4200 — *See Vol. C*

Calibration & Instrument Repair Services — See Services, Calibration & Instrument Repair (Vol. D)

Calibrators, Accelerometer-2900 — *See Vol. D*

Calibrators, Attenuation-2900 — *See Vol. D*

Calibrators, Automated-2900 — *See Vol. D*

Calibrators, Crystal-2900 — *See Vol. D*

Calibrators, Current-2900 — *See Vol. D*

Calibrators, Frequency-2900 — *See Vol. D*

Calibrators, LVDT-2900 — *See Vol. D*

Calibrators, Magnetic Field-2900 — *See Vol. D*

Calibrators, Meter — See Testers, Meter (Vol. D)

Calibrators, Oscilloscope-2900 — *See Vol. D*

Calibrators, Sound Level-2900 — *See Vol. D*

Calibrators, Sweep — See Generators, Sweep (Vol. D)

Calibrators, Synchro-2900 — *See Vol. D*

Calibrators, Time Base-2900 — *See Vol. D*

Calibrators, Transducer-2900 — *See Vol. D*

Calibrators, Voltage-2900 — *See Vol. D*

Calibrators, VSWR-2900 — *See Vol. D*

Calorimeters, Microwave-2900 — *See Vol. D*

Cameras, Data Recording-2325 — *See Vol. D*

Cameras, Digital Image Acquisition-2325 — *See Vol. D*

Cameras, Image Converter-1900 — *See Vol. D*

Cameras, Infrared-2325 — *See Vol. D*

Cameras, Oscilloscope-2975 — *See Vol. D*

Cameras, Television-1900 — *See Vol. D*

Cameras, Television, Fiber Optic-1900 — *See Vol. D*

Cans & Flat Packs, Integrated Circuit — See Packages, Integrated Circuit (Vol. A)

Cans, Capacitor, Relay, Semiconductor, Transformer, etc-2500 — *See Vol. C*

Capacitance Comparators — See Bridges, Capacitance (Vol. D)

Capacitor Arrays-1500 — *See Vol. A*

Capacitor, Folded Flag Tabs-1500 — *See Vol. A*

Capacitor Hardware-2800 — *See Vol. C*

Capacitor Leakage Indicators — See Testers, Capacitor (Vol. D)

Capacitor, Tap Rolls-1500 — *See Vol. A*

Capacitor Wafers-1500 — *See Vol. A*

Capacitors, Energy Storage-1500 — *See Vol. A*

Capacitors, Chip (For Microcircuits)-1500 — *See Vol. A*

Capacitors, Fixed, AC (Incl. Motor Start)-1500 — *See Vol. A*

Capacitors, Fixed, Air-1500 — *See Vol. A*

Capacitors, Fixed, Aluminum Electrolytic-1500 — *See Vol. A*

Capacitors, Fixed, Ceramic, Disc & Tubular-1500 — *See Vol. A*

Capacitors, Fixed, Ceramic, Monolithic-1500 — *See Vol. A*

Capacitors, Fixed, Feedthru-1500 — *See Vol. A*

Capacitors, Fixed, Film, Metallized & Nonmetallized-1500 — *See Vol. A*

Capacitors, Fixed, Foil-1500 — *See Vol. A*

Capacitors, Fixed, Glass-1500 — *See Vol. A*

Capacitors, Fixed, Laboratory Standard-1500 — *See Vol. A*

Capacitors, Fixed, Mica-1500 — *See Vol. A*

Capacitors, Fixed, Monolithic-1500 — *See Vol. A*

Capacitors, Fixed, Mylar — See Capacitors, Fixed, Film (Vol. A)

Capacitors, Fixed, Oil Filled-1500 — *See Vol. A*

Capacitors, Fixed, Paper, Metallized & Nonmetallized-1500 — *See Vol. A*

Capacitors, Fixed, Plastic — See Capacitors, Fixed, Film (Vol. A)

Capacitors, Fixed, Polycarbonate — See Capacitors, Fixed, Film (Vol. A)

Capacitors, Fixed, Polyester — See Capacitors, Fixed, Film (Vol. A)

Capacitors, Fixed, Polypropylene — See Capacitors, Fixed, Film (Vol. A)

Capacitors, Fixed, Polysulfone — See Capacitors, Fixed, Film (Vol. A)

Capacitors, Fixed, Polystyrene — See Capacitors, Fixed, Film (Vol. A)

Capacitors, Fixed, Porcelain-1500 — *See Vol. A*

Capacitors, Fixed, Tantalum Electrolytic-1500 — *See Vol. A*

Capacitors, Fixed, Vacuum-1500 — *See Vol. A*

Capacitors, Variable, Air-1500 — *See Vol. A*

Capacitors, Variable, Ceramic-1500 — *See Vol. A*

Capacitors, Variable, Film-1500 — *See Vol. A*

Capacitors, Variable, Gas Filled-1500 — *See Vol. A*

Capacitors, Variable, Glass-1500 — *See Vol. A*

Capacitors, Variable, HV (Lab Type)-Also See Decade Boxes, Capacitance-1500 — *See Vol. A*

Capacitors, Variable, Mica-1500 — *See Vol. A*

Capacitors, Variable, Padders & Trimmers-1500 — *See Vol. A*

Capacitors, Variable, Vacuum-1500 — *See Vol. A*

Capacitors (MIL), Fixed-2440

American Technical Ceramics Corporation, 1 Norden La., Huntington Sta., NY 11746, 516-271-9600 ..... A•1007
§† Component Research Co. Inc., 1655-26 St., Santa Monica, CA 90404, 213-829-3615 ..... A•1060-1063
CSI Capacitors, CSI Technlgs., 810 Rancheros Dr., San Marcos, CA 92069, 619-747-4000 ..... A•1070
† Electronic Concepts, Inc., Box 627 E, Eatontown, NJ 07724, 201-542-7880 ..... A•1072-1073,1075
ISL Products Int'l, Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093, 516-822-9601 ..... A•1094
Johanson Dielectrics, 2220 Screenland Dr., Burbank, CA 91505, 818-848-4465 ..... A•1104

Johanson Mfg. Corp., 400 Rockaway Valley Rd., Boonton, NJ 07005, 201-334-2676 ..... A•1105
Kemet, Union Carbide Corporation, Elctrns. Div., Components Dept., Box 5928, Greenville, SC 29606, 803-963-6348 ..... A•1106
† Mallory Capacitor Co., Mallory Comps. Grp., 3029 E. Washington St., Indianapolis, IN 46201, 317-636-5353 ..... A•1114
§† Mepco//Electra, Inc., North American Philips Corp., 5900 Australian Ave., West Palm Beach, FL 33407, 305-842-3201 ..... B•1009
Mepco//Electra, Inc., North American Philips Corp., 6071 St. Andrews Rd., Columbia, SC 29210, 803-772-2500 ..... B•1009
† Metuchen Capacitors, Inc., 420 Park Ave., Perth Amboy, NJ 08861, 201-442-0500 ..... A•1120
Nytronics Components Grp., Inc., Orange St., Darlington, SC 29532, 803-393-5421 ..... A•1150-1152,1153,1154,1155
Republic Elctrns. Corp., 176 E. 7th St., Paterson, NJ 07524, 201-279-0300 ..... A•1167
SFE Technologies, 1501 1st St., San Fernando, CA 91340, 213-365-9411 ..... A•1168
§† Tusonix, Inc., 7741 N. Business Park Drive, P. O. Box 37144, Tucson, AZ 85740-7144, 602-744-0400 ..... A•1190,1193
Wesco Electrical Co., 201 Munson St., Greenfield, MA 01301, 413-774-4358 ..... A•1198
† AVX Corporation, Box 867, Myrtle Bch., SC 29577 803-448-9411
§ Capar Components Corp., Div. of Diplomat Electronics, 25 Dubon Ct., Farmingdale, NY 11735 516-454-6390
§† Cornell-Dubilier Electronics, 150 Avenue "L", Newark, NJ 07105 201-589-7500
† Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
Corning Glass Works, Corning Elctrns., Houghton Pk., Bldg. A-2, Corning, NY 14830 607-974-8725
Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018 312-696-1000
† Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, NY 10550 914-699-2000
§† Electron Products, 2084 Central Ave., Duarte, CA 91010 818-359-8281
† Elmag, 54 Clark St., Newark, NJ 07104 201-481-1600
IEI-ISKRA Electronics, Inc., 222 Sherwood Ave., Farmingdale, NY 11735 516-753-0400
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
Maida Development Co., 20 Libby St., Hampton, VA 23663 804-723-0785
Microeap, Inc., 11120 Roselle St., San Diego, CA 92121 619-452-9812
§† Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067 404-952-9777
§† Murata Mfg. Co., Ltd., 26-10-2-chome-Tenjin, Nagaoka-Kyo-Shi, Kyoto, Japan, JAPAN 075-951-9111
Presidio Components, Inc., 7185 Construction Ct., San Diego, CA 92121 619-578-9390
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Southern Electronics, F-Dyne, 726 So. Flower St., Burbank, CA 91502 ... 213-845-2458
† Spectrum Control, Inc., 2185 W. 8th St., Erie, PA 16505 814-455-0966
Sprague Elec. Co., 481 Marshall St., No. Adams, MA 01247 413-664-4411
§† Tansitor Elctrns., West Rd., Bennington, VT 05201 802-442-5473
† TRW Capacitor Div., 301 West "O" St., Ogallala, NE 69153 308-284-3611
Union Carbide Corp., Elctrns. Div., Component Dept., Box 5928, Greenville, SC 29606 803-963-6348
U S Microtek Components Corporation, 11144 Penrose St., Sun Valley, CA 91352 818-767-6770

Capacitors (MIL), Variable-2440

Stettner Elctrns., 6135 Airways Blvd., Chattanooga, TN 37421, 615-892-0291 ..... A•1175
§† Tusonix, Inc., 7741 N. Business Park Drive, P. O. Box 37144, Tucson, AZ 85740-7144, 602-744-0400 ..... A•1188
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
Voltronics, West St., P.O. Box 476, E. Hanover, NJ 07936 201-887-1517

Caps, Connector-2100 — *See Vol. C*

Caps, Forms & Tapes, Heat Shrinkable-Also See Tubing, Heat Shrinkable-3100 — *See Vol. C*

Caps, Lenses, Indicator Light-2450

§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1020
§† Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 ..... B•1038
§ Industrial Devices, Inc., 7 Hudson St., Edgewater, NJ 07020, 201-224-4700 ..... B•1064
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ..... B•1082
§† Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ..... B•1088
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1649
§ Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 ..... B•1100
§ Sylvania Miniature Lighting, GTE Corporation, W. Main St., Hillsboro, NH 03244, 603-464-5533 ..... B•1110
§ Visual Communications Co., Inc., P.O. Box 986, El Segundo, CA 90245, 213-822-4727 ..... B•1113
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
† Angenieux Inc., 120 Derry Rd., Hudson, NH 02051 603-889-2116
† Atlantic Optical Moulding, Ellis St., P.O. Box 309, Dudley, MA 01570 617-943-1746
Control Inds. Inc., 530 Burnside Ave., Inwood, NY 11696 212-471-9800
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590 ... 516-935-3640
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§† Electrical Inds., 691 Central Ave., Murray Hill, NJ 07974 201-464-3200
§ Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§† Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
§ ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 .....201-291-3334; 800-221-0714
§ Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
NOBEX Div., Griffith Plastics Corp., 1027 California Dr., Box 4365, Burlingame, CA 94010 415-342-8170
§† Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Schott Elctrns., Hershey Dr., Ansonia, CT 06401 203-736-2677
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§† Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680 714-669-9850
† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092
§ Trimm, Inc., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048 312-362-3700

Caps, Wire Splicing — See Splicers, Wire (Vol. C)

Caps (MIL)-2440

Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018 312-696-1000
Presidio Components, Inc., 7185 Construction Ct., San Diego, CA 92121 619-578-9390

Card Equipment, Mark Sense-2000 — *See Vol. D*

Card Equip., Punch-2000 — *See Vol. D*

Card Equip., Reader-2000 — *See Vol. D*

Card Equip., Reader/Punch-2000 — *See Vol. D*

Card Holders, Circuit Board — See Enclosures, Circuit Board, Module, & Relay Mounting (Vol. C)

Cards, Data Communication/Interfaces-2000 — *See Vol. D*

Cards, Linear Function-2000 — *See Vol. D*

Cards, Memory — See Memory Devices (Vol. D), Memory Systems (Vol. D)

Cards, Logic-2000 — *See Vol. D*

Carriers — See Holders & Carriers, Chip (Vol. C)

Carts & Dollies, Instrument & Equipment-3800 — *See Vol. C*

Cases, Equipment, Instrument, Meter (Portable) — See Enclosures, Portable, Metallic & Nonmetallic (Vol. C)

Cases, Equipment, Instrument, Meter (Stationary) — See Enclosures, Equipment & Panel Mounting (Vol. C)

Cases, Shielded — See Enclosures, Shielded (Vol. C)

Cases, Transit — See Enclosures, Shipping (Vol. C)

Casters-1400 — *See Vol. C*

Cathode-Ray Readout Tubes — See Tubes, Readout (Vol. A)

CATV Systems & Equipment-1900 — *See Vol. D*

Cavities, Microwave-3450 — *See Vol. A*

Cells, Electrolytic (Timing) — See Timers, Electrolytic Cell (Vol. D)

Cells, Load-5500

Data Instruments, Inc., 4 Hartwell Pl., Lexington, MA 02173, 617-861-7450 ..... B•1790
Tedea USA, 7800 Deering Ave., Canoga Park, CA 91304, 818-884-8818 .. B•1827
† A. L. Design, Inc., 4232 Ridge Lea Rd., Amherst, NY 14226 716-833-6272
Automatic Timing & Controls Co., 201 So. Gulph Rd., King of Prussia, PA 19406 ..... 215-337-5500;800-441-8245
BLH Elctrns., 75 Shawmut Road, Canton, MA 02021 617-821-2000
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§† Dillon, W. C., & Co., National Controls, Inc., 2320 Airport Blvd., Santa Rosa, CA 95401 707-527-5555
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006 201-227-1002
§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511
§ GSE, 23640 Research Dr., Farmington Hills, MI 48024 313-476-7875
§ Helm Instr. Co., Inc., 1387 Dussel Drive, Maumee, OH 43537 419-893-4356

§ Hottinger Baldwin Measurements, 139 Newbury St, Framingham, MA 01701 617-875-8282
§ Interface, 7401 Butherus Dr., Scottsdale, AZ 85260 602-948-5555
§† Kistler-Morse, 10201 Willows Road NE, Redmond, WA 98052 206-881-8000
† Kulite Semiconductor Prods., Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000
§ Lion Precision, 60 Bridge St., Newton, MA 02195 617-969-4710
§ NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110 312-426-5900
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
† PCB Piezotronics, 3425 Walden Ave., Depew, NY 14043-2495 716-684-0001
§† Revere Corp. of Amer., 845 N. Colony Rd., Wallingford, CT 06492 203-269-7701
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Sensotec, Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471 203-481-5721

Cells, Photoconductive-3700

Advanced Detector Corp., Applied Solar Energy Corp., 15251 E. Don Julian Rd., Industry, CA 91746, 818-369-6886 ..... B•1203
† Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092, 201-233-7200 ..... B•1204
§ Clairex Electronics, 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602 ..... B•1206
§ EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ... B•1210
† Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901, 518-561-3160 ..... B•1215
A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 .. 201-722-9800
† Applied Solar Energy Corp., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749 818-968-6581
† Artech Corp., 2901 Telestar Ct., Falls Church, VA 22042 703-560-3292
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011
Hamamatsu Photonics K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
Hydrocap Corp., 975 N.W. 95 St., Miami, FL 33150 305-696-2504
Infrared Inds., Inc., P.O. Box 14200, Orlando, FL 32857 305-282-7700
Optoelectronics, Inc., 1309 Dynamic St., Petaluma, CA 94952 707-763-4181
§ Raytheon Co., 465 Centre St., Quincy, MA 02169 617-479-5300
Sanders Assocs., Flexprint Prods. Div., Grenier Fld., Manchester, NH 03103 603-669-4615
† Santa Barbara Resch. Ctr., 75 Coromar Dr., Goleta, CA 93117 805-968-3511
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
§ THORN EMI Gencom Inc., 23 Madison Rd., Fairfield, NJ 07006 201-575-5586
Tri-Tronics Co. Inc., 13420 Wright Cir., Tampa, FL 33624 813-855-4453
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516

Cells, Photoemissive-3700

Clairex Electronics, 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602 ..... B•1207
EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ... B•1210
TRW Optoelectronics Div., 1207 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ..... B•1222
A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 .. 201-722-9800
§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
† Artech Corp., 2901 Telestar Ct., Falls Church, VA 22042 703-560-3292
EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011
GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
Hamamatsu Photonics K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
§ Optek Technology, Inc., 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901 518-561-3160
§ THORN EMI Gencom Inc., 23 Madison Rd., Fairfield, NJ 07006 201-575-5586

Cells, Photovoltaic-3700

† Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092, 201-233-7200 ..... B•1204
§ Clairex Electronics, 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602 ..... B•1207
§ EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ... B•1210
† Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901, 518-561-3160 ..... B•1215
Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254, 617-890-6107 ..... A•2091
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 .. 201-722-9800
† Applied Solar Energy Corp., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749 818-968-6581
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
† Dionics, 65 Rushmore St., Westbury, NY 11590 516-997-7474
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
§ GNB Batteries Inc., Ind'l. Battery Div., 2010 Cabot Blvd. W., Langhorne, PA 19047 215-752-0555
Hamamatsu Photonics K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
Infrared Inds., Inc., P.O. Box 14200, Orlando, FL 32857 305-282-7700
§ Johnson Controls, Battery Div., 5757 N. Green Bay Ave., Milwaukee, WI 53201 414-228-2581
§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900
Optoelectronics, Inc., 1309 Dynamic St., Petaluma, CA 94952 707-763-4181
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
† Santa Barbara Resch. Ctr., 75 Coromar Dr., Goleta, CA 93117 805-968-3511
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
† Sohio Engineered Materials Co., Unit of Sohio, P. O. Box 156, Niagara Falls, NY 14302 716-278-2000
§† Solarex Corp., 1335 Piccard Dr., Rockville, MD 20850 301-948-0202
Spectrolab, Inc., 12500 Gladstone Ave., Sylmar, CA 91342 213-365-4611
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516

Cells, Solar — See Cells, Photovoltaic (Vol. B)

Cements — See Adhesives, (All Types) (Vol. C)

Chaff Systems (MIL)-3475 — *See Vol. D*

Chambers, Altitude-2550 — *See Vol. D*

Chambers, Anechoic-2550 — *See Vol. D*

Chambers, Environmental-2550 — *See Vol. D*

Chambers, Explosion-2550 — *See Vol. D*

Chambers, Fluid Conditioner-2550 — *See Vol. D*

Chambers, Humidity-2550 — *See Vol. D*

Chambers, Magnetic, Degaussing Coil-4525 — *See Vol. D*

Chambers, Pressure-2550 — *See Vol. D*

Chambers, Radiation-2550 — *See Vol. D*

Chambers, RFI/EMI-2550 — *See Vol. D*

Chambers, Shock-2550 — *See Vol. D*

Chambers, Space Simulation-3475 — *See Vol. D*

Chambers, Temperature-2550 — *See Vol. D*

Chambers, Vacuum-2550 — *See Vol. D*

Chambers, Vibration-2550 — *See Vol. D*

Chambers (MIL)-3475 — *See Vol. D*

Character Recognition Equip., Magnetic Ink-2000 — *See Vol. D*

Character Recognition Equip., Optical-2000 — *See Vol. D*

Chargers, Battery-4000 — *See Vol. D*

Chargers, Magnet — See Magnetizers (Vol. D)

Chassis, Circuit Board Mounting-1400 — *See Vol. C*

Chassis Marking Kits — See Kits, Marking (Vol. C)

Chassis, Metal-1400 — *See Vol. C*

Chassis (MIL), Electrical-2440

Prototek, Inc., 25 Standen Dr., Hamilton, OH 45015, 513-874-5094 ..... C•1714
Ango Electronics Corp., Post Office Box 112, Harrison, NJ 07029 ..... 212-685-6336; 201-484-1115
† LVC Inds., Inc., CO-ORD Switch Div., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
† Optima Enclosures, 2166 Mountain Indl. Blvd., Tucker, GA 30084 404-939-6340
† STRONGBOX, P.O. Box 84508, Los Angeles, CA 90073 213-204-0472
† Trilobyte Computer Corporation, 801 W. Grand Ave., Oakland, CA 94607 415-839-1100

Chassis Slides — See Slides, Cabinet, Chassis (Vol. C)

Checkers — See Analyzers (Vol. D), Testers (Vol. D)

Chemicals, Antistatic — See Coatings, Antistatic (Vol. C)

Chemicals, Electroplating-1600 — *See Vol. C*

Chemicals, Epoxy Stripping-1600 — *See Vol. C*

Chemicals, Etching-1700 — *See Vol. C*

Chemicals, Fungicidal — See Coatings, Fungicidal (Vol. C)

Chemicals, Tin Plating-1700 — *See Vol. C*

Chemicals, Wire Stripping-1600 — *See Vol. C*

Chestsets — See Handsets, Chestsets (Vol. D)

Chips, Integrated Circuit — See Integrated Circuits, Silicon Monolithic, Unpackaged Chips (Vol. A)

Chokes, AF — See Coils, AF (Vol. A)

Chokes, Filter-1800 — *See Vol. A*

Chokes, RF — See Coils, RF (Vol. A)

Chokes, Swinging-1800 — *See Vol. A*

Chokes, Waveguide-3450 — *See Vol. A*

Chokes (MIL)-2440

§† **Bell Inds., J. W. Miller Div., 19070 Reyes Ave., P.O. Box 5825, Rancho Dominguez, CA 90224, 213-537-5200** ..... **A•1210,1212,1214**
§† **Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078, 605-665-9301** ..... **A•1231,1236**
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... **A•1270**
Renco Elctrns., 60 Jefryn Blvd., E., Deer Park, NY 11729, 516-586-5566 ..... **A•1275**
† Atlas Engrg. Corp., 10 Cheney St., Dorchester, MA 02121 617-445-7100
Berkshire Transformer Corp., Route 341, P.O. Box 129, Kent, CT 06757 203-927-3541
† Bicron Elctrns., Box 807, Barlow St., Canaan, CT 06018 203-824-5125
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
Caddell-Burns Mfg., 40 E. 2nd St., Mineola, NY 11501 516-746-2310
† Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, NY 10550 914-699-2000
§† Delevan Div., American Precision Inds. Inc., 270 Quaker Rd., E. Aurora, NY 14052 716-652-3600
† Elnetic Elctrns., 1730 21st St., Santa Monica, CA 90404 213-828-9541
§† Jeffers Elctrns., Grand Plaza, 945 Grand Ave., Nogales, AZ 85621 602-287-5851
§† Microtran Co. Inc., 145 E. Mineola Ave., Valley Stream, NY 11580 516-561-6050
† NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865 201-454-2600
† Pan-Magnetics Intl., Inc., 455-A Carson Plaza Dr., Carson, CA 90746 213-532-1790
† PTC Transformers, P.O. Box 397, Rising Sun Road, Bordentown, NJ 08505 609-298-8200
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
† Torotel Prods. Inc., 13402 S. 71 Hwy., Grandview, MO 64030 816-761-6314
† Trans American Transformer, 142 Peconic Ave., Medford, NY 11763 516-654-1880
† Transco Products, Inc., 4241 Glencoe Ave., Marina del Rey, CA 90295 .. 213-822-0800
§† Transformer & Coil Products, TRW Electronic Assemblies Division, 150 Varick St., New York, NY 10013 212-255-3500

Choppers-Also See Light Choppers-4050 — *See Vol. D*

Choppers (MIL)-2440

† Balzers Optical Grp., 170 Locke Dr., Marlboro, MA 01752 617-481-9860
Philamon, Inc., 33 Dubon Ct., Farmingdale, NY 11735 516-249-2700

Circuit Analyzers — See Testers, Signal Tracing (Vol. D)

Circuit Board Holders, Jig Type — See Holders, Circuit Board (Vol. D)

Circuit Breakers-4300

† **Airpax Corp., Woods Rd., Cambridge, MD 21613, 301-228-4600** ..... **B•1226**
Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641, 203-233-5551 ..... **B•1515**
§† **Heinemann Elec. Co., Brunswick Pike, Alt. Rte. # 1, P.O.Box 6800, Lawrenceville, NJ 08648-0800, 609-882-4800** ..... **B•1236**
† **Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008, 408-377-4621** ..... **B•1443**
Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
§ Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
Brown Boveri Elec., Norristown Rd., Spring House, PA 19477 215-628-7400
§ Westinghouse Elec. Corp., Bryant Circuit Devices Div., 500 Sylvan Ave., Bridgeport, CT 06606 203-334-5561
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
§ Curtis Inds., 8000 West Tower Ave., Milwaukee, WI 53223 414-354-1500
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
† E-T-A Circuit Breakers, 7400 N. Croname Rd., Chicago, IL 60648 312-647-8303
Federal Pacific, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;in OH 800-245-4497
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211 408-747-0550
§ Inmark Corp., 147 West Cedar St., Norwalk, CT 06854 203-866-8474
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
§† Mechanical Products, Amstar, 1824 River St. P. O. Box 729E, Jackson, MI 49204 517-782-0391
† Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
§† Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Pyle-National, Brand-Rex Company, 1334 N. Kostner Ave., Chicago, IL 60651 312-342-6300
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
SL Waber, 300 Harvard Ave., Westville, NJ 08093 ..... 609-456-5400;800-257-8384
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Sylvania GTE Control Devices, Rte. 35, Standish, ME 04084 207-642-4535
§ Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ Underwriters Safety Device, Allied Amphenol Prods., 7300 W. Wilson Ave., Chicago, IL 60656 312-867-4600
§ The Wadsworth Elec. Mfg. Co., Inc., 20 W. 11th St., Covington, KY 41012 606-431-0900
Westinghouse Electric Corp., Indl. Govt. Tube Div., Westinghouse Circle, Horseheads, NY 14845 607-796-3211
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Circuit Breakers, Boxes, Panel Boards, Enclosures (MIL)-2440

Heinemann Elec. Co., Brunswick Pike, Alt. Rte. # 1, P.O.Box 6800, Lawrenceville, NJ 08648-0800, 609-882-4800 ..... **B•1236**
§ Mechanical Products, Amstar, 1824 River St. P. O. Box 729E, Jackson, MI 49204 517-782-0391

Circuit Testers — See Testers, Signal Tracing (Vol. D)

Circuits, Hybrid, Custom-3130 — *See Vol. A*

Circuits, Hybrid, Thick Film-3130 — *See Vol. A*

Circuits, Hybrid, Thin Film-3130 — *See Vol. A*

Circuits, Integrated — See Integrated Circuits (Specific Types) (Vol. A)

Circuits, Printed Flexible-1700 — *See Vol. C*

Circuits, Printed, Multilayer-1700 — *See Vol. C*

Circuits, Printed, Rigid, One & Two Sided-1700 — *See Vol. C*

Circuits, Printed (With Components) — See Cards, Linear Function (Vol. D)

Circuits, Thick Film, Thin Film — See Circuits, Hybrid (Vol. A)

Circulators, Ferrite-3450 — *See Vol. A*

Clamps & Clips, Cable-Also See Wire & Cable Ties-2800 — *See Vol. C*

Clamps & Clips, Component-2825 — *See Vol. C*

Clamps & Clips, Ground-2825 — *See Vol. D*

Clamps, Synchro & Servo-2800 — *See Vol. C*

Clamps (MIL), Cable-2440

§† **Heyco Molded Products, Box 160, Kenilworth, NJ 07033, 201-245-0033;800-526-4182** ..... **C•1227**
§ Accessories for Elctrns., Inc., 800 Merrick Rd., Baldwin, NY 11510-3593 516-546-1751
§† All-States, Inc., 1801 W. Foster Ave., Chicago, IL 60640 312-728-0525
§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644 201-796-2886
§† Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
† Micro Plastics Inc., Hwy 178 North, Flippin, AR 72634 ... 501-453-2261;1-800-643-2356
§† Panduit Corp., 17301 Ridgeland Ave., Tinley Park, IL 60477-0981 312-532-1800
Richco Plastic Co., 5825 N. Tripp Ave., Chicago, IL 60646 312-539-4060
§ TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007 312-981-6000
§† Tyton Corp., Box 23055, 7930 N. Faulkner Rd., Milwaukee, WI 53223 ... 414-355-1130

Cleaners, Magnetic Medium-1600 — *See Vol. C*

Cleaners, Ultrasonic-4100 — *See Vol. D*

Cleaners & Degreasers, Machine — See Machines, Cleaning & Degreasing (Vol. D)

Cleaners & Solvents-1600 — *See Vol. C*

Clean Room Equipment & Supplies-2550 — *See Vol. D*

Clips, Alligator-2100 — *See Vol. C*

Clips & Holders, Fuse-Also See Panels, Fuse-4300

§ **Atlee Inc., One Gill St., Woburn, MA 01801, 617-933-3510** ..... **B•1229**
Bel Fuse, 198 Van Vorst St., Jersey City, NJ 07302, 201-432-0463 ..... **B•1232**

Concord Elctrns., 30 Great Jones St., Dept. JE, New York, NY 10012, 212-777-6571 ..... C•1174
Connector Corp., 6025 N. Keystone Ave., Chicago, IL 60646, 312-539-3108 ..... C•1176
§† FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852, 301-881-8124;800-638-6594 ..... B•1235
§† Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ..... B•1243
§ National Tel-Tronics, State Road Hill, Meadville, PA 16335, 814-724-6440 ..... C•1473
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052, 201-762-6886 ..... B•1258
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911 ..... C•1506,1508
§ Accessories for Elctrns., Inc., 800 Merrick Rd., Baldwin, NY 11510-3593 516-546-1751
Accurate Elctrns., 169 S. Abbe Rd., P.O. Box 1287, Elyria, OH 44036 216-365-1211
§ Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, NJ 07657 201-943-7650
Alden Products Co., P.O. Box 860, 117 N. Main St., Brockton, MA 02403 617-583-0160
Alpha-Tek, 7286 Murdy Circle, Huntington Beach, CA 92647 714-847-7515
Auto-Swage Prods., 726 River Rd., Shelton, CT 06484 203-929-1401
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 ..... 201-428-8400; 800-526-9067
Carbone Lorraine Inds., 400 Myrtle Ave., Boonton, NJ 07005 ..... 201-DE4-0700
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
Components Corp., 6 Kinsey Pl., Denville, NJ 07834 201-627-0290
§ Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
Doran Mfg. Co., 2851 Massachusetts Ave., Cincinnati, OH 45225 513-681-5424
EG & G Birtcher, 4505 N. Arden Dr., El Monte, CA 91731 818-442-2572
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
Goldwell Comps., 1815 W. 205th St. Ste. 201, Torrance, CA 90501 213-533-1228
§ Gould Inc., Circuit Protection Div., 374 Merrimac St., Newburyport, MA 01950 ..... 617-462-6662/3131
§ Heyco Molded Products, Box 160, Kenilworth, NJ 07033 .. 201-245-0033;800-526-4182
§ Holub Industries, 1701 W. Bethany Rd., Sycamore, IL 60178 815-895-6501
§ Ideal Industries, 4450 Becker Pl., Sycamore, IL 60178 815-895-5181
§† Keystone Elctrns. Corp., 49 Bleecker St., New York, NY 10012 212-475-4600
§ Marathon Special Prods., 13300 Van Camp Rd., Bowling Green, OH 43402 419-352-8441
Miniature Metal Forming Div., 4819 Emerald St., P.O. Box 2962, Torrance, CA 90509 213-370-3679
† Panel Components Corp., P.O. Box 6626M, Santa Rosa, CA 95406 707-523-0600
§ Philmore Mfg., 40 Inip Dr., Inwood, NY 11696 516-239-6161
RDI/Reed Devices, Inc., 525 Randy Rd., Carol Stream, IL 60188 312-682-4100
Reliance Fuse, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;in OH 800-245-4497
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Seastrom Mfg. Co., Inc., 701 Sonora Ave., Glendale, CA 91201 213-245-9121
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
† Tech-Etch, Inc., 45 Aldrin Rd., Plymouth, MA 02360 617-747-0300
§ Underwriters Safety Device, Allied Amphenol Prods., 7300 W. Wilson Ave., Chicago, IL 60656 312-867-4600
Weidmuller Terminations, 821 Southlake Blvd., Richmond, VA 23236 ... 804-794-2877
§† Zierick Mfg. Corp., 44 Radio Circle, Mt. Kisco, NY 10549 914-666-2911

Clips, Battery-2100 — *See Vol. C*

Clips, Board, Harness-1700 — *See Vol. C*

Clips, Breadboard-4200 — *See Vol. C*

Clips, Fahnestock-2100 — *See Vol. C*

Clips, LED — See Retainers, Transistor & Diode

Clips, Logic Test-2900 — *See Vol. D*

Clips, Test-2100 — *See Vol. C*

Clips, Transistor & Diode — See Retainers, Transistor & Diode (Vol. C)

Clips (MIL), Electrical-2440

† Mueller Elec. Co., 1583 E 31st St., Dept. 20, Cleveland, OH 44114, 216-771-5225 ..... C•1470,1472
Autosplice, Inc., 59-12, 37th Ave, Woodside, NY 11377 718-429-0500
§† FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852 ..... 301-881-8124;800-638-6594
Interconics, Bussing Sys. Oper., a unit of BMC Industries, Inc., 2525 E. Vista Industria, Compton, CA 90220 213-639-2535
† Jettron Prods., P.O. Box 337, E. Hanover, NJ 07936 201-887-0571

Clocks, Time Keeping - Also See Oscillators, Clock-2200 — *See Vol. D*

Clocks & Controllers, Thermal-2200 — *See Vol. D*

Clutches, Friction-3500

Jan Hardware Mfg. Co., 47-27 36th St., Long Island City, NY 11101, 212-361-0800 ..... C•1593
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1196
§† Berg, W. M., Inc., 499 Ocean Ave., East Rockaway, NY 11518 516-599-5010
Dial Prods. Co., 19-21 Cottage St., Bayonne, NJ 07002 ..... 201-HE7-0720
Dodge-Master-Reeves, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;in OH 800-245-4497
§† Facet Enterprises, Inc., Elmira, NY 14903 607-737-8011
General Electro-Mechanical Corp., 785 Hertel Ave., Buffalo, NY 14207 .. 716-876-9685
Graphite Metallizing Corp., 1036 Nepperhan Ave., P.O. Box 110, Yonkers, NY 10702 914-968-8400
† Perfect Gear & Instr., 2101 Jericho Tpk., New Hyde Park, NY 11040 516-328-3300
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 ..... 516-ED3-5955
Sterling Instr., Div. Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 516-328-3300
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
§ Vemaline Prods. Div., P.O. Box 6267, Providence, RI 02940 401-739-7600

Clutches, Magnetic-3500

† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1011,1196,1197
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
† Component Specialties Corp., 9143 E. La Rosa Dr., Temple City, CA 91780 213-283-0015
Dial Prods. Co., 19-21 Cottage St., Bayonne, NJ 07002 ..... 201-HE7-0720
§† Facet Enterprises, Inc., Elmira, NY 14903 607-737-8011
General Electro-Mechanical Corp., 785 Hertel Ave., Buffalo, NY 14207 .. 716-876-9685
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
† Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
† Perfect Gear & Instr., 2101 Jericho Tpk., New Hyde Park, NY 11040 516-328-3300
PIC Design, P.O. Box 1004, Middlebury, CT 06762 203-758-8272
Sterling Instr., Div. Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 516-328-3300
† Stock Drive Prods., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 ..... 516-328-0200;328-3300

Clutches, Positive-3500

† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1196
Adams Rite Prods., Inc., 540 W. Chevy Chase Dr., Glendale, CA 91204 .. 818-241-5121
§† Berg, W. M., Inc., 499 Ocean Ave., East Rockaway, NY 11518 516-599-5010
Dial Prods. Co., 19-21 Cottage St., Bayonne, NJ 07002 ..... 201-HE7-0720
§† Facet Enterprises, Inc., Elmira, NY 14903 607-737-8011
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
† Perfect Gear & Instr., 2101 Jericho Tpk., New Hyde Park, NY 11040 516-328-3300

Coating Services — See Services, Coating (Vol. D)

Coatings, Antistatic-1600 — *See Vol. C*

Coatings, Compounds, Lubricants, etc., Heat Conductive-1600 — *See Vol. C*

Coatings, Conductive, Electric-1600 — *See Vol. C*

Coatings, Corrosion Resistant-1600 — *See Vol. C*

Coatings, Electromagnetic Wave Absorbing-1600 — *See Vol. C*

Coatings, Fungicidal-1600 — *See Vol. C*

Coatings, High Temperature, Ceramic, Plasma Spray — See Services, Coating (Vol. D)

Coatings, Insulating-3100 — *See Vol. C*

Coatings, Moisture Repellant & Waterproofing-1600 — *See Vol. C*

Coatings, Protective-1600 — *See Vol. C*

Code Actuated Switches — See Switches, Data (Vol. D)

Code & Tab Markers — See Wire Markers (All Types) (Vol. C)

Coded Discs, Optical — See Encoders, Shaft Angle, Optical (Vol. B)

Coders, AF-1300 — *See Vol. D*

Coders, Telephone, Dial-1900 — *See Vol. D*

Coders, Transponder-3400 — *See Vol. D*

Coil Assemblies & Forms-Also See Bobbins, Winding, Coil & Transformer-1800 — *See Vol. A*

Coil/Lens Aligners, Micropositioner-1800 — *See Vol. A*

Coil Standards — See Standards, Inductance (Vol. D)

Coil-Winding Equipment — See Machines, Coil Winding (Vol. D)

Coils, AF-1800 — *See Vol. A*

Coils, Antenna (Incl. Loading Type)-1800 — *See Vol. A*

Coils, pi Winding-1800 — *See Vol. A*

Coils, Broadcast-1800 — *See Vol. A*

Coils, Chip-1800 — *See Vol. A*

Coils, Degaussing-1800 — *See Vol. A*

Coils, Field-1800 — *See Vol. A*

Coils, Focusing-1800 — *See Vol. A*

Coils, Foil Wound-1800 — *See Vol. A*

Coils, High Q, Low Frequency-1800 — *See Vol. A*

Coils, Hum Eliminating — See Hum Eliminators (Vol. A)

Coils, Hybrid & Repeater-1800 — *See Vol. A*

Coils, IF-1800 — *See Vol. A*

Coils, Metallized Ceramic-1800 — *See Vol. A*

Coils, Metallized Glass-1800 — *See Vol. A*

Coils, Molded-1800 — *See Vol. A*

Coils, RF-1800 — *See Vol. A*

Coils, Relay-1800 — *See Vol. A*

Coils, Saturable Reactor-1800 — *See Vol. A*

Coils, Shielded-1800 — *See Vol. A*

Coils, Solenoid-1800 — *See Vol. A*

Coils, Telephone-1800 — *See Vol. A*

Coils, Telephone Pickup (Recording) — See Pickups, Telephone (Vol. D)

Coils, Toroidal-1800 — *See Vol. A*

Coils, Transducer-1800 — *See Vol. A*

Coils, Transformer-1800 — *See Vol. A*

Coils, TV (All Types)-1800 — *See Vol. A*

Coils, Variable-1800 — *See Vol. A*

Coils, Vidicon Alignment-1800 — *See Vol. A*

Coils (MIL), Non-RF-2440

† AIE Magnetics, Div. of Vernitron, 701 Murfreesboro Rd., Nashville, TN 37210 615-244-9024
† Automatic Coil Corp., Sub. Designatronics, Inc., 455 E. 10th Ave., Hialeah, FL 33010 305-883-5311
§† Bell Inds., J. W. Miller Div., 19070 Reyes Ave., P.O. Box 5825, Rancho Dominguez, CA 90224 213-537-5200
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
Caddell-Burns Mfg., 40 E. 2nd St., Mineola, NY 11501 516-746-2310
§ Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078 605-665-9301
† Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, NY 10550 914-699-2000
† Diamond Magnetics, P.O. Box 4736, San Luis Obispo, CA 93403 805-544-4019
Freed Transformer, 1718 Weirfield St., Ridgewood, NY 11385 212-386-1300
Hisonic, Inc., 249 N. Troost, P.O. Box 1130, Olathe, KS 66061-1130 913-782-0012
§† Inductive Prods., Inc., 11733 Markon Dr., Garden Grove, CA 92641 714-891-2572
§† Jeffers Elctrns., Grand Plaza, 945 Grand Ave., Nogales, AZ 85621 602-287-5851
† Magnetek, 7315 Red Deer Dr., Boulder, CO 80301-4696 303-442-6700
Magnetico Inc., 182 Morris Ave., Holtsville, NY 11742 516-654-1166
§† Microtran Co. Inc., 145 E. Mineola Ave., Valley Stream, NY 11580 516-561-6050
Neshaminy Transformer, Neshaminy Electronics Corp., Edison-Furlong Road, Furlong, PA 18925 215-794-7411
† North Hills Elctrns., 1 Alexander Pl., Glen Cove, NY 11542 516-671-5700
† NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
Nytronics Components Grp., Inc., Orange St., Darlington, SC 29532 803-393-5421
OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865 201-454-2600
† Oram Electronics, 12 Cranston Rd., Pittsford, NY 14534 716-381-4673
† Pan-Magnetics Intl, Inc., 455-A Carson Plaza Dr., Carson, CA 90746 213-532-1790
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552 ..... 914-699-5514; 800-431-1064
† Piconics, 26 Cummings Road, Tyngsboro, MA 01879 617-649-7501
† Raytheon Co., Microwave & Power Tube Div., 190 Willow St., Waltham, MA 02154 617-899-8400
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
Renco Elctrns., 60 Jefryn Blvd., E., Deer Park, NY 11729 516-586-5566
† Sigma Electronics Inc., 10830 Kinghurst Dr., Houston, TX 77099 713-933-4700
§ TDK Corporation of America, 4711 Golf Rd., Skokie, IL 60076 312-679-8200
† Torotel Prods. Inc., 13402 S. 71 Hwy., Grandview, MO 64030 816-761-6314
† Trans American Transformer, 142 Peconic Ave., Medford, NY 11763 516-654-1880
§† Transformer & Coil Products, TRW Electronic Assemblies Division, 150 Varick St., New York, NY 10013 212-255-3500
Vanguard Elctrns. Co., 1480 W. 178th St., Gardena, CA 90248 213-323-4100
§ Zambre Co., Inc., 2134 Old Middlefield Way, Mountain View, CA 94043 .. 415-968-9176

Coils (MIL), RF-2440

† **Automatic Coil Corp., Sub. Designatronics, Inc., 455 E. 10th Ave., Hialeah, FL 33010, 305-883-5311** ..... **A•1207**
§† **Bell Inds., J. W. Miller Div., 19070 Reyes Ave., P.O. Box 5825, Rancho Dominguez, CA 90224, 213-537-5200** ..... **A•1210,1212,1214**
§† **Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078, 605-665-9301** ..... **A•1231**
§† **Delevan Div., American Precision Inds. Inc., 270 Quaker Rd., E. Aurora, NY 14052, 716-652-3600** ..... **A•1238**
Freed Transformer, 1718 Weirfield St., Ridgewood, NY 11385, 212-386-1300 ..... **A•2152**
† **Hisonic, Inc., 249 N. Troost, P.O. Box 1130, Olathe, KS 66061-1130, 913-782-0012** ..... **A•2157**
† **North Hills Elctrns., 1 Alexander Pl., Glen Cove, NY 11542, 516-671-5700** ..... **A•1243**
§ **Nytronics Components Grp., Inc., Orange St., Darlington, SC 29532, 803-393-5421** ..... **A•1244**
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... **A•1267,1271**
SFE Technologies, 1501 1st St., San Fernando, CA 91340, 213-365-9411 ..... **A•1277**
Torotel Prods. Inc., 13402 S. 71 Hwy., Grandview, MO 64030, 816-761-6314 ..... **A•1281**
Amecon, Inc., 1900 S. Chris La., Anaheim, CA 92805 ..... 714-634-2220;800-392-2292
Atlantic Magnetics, Inc., 1441 S.W. 30th Ave., Pompano Beach, FL 33061 305-979-7920
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
Caddell-Burns Mfg., 40 E. 2nd St., Mineola, NY 11501 516-746-2310
Fil-Coil Economy Intl., Inc., 800 Axinn Ave., Garden City, NY 11530 516-228-9445
Lenox-Fugle Elctrns., 100 Sylvania Pl., S. Plainfield, NJ 07080 201-756-1164
OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865 201-454-2600
† Piconics, 26 Cummings Road, Tyngsboro, MA 01879 617-649-7501
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 400-988-0700
† Syntronic Instruments, Inc., 100 Industrial Rd., Addison, IL 60101 312-543-6444
Toko America, Inc., 1250 Feehanville Dr., Mt. Prospect, IL 60056 312-297-0070
† Trans American Transformer, 142 Peconic Ave., Medford, NY 11763 516-654-1880
§† Transformer & Coil Products, TRW Electronic Assemblies Division, 150 Varick St., New York, NY 10013 212-255-3500
Vanguard Elctrns. Co., 1480 W. 178th St., Gardena, CA 90248 213-323-4100

Cold-Cathode Readout Tubes — See Tubes, Readout (Vol. A)

Cold Plates — See Thermal Platforms (Vol. D)

Collection Systems (MIL)-3475 — *See Vol. D*

Collimators-2900 — *See Vol. D*

Combiners, Microwave — See Couplers, Microwave (Vol. A)

Communications Intelligence (Comint) Systems (MIL)-3475 — *See Vol. D*

Communications Systems, FM-1900 — *See Vol. D*

Communications Systems, Laser-1900 — *See Vol. D*

Communications Systems, Microwave-3400 — *See Vol. D*

Communications Systems, Multiplex-1900 — *See Vol. D*

Communications Systems, Telemetering-1900 — *See Vol. D*

Communications Systems, Telephone-1900 — *See Vol. D*

Commutators-3500

Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ..... **B•1701**
Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002 201-436-2230
† Aydin Vector Div., Box 328, Newtown, PA 18940 215-968-4271
† Base Ten Sys., One Electronics Dr., Box 3151, Trenton, NJ 08619 609-586-7010
§ Consell, 463 Payne Dr., Cheshire, CT 06410 203-272-5750
† Danmar Inds., 9705 Lurline Ave., Chatsworth, CA 91311 ..... 818-882-7979/5280
Graphite Metallizing Corp., 1036 Nepperhan Ave., P.O. Box 110, Yonkers, NY 10702 914-968-8400
† Omnitek, Inc., P.O. Box 102, 820 Pennsylvania Blvd., Feasterville, PA 19047 215-355-4443
§ Phoenix Data, Inc., 3384 W. Osborn Rd., Phoenix, AZ 85017 602-278-8528
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
Serial Lab Prods., Inc., 162 Cook Lane, P.O. Box 766, Marlboro, MA 01752 617-481-1684

Comparators, Analog — See Comparators, Voltage (Vol. D)

Comparators, Attenuation-3400 — *See Vol. D*

Comparators, Capacitance — See Bridges, Capacitance (Vol. D)

Comparators, Digital-2900 — *See Vol. D*

Comparators, Dimension Calibrators-4100 — *See Vol. D*

Comparators, Frequency-2900 — *See Vol. D*

Comparators, Impedance — See Bridges, Impedance (Vol. D)

Comparators, Inductance — See Bridges, Inductance (Vol. D)

Comparators, Optical-2900 — *See Vol. D*

Comparators, Phase-2900 — *See Vol. D*

Comparators, Resistance — See Bridges, Resistance (Vol. D)

Comparators, Voltage-2900 — *See Vol. D*

Compounds, Encapsulating, Molding, Potting-Also See Plastic Raw Materials-1600 — *See Vol. C*

Compounds, Insulating-3100 — *See Vol. C*

Computer-Aided Design Services — See Computers, CAD, CAM, & CAD/CAM (Vol. D), Services, Computer-Aided Design (Vol. D)

Computer Interfaces — See Interfaces, Computer

Computer Logic Circuits — See Cards, Logic (Vol. D), Circuits, Hybrid (Vol. A), Integrated Circuits (Vol. A), Modules, Logic (Vol. A)

Computer Tape Recorders — See Recorders, Computer Data (Vol. D)

Computer Type Indicators — See Displays, Indicator Lights (Vol. B)

Computers, Analog-2025 — *See Vol. D*

Computers, CAD, CAM, & CAD/CAM-2025 — *See Vol. D*

Computers, Digital, Mini-2025 — *See Vol. D*

Computers, Digital, Micro-2025 — *See Vol. D*

Computers, Hybrid, Analog/Digital-2025 — *See Vol. D*

Computers, Mainframe-2025 — *See Vol. D*

Computers, Micro-2025 — *See Vol. D*

Computers, Mini, High End-2025 — *See Vol. D*

Computers, Mini, Low End-2025 — *See Vol. D*

Computers, Mini, Midrange-2025 — *See Vol. D*

Computers, Personal-2025 — *See Vol. D*

Computers, Small Business-2025 — *See Vol. D*

Computer Sets (MIL), Digital Data-3475 — *See Vol. D*

Computer Systems (MIL)-3475 — *See Vol. D*

Computing Equipment, Peripheral — See Converters, Digital To Paper Tape (Vol. D), Printers (Vol. D), Terminals, Data Display (Vol. D), etc.

Concentrators, Communications-1900 — *See Vol. D*

Conditioners, Power Line — See Regulators & Stabilizers, Voltage (Vol. D), Line Conditioners (Vol. D)

Conductive Elastomers-4525 — *See Vol. C*

Conductive Fabrics, Films & Tapes — See Fabrics, Conductive (Vol. C)

Conductive Plastic Materials & Parts-4525 — *See Vol. C*

Conduit, Electrical-6000 — *See Vol. C*

Connecting Blocks, Data-2100 — *See Vol. C*

Connecting Blocks, Modular Telephones-2100 — *See Vol. C*

Connector Adapters-2100 — *See Vol. C*

Connector Backshells-2100 — *See Vol. C*

Connector Blocks, Mother Board-2100 — *See Vol. C*

Connector Boxes & Strips, Power Outlet-2800 — *See Vol. C*

Connectors, Antenna — See Connectors, RF, Coaxial & Triaxial (Vol. C)

Connectors, AC Power-2100 — *See Vol. C*

Connectors, Audio-2100 — *See Vol. C*

Connectors, Back Panel — See Connectors, Wirewrap (Z-3 Level) (Vol. C)

Connectors, Battery-2100 — *See Vol. C*

Connectors, Cable-2100 — *See Vol. C*

Connectors, Circular, MS/AN-2100 — *See Vol. C*

Connectors, DIN-2100 — *See Vol. C*

Connectors, D Subminiature-2100 — *See Vol. C*

Connectors, Edgeboard — See Connectors, Printed Circuit, Card Edge (Vol. C)

Connectors, Elastomeric-2100 — *See Vol. C*

Connectors, Fiber Optic-2475

§ **AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... B•1118**
ITT Cannon, 666 E. Dyer Road, Santa Ana, CA 92705-5684, 714-557-4700 ..... C•1275,1287
§ **Math Assocs., 2200 Shames Dr., Westbury, NY 11590, 516-334-6800 .... B•1124**
† **MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1121**
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... C•1467
§† **TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007, 312-981-6000 ..... B•1127**
§ A.C. Interface, 17911 Sampson, Huntington Beach, CA 92647 714-841-6090
§ Alpha Products, Inc., 5740 Corsa Ave. # 104, Westlake Village, CA 91362 818-889-9304
American Photonics Inc., 71 Commerce Dr., Brookfield Center, CT 06805 203-775-8950
§ AMP Distributor Marketing Div, A Division of AMP Products Corporation, Harrisburg, PA 17105 717-780-7025
§ Amphenol, An Allied Co., 43 Commerce Ct., Lisle, IL 60532 312-983-3500
AT&T, 1 Oak Way, Berkeley Heights, NJ 07922 1-800-372-2447
§ Augat Fiberoptics, 710 Narragansett Park Dr., Pawtucket, RI 02861 401-724-4400
§ Automatic Connector, Inc., 400 Moreland Rd., Commack, NY 11725 516-543-5000
§ Belden, Electronic Wire & Cable, P.O. Box 1980, Richmond, IN 47375 ... 317-983-5200
§ Bendix Corp., Electrical Comps. Div., Sidney, NY 13838 607-563-5324
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Component Mfg. Svc., Inc., 1 Component Park, W. Bridgewater, MA 02379 617-580-0111
† Dataware Sys. Lease, Inc., 30 Bay St., Staten Island, NY 10301 212-447-4911
Deutsch Co., Deutsch Fiber Optics Div., 7001 W. Imperial Hwy., Los Angeles, CA 90045 213-649-1400
§ Ercona, 125 Wilbur Pl., Bohemia, NY 11716 516-567-3399
§† General Cable Co., Fiber Optics Div., 160 Fieldcrest Ave., Raritan Ctr., Edison, NJ 08818 201-225-4780
§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
General Fiber Optics, Inc., 98 Commerce Rd., Cedar Grove, NJ 07009 .. 201-239-3400
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
† Hughes Aircraft Co., Connecting Devices Div., 17150 Von Karman Ave., Irvine, CA 92714 714-660-5701
Interoptics, Purdy Group, 770 Airport Blvd., Burlingame, CA 94010 415-347-7727
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
Jan Hardware Mfg. Co., 47-27 36th St, Long Island City, NY 11101 212-361-0800
LEMO U.S.A., Inc., P.O. Box 11488M, Santa Rosa, CA 95406 707-578-8811
Malco, Div. Microdot Electronic Components Group, 12 Progress Dr., Montgomeryville, PA 18936 215-699-5373
§ Methode Elctrns., Inc., 7444 W. Wilson Ave., Chicago, IL 60656 312-867-9600
Micro-Coax Components, Inc., a UTI Company, Box E, Collegeville, PA 19426 215-489-3700
NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000
† Optelecom, 15940 Luanne Dr., Gaithersburg, MD 20877 301-840-2121
Optical Fiber Technologies, Inc., P.O. Box 148, Nutting Lake, MA 01865 617-663-6629
Phalo Corp., Transitron Elctrn. Corp., 2 Friberg Parkway, Westborough, MA 01581 617-366-0830
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860

Rehlander Assocs., 118A Bridge St., Beverly, MA 01915 617-922-5961
Sabritec, 16631 Noyes Ave., Irvine, CA 92714 714-549-7350
Security Plastics, Inc., 14427 N.W. 60th Ave., Miami Lakes, FL 33014 305-823-5440
Seiko Instrs. U.S.A., Inc., 2990 W. Lomita Blvd., Torrance, CA 90505 213-530-8777
Souriau, Inc., 25158 Avenue Stanford, Valencia, CA 91355 805-257-4830
SpecTran Corp., 50 Hall Road, Sturbridge, MA 01566 617-347-2261
§ Stanley/AC Interface, 17911 Sampson Lane, Costa Mesa, CA 92647 ... 714-841-6090
Thomson-CSF Comps. Corp., Socapex Div., 6660 Variel Ave., Canoga Pk, CA 91303 213-887-0750
TRW Fiber Optic Prods., Connector Div., TRW Elctrn. Comps. Grp., 401 N. Broad St., Philadelphia, PA 19108 215-922-8900

Connectors, Filtered-2100 — *See Vol. C*

Connectors, Flat Cable (Incl. Flexible)-2100 — *See Vol. C*

Connectors, Fused-2100 — *See Vol. C*

Connectors, Heavy Duty, Power-2100 — *See Vol. C*

Connectors, Hermetically Sealed, Pressurized, or Waterproof-2100 — *See Vol. C*

Connectors, High Voltage (1,000 Volts & Over)-2100 — *See Vol. C*

Connectors, IDC (Insulation Displacement Contact)-2100 — *See Vol. C*

Connectors, Integrated Circuit — See Sockets, Integrated Circuit (Vol. C)

Connectors, LCD-2100 — *See Vol. C*

Connectors, Magnetron-2100 — *See Vol. C*

Connectors, Miniature, Subminiature & Microminiature-2100 — *See Vol. C*

Connectors, Missile (Umbilicals, Interstage, Post Boost)-3475 — *See Vol. D*

Connectors, Piggy Back — See Connectors, Wirewrap (Z-3 Level) (Vol. C)

Connectors, Plug-in, Program Board-2100 — *See Vol. C*

Connectors, Printed Circuit, Card Edge-2100 — *See Vol. C*

Connectors, Printed Circuit (Other than Card Edge)-2100 — *See Vol. C*

Connectors, Rack & Panel-2100 — *See Vol. C*

Connectors, RF, Coaxial & Triaxial-2100 — *See Vol. C*

Connectors, Solderless-2100 — *See Vol. C*

Connectors, Splicing-2100 — *See Vol. C*

Connectors, Stripline-2100 — *See Vol. C*

Connectors, Test-2100 — *See Vol. C*

Connectors, Thermocouple-2100 — *See Vol. C*

Connectors, Video-2100 — *See Vol. C*

Connectors, Wirewrap (Z-3 Level)-2100 — *See Vol. C*

Connectors, Wire — See Wire Nuts (Vol. C)

Connectors, Zero & Low Insertion Force-2100 — *See Vol. C*

Connectors & Terminals, Push-on, Quick Disconnect-2100 — *See Vol. C*

Connectors (MIL), Flat Cable-2440

§ **Eby Co., 2751 Southampton Rd., Philadelphia, PA 19154, 215-969-4200 ..... C•1184**
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ..... C•1197,1214,1215
§† **H&T Components Inc., H&T Components Ltd., 35 Carlough Road, Bohemia, NY 11716, 516-567-2282 ..... C•1226**
Kel-Am, 308 E. 5th, P.O. Box 313, Eldon, MO 65026, 314-392-7174 ..... C•1416
§† Alpha Wire Corp., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207 201-925-8000
† AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
† AMP Distributor Marketing Div, A Division of AMP Products Corporation, Harrisburg, PA 17105 717-780-7025
Autosplice, Inc., 59-12, 37th Ave, Woodside, NY 11377 718-429-0500
Auto-Swage Prods., 726 River Rd., Shelton, CT 06484 203-929-1401
§ Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
† Dataware Sys. Lease, Inc., 30 Bay St., Staten Island, NY 10301 212-447-4911
3M-Electronic Products Division, Bldg. 502, P.O. Box 2963, Austin, TX 78769-2963 512-834-6682
§† Panduit Corp., 17301 Ridgeland Ave., Tinley Park, IL 60477-0981 312-532-1800
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
Souriau, Inc., 25158 Avenue Stanford, Valencia, CA 91355 805-257-4830
§† Spectra-Strip Operations, Ampheral Prods., 7100 Lampson Ave., Garden Grove, CA 92642-0415 714-892-3361
§ Support Systems Intl. Corp., 150 South Second St., Richmond, CA 94804 415-234-9090
Symbex Corp., 72 Corwin Dr., Box 938, Painesville, OH 44077 216-354-0925
§ Thomas & Betts, Electronics Group Hdqtrs., 920 Route 202, Raritan, NJ 08869 201-469-4000
Urban Elctrns., P. O. Box 456, Dover, MA 02030 617-329-4068

Connectors (MIL), Power-2440

§† **ITT Cannon, 666 E. Dyer Road, Santa Ana, CA 92705-5684, 714-557-4700 ..... C•1276**
TRW Cylindrical Connector Div., TRW Electronic Components Grp., 8821 Science Center Dr., Minneapolis, MN 55428, 612-537-1010 ..... C•1566
Alden Products Co., P.O. Box 860, 117 N. Main St., Brockton, MA 02403 617-583-0160
§† Bendix Corp., Electrical Comps. Div., Sidney, NY 13838 607-563-5324
† Dataware Sys. Lease, Inc., 30 Bay St., Staten Island, NY 10301 212-447-4911
† Hypertronics Corp., 16 Brent Dr., Hudson, MA 01749 ..... 617-568-0451;800-225-9228
§ Ideal Industries, 4450 Becker Pl., Sycamore, IL 60178 815-895-5181
3M-Electronic Products Division, Bldg. 502, P.O. Box 2963, Austin, TX 78769-2963 512-834-6682
Pyle-National, Brand-Rex Company, 1334 N. Kostner Ave., Chicago, IL 60651 312-342-6300
Sabritec, 16631 Noyes Ave., Irvine, CA 92714 714-549-7350
Souriau, Inc., 25158 Avenue Stanford, Valencia, CA 91355 805-257-4830
Urban Elctrns., P. O. Box 456, Dover, MA 02030 617-329-4068
§† U.S. Components, Inc., Unitech PLC., 35 Carlough Rd., Bohemia, NY 11716 516-589-8080

Connectors (MIL), Printed Circuit-2440

† **AirBorn, Inc., 4321 AirBorn Dr., Addison, TX 75001, 214-931-3200 ..... C•1111**
† **AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... C•1136**
Caton Connector Corp., Jones River Indl. Pk., 20 Wapping Rd., Kingston, MA 02364, 617-585-4315 ..... C•1172
§† **Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078, 605-665-9301 ..... C•1180,1182**
Eby Co., 2751 Southampton Rd., Philadelphia, PA 19154, 215-969-4200 ..... C•1184
§† **H&T Components Inc., H&T Components Ltd., 35 Carlough Road, Bohemia, NY 11716, 516-567-2282 ..... C•1226**
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, NY 10012, 212-677-1881 ..... C•1272
§† **ITT Cannon, 666 E. Dyer Road, Santa Ana, CA 92705-5684, 714-557-4700 ..... C•1276**
Malco, Div. Microdot Electronic Components Group, 12 Progress Dr., Montgomeryville, PA 18936, 215-699-5373 ..... C•1446,1448
Symbex Corp., 72 Corwin Dr., Box 938, Painesville, OH 44077, 216-354-0925 ..... C•1528
§† **TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007, 312-981-6000 ..... C•1555,1559,1560,1561,1563,1564,1565**
§† Alpha Wire Corp., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207 201-925-8000
† AMP Distributor Marketing Div, A Division of AMP Products Corporation, Harrisburg, PA 17105 717-780-7025
§ Aries Elctrns., Box 130, Frenchtown, NJ 08825 201-996-6841
Autosplice, Inc., 59-12, 37th Ave, Woodside, NY 11377 718-429-0500
Auto-Swage Prods., 726 River Rd., Shelton, CT 06484 203-929-1401
Concord Elctrns., 30 Great Jones St., Dept. JE, New York, NY 10012 212-777-6571
Conductive Rubber Technlg., 1235 Coast Village Rd., Santa Barbara, CA 93108 805-969-5805
† CTS Corporation, 905 North West Blvd., Elkart, IN 46514 219-293-7511
† CTS Fabri-Tek Connector Inc., 9210 Science Center Dr., Minneapolis, MN 55428 612-533-3533
† CTS Fabri-Tek, Inc., CTS Corporation, 6900 Shady Oak Rd., Eden Prairie, MN 55344 612-941-9100
† Dataware Sys. Lease, Inc., 30 Bay St., Staten Island, NY 10301 212-447-4911
Du Pont Connector Systems, 30 Hunter La., Camp Hill, PA 17011 800-237-2374
† Dynatech Corp., 1225 E. Wakeham Ave., P.O. Box 1019, Dept. E, Santa Ana, CA 92702 714-558-8755
Edac Inc., 20 Railside Rd., Toronto, ON, CANADA M3A 1A4 416-445-2292
† Elco Corp., Interconnect Systems Div., 2250 Park Pl., El Segundo, CA 90245 213-675-3311
† Hypertronics Corp., 16 Brent Dr., Hudson, MA 01749 ..... 617-568-0451;800-225-9228
Kel-Am, 308 E. 5th, P.O. Box 313, Eldon, MO 65026 314-392-7174
3M-Electronic Products Division, Bldg. 502, P.O. Box 2963, Austin, TX 78769-2963 512-834-6682
§† Methode Elctrns., Inc., 7444 W. Wilson Ave., Chicago, IL 60656 312-867-9600
§ National Tel-Tronics, State Road Hill, Meadville, PA 16335 814-724-6440
Oxley, Inc., 6290 Sunset Blvd., Ste. 1126, Los Angeles, CA 90028 213-463-5120
§† Panduit Corp., 17301 Ridgeland Ave., Tinley Park, IL 60477-0981 312-532-1800
Pyle-National, Brand-Rex Company, 1334 N. Kostner Ave., Chicago, IL 60651 312-342-6300
Souriau, Inc., 25158 Avenue Stanford, Valencia, CA 91355 805-257-4830
§† Spectra-Strip Operations, Ampheral Prods., 7100 Lampson Ave., Garden Grove, CA 92642-0415 714-892-3361

Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ Thomas & Betts, Electronics Group Hdqtrs., 920 Route 202, Raritan, NJ 08869 201-469-4000
† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020
Urban Elctrns., P. O. Box 456, Dover, MA 02030 617-329-4068
§† U.S. Components, Inc., Unitech PLC., 35 Carlough Rd., Bohemia, NY 11716 516-589-8080

Connectors (MIL), RF-2440

Caton Connector Corp., Jones River Indl. Pk., 20 Wapping Rd., Kingston, MA 02364, 617-585-4315 ..... C•1172
Fischer-America, Inc., Div. of Technographics, Inc., 13756 Glenoaks Blvd., Sylmar, CA 91342, 818-362-9396 ..... C•1193
ITT Pomona Electronics, 1500 E. 9th St., P.O. Box 2767, Pomona, CA 91766, 714-623-3463 ..... C•1325
Jettron Prods., P.O. Box 337, E. Hanover, NJ 07936, 201-887-0571 ..... C•1409
Malco, Div. Microdot Electronic Components Group, 12 Progress Dr., Montgomeryville, PA 18936, 215-699-5373 ..... C•1446,1449
National Tel-Tronics, State Road Hill, Meadville, PA 16335, 814-724-6440 ..... C•1473
† Adams-Russell, Anzac Div., 80 Cambridge St., Burlington, MA 01803 671-273-3333
§ Alpha Products, Inc., 5740 Corsa Ave. # 104, Westlake Village, CA 91362 818-889-9304
† AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§ AMP Distributor Marketing Div, A Division of AMP Products Corporation, Harrisburg, PA 17105 717-780-7025
Applied Engrg. Prods., P.O. Box A-D, Amity Sta., New Haven, CT 06525 203-387-5282
§† Bendix Corp., Electrical Comps. Div., Sidney, NY 13838 607-563-5324
† Compac, 279 Skidmore Rd., Deer Park, NY 11729 516-667-3933
Concord Elctrns., 30 Great Jones St., Dept. JE, New York, NY 10012 212-777-6571
† Dataware Sys. Lease, Inc., 30 Bay St., Staten Island, NY 10301 212-447-4911
Delta Electronics Mfg. Corp., 416 Cabot St., Beverly, MA 01915 617-927-1060
† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
§† M/A-COM Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054 603-424-4111
Pyle-National, Brand-Rex Company, 1334 N. Kostner Ave., Chicago, IL 60651 312-342-6300
† Sabritec, 16631 Noyes Ave., Irvine, CA 92714 714-549-7350
Sealectro, 225 Hoyt St., Mamaroneck, NY 10543 914-698-5600
§ Support Systems Intl. Corp., 150 South Second St., Richmond, CA 94804 415-234-9090
† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020
§† TRW Cylindrical Connector Div., TRW Electronic Components Grp., 8821 Science Center Dr., Minneapolis, MN 55428 612-537-1010
Whittaker Corp., Electronic Resources Div., 100 E. Tujunga Ave., Burbank, CA 91502 818-843-5770

Consoles, Cabinet — See Benches, Consoles etc. (Vol. C)

Consoles (MIL), ECCM-3475 — *See Vol. D*

Contact Cleaners — See Cleaners & Solvents (Vol. C), Burnishers, Contact (Vol. C)

Contact Strips, Finger-4525 — *See Vol. C*

Contactors (MIL)-2440

† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621
§† Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000

Contactors — See Relays, Power (Vol. B)

Contacts, Electrical-2800 — *See Vol. C*

Contacts (MIL), Assemblies & Holders-2440

Autosplice, Inc., 59-12, 37th Ave, Woodside, NY 11377 718-429-0500
† Danmar Inds., 9705 Lurline Ave., Chatsworth, CA 91311 ..... 818-882-7979/5280
† Dataware Sys. Lease, Inc., 30 Bay St., Staten Island, NY 10301 212-447-4911
† Elco Corp., Interconnect Systems Div., 2250 Park Pl., El Segundo, CA 90245 213-675-3311
Elctrn. Molding Corp., 96 Mill St., Woonsocket, RI 02895 401-769-3800
§† Flight Connector Corp., Dubilier America, 233 E. Manville St., Rancho Dominguez, CA 90220 213-631-1133
† TRW Cylindrical Connector Div., TRW Electronic Components Grp., 8821 Science Center Dr., Minneapolis, MN 55428 612-537-1010
United Foam Plastics, 172 E. Main St., Georgetown, MA 01833 617-352-2200
§ U.S. Components, Inc., Unitech PLC., 35 Carlough Rd., Bohemia, NY 11716 516-589-8080

Containers, Shielded (All Types) — See Enclosures, Shielded (Vol. C)

Containers, Shipping, Metal & Fiberglass — See Enclosures, Shipping, Metallic & Nonmetallic (Vol. C)

Containers, Storage-3800 — *See Vol. C*

Controllers, Card Reader/Punch, Add-in-2000 — *See Vol. D*

Controllers, Card Reader/Punch, Standalone-2000 — *See Vol. D*

Controllers, Energy Conservation-2200 — *See Vol. D*

Controllers, Error-1900 — *See Vol. D*

Controllers, Floppy Disk Drive, Add-in-2000 — *See Vol. D*

Controllers, Floppy Disk Drive, Standalone-2000 — *See Vol. D*

Controllers, Hard Disk Drive, Add-in-2000 — *See Vol. D*

Controllers, Hard Disk Drive, Standalone-2000 — *See Vol. D*

Controllers, IEEE 488 (GPIB) Bus-2900 — *See Vol. D*

Controllers, Magnetic Tape Drive, Add-in-2000 — *See Vol. D*

Controllers, Magnetic Tape Drive, Standalone-2000 — *See Vol. D*

Controllers, Memory Device, Add-in-2000 — *See Vol. D*

Controllers, Memory Device, Standalone-2000 — *See Vol. D*

Controllers, Paper Tape Reader/Punch, Add-in-2000 — *See Vol. D*

Controllers, Paper Tape Reader/Punch, Standalone-2000 — *See Vol. D*

Controllers, Plotter, Add-in-2000 — *See Vol. D*

Controllers, Plotter, Standalone-2000 — *See Vol. D*

Controllers, Power-3130 — *See Vol. D*

Controllers, Printer, Add-in-2000 — *See Vol. D*

Controllers, Printer, Standalone-2000 — *See Vol. D*

Controllers, Programmable-2200 — *See Vol. D*

Controllers, Protocol, Communications-2000 — *See Vol. D*

Controllers, Terminal, Add-in-2000 — *See Vol. D*

Controllers, Terminal, Standalone-2000 — *See Vol. D*

Controls, Audio System Consoles-2200 — *See Vol. D*

Controls, Capacitance Operated-2200 — *See Vol. D*

Controls, Carbon — See Potentiometers (Vol. A), Rheostats (Vol. A)

Controls, Computer Input, Joysticks, Mouse Devices, etc.-2000 — *See Vol. D*

Controls, Constant Impedance — See Attenuators (Vol. A)

Controls, Counting & Sorting-2200 — *See Vol. D*

Controls, Density-2200 — *See Vol. D*

Controls, Dimension-4100 — *See Vol. D*

Controls, Environmental Test Equipment-2550 — *See Vol. D*

Controls, Fader-1300 — *See Vol. D*

Controls, Fluid Conductivity-2200 — *See Vol. D*

Controls, Fluid Flow-2200 — *See Vol. D*

Controls, Frequency-2200 — *See Vol. D*

Controls, Gas-2200 — *See Vol. D*

Controls, Humidity-2200 — *See Vol. D*

Controls, Ignitron Firing-2200 — *See Vol. D*

Controls, Joystick, Mouse Devices, etc. — See Controls, Computer Input (Vol. D)

Controls, Lamp Dimming, Flashing-2200 — *See Vol. D*

Controls, Level, Dry Material-2200 — *See Vol. D*

Controls, Level, Liquid-2200 — *See Vol. D*

Controls, Machine Tool-2200 — *See Vol. D*
Controls, Moisture — See Controls, Humidity (Vol. D)
Controls, Motor Speed-2200 — *See Vol. D*
Controls, Oscillator-2200 — *See Vol. D*
Controls, Photoelectric-2200 — *See Vol. D*
Controls, Positioning-4100 — *See Vol. D*
Controls, Pressure-2200 — *See Vol. D*
Controls, Proportional-2200 — *See Vol. D*
Controls, Proximity-Also See Controls, Capacitance Operated-2200 — *See Vol. D*
Controls, Remote-2200 — *See Vol. D*
Controls, Run, Shutdown Command, Start-2200 — *See Vol. D*
Controls, SCR-2200 — *See Vol. D*
Controls, Sensing/Monitoring-Voltage, Phase, Frequency-2200 — *See Vol. D*
Controls, Servo System-4900 — *See Vol. D*
Controls, Stepping Motor-2200 — *See Vol. D*
Controls, Temperature-2200 — *See Vol. D*
Controls, Timing — See Timers (Vol. D)
Controls, Torque, Electronic-2200 — *See Vol. D*
Controls, Vibrator-2200 — *See Vol. D*
Controls, Voltage Regulating — See Regulators & Stabilizers, Voltage (Vol. D)
Controls, Volume & Tone — See Potentiometers (Vol. A), Rheostats (Vol. A)
Control Systems, Air Traffic-3475 — *See Vol. D*
Control Systems, Robotics-4900 — *See Vol. D*
Convection Cooling Packages, Semiconductor — See Heat Sinks, Semiconductor (Vol. C)
Converters, AC to DC (Nonrotary) — See Power Supplies, AC Input, DC Output (Vol. D)
Converters, Analog to Digital-2325 — *See Vol. D*
Converters, Analog to Pulse-2325 — *See Vol. D*
Converters, ASCII to Baudot-2325 — *See Vol. D*
Converters, ASCII to BCD-2325 — *See Vol. D*
Converters, BCD to ASCII-2325 — *See Vol. D*
Converters, Binary to BCD-2325 — *See Vol. D*
Converters, Binary to Decimal-2325 — *See Vol. D*
Converters, Card to Tape-2000 — *See Vol. D*
Converters, CRT Display-2000 — *See Vol. D*
Converters, DC to DC, Less Than 30 VDC Output-4000 — *See Vol. D*
Converters, DC to DC, 30 to 300 VDC Output-4000 — *See Vol. D*
Converters, DC to DC, 300 to 1,000 VDC Output-4000 — *See Vol. D*
Converters, DC to DC, Greater Than 1,000 VDC Output-4000 — *See Vol. D*
Converters, DC to Sine/Cosine-2325 — *See Vol. D*
Converters, DC to Synchro-2325 — *See Vol. D*
Converters, Digital to Analog-2325 — *See Vol. D*
Converters, Digital to Paper Tape-2000 — *See Vol. D*
Converters, Digital to Resolver-2325 — *See Vol. D*
Converters, Digital to Synchro-2325 — *See Vol. D*
Converters, Frequency to Frequency-1900 — *See Vol. D*
Converters, Frequency to Voltage-2325 — *See Vol. D*
Converters, Frequency, Logarithmic-4050 — *See Vol. D*
Converters, Frequency Shift Keying-1900 — *See Vol. D*
Converters, Frequency to DC-Also See Power Supplies, AC Input, DC Output-4000 — *See Vol. D*
Converters, Graphic to Digital-2000 — *See Vol. D*
Converters, Multiplying, Analog to Digital & Digital to Analog-2325 — *See Vol. D*
Converters, Paper Tape to Magnetic Tape-2000 — *See Vol. D*
Converters, Phase-4050 — *See Vol. D*
Converters, Polar to Rectangular Coordinates-2325 — *See Vol. D*
Converters, Power Frequency, Electronic-4050 — *See Vol. D*
Converters, Power Frequency, Rotary-4050 — *See Vol. D*
Converters, Pressure to DC, Pressure to Frequency — See Transducers, Pressure (Vol. B)
Converters, Rectangular to Polar-2325 — *See Vol. D*
Converters, Resolver to Digital-2325 — *See Vol. D*
Converters, Rotary — See Motor Generator Sets (Vol. D)
Converters, Serial to Parallel/Parallel to Serial-2325 — *See Vol. D*
Converters, Synchro to Digital-2325 — *See Vol. D*
Converters, Synchro to Linear DC-2325 — *See Vol. D*
Converters, Synchro to Sine/Cosine-2325 — *See Vol. D*
Converters, Tape to Card-2000 — *See Vol. D*
Converters, Telemetry-1900 — *See Vol. D*
Converters, Thermal-5300
Beat Electrics Div., 400 Boren Ave. North, Seattle, WA 98109, 206-382-1300 ..... B•1743
Converters, UHF to VHF-1900 — *See Vol. D*
Converters, VLF to HF-1900 — *See Vol. D*
Converters, Voltage to Frequency-2325 — *See Vol. D*
Converters (MIL) DC to DC-3475 — *See Vol. D*
Converters (MIL), Frequency-3475 — *See Vol. D*
Coolants, Circuit & Component — See Refrigerants, Spray (Vol. C)
Cooling Equipment — See Air Conditioners (Vol. C), Blowers & Fans (Vol. C), Heat Exchangers & Systems (Vol. C)
Cooling/Heating Modules, Thermoelectric-5300
† Melcor/Materials Electrn. Prods., 994 Spruce St., Trenton, NJ 08648, 609-393-4178 ..... C•1652
TECA, ThermoElectric Cooling America Corp., 448 N. Halsted St., Chicago, IL 60622, 312-666-1600 ..... C•1675
§ Allen Co., Inc., Robert G., 7267 Coldwater Canyon, N. Hollywood, CA 91605 ..... 818-765-8300;800-423-3186
Cambridge Aero Instruments, Inc., 6A Dunham Rd., Billerica, MA 01821 617-275-0889
§ Casso-Solar, P.O. Box 163, U.S. Route 202, Pomona, NY 10970 914-354-2500
† Dresser Inds., 1505 Elm St., Dallas, TX 75201 214-746-6000
† EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
† Marlow Inds., 10451 Vista Park Rd., Dallas, TX 75238 214-340-4900
Products for Resch., 88 Holten St., Danvers, MA 01923 617-774-3250
† Sensortek, Inc., 154 Em Huron Ave., Clifton, NJ 07013 201-779-5577
§ Temptronic, 55 Chapel St., Newton, MA 02158 617-969-2501
Thomson-CSF Comps. Corp., Special Prods. Div., 301 Rte. 17 North, Rutherford, NJ 07070 201-438-2300
† Varo, Inc., Electron Devices Div., 2203 W. Walnut St., Garland, TX 75040 214-272-3561

Cooling Sprays — See Refrigerants, Spray (Vol. C)

Cords & Tapes, Lacing-6000 — *See Vol. C*

Cords, Communication, Control, Microphone, etc. — See Cable, Specific Type (Vol. C)

Cords, Line & Set, Extension-6000 — *See Vol. C*

Cords, Line (Lamp) — See Cable, Multiconductor (Vol. C)

Cords, Line, Resistance-6000 — *See Vol. C*

Cords, Patch-2100 — *See Vol. C*

Cords, Power — See Cable, Power (Vol. C)

Cords, Retractile-6000 — *See Vol. C*

Cords, Speaker Extension — See Cable, Audio (Vol. C)

Cords, Telephone, Modular — See Cable, Telephone (Vol. C)

Cords, Twin Lead — See Cable, Multiconductor (Vol. C)

Cords & Cable, Dial Drive-2400 — *See Vol. C*

Cords & Cord Sets, Telephone-6000 — *See Vol. C*

Cords & Cord Sets, International-6000 — *See Vol. C*

Cores, Ceramic-1850 — *See Vol. A*

Cores, Magnetic, Ferrite, L, E, etc.-1850 — *See Vol. A*

Cores, Magnetic, Ferrite, Pot/Cup-1850 — *See Vol. A*

Cores, Magnetic, Ferrite, Slug-1850 — *See Vol. A*

Cores, Magnetic, Ferrite, Toroid-1850 — *See Vol. A*

Cores, Magnetic, Ferrite, Yoke Section-1850 — *See Vol. A*

Cores, Magnetic, Metal Alloy (Other Than Silicon & Nickel-Iron)-1850 — *See Vol. A*

Cores, Magnetic, Nickel-Iron, L, EE, F, & Ring Laminations-1850 — *See Vol. A*

Cores, Magnetic, Nickel-Iron, Toroid-1850 — *See Vol. A*

Cores, Magnetic, Powdered Iron, Pot/Cup-1850 — *See Vol. A*

Cores, Magnetic, Powdered Iron, Slug-1850 — *See Vol. A*

Cores, Magnetic, Powdered Iron, Toroid-1850 — *See Vol. A*

Cores, Magnetic, Powdered Permalloy, Toroid-1850 — *See Vol. A*

Cores, Magnetic, Silicon C-1850 — *See Vol. A*

Cores, Magnetic, Silicon EI, EE, & F Laminations-1850 — *See Vol. A*

Cores, Magnetic, Silicon, Toroid-1850 — *See Vol. A*

Corners, Waveguide — See Bends & Twists, Microwave (Vol. A)

Coulometers — See Timers, Electrolytic Cell (Vol. D)

Countermeasures (CM) Sets (MIL), Airborne-3475 — *See Vol. D*

CM Sets (MIL), Internal-3475 — *See Vol. D*

CM Sets (MIL), Mobile-3475 — *See Vol. D*

Counter/Timers-2900 — *See Vol. D*

Counters, Bidirectional-2200 — *See Vol. D*

Counters, Coil Winding-2200 — *See Vol. D*

Counters, Decade-2200 — *See Vol. D*

Counters, Directional-2200 — *See Vol. D*

Counters, Electromagnetic-2200 — *See Vol. D*

Counters, Event-2200 — *See Vol. D*

Counters, Frequency-2900 — *See Vol. D*

Counters, Mechanical-2200 — *See Vol. D*

Counters, Particle-2900 — *See Vol. D*

Counters, Photoelectric-2200 — *See Vol. D*

Counters, Predetermining — See Counters, Preset (Vol. D)

Counters, Preset-2200 — *See Vol. D*

Counters, Printing-2200 — *See Vol. D*

Counters, Proportional — See Counters, Particle (Vol. D)

Counters, Pulse-2200 — *See Vol. D*

Counters, Reversible — See Counters, Bidirectional (Vol. D)

Counters, Revolution-2200 — *See Vol. D*

Counters, Universal-2900 — *See Vol. D*

Couplers, Acoustic-1900 — *See Vol. D*

Couplers, Antenna-1900 — *See Vol. D*

Couplers, Communications, Acoustic, Telephone-1900 — *See Vol. D*

Couplers, Directional-3450 — *See Vol. A*

Couplers, Fiber Optic-2475

Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 ..... A•2086

Aetna Telecommunications Labs., P.O. Box 723, 131 Flanders Rd., Westborough, MA 01581 617-366-0400

American Photonics Inc., 71 Commerce Dr., Brookfield Center, CT 06805 203-775-8950

AT&T, 1 Oak Way, Berkeley Heights, NJ 07922 1-800-372-2447

§ BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420

Canstar Communications, Canada Wire & Cable, Ltd., 1240 Ellesmere Rd., Scarborough, ON, CANADA M1P2X4 416-293-9722

Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300

GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237

§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371

† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-261-5600

Phalo Corp., Transitron Elctrn. Corp., 2 Friberg Parkway, Westborough, MA 01581 617-366-0830

Plainview Elctrns., 28 Cain Dr., Plainview, NY 11803 516-249-6677

Poly-Scientific, Litton Inds., 1213 N. Main St., Blacksburg, VA 24060 703-552-3014

Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

York Technology, Inc., Research Park, 139 Wall Street, Princeton, NJ 08540 609-924-7676

Couplers, Microwave-3450 — *See Vol. A*

Couplers, Multiset — See Couplers, Antenna (Vol. D)

Couplers, Optoelectronic — See Isolators, Optoelectronic (Vol. B)

Couplers, Rotary-3450 — *See Vol. A*

Couplers (MIL), Directional-2440

† Adams-Russell, Anzac Div., 80 Cambridge St., Burlington, MA 01803 671-273-3333

† Airtron, Litton Industries, Inc., 200 E. Hanover Ave., Morris Plains, NJ 07950 201-539-5500

† Dielectric Communications, General Signal, Tower Hill Rd., Raymond, ME 04071 ..... 207-655-4555;800-341-9678

Electrospace Sys., Inc., P. O. Box 831359, Richardson, TX 75083-1359 214-783-2004

† Engelmann Microwave Co., KDI Pyrofilm, 60 S. Jefferson Rd., Whippany, NJ 07981 201-887-5700

† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371

† Junction Devices, Inc., 2488-A Townsgate Rd., Westlake Village, CA 91361-2594 ..... 818-889-4030;805-497-4421

† KDI Electronics, Inc., Engelmann & Pyrofilm Divisions, 60 S. Jefferson Rd., Whippany, NJ 07981 201-887-8100

§† M/A-COM Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054 603-424-4111

RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334

† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844

Technical Research & Mfg., Inc., R.F.D. # 10, Manchester, NH 03103 ... 603-627-6000

† Transco Products, Inc., 4241 Glencoe Ave., Marina del Rey, CA 90295 .. 213-822-0800

Couplings, Quick-disconnect, Liquid or Gas-2500 — *See Vol. C*

Couplings, Shaft, Rigid & Flexible-2400 — *See Vol. C*

Covers, Protective (Incl. Dustcovers)-3800 — *See Vol. C*

Crimping Services — See Services, Crimping (Vol. D)

Crossbars — See Scanners, Crossbar (Vol. D)

Crystal Blanks-2300 — *See Vol. A*

Crystals, Frequency Control-2300 — *See Vol. A*

Crystals, Microprocessor-2300 — *See Vol. A*

Crystals, Piezoelectric-2300 — *See Vol. A*

Crystals, Quartz-2300 — *See Vol. A*

Crystals, Quartz, for Watches-2300 — *See Vol. A*

Crystals, Semiconductor(Ingots & Wafers)-2300 — *See Vol. A*

Crystals, YIG-2300 — *See Vol. A*

Crystals (MIL)-2440

† Bliley Elec. Co., 2545 W. Grandview Blvd., Erie, PA 16506, 814-838-3571 ..... A•1316,1318,1319
Croven Crystals, 500 Beech St., Whitby, ON, CANADA L1N 5S5, 416-668-3324 ..... A•1335
CTS Electronics Corp.,, Knights Division, 400 Reimann Ave., Sandwich, IL 60548, 815-786-8411 ..... A•1336
McCoy Electronics Co., Sub. Oak Technology Inc., 100 Watts St., P.O. Box B, Mt. Holly Springs, PA 17065, 717-486-3411 ..... A•1380
Monitor Prods. Co., Inc., Post Office Box 1966, Oceanside, CA 92054, 619-433-4510 ..... A•1388
§† M-Tron Inds., P.O. Box 630, E. Hwy. 50, Yankton, SD 57078, 605-665-9321 ..... A•1395
§† Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 ..... A•1396
Piezo Technology Inc., 2525 Shader Rd., Orlando, FL 32804, 305-298-2000 ..... A•1413
Reeves-Hoffman Div., 400 W. North St., Carlisle, PA 17013, 717-243-5929 ..... A•1424
Sokol Crystal Prods., Inc., 121 Water St., Mineral Point, WI 53565, 608-987-3363 ..... A•1435
§† Atomergic Chemetals Corp., 100 Fairchild Ave., Plainview, NY 11803 ... 516-349-8800
Cirtech, EG & G, 15237 Cherry St., Stanley, KS 66223 913-681-2801
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377 212-458-5811
† K & L Quartztek, K & L Microwave, 20 S. 48th Ave., Phoenix, AZ 85043 602-272-7944
§ Midland-Ross Corp., NEL Unit, 357 Beloit St., Burlington, WI 53105 414-763-3591
† Philips Electronics, Ltd., Crystal Dept., 601 Milner Avenue, Scarborough, ONTARIO, CAN. M1B 1M8 416-292-5161
† Piezo Crystal, 100 "K" St., Box 619, Carlisle, PA 17013 717-249-2151
† Valpey-Fisher, 75 South St, Hopkinton, MA 01748 617-435-6831

Cups, Encapsulation-1600 — *See Vol. C*

Current Limiters (MIL)-2440

Triac Electronic Systems, Inc., 87-27 Myrtle Ave., Glendale, NY 11385, 718-441-4759 ..... D•1132
† NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
† NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300

Current Sensors-Also See Transducers, Volt, etc.-2200 — *See Vol. D*

Current Sources-4000 — *See Vol. D*

Custom Molding Services, Plastics — See Services, Custom Molding, Plastics (Vol. D)

Cutters, Diagonal — See Cutters, Manual (Vol. C)

Cutters, Wire, Automatic — See Machines, Wire Measuring & Cutting (Vol. D)

Cutters, Wire, Manual-5400 — *See Vol. C*

Dampers, Servo-4900 — *See Vol. D*

Dampers, Structural, Chassis, Panel, etc. — See Mounts, Shock & Vibration (Vol. C)

Data Collection Equipment, Hand Held-2000 — *See Vol. D*

Data Collection Equipment, Modular-2000 — *See Vol. D*

Data Collection Equipment, Portable-2000 — *See Vol. D*

Data Acquisition & Reduction Systems-Also See Modules, Data Acquisition-2325 — *See Vol. D*

Data Compressors, Digital-2000 — *See Vol. D*

Data Display Indicators — See Displays Indicator Lights (Vol. B)

Data Display Systems — See Displays, CRT (Vol. A), Terminals, Data Display (Vol. D)

Data Links, Fiber Optic-2475

Amplifier Research, 160 School House Rd., Souderton, PA 18964-9990, 215-723-8181 ..... D•1003
† Math Assocs., 2200 Shames Dr., Westbury, NY 11590, 516-334-6800 .... B•1124
† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1121
American Photonics Inc., 71 Commerce Dr., Brookfield Center, CT 06805 203-775-8950
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§ AT&T, 1 Oak Way, Berkeley Heights, NJ 07922 1-800-372-2447
Atlantic Scientific Corp., 2711 S. Harbour City Blvd., Melbourne, FL 32901 305-725-8000
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ Augat Fiberoptics, 710 Narragansett Park Dr., Pawtucket, RI 02861 401-724-4400
§ Belden, Electronic Wire & Cable, P.O. Box 1980, Richmond, IN 47375 ... 317-983-5200
Canoga Data Sys., 6740 Eton Ave., Canoga Park, CA 91303 213-888-2003
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Corning Glass Works, Corning Elctrns., Houghton Pk., Bldg. A-2, Corning, NY 14830 607-974-8725
§ Dymec, 8 Lowell Ave., Winchester, MA 01890 617-729-7870
EOTec Corp., 420 Frontage Road, W. Haven, CT 06516 203-934-7961
EOTec Corporation, Fiber Optic Interconnect Group, 420 Frontage Road, West Haven, CT 06516 203-934-7961
Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011
Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
† Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377 212-458-5811
Gandalf Data, Inc., 1019 S. Noel Ave., Wheeling, IL 60090 312-541-6060
† General Optronics, 3005 Hadley Rd., So. Plainfield, NJ 07080 201-549-9000
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
Interoptics, Purdy Group, 770 Airport Blvd., Burlingame, CA 94010 415-347-7727
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
Kinetic Sys., 11 Maryknoll Dr., Lockport, IL 60441 815-838-0005
LeCroy Resch. Sys. Corp., 700 S. Main St., Spring Vly., NY 10977 914-425-2000
† M/A-COM Laser Diode, Inc., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
3M-Electronic Products Division, Bldg. 502, P.O. Box 2963, Austin, TX 78769-2963 512-834-6682
Mitsubishi Elctrns. America, Inc., Semiconductor Div., 1050 East Arques Ave., Sunnyvale, CA 94086 408-730-5900
§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900
NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 818-281-3636
Poly-Scientific, Litton Inds., 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
Proteon, Inc., 4 Tech Circle, Natick, MA 01760 617-655-3340
Pulsar Products Div., 2700 Merced St., San Leandro, CA 94577 415-577-7236
RCA Solid State Div., Route 202, Somerville, NJ 08876 201-685-6000
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060
Signatron, A Unit of Sundstrand Corp., 12 Hartwell Ave., Lexington, MA 02173 617-861-1500
† Teledyne Microelectronics, 12964 Panama St., Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
Telemet, 185 Dixon Ave., Amityville, NY 11701 516-842-2300

Data Links, Optical-2000 — *See Vol. D*

Data Loggers-2325 — *See Vol. D*

Data Security Devices: Encryptors, Decryptors — See Security Systems, Data

Data Switches — See Switches, Data (Vol. D)

Data Systems (MIL), Naval Tactical-3475 — *See Vol. D*

Data Translators — See Translators, Data

DCXO — See Oscillators, Digitally Compensated Crystal

Decade Boxes, Capacitance-2900 — *See Vol. D*

Decade Boxes, Inductance-2900 — *See Vol. D*

Decade Boxes, Resistance-2900 — *See Vol. D*

Decade Boxes, Transformer-2900 — *See Vol. D*

Decalcomania-Also See Labels, Pressure Sensitive-2400 — *See Vol. C*

Decapsulation Services — See Services, Decapsulation (Vol. D)

Decoders, Binary To Decimal — See Converters, Binary To Decimal (Vol. D)

Decoders, Digital To Analog — See Converters, Digital To Analog (Vol. D)

Decoders, Pulse-1900 — *See Vol. D*

Decoders, Readout — See Drivers & Decoders For Readouts (Vol. B)

Decoders, Telemetry — See Decoders, Tone (Vol. D)

Decoders, Tone-1900 — *See Vol. D*

Decoders, Video-1900 — *See Vol. D*

Decontaminants — See Cleaners & Solvents (Vol. C)

Decoys (MIL), Buoy-3475 — *See Vol. D*

Decryptors — See Security Systems, Data

Degaussers — See Demagnetizers (Vol. C), Coils, Degaussing (Vol. A)

Degreasers & Cleaners, Machine — See Machines, Cleaning & Degreasing (Vol. D)

Degreasing Chemicals — See Cleaners & Solvents (Vol. C)

Dehumidifiers (For Equipment)-2600 — *See Vol. C*

Dehydrators-4100 — *See Vol. D*

Delay Lines, Active-2350 — *See Vol. A*

Delay Lines, Cable-2350 — *See Vol. A*

Delay Lines, Digital-2350 — *See Vol. A*

Delay Lines, Dispersive (Frequency Variable)-2350 — *See Vol. A*

Delay Lines, Distributed, Constant (Fixed)-2350 — *See Vol. A*

Delay Lines, Distributed, Constant (Variable)-2350 — *See Vol. A*

Delay Lines, Glass & Quartz-2350 — *See Vol. A*

Delay Lines, Liquid-2350 — *See Vol. A*

Delay Lines, Lumped Constant (Electrically Variable)-2350 — *See Vol. A*

Delay Lines, Lumped Constant (Fixed)-2350 — *See Vol. A*

Delay Lines, Lumped Constant (Mechanically Variable)-2350 — *See Vol. A*

Delay Lines, Magnetostrictive-2350 — *See Vol. A*

Delay Lines, Programmable-2350 — *See Vol. A*

Delay Lines, SAW — See Surface Acoustic Wave Devices

Delay Lines, Strip-2350 — *See Vol. A*

Delay Lines, Trimmer-2350 — *See Vol. A*

Delay Lines, Ultrasonic-2350 — *See Vol. A*

Delay Lines, Video — See Delay Lines, Ultrasonic (Vol. A)

Delay Lines, Waveguide-2350 — *See Vol. A*

Delay Lines (MIL)-2440

† Automatic Coil Corp., Sub. Designatronics, Inc., 455 E. 10th Ave., Hialeah, FL 33010, 305-883-5311 ..... A•1464
Bel Fuse, 198 Van Vorst St., Jersey City, NJ 07302, 201-432-0463 ..... A•1486
§ Datamax Electronics, Inc., P. O. Box 2839, Blue Jay, CA 92631, 714-336-3561;714-951-5646 ..... A•1507
† ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., NJ 07650, 201-947-0400 ..... A•1508,1510,1514,1515
† Kappa Networks, Inc., 1443 Pinewood St., Rahway, NJ 07065, 201-541-1600 ..... A•1540
† Nano Pulse Industries, 440 Nibus St., Brea, CA 92670, 714-529-2600 .... A•1546
† Sawtek Inc., P.O. Box 18000, Orlando, FL 32860, 305-886-8860 ..... A•1432
Technitrol, 1952 E. Allegheny, Philadelphia, PA 19134, 215-426-9105 .... B•1010

Demagnetizers-4525 — *See Vol. C*

Demodulators-1900 — *See Vol. D*

Demodulators, Magnetic-2200 — *See Vol. D*

Densitometers-2900 — *See Vol. D*

Deposition Equipment, Vacuum & Accessories-Also See Evaporation Equipment, Electron Beam-4100 — *See Vol. D*

Desiccators — See Dehumidifiers (Vol. C)

Desks, Data Terminal — See Benches, Consoles, Tables (Vol. C)

Desoldering Tools & Equipment — See Soldering Accessories (Vol. C), Soldering Equip. (Vol. C), Soldering Guns (Vol. C), etc.

Detection & Ranging Systems (MIL)-3475 — *See Vol. D*

Detection Sets (MIL), IR-3475 — *See Vol. D*

Detection Systems, Laser-3700

Eltec Instruments Inc., P.O. Box 9610, Daytona Bch., FL 32020 904-253-5328

Detection Systems (MIL), Passive-3475 — *See Vol. D*

Detection Systems (MIL), Submarine-3475 — *See Vol. D*

Detector Arrays, Infrared-3700

Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092 201-233-7200
Eltec Instruments Inc., P.O. Box 9610, Daytona Bch., FL 32020 904-253-5328
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 818-281-3636

Detectors, Air Flow-2900 — *See Vol. D*

Detectors, AM/FM-2900 — *See Vol. D*

Detectors, Bar Code — See Readers, Bar Code (Vol. D)

Detectors, Coaxial-2900 — *See Vol. D*

Detectors, Corona — See Testers, Corona (Vol. D)

Detectors, Crystal-2300 — *See Vol. A*

Detectors, Fiber Optic-Also See Diodes, PIN-2475

MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1121
Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 ..... A•2086
§ A.C. Interface, 17911 Sampson, Huntington Beach, CA 92647 714-841-6090
Aetna Telecommunications Labs., P.O. Box 723, 131 Flanders Rd., Westborough, MA 01581 617-366-0400
† Applied Solar Energy Corp., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749 818-968-6581
§ Banner Engrg. Corp., 9714 - 10th Ave. N., Minneapolis, MN 55441 612-544-3164
§ BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420
† Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092 201-233-7200
Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
Deutsch Co., Deutsch Fiber Optics Div., 7001 W. Imperial Hwy., Los Angeles, CA 90045 213-649-1400
Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000
§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
General Fiber Optics, Inc., 98 Commerce Rd., Cedar Grove, NJ 07009 .. 201-239-3400
† General Optronics, 3005 Hadley Rd., So. Plainfield, NJ 07080 201-549-9000
Germanium Power Devices, Box 3065, Shawsheen Village Sta., Andover, MA 01810 617-475-5982
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
M/A-COM Laser Diode, Inc., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 .. 617-272-3000
§ Optek Technology, Inc., 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 818-281-3636
Photon, Inc., 14125 Capri Dr. #4, Los Gatos, CA 95030 408-866-0566
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
Rehlander Assocs., 118A Bridge St., Beverly, MA 01915 617-922-5961
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060
Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400
Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737
Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961
Spiricon, Inc., 2600 North Main, Logan, UT 84321 801-753-3729
Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265 214-995-3821
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516

Detectors, Flaw & Defect-2900 — *See Vol. D*

Detectors, GaAs-3450 — *See Vol. A*

Detectors, Ground Fault-4300 — *See Vol. D*

Detectors, Impedance — See Meters, Impedance (Vol. D)

Detectors, Infrared-3700

† Analog Modules, Inc., 126 Baywood Avenue, Longwood, FL 32750, 305-339-4356/4355 ..... B•1004
† Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092, 201-233-7200 ..... B•1204
HEI, Inc., 1495 Steiger Lake La., Victoria, MN 55386, 612-443-2500 ..... B•1211
§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 ..... A•2086
Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265, 214-995-3821 ..... B•1218
TRW Optoelectronics Div., 1207 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ..... B•1222
Advanced Kinetics, 1231 Victoria St, Costa Mesa, CA 92627 714-646-7165
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 .. 201-722-9800
Amperex Elctrn. Corp., Slatersville Div., Providence Pike, Slatersville, RI 02876 401-762-3800
§ Banner Engrg. Corp., 9714 - 10th Ave. N., Minneapolis, MN 55441 612-544-3164
† Barnes Engrg., 44 Commerce Rd., P.O. Box 53, Stamford, CT 06904 203-348-5381
Beckman Instrs., 2500 Harbor Blvd., Fullerton, CA 92634 714-871-4848
Burleigh Instrs., Burleigh Pk, Fishers, NY 14453 716-924-9355
Capintec Instrs., 6 Arrow Rd., Ramsey, NJ 07446 201-825-9500
† Cincinnati Elctrns., 2630 Glendale Milford Rd., Cincinnati, OH 45241 513-733-6100
Data Instruments, Inc., 4 Hartwell Pl, Lexington, MA 02173 617-861-7450
Dexter Research Ctr., Inc., 7300 Huron River Dr., Dexter, MI 48130 313-426-3921
Dolan-Jenner Inds., Box 1020, Woburn, MA 01801 617-935-7444
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
EG&G Gamma Scientific, Div. of EG&G Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034
ElectroPhysics Corp., 48 Spruce St., Nutley, NJ 07110 201-667-2262
Eltec Instruments Inc., P.O. Box 9610, Daytona Bch., FL 32020 904-253-5328
Femco, Inc., P.O. Box 26710 Parkmoor Sta., San Jose, CA 95159 408-946-1188
Fork Standards, Inc., 666 Western Ave., Lombard, IL 60148 312-932-9380
Gamma Scientific Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034
§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
Germanium Power Devices, Box 3065, Shawsheen Village Sta., Andover, MA 01810 617-475-5982
Hamamatsu Photonics K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
† Honeywell Inc., Aerospace & Defense Grp., Honeywell Plaza, Minneapolis, MN 55408 612-870-5186
§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
Hy-Cal Engrg., 9650 Telstar Ave., El Monte, CA 91731 213-444-4000
Inficon Leybold-Heraeus, Inc., 6500 Fly Rd, E. Syracuse, NY 13057 315-437-0377
Infrared Inds., Inc., P.O. Box 14200, Orlando, FL 32857 305-282-7700
§ International Laser Sys., 3404 N. Orange Blossom Trail, Orlando, FL 32804 305-295-4010
† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998 213-828-7496
Mikron Instr., Box 211, Ridgewood, NJ 07451 201-891-7330
NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000
Optoelectronics, Inc., 1309 Dynamic St., Petaluma, CA 94952 707-763-4181
Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 408-725-1220
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 818-281-3636
Photobell, 26 Just Rd., Fairfield, NJ 07006 201-227-3613
† Raytheon Co., Microwave & Power Tube Div., 190 Willow St., Waltham, MA 02154 617-899-8400
RCA Solid State Div., Route 202, Somerville, NJ 08876 201-685-6000
Sanders Assocs., Flexprint Prods. Div., Grenier Fld., Manchester, NH 03103 603-669-4615
† Santa Barbara Resch. Ctr., 75 Coromar Dr., Goleta, CA 93117 805-968-3511
† Scientech, Inc., 5649 Arapahoe Ave., Boulder, CO 80303 .. 303-444-1361;800-525-0522
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060
Sensor Techn., 21012 Lassen St, Chatsworth, CA 91311 213-882-4100
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400
Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961
Spiricon, Inc., 2600 North Main, Logan, UT 84321 801-753-3729
† Thermometrics, Inc., 808 U.S. Hwy. # 1, Edison, NJ 08817-4695 201-287-2870
§ THORN EMI Gencom Inc., 23 Madison Rd., Fairfield, NJ 07006 201-575-5586
§ TRW, Dynalco Controls Div., 5200 NW 37th, P.O. Box 8187, Ft. Lauderdale, FL 33310 305-739-4300
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516
§ Victory Engrg. Corp., Victory Rd., Springfield, NJ 07081 201-379-5900

Detectors, Light Intensity — See Meters, Light, Nonphotographic (Vol. D)

Detectors, Magnetic — See Meters, Gauss (Vol. D)

Detectors, Microwave-3400 — *See Vol. D*

Detectors, Null — See Indicators, Null (Vol. D)

Detectors, Phase Sensitive-2900 — *See Vol. D*

Detectors, Photovoltaic — See Cells, Photovoltaic (Vol. B)

Detectors, RF-2900 — *See Vol. D*

Detectors, Radiation-2900 — *See Vol. D*

Detectors, Resistance Temperature (RTDs) — See Thermometers, Resistance (Vol. D)

Detectors, Standing Wave-2900 — *See Vol. D*

Detectors, Synchronous-2900 — *See Vol. D*

Detectors, Tone-1900 — *See Vol. D*

Detectors, Ultraviolet-2900 — *See Vol. D*

Detectors, Vacuum-4100 — *See Vol. D*

Detectors, Vibration — See Transducers, Vibration (Vol. B)

Detectors, Video-2900 — *See Vol. D*

Detectors, Voltage-2900 — *See Vol. D*

Detectors (MIL), IR-3475 — *See Vol. D*

Detectors (MIL), Radar-3475 — *See Vol. D*

DIACs-4800 — *See Vol. A*

Dials, Instrument, Metal, Plastic, etc.-2400 — *See Vol. C*

Dials, Turns Counting-2400 — *See Vol. C*

Dielectric Heating Equipment-4100 — *See Vol. D*

Dielectrics — See Films (Vol. C), Insulation Materials (Vol. C)

Differentials, Mechanical — See Gears & Gear Mechanisms (Vol. B)

Digital Panel Meters — See Meters, Panel (Digital) (Vol. D)

Digital Tape Recorders — See Recorders, Computer Data (Vol. D)

Digitizers, Audio (Sonic)-2000 — *See Vol. D*

Digitizers, Video-2000 — *See Vol. D*

Digitizers, Pencil Follower (Incl. Coordinate & Graphic)-2000 — *See Vol. D*

Digitizers, Transient & Waveform-2900 — *See Vol. D*

Dimmers, Light — See Controls, Lamp Dimming, Flashing (Vol. D)

Diode Arrays (Incl. Photo)-3700

Advanced Detector Corp., Applied Solar Energy Corp., 15251 E. Don Julian Rd., Industry, CA 91746, 818-369-6886 ..... B•1203
Assembly Specialists, 914 Main St., Box 965, Acton, MA 01720, 617-263-9100 ..... C•1700
Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092, 201-233-7200 ..... B•1204
§ EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ... B•1210
K & M Elctrns., 123 Interstate Dr., W. Springfield, MA 01089, 413-781-1350 ..... A•1879
Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 ..... A•2081
† Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901, 518-561-3160 ..... B•1215
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 .. 201-722-9800
Alpha Inds., Inc.-MSD Div., 20 Sylvan Rd., Woburn, MA 01801 617-935-5150
† Andrich Sys., Inc., 1699 Roosevelt Ave., Bohemia, NY 11716 516-589-5656
† Applied Solar Energy Corp., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749 818-968-6581
† Basic Electronics, Inc., 11762 Western Ave. "Q", Stanton, CA 90680 714-530-2400
§ BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420
† Beckman Industrial Corp., Electronic Technologies Div., 2500 Harbor Blvd., Fullerton, CA 92634 714-871-4848
Codi Semiconductor, Inc., 350 Hurst Ave., Linden, NJ 07036 201-862-8484
† Dionics, 65 Rushmore St., Westbury, NY 11590 516-997-7474
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
† Elctrn. Devices, 21 Gray Oaks Ave., Yonkers, NY 10710 914-965-4400
§† Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
Hamamatsu Photonics K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
HEI, Inc., 1495 Steiger Lake La., Victoria, MN 55386 612-443-2500
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Hitachi America, 1800 Bering Dr., San Jose, CA 95112 408-292-6404
§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271

Infrared Inds., Inc., P.O. Box 14200, Orlando, FL 32857 305-282-7700
† International Sensor Systems, Inc., Aurora Industrial Pk., Box 345, Aurora, NE 68818 402-694-6111
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248
McGuirk Electronics Co. Inc., 212 So. Main St, P. O. Box 853, Middleton, MA 01949 617-933-3500
† Mel Tec, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090 .. 617-329-1508
† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998 213-828-7496
† Micro Semiconductor, 2830 S. Fairview St., Santa Ana, CA 92704 714-979-8220
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
§ NEC Elctrns. USA Inc., NEC Electron Div., 252 Humboldt Ct., Sunnyvale, CA 94086 408-745-6520
§ Optek Technology, Inc., 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Optoelectronics, Inc., 1309 Dynamic St., Petaluma, CA 94952 707-763-4181
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
RCA Solid State Div., Route 202, Somerville, NJ 08876 201-685-6000
RCA Solid State Div., Linear Integrated Circuits, Rte. 202, Somerville, NJ 08876 201-685-6000
Rohm Corp., 8 Whatney, Irvine, CA 92718 714-855-2131
§ Semtech, 652 Mitchell Rd., Newbury Park, CA 91320 213-628-5392
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400
† Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737
† Solid State Devices, 14830 Valley View Ave., La Mirada, CA 90638 213-921-9660
§† Solitron Devices, Inc., Semiconductor Group, 1177 Blue Heron Rd., Riviera Beach, FL 33404 305-848-4311
Spiricon, Inc., 2600 North Main, Logan, UT 84321 801-753-3729
Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254 617-890-6107
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516
† Voltage Multipliers, Inc., 8711 W. Roosevelt Ave., Visalia, CA 93291 209-651-1402

Diodes, Avalanche-4800 — *See Vol. A*

Diodes, Backward-4800 — *See Vol. A*

Diodes, Breakdown — See Diodes, Avalanche (Vol. A)

Diodes, Chip, Unpackaged-4800 — *See Vol. A*

Diodes, Electroluminescent (Radiating)-4800 — *See Vol. A*

Diodes, Frequency Multiplier-4800 — *See Vol. A*

Diodes, Germanium-4800 — *See Vol. A*

Diodes, Gunn-4800 — *See Vol. A*

Diodes, High Voltage (1,000 Volts & Over)-4800 — *See Vol. A*

Diodes, Hot Carrier-4800 — *See Vol. A*

Diodes, Impatt-4800 — *See Vol. A*

Diodes, Infrared-4800 — *See Vol. A*

Diodes, Laser-4800 — *See Vol. A*

Diodes, Light Emitting (LEDs)-3700

§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1019
Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092, 201-233-7200 ..... B•1204
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 ..... B•1032
§ EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ... B•1210
† Gilway Technical Lamp, 165 New Boston Street, Woburn, MA 01801, 617-935-4442 ..... B•1054
IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211, 408-747-0550 ..... B•1056
§ Industrial Devices, Inc., 7 Hudson St., Edgewater, NJ 07020, 201-224-4700 ..... B•1014,1017,1057-1077
§† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1078
Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ..... B•1082
ISL Products Int'l, Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093, 516-822-9601 ..... A•2075
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505, 213-534-1505 ..... B•1083
§ Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101, 718-392-8800 ..... B•1085
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ..... B•1088
† Math Assocs., 2200 Shames Dr., Westbury, NY 11590, 516-334-6800 .... B•1124
† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1121
† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... B•1091
§ Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
§ Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 ..... B•1098
Stettner Elctrns., 6135 Airways Blvd., Chattanooga, TN 37421, 615-892-0291 ..... A•1175
Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254, 617-890-6107 ..... A•2091
Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265, 214-995-3821 ..... B•1218
§† A.C. Interface, 17911 Sampson, Huntington Beach, CA 92647 714-841-6090
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 .. 201-722-9800
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
§ AND, 770 Airport Blvd., Burlingame, CA 94010 415-347-9916
Clairex Electronics, 560 S. 3rd Ave., Mt. Vernon, NY 10550 914-664-6602
† Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
§ Collmer Semiconductor, Inc., 14368 Proton Rd., Dallas, TX 75234-3335 214-233-1589
Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
Data Display Products, Box 91072, Los Angeles, CA 90009 213-640-0442
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
Ei North America, 15 W. 53rd St. Suite 47E, New York, NY 10019 212-315-3099
§ Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
§† Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
† General Optronics, 3005 Hadley Rd., So. Plainfield, NJ 07080 201-549-9000
§ Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
Golden Pacific Elctrns., Inc., 1020 N. Batavia St., Ste. Q, Orange, CA 92667 ..... 714-538-9752/9753
Hamamatsu Photonics K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
HEI, Inc., 1495 Steiger Lake La., Victoria, MN 55386 612-443-2500
§† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Hitachi America, 1800 Bering Dr., San Jose, CA 95112 408-292-6404
§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
§ JKL Comps., 13343 Paxton St., Pacoima, CA 91331 818-896-0019
§† Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
† Laser Diode Labs, 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
§ Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§ Liberty Intl. Corp., 2539 237th St., Suite F, Torrance, CA 90505 213-539-6452
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248
§† M/A-COM Laser Diode, Inc., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
Micropac Inds., 905 E. Walnut St., Garland, TX 75040 214-272-3571
Micropac Inds., Inc., General Sensors Div., 905 E. Walnut St., Garland, TX 75040 214-272-3571
Mitsubishi Elctrns. America, Inc., Semiconductor Div., 1050 East Arques Ave., Sunnyvale, CA 94086 408-730-5900
National Semiconductor Optoelectronics, 365 Jordan Road, Troy, NY 12180-8396 518-271-2100
NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000
§ NEC Elctrns. USA Inc., NEC Electron Div., 252 Humboldt Ct., Sunnyvale, CA 94086 408-745-6520
§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 201-748-5089
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260 602-991-0942
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Optek Technology, Inc., 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 408-725-1220
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
§ Oshino Electric Lamp Works, Ltd., 5-2, Mianami-Shinagawa 2-chome, Shinagawa-Ku, Tokyo, JAPAN 03-471-8548
§† Paccom, 3928 148th NE, Redmond, WA 98052 ..... 206-883-9200;800-426-6254
§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
§† Philips ECG, Inc., 100 First Ave., Waltham, MA 02254 617-890-6107
§ RCA Distr. & Special Prods. Div., RCA Corp., 2000 Clements Bridge Rd., Deptford, NJ 08096 609-541-3636
§ Rohm Corp., 8 Whatney, Irvine, CA 92718 714-855-2131
§ Sanken Elec. Co., 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, JAPAN 03-986-6151
Sanken Elec. U.S.A. Corp., 3848 Carson St., Ste. 105, Torrance, CA 90503 213-540-2209
§ Sanyo Semiconductor Corp., 7 Pearl Ct., Allendale, NJ 07401 201-825-8080
Schroff Inc., 170 Commerce Dr., Warwick, RI 02886 401-732-3770
§ Schroff UK Ltd., Maylands Ave., Hemel Hempstead, Herts, ENGLAND HP2 4SG 0442-40471/6
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400

Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
§† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092
§ Sprague Electric Company, Distribution Division, 481 Marshall St., No. Adams, MA 01247 413-664-4481
§ Stanley/AC Interface, 17911 Sampson Lane, Costa Mesa, CA 92647 ... 714-841-6090
§ Teknational Inds., Inc., 430 S. Clinton Ave., Rochester, NY 14620 716-232-1291
Visual Communications Co., Inc., P.O. Box 986, El Segundo, CA 90245 .. 213-822-4727
§ Wamco, Inc., 11555-A Coley River Cir., Fountain Valley, CA 92708 714-545-5560
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
Zexco, 7661 Densmore, #8, Van Nuys, CA 91406 818-997-7895

Diodes, Limiting-4800 — *See Vol. A*

Diodes, Liquid Crystal (LCDs)-3700

Excel Technology Intl. Corp., 4-5 Stryker La., Hillsborough Indl. Pk., Belle Mead, NJ 08502 201-874-4747
ISL Products Int'l, Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 .. 516-822-9601
§ Stanley/AC Interface, 17911 Sampson Lane, Costa Mesa, CA 92647 ... 714-841-6090
† UCE, Inc., 24 Fitch St., Norwalk, CT 06855 203-838-7509

Diodes, Matched Pairs-4800 — *See Vol. A*

Diodes, Matched Quads-4800 — *See Vol. A*

Diodes, Microwave Detector-4800 — *See Vol. A*

Diodes, Microwave Mixer-4800 — *See Vol. A*

Diodes, Noise-4800 — *See Vol. A*

Diodes, Photoelectric-3700

Advanced Detector Corp., Applied Solar Energy Corp., 15251 E. Don Julian Rd., Industry, CA 91746, 818-369-6886 ..... B•1203
† Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092, 201-233-7200 ..... B•1204
§ Clairex Electronics, 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602 ..... B•1207
§ EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ... B•1210
Gilway Technical Lamp, 165 New Boston Street, Woburn, MA 01801, 617-935-4442 ..... B•1054
† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1121
† Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901, 518-561-3160 ..... B•1215
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 .. 201-722-9800
§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
† Applied Solar Energy Corp., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749 818-968-6581
Cherry Semiconductor Corp, 2000 S. County Trail, East Greenwich, RI 02818 401-885-3600
EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
Ferranti Elec., 87 Modula Ave., Commack, NY 11725 516-543-0200
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
§ Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
Micropac Inds., 905 E. Walnut St., Garland, TX 75040 214-272-3571
Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900
§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 201-748-5089
§ Optek Technology, Inc., 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Optoelectronics, Inc., 1309 Dynamic St., Petaluma, CA 94952 707-763-4181
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
† Santa Barbara Resch. Ctr., 75 Coromar Dr., Goleta, CA 93117 805-968-3511
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
§† Solarex Corp., 1335 Piccard Dr., Rockville, MD 20850 301-948-0202
§† Thor Elctrns., 321 Pennsylvania Ave., Linden, NJ 07036 201-486-3300
§ THORN EMI Gencom Inc., 23 Madison Rd., Fairfield, NJ 07006 201-575-5586
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516

Diodes, PIN-4800 — *See Vol. A*

Diodes, Schottky-4800 — *See Vol. A*

Diodes, Selenium — See Rectifiers, Selenium (Vol. A)

Diodes, Silicon-4800 — *See Vol. A*

Diodes, Step Recovery-4800 — *See Vol. A*

Diodes, Switching-4800 — *See Vol. A*

Diodes, Temperature Compensating-4800 — *See Vol. A*

Diodes, Trigger — See Diodes, Avalanche (Vol. A)

Diodes, Tunnel-4800 — *See Vol. A*

Diodes, Varactor-4800 — *See Vol. A*

Diodes, Video Detector — See Diodes, Microwave Detector (Vol. A)

Diodes, Zener & Stabistors (Forward Reference Diodes)-4800 — *See Vol. A*

Diodes (MIL)-2440

† Eaton Corp., Microwave Components Div., 680 W. Maude Ave., Sunnyvale, CA 94086 408-733-3883
† Koep Precision Standards, Inc., P. O. Box 191, So. Plainfield, NJ 07080 201-549-9280
Philips ECG, Inc., 100 First Ave., Waltham, MA 02254 617-890-6107
Semicon, 10 North Ave., Burlington, MA 01803 617-272-9015
§† TRW Microwave, 825 Stewart Dr., Sunnyvale, CA 94086 408-732-0880
Voltage Multipliers, Inc., 8711 W. Roosevelt Ave., Visalia, CA 93291 209-651-1402

Diplexers, Antenna-1900 — *See Vol. D*

Direction Finders (MIL), High Frequency-3475 — *See Vol. D*

Direction Finders (MIL), Radio-3475 — *See Vol. D*

Direction Finding Sets & Systems (MIL)-3475 — *See Vol. D*

Discharge Systems, Energy-4000 — *See Vol. D*

Discriminators-1900 — *See Vol. D*

Disks, Computer Memory — See Memory Systems, Disk (Vol. D)

Disks, Magnetic 3½"-2000 — *See Vol. D*

Disks, Magnetic, 5¼" Flexible-2000 — *See Vol. D*

Disks, Magnetic, 8" Flexible-2000 — *See Vol. D*

Disks, Magnetic, Front-loading Cartridge-2000 — *See Vol. D*

Disks, Magnetic, Pack-2000 — *See Vol. D*

Disks, Magnetic, Sub-4"-2000 — *See Vol. D*

Disks, Magnetic, Top-loading Cartridge-2000 — *See Vol. D*

Disks, Magnetic, Winchester Module-2000 — *See Vol. D*

Disks, Memory, Flexible — See Memory Systems, Disk, Flexible (Vol. D)

Disks, Optical Encoder — See Encoders, Shaft Angle, Optical (Vol. B)

Dispensers, Adhesive-1600 — *See Vol. C*

Dispensers, DIP & IC — See Machines, Component Handling (Vol. D)

Dispensers (MIL), Chaff-3475 — *See Vol. D*

Dispensing Pods (MIL), Chaff-3475 — *See Vol. D*

Display Modules-2450

§ Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, 402-564-3131 ..... B•1026
Elec-tek, Inc., 10280 Alliance Rd., Cincinnati, OH 45242 513-793-7937
Endicott Resch. Grp., Inc., 2601 Wayne St., P.O. Box 269, Endicott, NY 13760 607-754-9187
† Infodex, Inc., 395 W. Main St., Waterbury, CT 06702 203-757-9291
Kinetic Sys., 11 Maryknoll Dr., Lockport, IL 60441 815-838-0005
KMC Systems, Inc., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432 201-447-0007
K-Systems, Inc., 3902 Lilac, Las Cruces, NM 88005 505-526-3209
§† NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110 312-426-5900

Display Power Supplies — See Converters, DC to DC (Vol. D), Power Supplies, AC Output (Vol. D)

Displays, CRT-5700 — *See Vol. A*

Displays, Dot Matrix-2450

Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1024
§ Chrono-log Corp., 2 W. Park Rd., Havertown, PA 19083, 215-853-1130 .. D•1061
§ Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, 402-564-3131 ..... B•1025
§ Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 ..... B•1029,1031
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ..... B•1040
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1079,1726
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... B•1091

§ Seiko Instrs. U.S.A., Inc., 2990 W. Lomita Blvd., Torrance, CA 90505, 213-530-8777 ..... B•1092
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706, 516-666-8000 .... B•1105
Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265, 214-995-3821 ..... B•1218
Texmate, Inc., 348 S. Cedros Ave., P.O. Box 2000, Solana Beach, CA 92075, 619-481-7177 ..... D•1379
VL Electronics, 2775 Glendower Ave., Los Angeles, CA 90027, 213-661-8883 ..... B•1117
§ A.C. Interface, 17911 Sampson, Huntington Beach, CA 92647 714-841-6090
§ AND, 770 Airport Blvd., Burlingame, CA 94010 415-347-9916
Astec USA, Ltd., A BSR Intl. Co., 2880 San Tomas Expwy., #200, Santa Clara, CA 95051 408-748-1200
† Astronautics Corporation of America, P.O. Box 523, Milwaukee, WI 53201-0523 414-447-8200
Colorgraphic Communications Corp., 2379 John Glenn Dr. Ste. 105, P.O. Box 80448, Atlanta, GA 30366 404-455-3921
Computerwise, 4006 E 137th Terr., Grandview, MO 64030 816-765-3330
Crystaloid Elctrns., Box 628, Hudson, OH 44236 216-655-2429
Digital Elctrns., 26142 Eden Landing Rd., Ste. 2, Hayward, CA 94545 415-786-0520
Digital Equip., One Iron Way, Marlborough, MA 01752
Dotronix, 160 First St. SE, New Brighton, MN 55112 612-633-1742
Durgin & Browne, 80 Allen Rd., So. Burlington, VT 05401 802-863-6873
† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
Elec-tek, Inc., 10280 Alliance Rd., Cincinnati, OH 45242 513-793-7937
Fema Elctrns. Corp., 12-6 Edgeboro Rd., E. Brunswick, NJ 08816 201-238-1223
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
§† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
† Hazeltine Corp., 500 Commack Rd., Commack, NY 11725 516-462-5100
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Hitachi America, 1800 Bering Dr., San Jose, CA 95112 408-292-6404
International Instrumentation, 31131-602 Via Colinas, Westlake Vlg., CA 91362 213-991-9614
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248
† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000
Noritake Elctrns., Inc., Noritake Co., Ltd. (Japan), 22410 Hawthorne Blvd., #6, Torrance, CA 90505 213-373-6704
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400
§ Thor Elctrns., 321 Pennsylvania Ave., Linden, NJ 07036 201-486-3300
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† UCE, Inc., 24 Fitch St, Norwalk, CT 06855 203-838-7509

Displays, Edge Lighted & Back Lighted-2450

Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ..... B•1046
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1656
Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
Crystaloid Elctrns., Box 628, Hudson, OH 44236 216-655-2429
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
§† Glar-Ban Div. of Mark IV Inds., Inc., 2937 Alt Blvd., Grand Island, NY 14072 716-773-2871
KMC Systems, Inc., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432 201-447-0007
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
† Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
† Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† UCE, Inc., 24 Fitch St, Norwalk, CT 06855 203-838-7509

Displays, Electroluminescent-2450

§ Densitron Corp., 20775 Western Ave., Torrance, CA 90501 213-618-9647
† Infodex, Inc., 395 W. Main St., Waterbury, CT 06702 203-757-9291
Kollsman Instr., 220 Daniel Webster Hwy., Merrimack, NH 03054 603-889-2500
§ Sumitronics, Inc., Sumitomo Corporation, 1270 Oakmead Pkwy. Ste. 201, Sunnyvale, CA 94086 408-737-7683
§† Supertex, Inc., 1225 Bordeaux Dr., P.O. Box 3607, Sunnyvale, CA 94088 408-744-0100
† UCE, Inc., 24 Fitch St, Norwalk, CT 06855 203-838-7509

Displays, Electromagnetic-2450

§ Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 ..... B•1029
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706, 516-666-8000 ..... B•1105-1107,1105,1106,1107
† Astronautics Corporation of America, P.O. Box 523, Milwaukee, WI 53201-0523 414-447-8200
† Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809 219-747-3121
§ Densitron Corp., 20775 Western Ave., Torrance, CA 90501 213-618-9647
Electrodynamics, Inc., A Talley Inds. Co., 1200 Hicks Rd., Rolling Meadows, IL 60008 312-259-0740
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
§† Glar-Ban Div. of Mark IV Inds., Inc., 2937 Alt Blvd., Grand Island, NY 14072 716-773-2871
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
† Minelco Inc. - A Talley Ind., 135 S. Main St., Thomaston, CT 06787-0459 203-283-8261
† Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
Schroff Inc., 170 Commerce Dr., Warwick, RI 02886 401-732-3770
Show 'N Tell Products, AMG, Inc., 155 Franklin Street, Dayton, OH 45402 513-223-8211

Displays, Fiber Optic-2450

ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
Galileo Electro-Optics Corp., Galileo Pk., Sturbridge, MA 01518 617-347-9191
General Fiber Optics, Inc., 98 Commerce Rd., Cedar Grove, NJ 07009 .. 201-239-3400
§ Mitsubishi Elctrns., Industrial Electronics Div., 991 Knox Street, Torrance, CA 90502 213-515-3993
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300

Displays, Graphic-2450

Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1024
§ Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, 402-564-3131 ..... B•1025
§ Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 ..... B•1029,1031
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ..... B•1046
Dixson, Inc., Instrument Div., Box 1449, Grand Junction, CO 81502, 303-242-8863 ..... D•1349
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1726
Seiko Instrs. U.S.A., Inc., 2990 W. Lomita Blvd., Torrance, CA 90505, 213-530-8777 ..... B•1092
Telpar, Inc., 4137 Billy Mitchell Rd., P.O. Box 796, Addison, TX 75001, 214-233-6631 ..... D•1075
† Alden Electronics, Inc., 40 Washington Street, Westboro, MA 01581 617-366-8851
§ AND, 770 Airport Blvd., Burlingame, CA 94010 415-347-9916
§ Andromeda Sys., 9000 Eton Ave., Canoga Park, CA 91304 818-709-7600
Applied Sys., 26401 Harper Ave., St. Clair Shores, MI 48081 313-779-8700
† Astronautics Corporation of America, P.O. Box 523, Milwaukee, WI 53201-0523 414-447-8200
§ Auto-trol Tech., 12500 N. Washington St., Denver, CO 80233 303-452-4919
† Aydin Corp., 700 Dresher Rd., Horsham, PA 19044 215-657-7510
§† Aydin Controls, 414 Commerce Dr., Ft. Washington, PA 19034 215-542-7800
Colorgraphic Communications Corp., 2379 John Glenn Dr. Ste. 105, P.O. Box 80448, Atlanta, GA 30366 404-455-3921
† Conrac Corp., System Comps. Div., 1700 S. Mountain Ave., Duarte, CA 91010 213-359-9141
Control Systems, 2855 Anthony Lane, Minneapolis, MN 55418 612-789-2421
CPS Inc., 110 Wolfe Rd., Sunnyvale, CA 94086 408-738-0530
Crystaloid Elctrns., Box 628, Hudson, OH 44236 216-655-2429
Data Ray Corp., 452 Burbank Street, Broomfield, CO 80020 303-469-5173
Digital Elctrns., 26142 Eden Landing Rd., Ste. 2, Hayward, CA 94545 415-786-0520
Digital Equip., One Iron Way, Marlborough, MA 01752
Dotronix, 160 First St. SE, New Brighton, MN 55112 612-633-1742
Evans & Sutherland Computer Corp., P.O. Box 8700, 580 Arapeen Dr., Salt Lake City, UT 84108 801-582-5847
Excel Technology Intl. Corp., 4-5 Stryker La., Hillsborough Indl. Pk., Belle Mead, NJ 08502 201-874-4747
Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011
Fema Elctrns. Corp., 12-6 Edgeboro Rd., E. Brunswick, NJ 08816 201-238-1223
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
General Digital Industries Inc., 7702 Governors Dr. W., Huntsville, AL 35805 205-837-8305
Genstar Rental Elctrns., 2445 Faber Pl., Palo Alto, CA 94303 415-856-7600
Golden Pacific Elctrns., Inc., 1020 N. Batavia St., Ste. Q, Orange, CA 92667 ..... 714-538-9752/9753
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
† Hartman Systems, Figgie Intl., 360 Wolf Hill Rd., Huntington Sta., NY 11746 516-427-7500
Image Technology Methods Corp., 103 Moody St., Waltham, MA 02154 617-894-1720
† Infodex, Inc., 395 W. Main St., Waterbury, CT 06702 203-757-9291
KMC Systems, Inc., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432 201-447-0007
Lexidata Corp., 755 Middlesex Tpke., Billerica, MA 01865 ..... 617-663-8550; 800-472-4747
Lundy Elctrns. & Systems, Inc., 1 Robert La., Glen Head, NY 11545 516-671-9000
§ Megatek Corp., 9645 Scranton Road, San Diego, CA 92121 619-455-5590
Metra Instrs., 2056 Bering Dr., San Jose, CA 95131 408-297-8530
§ Mitsubishi Elctrns., Industrial Electronics Div., 991 Knox Street, Torrance, CA 90502 213-515-3993
Noritake Elctrns., Inc., Noritake Co., Ltd. (Japan), 22410 Hawthorne Blvd., #6, Torrance, CA 90505 213-373-6704
Peritek Corp., 5550 Redwood Rd., Oakland, CA 94619 415-531-6500
Photo Chem. Prods. Cal., 18031 Susana Rd., Compton, CA 90224 213-603-0400
§ Ramtek, 2211 Lawson Lane, Santa Clara, CA 95050 408-988-2211
Raster Graphics, Inc., P. O. Box 5157, Bend, OR 97701 503-388-2584
† SAI Technlg. Co., Science Applications Inc., 4060 Sorrento Valley Blvd., San Diego, CA 92121 619-452-9150
Show 'N Tell Products, AMG, Inc., 155 Franklin Street, Dayton, OH 45402 513-223-8211
§ Summit CAD Corp., 5222 FM 1960 W100, Houston, TX 77069 713-440-1468
† Systems Resch. Labs., Inc., 2800 Indian Ripple Rd., Dayton, OH 45440 .. 513-426-6000
† Tektronix, Inc., P. O. Box 500, Y3-314, Beaverton, OR 97077 ..... 800-547-1512;Oregon only 800-452-1877

Wavetek Indiana, Inc., 5808 Churchman, Beech Grove, IN 46107 317-787-3332

Displays, Indicator Lights-2450

† **Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... B•1091**
† Astronautics Corporation of America, P.O. Box 523, Milwaukee, WI 53201-0523 414-447-8200
§† Digitech Industries, Inc., 66 Grove St., Ridgefield, CT 06877 203-438-3731
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087 ..... 312-662-7667; 800-323-9605
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§† Glar-Ban Div. of Mark IV Inds., Inc., 2937 Alt Blvd., Grand Island, NY 14072 716-773-2871
Hellesens Battery Engrg., Inc., A/S Hellesens, 1636 Hyde Park Ave., Hyde Park, MA 02136 617-361-7555
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 ... 818-787-0311
Interface Products, Inc., 2185 S. Grand Ave., Santa Ana, CA 92705 714-549-4977
Interswitch, 770 Airport Blvd., Burlingame, CA 94010 415-347-8217
JKL Comps., 13343 Paxton St., Pacoima, CA 91331 818-896-0019
† Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
† Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Show 'N Tell Products, AMG, Inc., 155 Franklin Street, Dayton, OH 45402 513-223-8211
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265 214-995-3821
§† Wamco, Inc., 11555-A Coley River Cir., Fountain Valley, CA 92708 714-545-5560
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791

Displays, Graphic Systems-2000 — *See Vol. D*

Displays, Laser-2450

† Laser Concepts, Omega Organization Intl., P.O. Box 687, Mercer Island, WA 98040 206-232-6256
† Singer Co., Librascope Div., 833 Sonora Ave., Glendale, CA 91201 818-244-6541

Displays, Light-emitting Diode (LED)-2450

Canyon Elctrns., 2001 W. North Lane, Phoenix, AZ 85021, 602-944-4421 ..... B•1022
§ **Chrono-log Corp., 2 W. Park Rd., Havertown, PA 19083, 215-853-1130 .. D•1061**
Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ..... B•1541
§ **C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880, 617-246-1720 ..... D•1114**
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ..... B•1040
§† **Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1078**
§ **Newport Electronics, 630 E. Young St., Santa Ana, CA 92705, 714-540-4914 ..... D•1371**
§† **Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... B•1091**
Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265, 214-995-3821 ..... B•1218
Texmate, Inc., 348 S. Cedros Ave., P.O. Box 2000, Solana Beach, CA 92075, 619-481-7177 ..... D•1379
§ A.C. Interface, 17911 Sampson, Huntington Beach, CA 92647 714-841-6090
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 .. 201-722-9800
American Elctrn. Labs., Inc., Hybrid/MIC Div., P.O. Box 552, Lansdale, PA 19446
§ AND, 770 Airport Blvd., Burlingame, CA 94010 415-347-9916
Artisan Elctrns., 5 Eastmans Rd., Parsippany, NJ 07054 201-887-7100
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 414-332-8100
§ Cincinnati Electrosys., 469 Wards Corner Rd., Loveland, OH 45140 513-831-4347
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587 718-497-7600
Digitec Corp., 918 Woodley Rd., P.O. Box 458, Dayton, OH 45401 513-254-6251
§† Digitech Industries, Inc., 66 Grove St., Ridgefield, CT 06877 203-438-3731
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460 203-877-4577
Elec-tek, Inc., 10280 Alliance Rd., Cincinnati, OH 45242 513-793-7937
§ Electro Industries, Div. E.I. Elctrns., Inc., 1800 Shames Drive, Westbury, NY 11590 516-334-0870
§ Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
Extech International Corp., 150 Bear Hill Rd., Waltham, MA 02154 617-890-7440
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
Golden Pacific Elctrns., Inc., 1020 N. Batavia St., Ste. Q, Orange, CA 92667 ..... 714-538-9752/9753
§† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
† Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211 408-747-0550
Innovatek Microsystems, Inc., Smithfield Rd., R1 Box 104, Millerton, NY 12546-9720 914-373-9003
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025 312-729-5330
§ International Microtronics Corp., 4016 E. Tennessee St., Tucson, AZ 85714 602-748-7900
Interswitch, 770 Airport Blvd., Burlingame, CA 94010 415-347-8217
† Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248
Matrix Corp., 1639 Green St., Raleigh, NC 27603 919-833-2837
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
§ National Semiconductor Optoelectronics, 365 Jordan Road, Troy, NY 12180-8396 518-271-2100
§ NEC Elctrns. USA Inc., NEC Electron Div., 252 Humboldt Ct., Sunnyvale, CA 94086 408-745-6520
§ NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110 312-426-5900
§ Paccom, 3928 148th NE, Redmond, WA 98052 ..... 206-883-9200;800-426-6254
Philips ECG, Inc., 100 First Ave., Waltham, MA 02254 617-890-6107
Pho-Tronics, 8701 W. Bradley Rd., Milwaukee, WI 53224 414-355-6704
† Rohm Corp., 8 Whatney, Irvine, CA 92718 714-855-2131
Sanken Elec. Co., 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, JAPAN 03-986-6151
Schroff Inc., 170 Commerce Dr., Warwick, RI 02886 401-732-3770
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
§ Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680 714-669-9850
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Show 'N Tell Products, AMG, Inc., 155 Franklin Street, Dayton, OH 45402 513-223-8211
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
§ Sprague Electric Company, Distribution Division, 481 Marshall St., No. Adams, MA 01247 413-664-4481
§ Stanley/AC Interface, 17911 Sampson Lane, Costa Mesa, CA 92647 ... 714-841-6090
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
† Teledyne Microelectronics, 12964 Panama St., Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
Telesis Laboratory, Box 1972, Chillocothe, OH 45601 614-642-5000
§ Texas Instrs., Inc., Box 225012-MS-84, Dallas, TX 75265 214-995-6611
§ Thor Elctrns., 321 Pennsylvania Ave., Linden, NJ 07036 201-486-3300
§ Wamco, Inc., 11555-A Coley River Cir., Fountain Valley, CA 92708 714-545-5560
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791

Displays, Lighted Segment-2450

Canyon Elctrns., 2001 W. North Lane, Phoenix, AZ 85021, 602-944-4421 ..... B•1022
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1024
§ **Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ..... B•1541**
§ **Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, 402-564-3131 ..... B•1025,1027**
§ **Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 ..... B•1029**
§ **Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 ..... B•1038**
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ..... B•1040
† **Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1078**
§ **NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110, 312-426-5900 ..... B•1089**
† **Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... B•1091**
Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706, 516-666-8000 .... B•1105
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 .. 201-722-9800
§ AND, 770 Airport Blvd., Burlingame, CA 94010 415-347-9916
Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54703 715-834-9595
Cincinnati Electrosys., 469 Wards Corner Rd., Loveland, OH 45140 513-831-4347
Digital Elctrns., 26142 Eden Landing Rd., Ste. 2, Hayward, CA 94545 415-786-0520
Durgin & Browne, 80 Allen Rd., So. Burlington, VT 05401 802-863-6873
† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011
Fema Elctrns. Corp., 12-6 Edgeboro Rd., E. Brunswick, NJ 08816 201-238-1223
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025 312-729-5330
Interswitch, 770 Airport Blvd., Burlingame, CA 94010 415-347-8217
JKL Comps., 13343 Paxton St., Pacoima, CA 91331 818-896-0019
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
† Plasmarc Technologies, Inc., 180 Passaic Avenue, Fairfield, NJ 07006 .. 201-575-0870

§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
§ Wamco, Inc., 11555-A Coley River Cir., Fountain Valley, CA 92708 714-545-5560

Displays, Liquid Crystal (LCD)-2450

C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880, 617-246-1720 ..... D•1114
§ Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 ..... B•1031
Excel Technology Intl. Corp., 4-5 Stryker La., Hillsborough Indl. Pk., Belle Mead, NJ 08502, 201-874-4747 ..... B•1050
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 ..... B•1389
† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1078
Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716, 201-291-0500;800-631-2165 ..... D•1124
NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110, 312-426-5900 ..... D•1366
§† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... B•1091
§ Seiko Instrs. U.S.A., Inc., 2990 W. Lomita Blvd., Torrance, CA 90505, 213-530-8777 ..... B•1092
§ Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
Texmate, Inc., 348 S. Cedros Ave., P.O. Box 2000, Solana Beach, CA 92075, 619-481-7177 ..... D•1379
VL Electronics, 2775 Glendower Ave., Los Angeles, CA 90027, 213-661-8883 ..... B•1117
§ A.C. Interface, 17911 Sampson, Huntington Beach, CA 92647 714-841-6090
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
Amperex Elctrn. Corp., Slatersville Div., Providence Pike, Slatersville, RI 02876 401-762-3800
§ AND, 770 Airport Blvd., Burlingame, CA 94010 415-347-9916
Computerwise, 4006 E 137th Terr., Grandview, MO 64030 816-765-3330
Crystaloid Elctrns., Box 628, Hudson, OH 44236 216-655-2429
† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
Endicott Resch. Grp., Inc., 2601 Wayne St, P.O. Box 269, Endicott, NY 13760 607-754-9187
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
Extech International Corp., 150 Bear Hill Rd., Waltham, MA 02154 617-890-7440
† Fema Elctrns. Corp., 12-6 Edgeboro Rd., E. Brunswick, NJ 08816 201-238-1223
Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
Hitachi America, 1800 Bering Dr., San Jose, CA 95112 408-292-6404
† Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
International Instrumentation, 31131-602 Via Colinas, Westlake Vlg., CA 91362 213-991-9614
§ LXD, Inc., 24500 Highpoint Road, Beachwood, OH 44122 216-292-3300
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Stanley/AC Interface, 17911 Sampson Lane, Costa Mesa, CA 92647 ... 714-841-6090
§ Sumitronics, Inc., Sumitomo Corporation, 1270 Oakmead Pkwy. Ste. 201, Sunnyvale, CA 94086 408-737-7683
§ Thor Elctrns., 321 Pennsylvania Ave., Linden, NJ 07036 201-486-3300
† UCE, Inc., 24 Fitch St., Norwalk, CT 06855 203-838-7509

Displays, Message-2450

§ Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, 402-564-3131 ..... B•1025
Elec-tek, Inc., 10280 Alliance Rd., Cincinnati, OH 45242 513-793-7937
§ Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716 ..... 201-291-0500; 800-631-2165
Laser Concepts, Omega Organization Intl., P.O. Box 687, Mercer Island, WA 98040 206-232-6256
§† NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110 312-426-5900
† Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
† UCE, Inc., 24 Fitch St., Norwalk, CT 06855 203-838-7509

Displays, Planar Gas Discharge-2450

Canyon Elctrns., 2001 W. North Lane, Phoenix, AZ 85021, 602-944-4421 ..... B•1022
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1024
§ Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, 402-564-3131 ..... B•1025
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1079,1726
† Astronautics Corporation of America, P.O. Box 523, Milwaukee, WI 53201-0523 414-447-8200
Beckman Instrs., 2500 Harbor Blvd., Fullerton, CA 92634 714-871-4848
§ Densitron Corp., 20775 Western Ave., Torrance, CA 90501 213-618-9647
Displays, Inc., Mifflin Countey Indl. Pk., Rte. 4, Box 6AAA, Lewistown, PA 17044 717-242-2541
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
§ Hi-Tech Components, Mitsubishi International Corp., 520 Madison Ave., New York, NY 10022 212-605-2607
§† Interstate Electronics Corp., Box 3117, 1001 E. Ball Rd., Anaheim, CA 92803 714-635-7210
§ Newport Electronics, 630 E. Young St., Santa Ana, CA 92705 714-540-4914
§ PlasmaGraphics Corp., 141 Mount Bethel Rd., P.O. Box 4903, Warren, NJ 07060 201-757-5000
† SAI Technlg. Co., Science Applications Inc., 4060 Sorrento Valley Blvd., San Diego, CA 92121 619-452-9150

Displays, Plasma-2450

§ Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, 402-564-3131 ..... B•1025
§ Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 ..... B•1029
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1079
Hi-Tech Components, Mitsubishi International Corp., 520 Madison Ave., New York, NY 10022 212-605-2607
§ PlasmaGraphics Corp., 141 Mount Bethel Rd., P.O. Box 4903, Warren, NJ 07060 201-757-5000
Singer Co., Librascope Div., 833 Sonora Ave., Glendale, CA 91201 818-244-6541

Displays, Projection Type (CRT; Electromechanical; Film; Light Valve)-2450

† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1726
† Astronautics Corporation of America, P.O. Box 523, Milwaukee, WI 53201-0523 414-447-8200
Aydin Corp., 700 Dresher Rd., Horsham, PA 19044 215-657-7510
† Cardion Elctrns., Div. of Gen. Sig. Conts., Inc. Unit of Gen. Sig. Corp., Long Island Expwy., Woodbury, NY 11797 516-921-7300
§ Data General, 4400 Computer Dr., Westboro, MA 01581 617-366-8911
Data Ray Corp., 452 Burbank Street, Broomfield, CO 80020 303-469-5173
§ Datatron, Inc., 2942 Dow Ave., Tustin, CA 92680 714-544-9970
† Devco Engrg., Control Sys. Div., 36 Pier Lane West, Fairfield, NJ 07006 ..... 201-CA8-0321
Dotronix, 160 First St. SE, New Brighton, MN 55112 612-633-1742
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
§† E-Systems, Garland Div., Box 226118, Dallas, TX 75266 214-272-0515
General Instr., Govt. Sys., 600 W. John St., Hicksville, NY 11802-0709 ... 516-933-3000
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
Lexidata Corp., 755 Middlesex Tpke., Billerica, MA 01865 ..... 617-663-8550; 800-472-4747
Memorex Corp., San Thomas at Central Expwy., Santa Clara, CA 95052 408-987-1000
Mitsubishi Elctrns., Industrial Electronics Div., 991 Knox Street, Torrance, CA 90502 213-515-3993
† Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788 516-435-8300
† Orbit Instrument of Cal., 6431 Global Dr., Cypress, CA 90630 714-527-0561
Sanders Assocs., Flexprint Prods. Div., Grenier Fld., Manchester, NH 03103 603-669-4615
§† Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680 714-669-9850
† Singer Co., Librascope Div., 833 Sonora Ave., Glendale, CA 91201 818-244-6541
† Systems Resch. Labs., Inc., 2800 Indian Ripple Rd., Dayton, OH 45440 .. 513-426-6000
Tektronix, Inc., P. O. Box 500, Y3-314, Beaverton, OR 97077 ..... 800-547-1512;Oregon only 800-452-1877
† Terminal Data Corp., 15733 Crabbs Branch Way, Rockville, MD 20855 .. 301-921-8282
† UCE, Inc., 24 Fitch St., Norwalk, CT 06855 203-838-7509
Wavetek Rockland Scientific, Inc., 10 Volvo Dr., Rockleigh Indl. Pk., Rockleigh, NJ 07647 201-767-7900

Displays, Remote-2450

§ Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601 402-564-3131
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
Elec-tek, Inc., 10280 Alliance Rd., Cincinnati, OH 45242 513-793-7937
† Hartman Systems, Figgie Intl., 360 Wolf Hill Rd., Huntington Sta., NY 11746 516-427-7500
† Infodex, Inc., 395 W. Main St., Waterbury, CT 06702 203-757-9291
Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025 312-729-5330
KMC Systems, Inc., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432 201-447-0007
§† NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110 312-426-5900
† UCE, Inc., 24 Fitch St., Norwalk, CT 06855 203-838-7509

Displays, Status-2450

Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1024
C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880, 617-246-1720 ..... D•1114
† Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ..... B•1046
§ NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110, 312-426-5900 ..... D•1069,1127,1159,1368
§† Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 .. 201-722-9800
Applied Sys., 26401 Harper Ave., St. Clair Shores, MI 48081 313-779-8700
Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54703 715-834-9595
† Cardion Elctrns., Div. of Gen. Sig. Conts., Inc. Unit of Gen. Sig. Corp., Long Island Expwy., Woodbury, NY 11797 516-921-7300
Cincinnati Electrosys., 469 Wards Corner Rd., Loveland, OH 45140 513-831-4347
§ Datatron, Inc., 2942 Dow Ave., Tustin, CA 92680 714-544-9970
Datum Inc., Timing/Aacom Divisions, 1363 S. State College Blvd., Anaheim, CA 92806 714-533-6333
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587 718-497-7600
§† Digitech Industries, Inc., 66 Grove St., Ridgefield, CT 06877 203-438-3731
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113

Elec-tek, Inc., 10280 Alliance Rd., Cincinnati, OH 45242 513-793-7937
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
§† E-Systems, Garland Div., Box 226118, Dallas, TX 75266 214-272-0515
Fairchild Camera & Instr. Corp., 464 Ellis St, 20-2271, Mountain View, CA 94042 415-962-5011
† Hartman Systems, Figgie Intl., 360 Wolf Hill Rd., Huntington Sta., NY 11746 516-427-7500
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 ... 818-787-0311
† Infodex, Inc., 395 W. Main St., Waterbury, CT 06702 203-757-9291
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
JKL Comps., 13343 Paxton St., Pacoima, CA 91331 818-896-0019
KMC Systems, Inc., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432 201-447-0007
† Minelco Inc. - A Talley Ind., 135 S. Main St., Thomaston, CT 06787-0459 203-283-8261
§ Mitsubishi Elctrns., Industrial Electronics Div., 991 Knox Street, Torrance, CA 90502 213-515-3993
† Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
† Photo Chem. Prods. Cal., 18031 Susana Rd., Compton, CA 90224 213-603-0400
† Plasmarc Technologies, Inc., 180 Passaic Avenue, Fairfield, NJ 07006 .. 201-575-0870
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Show 'N Tell Products, AMG, Inc., 155 Franklin Street, Dayton, OH 45402 513-223-8211
§† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706 516-666-6000
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Telesis Laboratory, Box 1972, Chillocothe, OH 45601 614-642-5000
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† UCE, Inc., 24 Fitch St, Norwalk, CT 06855 203-838-7509

Displays, Storage Tube — See Displays, CRT (Vol. A)

Displays, Touch Sensitive (Infrared & Mechanical) — See Touch Monitors (Vol.), Touch Panels (Vol.), Touch Terminals

Displays, Tube — See Tubes, Readout (Vol. A)

Displays, Vacuum Fluorescent-2450

Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1079
Comark Corp., 93 W St, P. O. Box 474, Medfield, MA 02052 617-359-8161
Digital Elctrns., 26142 Eden Landing Rd., Ste. 2, Hayward, CA 94545 415-786-0520
NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000
Noritake Elctrns., Inc., Noritake Co., Ltd. (Japan), 22410 Hawthorne Blvd., # 6, Torrance, CA 90505 213-373-6704
TL Industries, Inc., 2541 Tracy Road, Toledo, OH 43619 1-419-666-8144

Display Sets (MIL), Computer-3475 — See Vol. D

Dissipators, Heat — See Heat Sinks, Semiconductor (Vol. C), Heat Sinks, Soldering (Vol. C)

Distortion Analyzers, Indicators — See Analyzers, AF (Vol. D)

Dividers, Analog-3130 — See Vol. A

Dividers, Frequency-3450 — See Vol. A

Dividers, Power (LF, HF, VHF, UHF)-3450 — See Vol. A

Dividers, Power, Microwave-3450 — See Vol. A

Dividers, Voltage-Also See Networks, Resistance; Transformers, Voltage Dividing-2900 — See Vol. D

Doublers, Frequency — See Multipliers, Frequency (Vol. A)

Doublers, Voltage-Also See Rectifiers, Bridges & Assemblies-4800 — See Vol. A

Down Converters-3400 — See Vol. D

Drafting Machines-4200 — See Vol. C

Drafting Symbols, Dry Transfer, Pressure Sensitive, etc. (Incl. Lettering)-4200 — See Vol. C

Drawers, Sliding-1400 — See Vol. C

Drills & Accessories, Manual & Power-5400 — See Vol. C

Drivers & Decoders For Readouts-2450

§ Anaheim Automation, 910 E. Orangefair La., Anaheim, CA 92801 714-992-6990
Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54703 715-834-9595
§ C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880 617-246-1720
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587 718-497-7600
† Dionics, 65 Rushmore St., Westbury, NY 11590 516-997-7474
Dio-Rey, Div. of Info-Lite, 422 Cliff St, Fairview, NJ 07022 201-941-4455
§ Exar Corp., P. O. Box 62229, 750 Palomar Ave., Sunnyvale, CA 94086 .. 408-732-7970
§ Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
§† Hughes Solid State Products, 500 Superior Ave., Dept. E8, Newport Bch., CA 92658-8903 714-759-2411
§ LSI Computer Sys., 1235 Walt Whitman Rd., Melville, NY 11747 516-271-0400
† Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788 516-435-8300
§ Paccom, 3928 148th NE, Redmond, WA 98052 ..... 206-883-9200;800-426-6254
§† RCA Solid State Div., Route 202, Somerville, NJ 08876 201-685-6000
§† RCA Solid State Div., CMOS IC Mktg., Rte. 202, Somerville, NJ 08876 ... 201-685-6000
RCA Solid State Div., Linear Integrated Circuits, Rte. 202, Somerville, NJ 08876 201-685-6000
§† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680 714-669-9850
§ Signetics, U.S. Philips Corp., 811 E. Arques Ave, P.O. Box 3409, Sunnyvale, CA 94088-3409 408-739-7700
§† Sprague Elec. Co., Integrated Circuit Div., 115 Northeast Cutoff, Worcester, MA 01606 617-853-5000
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706 516-666-8000
§† Supertex, Inc., 1225 Bordeaux Dr., P.O. Box 3607, Sunnyvale, CA 94088 408-744-0100
Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254 617-890-6107
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
§† Teledyne Semiconductor, 1300 Terra Bella Ave., PO Box 7267, Mountain View, CA 94039-7267 415-968-9241
† UCE, Inc., 24 Fitch St, Norwalk, CT 06855 203-838-7509

Drivers, Chopper-1100 — See Vol. D

Drivers, Nut-5400 — See Vol. C

Drivers, Solenoid-4550

† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008, 408-377-4621 ..... B•1443
§† Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248 213-532-3092
† Circuit Techn., 160 Smith St, Farmingdale, NY 11735 516-293-8686
† Dionics, 65 Rushmore St, Westbury, NY 11590 516-997-7474
§ MKS Electronics Corp., 454 E. Donovan Rd., Kansas City, KS 66115 913-371-1351
§ Namco Controls, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060 216-946-9900
Sanken Elec. Co., 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, JAPAN 03-986-6151
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
Silicon General, 11861 Western Ave., Garden Grove, CA 92641 714-898-8121
§ Sprague Elec. Co., Integrated Circuit Div., 115 Northeast Cutoff, Worcester, MA 01606 617-853-5000
Voltex, 3460 Great Neck Rd., Amityville, NY 11701 516-842-2772

Drivers, Speaker-1300 — See Vol. D

Drivers, Switch-3450 — See Vol. A

Drivers, Tube — See Drivers & Decoders for Readouts (Vol. B)

Drives & Drive Mechanisms (Dial)-2400 — See Vol. C

Drives/Subsystems, Core Disk Emulator-2000 — See Vol. D

Drives/Subsystems, Disk, 3½" Diskette-2000 — See Vol. D

Drives/Subsystems, Disk, 5¼" Diskette-2000 — See Vol. D

Drives/Subsystems, Disk, 5¼" Winchester-2000 — See Vol. D

Drives, Subsystems, Disk, 8" Diskette-2000 — See Vol. D

Drives/Subsystems, Disk, 8" Winchester-2000 — See Vol. D

Drives/Subsystems, Disk, 14" Winchester-2000 — See Vol. D

Drives/Subsystems, Disk, Fixed-2000 — See Vol. D

Drives/Subsystems, Disk, Fixed/Removable-2000 — See Vol. D

Drives/Subsystems, Magnetic Tape, ¼" Cartridge-2000 — See Vol. D

Drives/Subsystems, Magnetic Tape, Cassette-2000 — See Vol. D

Drives/Subsystems, Magnetic Tape, Reel-to-Reel-2000 — See Vol. D

Drives/Subsystems, Semiconductor Emulator-2000 — *See Vol. D*

Dry Transfer Letters & Numbers — See Kits, Marking (Vol. C)

Ducts, Wiring-6000 — *See Vol. C*

Dummy Loads, Electronic-2900 — *See Vol. D*

Dummy Loads, Microwave-2900 — *See Vol. D*

Dummy Loads, Power-2900 — *See Vol. D*

Dummy Loads, Programmable-2900 — *See Vol. D*

Dummy Loads, Resistive-2900 — *See Vol. D*

Dummy Loads (MIL), RF-2440

† Alan Inds., P.O. Box 1203, Columbus, IN 47201 812-372-8869
† Bird Elctrn., 30303 Aurora Rd., Cleveland, OH 44139 216-248-1200
† Compac, 279 Skidmore Rd., Deer Park, NY 11729 516-667-3933
Continental Electronics Mfg. Co., P.O. Box 270879, Dallas, TX 75227 214-381-7161
† Engelmann Microwave Co., KDI Pyrofilm, 60 S. Jefferson Rd., Whippany, NJ 07981 201-887-5700
† KDI Electronics, Inc., Engelmann & Pyrofilm Divisions, 60 S. Jefferson Rd., Whippany, NJ 07981 201-887-8100
† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020

Duplexers, Microwave-3400 — *See Vol. D*

Duplexers, Nonmicrowave-1900 — *See Vol. D*

Duplicators, Magnetic Tape-1300 — *See Vol. D*

Dust Covers — See Covers, Protective (Vol. C)

DVMs — See Meters, Volt, Digital (Vol. D)

Earphones — See Headphones (Vol. D)

Earth Stations, TV, Receive Only-1900 — *See Vol. D*

Editing Equipment, Tape-1300 — *See Vol. D*

Ejectors & Extractors, PC Boards — See Pullers, Circuit Board (Vol. C)

Elastomers, Conductive — See Conductive Elastomers (Vol. C)

Elastomers, Heat Shrinkable — See Caps, Forms & Tapes, Heat Shrinkable (Vol. C)

Electret — See Microphones, Condenser (Vol. D)

Electrical Measurement & Test Services — See Services, Electrical Measurement & Test (Vol. D)

Electrodes, Electroplating — See Electroplating Equipment & Supplies (Vol. D)

Electrodes, High Voltage-2900 — *See Vol. D*

Electromagnets-1850 — *See Vol. A*

Electronic Counter Countermeasures (ECCM) Fixes (MIL)-3475 — *See Vol. D*

Electronic Countermeasures (ECM) (MIL), Cruise Missiles-3475 — *See Vol. D*

ECMs (MIL), Torpedo Defense-3475 — *See Vol. D*

ECM Sets (MIL)-3475 — *See Vol. D*

ECM Sets (MIL), Close Air Support-3475 — *See Vol. D*

ECM Sets (MIL), Shipboard-3475 — *See Vol. D*

ECM Systems (MIL)-3475 — *See Vol. D*

ECM Systems (MIL), Deceptive-3475 — *See Vol. D*

Electronic Intelligence (Elint) (MIL)-3475 — *See Vol. D*

Electronic Loads — See Dummy Loads (Vol. D)

Electronic Support Measures (ESM) Sets (MIL)-3475 — *See Vol. D*

ESM (MIL), Digitally Controlled-3475 — *See Vol. D*

ESM (MIL), Ships-3475 — *See Vol. D*

ESM Suites (MIL)-3475 — *See Vol. D*

ESM Systems (MIL), Automated-3475 — *See Vol. D*

ESM Systems (MIL), IFM Receiver-3475 — *See Vol. D*

Electronic Warfare (EW) Sets (MIL)-3475 — *See Vol. D*

EW Sets (MIL), Ground Multitarget-3475 — *See Vol. D*

EW Sets (MIL), Portable-3475 — *See Vol. D*

EW Suites (MIL), Ships-3475 — *See Vol. D*

EW Systems (MIL), Advanced Airborne Multitarget-3475 — *See Vol. D*

Electroplating Equipment & Supplies-4100 — *See Vol. D*

Electrostatic Discharge Guns - Also See Generators, ESD-2900 — *See Vol. D*

Electrostatic Discharge (MIL)-2440

§† NRD, Mark IV Ind., Inc., 2937 Alt Blvd. N., Grand Island, NY 14072, 716-773-7634 ..... D•1983
§† ACL Inc., 1960 E. Devon Ave., Elk Grove, IL 60007 312-981-9212
Brady Co., 574A Somerset St., N. Plainfield, NJ 07060 201-753-7988
Caypin Industries, Inc., P. O. Box 9737, Ft. Wayne, IN 46899 ..... 219-432-1515; 1-800-348-1771
Electrostatic Consltg. Assocs., 556 Lowell Rd., Groton, MA 01450 617-448-5485
† KeyTek Instr. Corp., 12 Cambridge St., Burlington, MA 01803 617-272-5170
Schaffner EMC, Inc., Instr. Div., 825 Lehigh Avenue, Union, NJ 07083 201-851-0644
§ Semtronics Corp., 310 Hwy 7 74 S, P.O. Box 2248, Peachtree City, GA 30269 404-487-6681
Simco Co., 2257 North Penn Rd., Hatfield, PA 19440 215-822-2171
Voyager Technologies, Inc., 2250 Cabot Blvd. W. Bldg. 40M, Langhorne, PA 19047 215-750-0270

Elements, Sensing — See Transducers (Vol. B)

Eliminators, Battery — See Power Supplies, AC to DC Adapter (Vol. D)

Emitter Location & Identification System (MIL), Automatic Ground Transportable-3475 — *See Vol. D*

Emitters/Detectors, Infrared-3700 — *See Vol. A*

Emitters, Fiber Optic-Also See Diodes, Laser-2475

† Math Assocs., 2200 Shames Dr., Westbury, NY 11590, 516-334-6800 .... B•1124
§† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1121
§ A.C. Interface, 17911 Sampson, Huntington Beach, CA 92647 714-841-6090
§ Banner Engrg. Corp., 9714 - 10th Ave. N., Minneapolis, MN 55441 612-544-3164
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Deutsch Co., Deutsch Fiber Optics Div., 7001 W. Imperial Hwy., Los Angeles, CA 90045 213-649-1400
Dolan-Jenner Inds., Box 1020, Woburn, MA 01801 617-935-7444
Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011
Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000
§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
General Fiber Optics, Inc., 98 Commerce Rd., Cedar Grove, NJ 07009 .. 201-239-3400
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Hitachi America, 1800 Bering Dr., San Jose, CA 95112 408-292-6404
Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
† Laser Diode Labs, 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900
§ Optek Technology, Inc., 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 818-281-3636
RCA Solid State Div., Route 202, Somerville, NJ 08876 201-685-6000
Rehlander Assocs., 118A Bridge St., Beverly, MA 01915 617-922-5961
Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400
Thomson-CSF Comps. Corp., Special Prods. Div., 301 Rte. 17 North, Rutherford, NJ 07070 201-438-2300
Zexco, 7661 Densmore, # 8, Van Nuys, CA 91406 818-997-7895

Emulators, In-circuit-2900 — *See Vol. D*

Emulators, RTS-2900 — *See Vol. D*

Encapsulating Materials — See Compounds, Encapsulating, Molding, Potting (Vol. C)

Encapsulation Services — See Services, Encapsulation (Vol. D)

Enclosures, Circuit Board, Module, & Relay Mounting-1400 — *See Vol. C*

Enclosures, CRT — See Mounts CRT

Enclosures, Equipment & Panel Mounting-1400 — *See Vol. C*

Enclosures, Instrument, With Integral Connectors-1400 — *See Vol. C*

Enclosures, Keyboard-1400 — *See Vol. C*

Enclosures, Nonmetallic-1400 — *See Vol. C*

Enclosures, Portable, Metallic & Nonmetallic-1400 — *See Vol. C*

Enclosures, Shielded-1400 — *See Vol. C*

Enclosures, Shipping, Metallic & Nonmetallic-3800 — *See Vol. C*

Enclosures, (MIL)-2440

Electronic Enclosures, Div. Wyle Labs, 225 South Aviation Blvd., El Segundo, CA 90245, 213-643-8181 ..... C•1056
Rose Enclosures Sys., Inc., 12140 Parklawn Dr., Rockville, MD 20852, 301-984-1783 ..... C•1078
† Langley, P.O. Box 2911, San Diego, CA 92112 619-264-3181
† STRONGBOX, P.O. Box 84508, Los Angeles, CA 90073 213-204-0472
† Trilobyte Computer Corporation, 801 W. Grand Ave., Oakland, CA 94607 415-839-1100

Encoders, Digital — See Encoders, Shaft Angle (Vol. B)

Encoders, Displacement, Linear-5500

Dynamics Research Corp., Encoder Division, 60 Concord St., Wilmington, MA 01887, 617-658-6100 ..... B•1793
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1831
§ Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
Bausch & Lomb, 820 Linden Ave., Rochester, NY 14625 716-338-6000
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
Disc Instruments, Honeywell, 102 E. Baker St., Costa Mesa, CA 92626 714-979-5300
Elm Systems, 1101 Brown St., Wauconda, IL 60084 312-526-5003
§ Encoder Prods., 1601B Dover Rd., Sandpoint, ID 83864 208-263-8541
† Farrand Controls, Div. of Farrand Industries, Inc., 99 Wall St., Valhalla, NY 10595 ..... 914-RO1-2600
§ Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
† Itek Measurement Sys., Div. Litton Inds., 27 Christina St., Newton, MA 02161 617-969-7300
Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
† Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788 516-435-8300
Perfect Gear & Instr., 2101 Jericho Tpk., New Hyde Park, NY 11040 516-328-3300
Photronic Labs., Secor Rd., Brookfield Ctr., CT 06805 203-775-0465
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
† Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Siltran Digital, 2250 Monterey Rd., Atascadero, CA 93422 805-466-3209
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
§ Temposonics, MTS Sys. Corp., 111 East Ames Ct., Plainview, NY 11803 516-349-1950
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
† Transmagnetics, 210 Adams Blvd., Farmingdale, NY 11735 516-293-3100

Encoders, Fiber Optic-2475

Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000

Encoders, Magnetic Strip-5500

Xico, Inc., 120 Ocean Way, Santa Monica, CA 90402, 213-454-0302 ..... D•1082
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
Creative Micro Systems, 3822 Cerritos Ave., Los Alamitos, CA 90720 213-493-2484
Elcom Industries, Inc., 10268 Bach Blvd., St. Louis, MO 63132 314-429-3100
§ Identatronics, Inc., 425 Lively Blvd., Elk Grove, IL 60007 ..... 312-437-2654; 1-800-323-5403
† Vertex Inds., Inc., Vertel Div., P.O. Box 1123, 23 Carol St., Clifton, NJ 07014 201-472-1331

Encoders, Proof-2000 — *See Vol. D*

Encoders, Shaft Angle, Contacting-5500

Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002, 201-436-2230 ..... B•1137
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731, 516-261-3300 ..... D•1141
ILC Data Device Corp., 105 Wilbur Pl., Bohemia, NY 11716, 516-567-5600 ..... D•1150
Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141, 703-639-2495 ..... B•1163
§ Litton Encoder Div., 20745 Nordhoff St., Chatsworth, CA 91311, 818-341-6161 ..... B•1801
Motor-Tronics, Inc., 2142 Industrial Ct., Bldg. "F", Vista, CA 92083, 619-727-7430 ..... B•1176
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506, 201-427-3100 ..... B•1185
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1011,1830,1831
§† Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
BEI Motion Systems Co., Corporate Off., 166 Geary St., Ste. 1400, San Francisco, CA 94108 415-788-6840
BEI Motion Sys. Co., Computer Prod. Div., 1755 B La Costa Meadows Dr., San Marcos, CA 92069 619-471-2600
BEI Motion Sys. Co., General Control Systems Div., 564 Alpha Dr., Pittsburgh, PA 15238 412-963-0515
BEI Motion Sys. Co., Industrial Encoder Div., 7230 Hollister Ave., Goleta, CA 93117 805-968-0782
BEI Motion Sys. Co., Position Controls Div., 819 Reddick Ave., Santa Barbara, CA 93103 805-966-1538
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
† Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788 516-435-8300
Texas Instrs., Inc., Box 225012-MS-84, Dallas, TX 75265 214-995-6611
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351
ZI-TECH Instr. Corp., 2151 Park Blvd., Box 60490, Palo Alto, CA 94306 415-326-2151

Encoders, Shaft Angle, Magnetic-5500

ILC Data Device Corp., 105 Wilbur Pl., Bohemia, NY 11716, 516-567-5600 ..... D•1150
§ Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716, 201-291-0500;800-631-2165 ..... D•1124
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506, 201-427-3100 ..... B•1185
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1831
† Aeroflex Labs., Magnetic Prods. Div., 35 South Service Road, Plainview, NY 11803 516-694-6700
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
† Farrand Controls, Div. of Farrand Industries, Inc., 99 Wall St., Valhalla, NY 10595 ..... 914-RO1-2600
Innovatek Microsystems, Inc., Smithfield Rd., R1 Box 104, Millerton, NY 12546-9720 914-373-9003
Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
† Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788 516-435-8300
† Performance Controls Inc., 333-E Byberry Rd., Hatboro, PA 19040 215-675-6500
Real Time Sys., 152 S. MacQuesten Pkwy., Mt. Vernon, NY 10550 914-667-0425
† Singer Co., Librascope Div., 833 Sonora Ave., Glendale, CA 91201 818-244-6541
§ Temposonics, MTS Sys. Corp., 111 East Ames Ct., Plainview, NY 11803 516-349-1950
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
† Transmagnetics, 210 Adams Blvd., Farmingdale, NY 11735 516-293-3100

Encoders, Shaft Angle, Optical-5500

BEI Motion Sys. Co., Computer Prod. Div., 1755 B La Costa Meadows Dr., San Marcos, CA 92069, 619-471-2600 ..... B•1783
BEI Motion Sys. Co., Digital Prods. Div., P.O. Box 3838, Little Rock, AR 72203, 501-851-4000 ..... B•1782
BEI Motion Sys. Co., Industrial Encoder Div., 7230 Hollister Ave., Goleta, CA 93117, 805-968-0782 ..... B•1782
BEI Motion Sys. Co., Position Controls Div., 819 Reddick Ave., Santa Barbara, CA 93103, 805-966-1538 ..... B•1782
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 ..... B•1144
Datametrics • Dresser Inds., Inc., 340 Fordham Road, Wilmington, MA 01887, 617-658-5410 ..... B•1791
Dynamics Research Corp., Encoder Division, 60 Concord St., Wilmington, MA 01887, 617-658-6100 ..... B•1793
Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343, 612-931-2700 ..... B•1147
† Itek Measurement Sys., Div. Litton Inds., 27 Christina St., Newton, MA 02161, 617-969-7300 ..... B•1797
§ Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716, 201-291-0500;800-631-2165 ..... D•1124
Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141, 703-639-2495 ..... B•1163
§ Litton Encoder Div., 20745 Nordhoff St., Chatsworth, CA 91311, 818-341-6161 ..... B•1801
† Maxon Precision Motors, Inc., 838 Mitten Rd., Burlingame, CA 94010, 415-697-9614 ..... B•1171
Portescap U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490, 215-277-0433 ..... B•1181
Renco, 26 Coromar Dr., Goleta, CA 93017-3094, 805-968-1525 ..... B•1824
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506, 201-427-3100 ..... B•1185
U.S. Digital, 12371 Kensington Rd., Los Alamitos, CA 90720, 213-594-0094 ..... B•1829
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1011,1830,1831
§† Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151

† Computer Conversions Corp., 6 Dunton Ct, E. Northport, NY 11731 516-261-3300
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
§ C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880 617-246-1720
§ Data Technology, Inc., 4 Gill St., Woburn, MA 01811 617-935-8820
Disc Instruments, Honeywell, 102 E. Baker St., Costa Mesa, CA 92626 .. 714-979-5300
§ Dynapar, 1675 Delany Rd., Gurnee, IL 60031 312-662-2666
Elform, Inc., 521 Dunn Circle, Sparks, NV 89431 702-356-1734
Elm Systems, 1101 Brown St., Wauconda, IL 60084 312-526-5003
§ Encoder Prods., 1601B Dover Rd., Sandpoint, ID 83864 208-263-8541
Fork Standards, Inc., 666 Western Ave., Lombard, IL 60148 312-932-9380
FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 .....312-231-3511; 312-932-9380
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
† HH Controls Co., Inc., 16 Frost St., Arlington, MA 02174 617-646-2626
§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
† Measurement Sys., Inc., 121 Water St., Norwalk, CT 06854 203-838-5561
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 ... 813-822-2529
Motion Control Devices, Inc., 80 Stedman St., Lowell, MA 01851 617-454-3407
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
§ Optek Technology, Inc., 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 408-725-1220
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
† Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788 516-435-8300
Oriel Corp., 250 Long Beach Blvd., Stratford, CT 06497-0872 203-377-8282
Photronic Labs., Secor Rd., Brookfield Ctr., CT 06805 203-775-0465
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
† Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Stock Drive Prods., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 ..... 516-328-0200;328-3300
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265 214-995-3821
Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
Wide Range Elctrns. Corp., 2119 Schultz Rd., St. Louis, MO 63146 314-567-5366
ZI-TECH Instr. Corp., 2151 Park Blvd., Box 60490, Palo Alto, CA 94306 415-326-2151

Encoders, Shaft Position — See Encoders, Shaft Angle (Vol. B), Resolvers, Synchro (Vol. D)

Encoders, Tone-1900 — ***See Vol. D***

Encryptors — See Security Systems, Data

Engineering Reference Books — See Technical Books (Vol. D)

Energy Management Systems-2200 — ***See Vol. D***

Environmental Testing Services — See Services, Environmental Testing (Vol. D)

Epoxies — See Compounds, Enscapsulating, Molding, Potting (Vol. C), Adhesives (Vol. C)

Equalizers, Audio-1300 — ***See Vol. D***

Equalizers, Delay-1900 — ***See Vol. D***

Equalizers, Phase-1900 — ***See Vol. D***

Erasers, Magnetic Tape (Bulk)-1300 — ***See Vol. D***

Erasing Equipment, EPROM-3130 — ***See Vol. A***

Escutcheons-2400 — ***See Vol. C***

Etchants, Fluorocarbon-1600 — ***See Vol. C***

Etchants, Printed Circuit-1700 — ***See Vol. C***

Etching & Engraving — See Services, Metal Etching, Engraving (Vol. D)

Ethernet Extenders-2475

American Photonics Inc., 71 Commerce Dr., Brookfield Center, CT 06805 203-775-8950
TCL Incorporated, 41829 Albrae Street, Fremont, CA 94538 415-657-3800

Evaporation Equipment, Electron Beam-4100 — ***See Vol. D***

Exciters — See Oscillators (Vol. A)

Exciters, Vibration — See Testers, Vibration (Vol. D)

Expanders, Data-3475 — ***See Vol. D***

Expanders, Meter — See Multipliers, Meter (Vol. D)

Extractors, Circuit Board, Tube — See Pullers, Circuit Board (Vol. C)

Extractors, DIP, IC, & Pin Grid Array-5400 — ***See Vol. C***

Eyelets-2825 — ***See Vol. C***

Fabrics, Conductive-4525 — ***See Vol. C***

Facsimile Equipment, Receive Only-1900 — ***See Vol. D***

Facsmile Equipment, Send Only-1900 — ***See Vol. D***

Facsimile Equipment, Send/Receive-1900 — ***See Vol. D***

Fans, Axial-2600 — ***See Vol. C***

Fans, Propeller-2600 — ***See Vol. C***

Fans, Tubeaxial-2600 — ***See Vol. C***

Fans, Vaneaxial-2600 — ***See Vol. C***

Fans/Blowers (MIL)-2440

† **IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070** ..... **C•1644**
IMC Magnetics Corp., New Hampshire Div., Rte. 16B, Rochester, NH 03867, 603-332-5300 ..... **C•1647**
Cambridge Aero Instruments, Inc., 6A Dunham Rd., Billerica, MA 01821 617-275-0889

Fasteners, Cable & Wire — See Wire & Cable Ties (Vol. C)

Fasteners, Metal-2825 — ***See Vol. C***

Fasteners, Nonmetallic-2825 — ***See Vol. C***

Fault Locators — See Detectors (Vol. D)

Feedthrus & Seals, Environmental-2500 — ***See Vol. C***

Ferrite Material & Parts-1850 — ***See Vol. A***

Ferrules, Cable-end-2825 — ***See Vol. C***

Fiber Optic Components — See Adapters (Vol. B), Attenuators (Vol. B), Cable (Vol. B), Connectors (Vol. B), Couplers (Vol. B), Detectors (Vol. B), Isolators (Vol. B), Light Sources (Vol. B), Receivers (Vol. B), Transmitters (Vol. B)

Fiber Optic Data Links — See Data Links, Fiber Optic

Fiber Optic Scanners — See Scanners, Fiber Optic (Vol. B)

Fiber Optic Splices & Splicing Equipment-2475

GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000
York Technology, Inc., Research Park, 139 Wall Street, Princeton, NJ 08540 609-924-7676

Fiber Optics (MIL)-2440

Artel Communications Corp., 93 Grand St., Worcester, MA 01602 617-752-5690
† Circuit Techn., 160 Smith St., Farmingdale, NY 11735 516-293-8686
† Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Corning Glass Works, Telecomm Prods Dept., BH-5, Corning, NY 14830 607-974-9000
† Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
† Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000
FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 .....312-231-3511; 312-932-9380
Galileo Electro-Optics Corp., Galileo Pk., Sturbridge, MA 01518 617-347-9191
Gandalf Data, Inc., 1019 S. Noel Ave., Wheeling, IL 60090 312-541-6060
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Incom, Inc., 205 Chapin St., P.O. Drawer G, Southbridge, MA 01550 617-765-9151
§† ITT Cannon, 666 E. Dyer Road, Santa Ana, CA 92705-5684 714-557-4700
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
Jan Hardware Mfg. Co., 47-27 36th St., Long Island City, NY 11101 212-361-0800
LeCroy Resch. Sys. Corp., 700 S. Main St., Spring Vly., NY 10977 914-425-2000
§ Mechanical Techn., 968 Albany Shaker Rd., Latham, NY 12110 518-785-2353
§† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998 213-828-7496
Mikron Instr., Box 211, Ridgewood, NJ 07451 201-891-7330
† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
Orionics, Inc., 34368E Frontage Rd., Bozeman, MT 59715 406-586-8256
Pirelli Cable Corp., Special Cable Div., P.O. Box 50, Wallingford, CT 06492 ..... 203-265-5533;800-243-3959
† Poly-Scientific, Litton Inds., 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
Rehlander Assocs., 118A Bridge St., Beverly, MA 01915 617-922-5961

RFL Inds., A Dowty Grp. Co./Comms. Div., Powerville Rd., Boonton, NJ 07005 201-334-3100
Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621
† Times Fiber Communications, Inc., 358 Hall Ave., P.O. Box 384, Wallingford, CT 06492-0384 203-265-8500
† TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007 312-981-6000

Fiber Optic Test Equipment — See Test Equipment, Fiber Optic (Vol. B), Testers, Fiber Optic (Vol. D)

Films, Masking (Incl. Photographic)-3100 — *See Vol. C*

Films, Resistance-4700 — *See Vol. A*

Filters, AF-2700 — *See Vol. A*

Filters, Air — See Air Cleaners & Filters (Vol. C)

Filters, Antialias-2700 — *See Vol. A*

Filters, Analog — See Filters, Continuously Variable (Vol. A)

Filters, Antenna-2700 — *See Vol. A*

Filters, Band Elimination-2700 — *See Vol. A*

Filters, Bandpass-2700 — *See Vol. A*

Filters, Bandpass, SAW (Surface Acoustic Wave)-2700 — *See Vol. A*

Filters, Band Reject, Band Stop — See Filters, Band Elimination (Vol. A)

Filters, Ceramic-2700 — *See Vol. A*

Filters, Coaxial-2700 — *See Vol. A*

Filters, Color, Panel Light - Also see Lenses, Readout & Display; Lenses, Filters, Windows, Infrared-2450

† JMJ Technical Prods., 50 Wheeler Point Rd., Newark, NJ 07105, 201-589-4257 ..... C•1613
RMF Prods., Inc., 1275 Paramount Pkwy., P.O. Box 520, Batavia, IL 60510, 312-879-0020 ..... C•1616
† AME Corp., 101 E. Main St, Little Falls, NJ 07424 201-256-3939
APM-Hexseal, 44 Honeck St, Englewood, NJ 07631 201-569-5700
Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
GraphTec Services, Inc., 1600 N.W. Madrid Way, Boca Raton, FL 33432 305-392-3373
† Hoffman Engineering Corp., P.O. Box 300, Old Greenwich, CT 06870 ... 203-325-8933
† Metavac, Inc., 45-68 162nd St, Flushing, NY 11358 ..... 212-HI5-0400
† Panelgraphic Corp., 10 Henderson Dr., W. Caldwell, NJ 07006 201-227-1500
Photo Chem. Prods. Cal., 18031 Susana Rd., Compton, CA 90224 213-603-0400
RFI Corporation, 100 E. Pine Aire Dr., Bay Shore, NY 11706 516-231-6400
SL Homalite, Div. of SL Inds., 11 Brookside Dr., Wilmington, DE 19804 .. 302-652-3686

Filters, Comb-2700 — *See Vol. A*

Filters, Continuously Variable-2700 — *See Vol. A*

Filters, Crystal (Incl. Monolithic Devices)-2300 — *See Vol. A*

Filters, Delay-2700 — *See Vol. A*

Filters, Digital-2700 — *See Vol. A*

Filters, Display-2450

† Balzers Optical Grp., 170 Locke Dr., Marlboro, MA 01752 617-481-9860
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
Crosspoint, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
Dontech Inc., 601-606 Airport Indl. Blvd., Doylestown, PA 18901 215-348-5010
† Hartman Systems, Figgie Intl., 360 Wolf Hill Rd., Huntington Sta., NY 11746 516-427-7500
† Metavac, Inc., 45-68 162nd St, Flushing, NY 11358 ..... 212-HI5-0400
SL Homalite, Div. of SL Inds., 11 Brookside Dr., Wilmington, DE 19804 .. 302-652-3686
§ Sun-Flex Co., Inc., 20 Pimentel Ct., Novato, CA 94947 415-883-1221

Filters, EMI/RFI-2700 — *See Vol. A*

Filters, Equalizer-2700 — *See Vol. A*

Filters, Harmonic-2700 — *See Vol. A*

Filters, High Pass-2700 — *See Vol. A*

Filters, Hybrid-2700 — *See Vol. A*

Filters, IF-2700 — *See Vol. A*

Filters, Ladder-2700 — *See Vol. A*

Filters, LC-2700 — *See Vol. A*

Filters, Line — See Filters, EMI/RFI (Vol. A)

Filters, Linear Phase-2700 — *See Vol. A*

Filters, Low Pass-2700 — *See Vol. A*

Filters, Mechanical-2700 — *See Vol. A*

Filters, Microwave-3450 — *See Vol. A*

Filters, Miniature, Subminiature, Microminiature - Also see specific types of filters-2700 — *See Vol. A*

Filters, Notch — See Filters, Band Elimination (Vol. A)

Filters, Optical-2700 — *See Vol. A*

Filters, Programmable — See Filters, Variable (Vol. A)

Filters, RF-2700 — *See Vol. A*

Filters, Single Sideband-2700 — *See Vol. A*

Filters, Synchronous Tracking-2700 — *See Vol. A*

Filters, Telemetering-1900 — *See Vol. D*

Filters, Tone, Telegraph-2700 — *See Vol. A*

Filters, Tunable — See Filters, Continuously Variable (Vol. A)

Filters, Tuning Fork-2300 — *See Vol. A*

Filters, UHF & VHF-2700 — *See Vol. A*

Filters, Variable-2700 — *See Vol. A*

Filters, Vestigial Sideband-2700 — *See Vol. A*

Filters, Video-2700 — *See Vol. A*

Filters, Waveguide-3450 — *See Vol. A*

Filters, YIG-2700 — *See Vol. A*

Filters (MIL), Electrical & Networks-2440

Chesterfield Prods., 37 Midland Ave., Elmwood Park, NJ 07407, 201-797-9655 ..... A•1593
Comstron Corp., 200 E. Sunrise Hwy., Freeport, NY 11520, 516-546-9700 ..... A•1327,1595
† **Elect. Prec. Comp. Corp., 11 W. Sandford Blvd., Mt. Vernon, NY 10550, 914-664-2333** ..... A•1603
† **ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., NJ 07650, 201-947-0400** ..... A•1604
Fred Transformer, 1718 Weirfield St., Ridgewood, NY 11385, 212-386-1300 ..... A•2151
Frequency Selective Networks, Inc., 69-20 Garfield Ave., Woodside, NY 11377, 718-424-7500 ..... A•1369
Hisonic, Inc., 249 N. Troost, P.O. Box 1130, Olathe, KS 66061-1130, 913-782-0012 ..... A•1610-1605,2157
† **Hughes Solid State Products, 500 Superior Ave., Dept. E8, Newport Bch., CA 92658-8903, 714-759-2411** ..... A•1370
§† **Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777** ..... A•1396,1616
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... A•1271
† **Piconics, 26 Cummings Road, Tyngsboro, MA 01879, 617-649-7501** ..... A•1618
SFE Technologies, 1501 1st St., San Fernando, CA 91340, 213-365-9411 ..... A•1630
Sokol Crystal Prods., Inc., 121 Water St., Mineral Point, WI 53565, 608-987-3363 ..... A•1435,1437
† Cirtech, EG & G, 15237 Cherry St, Stanley, KS 66223 913-681-2801
† Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
Dale Electronics, Inc., Tempe Div., 1155 W. 23rd St., Tempe, AZ 85282 .. 602-967-7874
† Elmag, 54 Clark St., Newark, NJ 07104 201-481-1600
Engineered Comps. Co., P. O. Box 8121, San Luis Obispo, CA 93403-8121 805-544-3800
† Ferretec Inc., 1701A Fortune Dr., San Jose, CA 95131 408-263-1216
Fil-Coil Economy Intl., Inc., 800 Axinn Ave., Garden City, NY 11530 516-228-9445
† Filtron Co., Inc., Div. of Aeroflex Labs., Inc., 148-E Sweet Hollow Rd., Old Bethpage, NY 11804 516-752-1144
† Hertz Filter, 3 Aerial Way, Syosset, NY 11791 516-822-4770
† K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424
† K & L Quartztek, K & L Microwave, 20 S. 48th Ave., Phoenix, AZ 85043 602-272-7944
† KR Electronics, Inc., 91 Avenel St, Avenel, NJ 07001 201-636-1900
† Mel Tec, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090 .. 617-329-1508
Microsonics Inc., 60 Winter St, Weymouth, MA 02188 617-337-4200
† OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865 201-454-2600
† Polyphase Instr., 175 Commerce Dr., Ft. Washington, PA 19034 215-643-6950
Reeves-Hoffman Div., 400 W. North St, Carlisle, PA 17013 717-243-5929
Spectrum Control, Inc., 2185 W. 8th St, Erie, PA 16505 814-455-0966
† Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 400-988-0700
† Transco Products, Inc., 4241 Glencoe Ave., Marina del Rey, CA 90295 .. 213-822-0800
§† Transformer & Coil Products, TRW Electronic Assemblies Division, 150 Varick St., New York, NY 10013 212-255-3500
TTE, Inc., 11650 W. Olympic Blvd., Los Angeles, CA 90064 213-478-8224

† Tusonix, Inc., 7741 N. Business Park Drive, P. O. Box 37144, Tucson, AZ 85740-7144 602-744-0400
Vernitron Piezoelectric Div., 232 Forbes Rd., Bedford, OH 44146-5478 .. 216-232-8600

Flanges, Waveguide-3450 — *See Vol. A*

Flanges (MIL), Waveguide-2440

Alpha Inds., Inc. - TRG Millimeter Comp., 20 Sylvan Rd., Woburn, MA 01801 617-935-5150
Microwave Development Labs., 10 Michigan Dr., Natick, MA 01760 617-655-0060

Flashers-2200 — *See Vol. D*

Flashers (MIL)-2440

† Logitek, Inc., 101 Christopher St., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1437
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Modular Devices, 50 Orville Dr., Bohemia, NY 11716 516-567-9620
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060

Flashlights & Lanterns-4000 — *See Vol. D*

Flat Packages, Integrated Circuit — See Packages, Integrated Circuit (Vol. A)

Fluid Flow Indicators — See Meters, Fluid Flow (Vol. D)

Flux, Brazing & Soldering Materials-4600 — *See Vol. C*

Foil, Magnetic-1850 — *See Vol. A*

Foil, Magnetic Shielding — See Shields, Magnetic (Vol. C)

Forks, Tuning — See Tuning Forks (Vol. A)

Forms, Coil — See Coil Assemblies & Forms (Vol. A)

Frames, Cabinet & Rack-1400 — *See Vol. C*

Freeze Spray — See Refrigerants, Spray (Vol. C), Coolants, Circuit & Component (Vol. C)

Freezer Cabinets — See Refrigerators, Environmental Test (Vol. D)

Frequency Analyzers — See Analyzers, Spectrum (Vol. D)

Frequency Extenders — See Dividers, Frequency (Vol. A)

Frequency Sources — See Oscillators (Vol. A)

Frequency Standards — See Standards, Frequency (Vol. D)

Frozen Epoxies — See Compounds, Encapsulating, Molding, Potting

Furnaces, Electric-4100 — *See Vol. D*

Furnaces, Gas (Production)-4100 — *See Vol. D*

Furnaces, Vacuum-4100 — *See Vol. D*

Furniture, Electronic Lab. — See Benches, Consoles, Stools, Tables (Lab & Shop) (Vol. C)

Fuse Clips — See Clips & Holders, Fuse (Vol. B)

Fuse Elements-4300

§ FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852, 301-881-8124;800-638-6594 ..... B•1235
Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 .....201-428-8400; 800-526-9067
§† Fusecom, 14864 NE 95th St., Redmond, WA 98052 206-881-2442
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052 201-762-6886
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Semikron, Inc., 11 Executive Dr., P.O. Box 66, Hudson, NH 03051 .....603-883-8102; 1-800-258-1308

Fuseholders — See Clips & Holders, Fuse

Fuses-4300

§ Bel Fuse, 198 Van Vorst St., Jersey City, NJ 07302, 201-432-0463 ..... B•1230
Concord Elctrns., 30 Great Jones St., Dept. JE, New York, NY 10012, 212-777-6571 ..... C•1174
§† Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ..... B•1240
† Panel Components Corp., P.O. Box 6626M, Santa Rosa, CA 95406, 707-523-0600 ..... B•1254
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052, 201-762-6886 ..... B•1259
Alden Products Co., P.O. Box 860, 117 N. Main St., Brockton, MA 02403 617-583-0160
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
† Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 .....201-428-8400; 800-526-9067
§ Carbone Lorraine Inds., 400 Myrtle Ave., Boonton, NJ 07005 ..... 201-DE4-0700
Elcom Systems, Inc., 932 Clint Moore Rd., Boca Raton, FL 33431 305-994-1774
§ FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852 ..... 301-881-8124;800-638-6594
§ Fuji-Svea, P.O. Box 3375, Torrance, CA 90510 213-533-1221
§† Fusecom, 14864 NE 95th St., Redmond, WA 98052 206-881-2442
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ Goldwell Comps., 1815 W. 205th St. Ste. 201, Torrance, CA 90501 213-533-1228
§† Gould Inc., Circuit Protection Div., 374 Merrimac St., Newburyport, MA 01950 ..... 617-462-6662/3131
International Comps. Corp., 105 Maxess Rd., Melville, NY 11747 516-293-1500
§ International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
Mepco//Electra, Inc., North American Philips Corp., 11468 Sorrento Valley Rd., San Diego, CA 92121 619-453-0332
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
† Raymond Engrg. Inc., Raycorder Prods. Div., 217 Smith St., Middletown, CT 06457 203-632-1000
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
§ Reliance Fuse, 2070 Maple St., Des Plaines, IL 60016 312-299-2211
Reliance Fuse, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;in OH 800-245-4497
† Rush/Houston, Inc., 600 Kealrick, Ste C-40, Houston, TX 77060 713-682-5151
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Semikron, Inc., 11 Executive Dr., P.O. Box 66, Hudson, NH 03051 .....603-883-8102; 1-800-258-1308
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Fuses, Failure Indicating-4300

Bel Fuse, 198 Van Vorst St., Jersey City, NJ 07302, 201-432-0463 ..... B•1232
§ FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852, 301-881-8124;800-638-6594 ..... B•1235
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ..... B•1243
Alden Products Co., P.O. Box 860, 117 N. Main St., Brockton, MA 02403 617-583-0160
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 .....201-428-8400; 800-526-9067
§ Carbone Lorraine Inds., 400 Myrtle Ave., Boonton, NJ 07005 ..... 201-DE4-0700
§ Chatham Controls, 33 River Rd., Chatham, NJ 07928 201-635-8892
§† Fusecom, 14864 NE 95th St., Redmond, WA 98052 206-881-2442
§† Gould Inc., Circuit Protection Div., 374 Merrimac St., Newburyport, MA 01950 ..... 617-462-6662/3131
§ International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
† Raymond Engrg. Inc., Raycorder Prods. Div., 217 Smith St., Middletown, CT 06457 203-632-1000
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
§ Reliance Fuse, 2070 Maple St., Des Plaines, IL 60016 312-299-2211
Reliance Fuse, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;in OH 800-245-4497
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311

Fuses, Fuseholders, Boxes & Panels (MIL)-2440

§† FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852, 301-881-8124;800-638-6594 ..... B•1235
† Alan Inds., P.O. Box 1203, Columbus, IN 47201 812-372-8869
§ Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 .....201-428-8400; 800-526-9067
§ Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
† Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
Doran Mfg. Co., 2851 Massachusetts Ave., Cincinnati, OH 45225 513-681-5424
§† Fusecom, 14864 NE 95th St., Redmond, WA 98052 206-881-2442
International Comps. Corp., 105 Maxess Rd., Melville, NY 11747 516-293-1500
ISL Products Int'l, Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 .. 516-822-9601
§† Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
§ National Tel-Tronics, State Road Hill, Meadville, PA 16335 814-724-6440
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052 201-762-6886
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311

Fuses, Thermal-4300

Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 .. B•1754
Micro Devices Product Group, Therm-O-Disc, Inc., 1320 South Main Street, P.O. Box 3538, Mansfield, OH 44907, 419-756-5005 ..... B•1775
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907, 419-756-5911 ..... B•1775
Accurate Elctrns., 169 S. Abbe Rd., P.O. Box 1287, Elyria, OH 44036 216-365-1211
Bel Fuse, 198 Van Vorst St., Jersey City, NJ 07302 201-432-0463
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 .....201-428-8400; 800-526-9067
§ Chatham Controls, 33 River Rd., Chatham, NJ 07928 201-635-8892

Fasco Industries, Inc., Div. of Hawker Siddeley Grp. Plc., 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
§ FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852 ..... 301-881-8124;800-638-6594
§ Inmark Corp., 147 West Cedar St., Norwalk, CT 06854 203-866-8474
§ Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443 616-777-2602
§ Murata Mfg. Co., Ltd., 26-10-2-chome-Tenjin, Nagaoka-Kyo-Shi, Kyoto, Japan, JAPAN 075-951-9111
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052 201-762-6886
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
† Raymond Engrg. Inc., Raycorder Prods. Div., 217 Smith St., Middletown, CT 06457 203-632-1000
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
Reliance Fuse, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;in OH 800-245-4497
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
§ Solder Absorbing Technology (SAT), South End Bridge Circle, Agawam, MA 01001 800-628-8862

Gauges, Displacement, Linear-5400 — *See Vol. C*

Gauges, Humidity-2900 — *See Vol. D*

Gauges, Ionization-2900 — *See Vol. D*

Gauges, Pressure-Also See Transducers, Pressure-2900 — *See Vol. D*

Gauges, Strain-5500

BLH Elctrns., 75 Shawmut Road, Canton, MA 02021 617-821-2000
CDS - Colorado Data Sys., 3301 W. Hampden, Unit C, Englewood, CO 80110 303-762-1640
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006 201-227-1002
§ Hottinger Baldwin Measurements, 139 Newbury St., Framingham, MA 01701 617-875-8282
§† Kistler-Morse, 10201 Willows Road NE, Redmond, WA 98052 206-881-8000
† Kulite Semiconductor Prods., Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000
Measurements Group, Inc., Box 27777, Raleigh, NC 27611 919-365-3800
§ NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110 312-426-5900
§ Newport Electronics, 630 E. Young St., Santa Ana, CA 92705 714-540-4914
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840 201-548-2800

Gauges, Temperature-2900 — *See Vol. D*

Galvanometers — See Meters, Galvanometer (Vol. D)

Gaskets — See Seals (Vol. C)

Gaskets, Shielding, RF-Also See Shields, RF-4525 — *See Vol. C*

Gates, Computer Circuit (AND, OR, NOR, etc.) — See Cards, Logic (Vol. D)

Gearheads & Speed Reducers - Also see gears and gear mechanisms-3500

† Maxon Precision Motors, Inc., 838 Mitten Rd., Burlingame, CA 94010, 415-697-9614 ..... B•1171
† Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ..... B•1173
Portescap U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490, 215-277-0433 ..... B•1181
§† Berg, W. M., Inc., 499 Ocean Ave., East Rockaway, NY 11518 516-599-5010
Berger-Lahr Corp., Fitzgerald Dr., Jaffrey, NH 03452 603-532-7701
† Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809 219-747-3121
§ Canon U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042 516-488-6700
† Dresser Inds., 1505 Elm St., Dallas, TX 75201 214-746-6000
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820 603-742-3330
§ Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
† Eversheds & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590 516-334-7070
§ Jan Hardware Mfg. Co., 47-27 36th St., Long Island City, NY 11101 212-361-0800
Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 818-991-6111
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
† PIC Design, P.O. Box 1004, Middlebury, CT 06762 203-758-8272
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 ..... 516-ED3-5955
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
Sterling Instr., Div. Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 516-328-3300
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
§† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
† Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 312-585-1212

Gears & Gear Mechanisms (Precision)-2500 — *See Vol. C*

Generator Groups (MIL), Signal-3475 — *See Vol. D*

Generators, AM-2900 — *See Vol. D*

Generators, AM/FM-2900 — *See Vol. D*

Generators, Arbitrary Waveform-2900 — *See Vol. D*

Generators, Audio-2900 — *See Vol. D*

Generators, Bar, Dot & Crosshatch-2900 — *See Vol. D*

Generators, Baud Rate-1900 — *See Vol. D*

Generators, Character-2325 — *See Vol. D*

Generators, Color Bar-2900 — *See Vol. D*

Generators, Digital Delay — See Generators, Timing, Digital (Vol. D)

Generators, Electrical Power-4000 — *See Vol. D*

Generators, Electrostatic Discharge - Also See Electrostatic Discharge Guns-2900 — *See Vol. D*

Generators, FM-2900 — *See Vol. D*

Generators, FM/Stereo-2900 — *See Vol. D*

Generators, Frequency Synthesizer-2900 — *See Vol. D*

Generators, Function-2900 — *See Vol. D*

Generators, Gating/Timing-2900 — *See Vol. D*

Generators, Hall-5500

§† Bell, F. W., Inc., 6120 Hanging Moss Rd., Orlando, FL 32807, 305-678-6900 ..... B•1784, D•1113
† Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803 516-694-6700
† American Aerospace Controls, 570 Smith St., Farmingdale, NY 11735 516-694-5100
LDJ Incorporated, 2200 Stephenson Hwy., P.O. Box 219, Troy, MI 48099-0219 313-528-2202
Magnetic Instrumentation, 8350 E. 48TH ST., Indianapolis, IN 46226 317-545-2102
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, OH 43212 614-486-9561
RFL Inds., A Dowty Grp. Co./Instr. Div., Powerville Rd., Boonton, NJ 07005 201-334-3100
Sprague Electric Company, Distribution Division, 481 Marshall St., No. Adams, MA 01247 413-664-4481

Generators, Harmonic-2900 — *See Vol. D*

Generators, Impulse-2900 — *See Vol. D*

Generators, Infrared — See Lamps, Infrared (Vol. B)

Generators, Ion - Also see Static Eliminating Materials and Equipment; Generators ESD-2900 — *See Vol. D*

Generators, Low Frequency-2900 — *See Vol. D*

Generators, Light Pulse-2900 — *See Vol. D*

Generators, Marker-2900 — *See Vol. D*

Generators, Microwave-3400 — *See Vol. D*

Generators, Noise, Random (Electrical)-2900 — *See Vol. D*

Generators, Phase-2900 — *See Vol. D*

Generators, Programmable, Function-2900 — *See Vol. D*

Generators, Programmable, Pulse-2900 — *See Vol. D*

Generators, Programmable, Synthesizers-2900 — *See Vol. D*

Generators, Pulse-2900 — *See Vol. D*

Generators, Pulse, Nuclear Instrumentation Module (NIM)-2900 — *See Vol. D*

Generators, RF-2900 — *See Vol. D*

Generators, Sawtooth, Sine — See Generators, Function (Vol. D)

Generators, Signal-Also See Generators, Specific Type-2900 — *See Vol. D*

Generators, Sine/Cosine Function (Module)-3130 — *See Vol. A*

Generators, Spectrum — See Generators, Sweep (Vol. D)

Generators, Spike-2900 — *See Vol. D*

Generators, Square Wave — See Generators, Function (Vol. D)

Generators, Sweep-2900 — *See Vol. D*

Generators, Time Code-2000 — *See Vol. D*

Generators, Timing, Digital-2000 — *See Vol. D*

Generators, Tone-2900 — *See Vol. D*

Generators, Tone Burst-2900 — *See Vol. D*

Generators, Transient Line Voltage-2900 — *See Vol. D*

Generators, UHF/VHF-2900 — *See Vol. D*

Generators, Ultrasonic-2900 — *See Vol. D*

Generators, White Noise-2900 — *See Vol. D*

Generators, Word-2900 — *See Vol. D*

Geophysical Equip. — See Transducers (Vol. B)

Germanium — See Crystals, Semiconductor (Vol. A)

Glass Diode Sleeves-2500 — *See Vol. C*

Glues — See Adhesives (Vol. C)

Glass Parts-2500 — *See Vol. C*

Graphic Recording Instruments — See Recorders (Vol. D)

Graphic Recording Paper & Supplies-3000 — *See Vol. D*

Graphite Parts-2500 — *See Vol. C*

Grilles & Accessories, Speaker-1300 — *See Vol. D*

Grilles, Metal, Plastic-1400 — *See Vol. C*

Grommets & Bushings-2800 — *See Vol. C*

Ground Fault Detectors & Accessories — See Detectors, Ground Fault (Vol. D)

Guides, Circuit Board-1400 — *See Vol. C*

Gyros (All Types)-2200 — *See Vol. D*

Hall Effect Devices — See Generators, Hall (Vol. B), Magnetoresistors, Hall (Vol. A), Multipliers, Hall (Vol. A), Probes, Hall (Vol. A), Switches, Hall Effect (Vol. B)

Handlers, Integrated Circuit (Automatic)-4100 — *See Vol. D*

Handles For Cabinets, Circuit Boards, Racks, etc.-1400 — *See Vol. C*

Handsets, Chestsets, Headsets, etc.-1300 — *See Vol. D*

Hardware — See Fasteners (Vol. C), Clamps (Vol. C), Terminals (Vol. C), etc.

Hardware (MIL), Connector-2440

† **Jettron Prods., P.O. Box 337, E. Hanover, NJ 07936, 201-887-0571 ..... C•1409**
§† **TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007, 312-981-6000 ..... C•1555**
Autosplice, Inc., 59-12, 37th Ave, Woodside, NY 11377 718-429-0500
Auto-Swage Prods., 726 River Rd., Shelton, CT 06484 203-929-1401
Concord Elctrns., 30 Great Jones St., Dept. JE, New York, NY 10012 212-777-6571
† Fema Elctrns. Corp., 12-6 Edgeboro Rd., E. Brunswick, NJ 08816 201-238-1223
ITT Cannon, 666 E. Dyer Road, Santa Ana, CA 92705-5684 714-557-4700
§† Lyn-Tron, Inc., 3150 Damon Way, Burbank, CA 91505 .... 213-849-6211;800-423-2734
† Micro Plastics Inc., Hwy 178 North, Flippin, AR 72634 .... 501-453-2261;1-800-643-2356
§ National Tel-Tronics, State Road Hill, Meadville, PA 16335 814-724-6440

Harnesses, Wire — See Cable Assemblies & Harnesses (Vol. C)

Headers, Connector — See Connectors, Cable (Vol. C), Connectors, Flat Cable (Vol. C), etc.

Headers, DIP-2100 — *See Vol. C*

Headers, Hermetic — See Seals, Hermetic (Vol. C), Services, Hermetic Sealing (Vol. D)

Headers, Relay & Transformer-2100 — *See Vol. C*

Headers, Shrouded-2100 — *See Vol. C*

Headers, Socket-2100 — *See Vol. C*

Headers, Transistor & Diode-2500 — *See Vol. C*

Headphones-1300 — *See Vol. D*

Heads, Magnetic Recording-1300 — *See Vol. D*

Heads, Reflective-3700

Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080

Headsets (MIL)-2440

§ Alpha Products, Inc., 5740 Corsa Ave. #104, Westlake Village, CA 91362 818-889-9304
§† Rye Inds., Inc., 125 Spencer Pl., P.O. Box M, Mamaroneck, NY 10543 ... 914-698-0080
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
† Telephonics, 770 Park Ave., Huntington, NY 11743 516-549-6000
Trimm, Inc., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048 312-362-3700

Heat Dissipators — See Heat Sinks, Semiconductor (Vol. C), Heat Sinks, Soldering (Vol. C)

Heaters, Immersion-4100 — *See Vol. D*

Heaters & Heating Elements (For Components & Equipment)-Also See Ovens-5300

§ **Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 .. B•1754**
Micro Technical Inds., Micro-Ohm Corp., 23666 Birtcher Dr., #B, Lake Forest, CA 92630, 714-855-4326 ..... D•1170
§ **Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 ..... B•1759,1762**
Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 ..... A•1908
Acme Elec. Heating Corp., 4685 E. 11th, Hialeah, FL 33013 305-685-8326
Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
† Armstrong World Inds., W. Liberty St., Lancaster, PA 17604 717-397-0611
† Blue M, A Unit of General Signal, 138th & Chatham Sts., Blue Island, IL 60406 312-385-9000
† BTU Engrg. Corp., Bruce Sys., Esquire Rd., N. Billerica, MA 01862 617-667-4111
Capitol Temptrol, 5 Coulton Rd., Old Lyme, CT 06371 203-739-4421
§† Casso-Solar, P.O. Box 163, U.S. Route 202, Pomona, NY 10970 914-354-2500
§† Despatch Inds., P.O. Box 1320, Minneapolis, MN 55440 612-331-1873
Easy Heat-Wirekraft, 555 North Michigan St., Lakeville, IN 46536 219-784-3011
† Electrofilm, 27727 Avenue Scott, Valencia, CA 91355 805-257-2240
Eraser Co., Box 4961, Syracuse, NY 13221 315-454-3237
§ GTE Corp., Sylvania Emissive Prods./Process Heat, Portsmouth Ave., Exeter, NH 03833 603-772-4331
† Minco Prods., 7300 Commerce La., Minneapolis, MN 55432 612-571-3121
† Molecu-Wire, P.O. Box 495, Farmingdale, NJ 07727 201-938-9473
† NANMAC Corp., 9 Mayhew St., Framingham, MA 01701 617-872-4811
OAL Assocs., P.O. Box J, Escondido, CA 92025 619-743-7143
§ Pamran, 1101 Cedar Creek, Racine, WI 53402 414-639-9076
§† Philips Elmet, 1560 Lisbon Rd., Lewiston, ME 04240 207-784-3591
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
Research, Inc., Box 24064, Minneapolis, MN 55424 612-941-3300
§† Safeway Products, 440 Middlefield St., Middletown, CT 06457 203-346-6601
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
† Sierracin/Thermal Sys., 13920 S. Broadway, Los Angeles, CA 90061 213-321-4350
† Sohio Engineered Materials Co., Unit of Sohio, P. O. Box 156, Niagara Falls, NY 14302 716-278-2000
† Thermolab, 13345 Saticoy St., N. Hollywood, CA 91605 213-875-0105
† Trent, Inc., 201 Leverington Ave., Philadelphia, PA 19127 215-482-5000
Ultra Carbon, Box X-924, Bay City, MI 48707 517-894-2911
§ Wellman Thermal Sys., 1 Progress Rd, Shelbyville, IN 46176 317-398-4411

Heat Exchangers & Systems-2600 — *See Vol. C*

Heat Guns, Production-5400 — *See Vol. C*

Heating Elements, Infrared-5300

Acme Elec. Heating Corp., 4685 E. 11th, Hialeah, FL 33013 305-685-8326
§ Research, Inc., Box 24064, Minneapolis, MN 55424 612-941-3300
S. F. Products Corporation, P. O. Box 369, Southport, CT 06490 203-929-6180
§ Wellman Thermal Sys., 1 Progress Rd, Shelbyville, IN 46176 317-398-4411

Heat Pumps — See Cooling/Heating Modules, Thermoelectric (Vol. B)

Heat Shrinkable Elastomers, Plastics — See Caps, Forms & Tapes, Heat Shrinkable (Vol. C), Tubing, Heat Shrinkable (Vol. C)

Heat Sinks, Semiconductor-2600 — *See Vol. C*

Heat Sinks, Soldering-4600 — *See Vol. C*

Heat Sinks (MIL)-2440
Thermalloy, Inc., 2021 W. Valley View, P. O. Box 810839, Dallas, TX 75381-0839, 214-243-4321 ..... C•1679
UNITRACK Div., Calabro Inds., Inc., Goshen Corp. Plc., P.O. Box 1927, 1372 Enterprise Dr., West Chester, PA 19380, 215-692-0800 ..... C•1094
§† Accessories for Elctrns., Inc., 800 Merrick Rd., Baldwin, NY 11510-3593 516-546-1751
§† Calmark Corp., 4915 Walnut Grove Ave., San Gabriel, CA 91776 818-287-0451
Dow Corning Corp., Box 0994, Midland, MI 48686-0994 517-496-4000
§† IERC, 135 W. Magnolia Blvd., Burbank, CA 91502 ..... 818-849-2481;818-786-1182
† Thermal Prods. Group, IMC Magnetics Corp., 100 Jericho Quad., Ste. 221, Jericho, NY 11753 516-938-0800
Mann, Henry, Inc., 3983 Mann Road, Huntingdon Valley, PA 19006 215-355-7200
Precision Extrusions, Inc., Box 120, Bensenville, IL 60106 312-766-0340
† Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706 516-666-8000
WEI Corp., 1405 S. Village Way, Santa Ana, CA 92705 714-834-9333

Hermetic Sealing — See Machines, Hermetic Sealing (Vol. D), Seals, Hermetic (Vol. C), Services, Hermetic Sealing (Vol. D)

High Vacuum Services — See Services, High Vacuum (Vol. D)

Hinges-2825 — *See Vol. C*

Holders, Battery — See Retainers, Battery (Vol. C), Connectors, Battery (Vol. C)

Holders, Brush — See Brushes & Brush Assemblies (Vol. B)

Holders, Circuit Board (Production Type)-4100 — *See Vol. D*

Holders, Crystal-2300 — *See Vol. A*

Holders, Diode-2500 — *See Vol. C*

Holders, Fuse — See Clips & Holders, Fuse (Vol. B), Panels, Fuse (Vol. B)

Holders, Lamp — See Sockets, Lamp & Lamp Assemblies (Vol. B)

Holders, Test Lead-2900 — *See Vol. D*

Holders, Tube — See Retainers, Tube (Vol. A)

Holders & Carriers, Chip (Capacitor, IC, LSI)-2100 — *See Vol. C*

Holders & Carriers, IC, LSI (Packaged)-3130 — *See Vol. A*

Honeycomb Sheets, Panels, etc.-2500 — *See Vol. C*

Hoods, Oscilloscope-2975 — *See Vol. D*

Housings, Circuit Module — See Enclosures, Circuit Board, Module & Relay Mounting (Vol. C)

Housings, Photomultiplier Tube — See Photomultiplier Tube Housings (Vol. A)

Housings, Terminal-1400 — *See Vol. C*

Hum Eliminators-2700 — *See Vol. A*

Hybrid Circuits — See Circuits, Hybrid (Vol. A)

Hybrid Voltage Regulators — See Regulators & Stabilizers

Identification, Friend or Foe (IFF) ESM (MIL)-3475 — *See Vol. D*

Image Processing Systems — See Processors, Image

Imagers, Thermal-2900 — *See Vol. D*

IEEE 488 (GPIB) Bus — See Controllers, IEEE 488 (GPIB) (Vol. D)

Impedance Comparators — See Bridges, Impedance (Vol. D)

Impedance Converters, Microwave-3400 — *See Vol. D*

Inclinometers-2900 — *See Vol. D*

Incremental Magnetic Recorders — See Recorders, Computer Data (Vol. D)

Indexers (Stepping Motor)-3500
PKS - Digiplan Ltd., 1859 Charter Lane, Lancaster, PA 17601 717-299-2706

Indicator Lights — See Lights, Indicator (Vol. B)

Indicators, Angle-Also See Encoders, Shaft Position-5500
BEI Motion Sys. Co., Computer Prod. Div., 1755 B La Costa Meadows Dr., San Marcos, CA 92069, 619-471-2600 ..... B•1783
† BEI Motion Sys. Co., Digital Prods. Div., P.O. Box 3838, Little Rock, AR 72203, 501-851-4000 ..... B•1782
BEI Motion Sys. Co., Industrial Encoder Div., 7230 Hollister Ave., Goleta, CA 93117, 805-968-0782 ..... B•1782
BEI Motion Sys. Co., Position Controls Div., 819 Reddick Ave., Santa Barbara, CA 93103, 805-966-1539 ..... B•1782
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731, 516-261-3300 ..... D•1140
Control Sciences, Inc., 9509 Vassar Ave., Chatsworth, CA 91311, 818-709-5510 ..... D•1143-1141,1146
† Control Technology Co., 41-16 29th St., Long Island City, NY 11101, 718-361-2133 ..... D•1987
† Interface Engrg., 386 Lindelof Ave., Stoughton, MA 02072, 617-344-7383 ..... D•1156
† North Atlantic Inds., Instrument Div., 60 Plant Ave., Hauppauge, NY 11788, 516-582-6500 ..... D•1283
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ..... B•1828
† Transmagnetics, 210 Adams Blvd., Farmingdale, NY 11735, 516-293-3100 ..... D•1162
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1011-1163,1830,1831
Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002 201-436-2230
† Analog Devices, P.O. Box 280, Norwood, MA 02062 617-329-4700
† Astronautics Corporation of America, P.O. Box 523, Milwaukee, WI 53201-0523 414-447-8200
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
BEI Motion Systems Co., Corporate Off., 166 Geary St., Ste. 1400, San Francisco, CA 94108 415-788-6840
BEI Motion Sys. Co., General Control Systems Div., 564 Alpha Dr., Pittsburgh, PA 15238 412-963-0515
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
Disc Instruments, Honeywell, 102 E. Baker St., Costa Mesa, CA 92626 .. 714-979-5300
† Electric Tachometer, 68th & Upland Sts., Philadelphia, PA 19142 ..... 215-SA6-7723
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
† HH Controls Co., Inc., 16 Frost St., Arlington, MA 02174 617-646-2626
Howell Instrs., 3479 W. Vickery Blvd., Ft. Worth, TX 76107 817-336-7411
† Humphrey, Inc., 9212 Balboa Ave., San Diego, CA 92123 619-565-6631
† ILC Data Device Corp., 105 Wilbur Pl., Bohemia, NY 11716 516-567-5600
† Industrial Control Co., 3100 Pineda Ave., Rockledge, FL 32955 305-259-7105
Innovatek Microsystems, Inc., Smithfield Rd., R1 Box 104, Millerton, NY 12546-9720 914-373-9003
Itek Measurement Sys., Div. Litton Inds., 27 Christina St., Newton, MA 02161 617-969-7300
§† Mechanical Engraving, 4500 Bullard Ave, Bronx, NY 10470 212-324-4455
† Metric Sys., 645 Anchors St., Ft. Walton Beach, FL 32548 904-244-9600
† Natel Engrg. Co., Inc., 4550 Runway St, Simi Valley, CA 93063 805-581-3950
† Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
Precision Level Vial Co., Warren Industries Inc., 1800-D Mearns Rd., Warminster, PA 18974 215-675-2355
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351
§† Veeder-Root, 70 Sargeant St., Hartford, CT 06102 203-527-7201
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073 619-428-5581
† Warren-Knight Instr. Co., Warren Inds., Inc., 2045 Bennett Rd., Philadelphia, PA 19116 215-464-9300

Indicators, Azimuth-5500
† Control Technology Co., 41-16 29th St., Long Island City, NY 11101, 718-361-2133 ..... D•1987
† Interface Engrg., 386 Lindelof Ave., Stoughton, MA 02072, 617-344-7383 ..... D•1156
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
† Astronautics Corporation of America, P.O. Box 523, Milwaukee, WI 53201-0523 414-447-8200
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
† GAP Instr., 40 Oser Ave., Hauppauge, NY 11787 516-273-0909
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
† Humphrey, Inc., 9212 Balboa Ave., San Diego, CA 92123 619-565-6631
† Industrial Control Co., 3100 Pineda Ave., Rockledge, FL 32955 305-259-7105
Jewell Electrical Instrs., Grenier Field, Manchester, NH 03108 603-669-6400
† Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-5444
§† Mechanical Engraving, 4500 Bullard Ave, Bronx, NY 10470 212-324-4455
† Metric Sys., 645 Anchors St., Ft. Walton Beach, FL 32548 904-244-9600
† Natel Engrg. Co., Inc., 4550 Runway St, Simi Valley, CA 93063 805-581-3950

North Atlantic Inds., Instrument Div., 60 Plant Ave., Hauppauge, NY 11788 516-582-6500
† Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† Transmagnetics, 210 Adams Blvd., Farmingdale, NY 11735 516-293-3100
§† Veeder-Root, 70 Sargeant St., Hartford, CT 06102 203-527-7201
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073 619-428-5581
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 312-585-1212
† Warren-Knight Instr. Co., Warren Inds., Inc., 2045 Bennett Rd., Philadelphia, PA 19116 215-464-9300

Indicators, Capacitor Leakage — See Testers, Capacitor (Vol. D)

Indicators, Circuit Condition, On, Off, etc. (Electromechanical)-Also See Indicators, Instrument, Flag, Pointer, etc.-2450

Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ..... D•1110
EMICO Inc., Box 368, Dublin, PA 18917, 215-249-9330 ..... D•1352
§† FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852, 301-881-8124;800-638-6594 ..... B•1235
§ Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
Applied Control, 1275 Bloomfield Ave., Fairfield, NJ 07006-2828 201-227-5454
† Astronautics Corporation of America, P.O. Box 523, Milwaukee, WI 53201-0523 414-447-8200
Bluffton Products, Inc., Tegam, Inc., 7230 North Ridge Road, Madison, OH 44057 216-946-3572
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087 ..... 312-662-7667; 800-323-9605
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
§ Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
§ Industrial Devices, Inc., 7 Hudson St., Edgewater, NJ 07020 201-224-4700
Information Technolgoy A.D.S.C., P.O. Box 470, College Park, MD 20740 301-779-5110
International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
Jay-El Prods., Sub. Ducommun Inc., 1859 W. 169th St., Gardena, CA 90247 213-323-7130
Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Lark Electronics, Inc., Box 390, New York, NY 10040 212-569-0430
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
† Minelco Inc. - A Talley Ind., 135 S. Main St., Thomaston, CT 06787-0459 203-283-8261
§ Modutec, 18 Marshall St., Norwalk, CT 06854 203-853-3636
§ Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
† Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
† SR Engineering, Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Star Micronics, Inc., Components Div., 70-D Ethel Rd. W., Piscataway, NJ 08854 201-572-9512
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706 516-666-8000
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 215-825-4990
§† Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073 619-428-5581
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 312-585-1212
Xycom, 750 N. Maple Rd., Saline, MI 48176 313-429-4971

Indicators, Computer Type & Data Display — See Lamps, Dial, Panel, Pilot Incandescent & Accessories (Vol. B)

Indicators, Distortion — See Analyzers, AF (Vol. D)

Indicators, Elapsed Time-2200 — *See Vol. D*

Indicators, Electromechanical — See Indicators, Circuit Condition, On / Off (Vol. B)

Indicators, Frequency — See Meters, Frequency (Vol. D)

Indicators, Directional-2200 — *See Vol. D*

Indicators, Illumination — See Meters, Light (Nonphotographic) (Vol. D)

Indicators, Instrument, Flag, Pointer, etc.-2450

Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ..... D•1110
EMICO Inc., Box 368, Dublin, PA 18917, 215-249-9330 ..... D•1352
Jewell Electrical Instrs., Grenier Field, Manchester, NH 03108, 603-669-6400 ..... D•1359
Advanced Techn. Research Labs., 5645 K General Washington Dr., Alexandria, VA 22312 703-750-2920
Airpax Corp., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313 305-587-1100
§† Analytical Meas., 31 Willow St., Chatham, NJ 07928 201-273-7500
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Astronautics Corporation of America, P.O. Box 523, Milwaukee, WI 53201-0523 414-447-8200
Beede Electrical Instr. Co., S. Main St., Penacook, NH 03303 603-753-6362
† CDRL Data, Inc., 320 West Lone Cactus Drive Ste. 6, Phoenix, AZ 85027 602-582-8844
Chessell Corp., Penns Trail, Newtown, PA 18940 215-968-0660
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
Communications Instrs., Inc., Box 520, Fairview, NC 28730 704-628-1711
Crompton Instrs., 2763 Higgins Road, Elk Grove Village, IL 60007 714-841-2901
Crompton Instrs., Hawker Siddley, 2763 Old Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
Hickok Elec. Instr., 10514 DuPont Ave., Cleveland, OH 44108 216-541-8060
† Ideal Precision Meter, 214 Franklin St., Brooklyn, NY 11222 212-383-6904
International Instruments, General Resistance, Inc., Twin Lakes Rd, P.O. Box 185, N. Branford, CT 06471 203-481-3450
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
† Minelco Inc. - A Talley Ind., 135 S. Main St., Thomaston, CT 06787-0459 203-283-8261
§ Modutec, 18 Marshall St., Norwalk, CT 06854 203-853-3636
Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
† Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
§ Ragen Data Systems, Inc., 3 Oval Dr., Central Islip, NY 11722 516-234-3800
† Rodale Elctrns. Corp., 603 Chestnut St., Garden City, NY 11530 516-222-0050
Sensitive Research Instrs., 25 Dock St., Mt. Vernon, NY 10550 914-699-9717
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† SR Engineering, Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706 516-666-8000
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 312-585-1212

Indicators, Liquid Level-2200 — *See Vol. D*

Indicators, Null-2900 — *See Vol. D*

Indicators, Numeric Readout — See Tubes, Readout (Vol. A)

Indicators, Phase Rotation-2200 — *See Vol. D*

Indicators, Phase Sequence-2200 — *See Vol. D*

Indicators, Positioning-2200 — *See Vol. D*

Indicators, Power Level — See Monitors, Power (Vol. D)

Indicators, Pressure — See Gauges, Pressure (Vol. D)

Indicators, Proximity — See Sensors, Proximity (Vol. D)

Indicators, RF — See Meters, Frequency (Vol. D)

Indicators, Rotary Shaft Position — See Encoders, Shaft Angle (Vol. B)

Indicators, Servo-4900 — *See Vol. D*

Indicators, Shorted Turn — See Testers, Coil (Vol. D)

Indicators, Sound Level — See Meters, Audio Level (Vol. D)

Indicators, Speed-3500

Control Technology Co., 41-16 29th St., Long Island City, NY 11101, 718-361-2133 ..... D•1987
§ AEMC, 99 Chauncy, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Airpax Corp., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313 305-587-1100
Analogic Corp., 8 Centennial Dr., Peabody, MA 01961 .....617-532-5660;617-777-4500; 617-246-0300;800-451-1
§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Atec, Inc., Box 19426, 8219 Kempwood Dr., Houston, TX 77055 713-468-7971

Beede Electrical Instr. Co., S. Main St., Penacook, NH 03303 603-753-6362
Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611
§ Biddle Instruments, A Thorn EMI Co., 510 Township Line Rd., Blue Bell, PA 19422 215-646-9200
Bindicator, P.O. Box 9, 1915 Dove St., Port Huron, MI 48060 313-987-2700
Chessell Corp., Penns Trail, Newtown, PA 18940 215-968-0660
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
Crompton Instrs., 2763 Higgins Road, Elk Grove Village, IL 60007 714-841-2901
Crompton Instrs., Hawker Siddley, 2763 Old Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
§ C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880 617-246-1720
Digitec Corp., 918 Woodley Rd., P.O. Box 458, Dayton, OH 45401 513-254-6251
Disc Instruments, Honeywell, 102 E. Baker St., Costa Mesa, CA 92626 714-979-5300
§ Dynapar, 1675 Delany Rd., Gurnee, IL 60031 312-662-2666
Eldec Corp., Monitor & Control Div., 16700 13th Ave. W., P.O. Box 100, Lynnwood, WA 98046-0100 206-743-1313
† Electric Tachometer, 68th & Upland Sts., Philadelphia, PA 19142 ..... 215-SA6-7723
Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343 612-931-2700
† Engler Instruments Operation, Stemco Truck Products Division, 250 Culver Ave., Jersey City, NJ 07305 201-332-5353
Epsilon-Lambda Elctrns. Corp., 427 Stevens St., Geneva, IL 60134 312-232-9611
Esterline Angus Instr. Corp., Box 24000, Indianapolis, IN 46224 317-244-7611
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
† Faria, Thomas G., Corp., P.O. Box 0983, Uncasville, CT 06382 203-848-9271
Harrel, Inc., 16 Fitch St., E. Norwalk, CT 06855 203-866-2573
Howell Instrs., 3479 W. Vickery Blvd., Ft. Worth, TX 76107 817-336-7411
§ IVO Inds., Inc., 201 Industrial Way W., P.O. Drawer 917, Eatontown, NJ 07724 201-542-5151
Jewell Electrical Instrs., Grenier Field, Manchester, NH 03108 603-669-6400
§ Jumbo Process Control, Inc., 410 Garibaldi Ave., Lodi, NJ 07644 201-779-7744
Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-5444
Mag-Con, 1626 Terrace Dr., St. Paul, MN 55113 612-633-8820
§ Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131
§ NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110 312-426-5900
† Power Instrs. Products, Amatek/Mansfield & Green Div., 8600 Somerset Dr., Largo, FL 33543 813-536-7831
PPM, Inc., 4521 Emery Ind. Pkwy., Cleveland, OH 44128 216-292-6006
§ Ragen Data Systems, Inc., 3 Oval Dr., Central Islip, NY 11722 516-234-3800
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506 201-427-3100
SGS Semiconductor Corporation, 1000 E. Bell Road, Phoenix, AZ 85022 602-867-6100
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
§ Torq Corp., 32 W. Monroe St., Bedford, OH 44146 216-232-4100
§ TRW, Dynalco Controls Div., 5200 NW 37th, P.O. Box 8187, Ft. Lauderdale, FL 33310 305-739-4300
§ Westberg Mfg., Inc., 3400 Westach Way, Sonoma, CA 95476 707-938-2121
Westronics Inc. of Texas, 2441 Northeast Pkwy., Box 4619, Ft. Worth, TX 76106 817-625-2311

Indicators, Temperature — See Meters, Temperature (Vol. D)

Indicators, Temperature (Not Meter Type)-5300

Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..... B•1683
† Acromag, 30765 Wixom Rd., Wixom, MI 48096 313-624-1541
Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726
§ Acurex-Autodata, 555 Clyde, Mountain View, CA 94039 415-964-3200
Advanced Techn. Research Labs., 5645 K General Washington Dr., Alexandria, VA 22312 703-750-2920
§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
§† Applied Electro Technlg. Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Atec, Inc., Box 19426, 8219 Kempwood Dr., Houston, TX 77055 713-468-7971
§ Athena Controls, Inc., 5145 Campus Dr., Whitemarsh Ind. Campus, Plymouth Meeting, PA 19462 215-828-2490
§† Bailey Controls Co., 29801 Euclid Ave., Wickliffe, OH 44092 216-585-5800
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
Biddle Instruments, A Thorn EMI Co., 510 Township Line Rd., Blue Bell, PA 19422 215-646-9200
Bluffton Products, Inc., Tegam, Inc., 7230 North Ridge Road, Madison, OH 44057 216-946-3572
Capintec Instrs., 6 Arrow Rd., Ramsey, NJ 07446 201-825-9500
Chessell Corp., Penns Trail, Newtown, PA 18940 215-968-0660
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8300
Eldec Corp., Monitor & Control Div., 16700 13th Ave. W., P.O. Box 100, Lynnwood, WA 98046-0100 206-743-1313
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. #5, York, PA 17402 717-767-6517
EOTec Corp., 420 Frontage Road, W. Haven, CT 06516 203-934-7961
§ Everest Interscience, Inc., P.O. Box 345, Tustin, CA 92681 ..... 714-992-4461; 714-730-0747
§† Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701 617-872-8841
Frank, B.H., Co., 3733 W. 139th St., Hawthorne, CA 90250 213-675-9182
Gordon, Claud S., Co., 5710 Kenosha St., Richmond, IL 60071 815-678-2211
Gould Inc., Recording Systems Div., 3631 Perkins Ave., Cleveland, OH 44114 216-361-3315
Gulton Inds., Inc., Graphic Instruments Div., Gulton Ind'l. Pk., E. Greenwich, RI 02818 401-884-6800
† Harrel, Inc., 16 Fitch St., E. Norwalk, CT 06855 203-866-2573
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
† Howell Instrs., 3479 W. Vickery Blvd., Ft. Worth, TX 76107 817-336-7411
Hy-Cal Engrg., 9650 Telstar Ave., El Monte, CA 91731 213-444-4000
§ IR Scientific, Box 110, Carlisle, MA 01741 617-369-7118
§ Jumbo Process Control, Inc., 410 Garibaldi Ave., Lodi, NJ 07644 201-779-7744
Keystone Carbon, Thermistor Div., St. Marys, PA 15857 814-781-1591
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
§ Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131
§ National Controls Corp., 931 N. DuPage Ave., Lombard, IL 60148 312-932-6900
§ Pacific Transducer, 2301 Federal, Los Angeles, CA 90064 213-478-1134
PPM, Inc., 4521 Emery Ind. Pkwy., Cleveland, OH 44128 216-292-6006
Princo Instrs., Inc., 1020 Industrial Hwy., Southampton, PA 18966 215-355-1500
Sensortek, Inc., 154 Em Huron Ave., Clifton, NJ 07013 201-779-5577
Siltran Digital, 2250 Monterey Rd., Atascadero, CA 93422 805-466-3209
§ Solder Absorbing Technology (SAT), South End Bridge Circle, Agawam, MA 01001 800-628-8862
Stow Labs., Inc., Kane Ind'l. Dr., Hudson, MA 01749 617-562-9347
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
Tempil Div., Big Three Inds., Hamilton Blvd., S. Plainfield, NJ 07080 201-757-8300
Thermographics Measurements Ltd., 3733 W. 139th St., Hawthorne, CA 90250 213-675-9182
§ TRW, Dynalco Controls Div., 5200 NW 37th, P.O. Box 8187, Ft. Lauderdale, FL 33310 305-739-4300
§ United Elec. Controls, 85 School St., Watertown, MA 02172 ..... 617-WA6-1000
§ West Division, Gulton Industries, Inc., 3860 N. River Rd., Schiller Park, IL 60176 312-678-6400

Indicators, Tilt-2200 — *See Vol. D*

Indicators, VSWR — See Meters, Standing Wave Ratio (Vol. D)

Indicators (MIL), Fault Locating-3475 — *See Vol. D*

Inductance Comparators — See Bridges, Inductance (Vol. D)

Inductance Standards — See Standards, Inductance (Vol. D)

Induction Potentiometers — See Resolvers, Synchro (Vol. D)

Inductors — See Coils (Vol. A)

Inductors (MIL) — See Coils (MIL)

Infrared Emitter Detectors — See Emitters/Detectors, Infrared

Infrared (IR) Equipment (MIL)-3475 — *See Vol. D*

Infrared Soldering — See Soldering Equipment, Infrared

Inks for Thick Film Microcircuits-1700 — *See Vol. C*

Input/Output Equipment, Voice-2000 — *See Vol. D*

Input/Output Switching Modules — See Modules, Control & Switching (Vol. D)

Inserters, DIP & IC — See Extractors, DIP & IC (Vol. C)

Insertion Loss Measurement Systems-2900 — *See Vol. D*

Inserts — See Bushings, etc. (Vol. C)

Installation Equipment, Fiber Optic-4100 — *See Vol. D*

Instrumentation, Fiber Optic-4100 — *See Vol. D*

Instrument Design Services (Industrial) — See Services, Instrument Design (Industrial) (Vol. D)

Instrument Parts, Precision — See Bearings (Vol. C), Gears & Gear Mechanisms (Precision) (Vol. C)

Instruments, Test & Measuring, GPIB (IEEE 488) Compatible-2900 — *See Vol. D*

Insulation Materials-3100 — *See Vol. C*

Insulation Parts, Fabricated-3100 — *See Vol. C*

Insulators, Antenna-3100 — *See Vol. C*

Insulators, Bushing (Metallized) — See Bushings, etc. (Vol. C)

Insulators, Clip, Test & Battery-3100 — *See Vol. C*

Insulators, Mica-3100 — *See Vol. C*

Integrated Circuit Handlers — See Handlers, Integrated Circuit (Automatic) (Vol. D)

Integrated Circuit Interconnect Systems-3200 — *See Vol. C*

Integrated Circuit Design Aids-4200 — *See Vol. C*

Integrated Circuits, Custom/Semicustom-3130 — *See Vol. A*

Integrated Circuits, Digital-3130 — *See Vol. A*

Integrated Circuits, Interface-3130 — *See Vol. A*

Integrated Circuits, Linear-3130 — *See Vol. A*

Integrated Circuits, Memory-3130 — *See Vol. A*

Integrated Circuits, Microprocessor-3130 — *See Vol. A*

Integrated Circuits, Silicon Monolithic, Unpackaged Chips-3130 — *See Vol. A*

Integrators, Electronic-2325 — *See Vol. D*

Integrators, Mechanical & Electromechanical-2200 — *See Vol. D*

Intensifiers, Image-5700 — *See Vol. A*

Intercom Systems — See Switching Systems, Audio (Vol. D)

Interconnection Systems-3200 — *See Vol. C*

Interfaces, Computer/Peripheral-2000 — *See Vol. D*

Interfaces, Telex/Computer-1900 — *See Vol. D*

Interrupters, Photo-3700

Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265 214-995-3821

Interrupters, Ground Fault-4300

§ **Perma Power Elctrns., 5615 W. Howard Ave., Chicago, IL 60648, 312-647-9414** ..... **C•1691**

§ Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000

Interrupters, Optoelectronic-3700

Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400

Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265 214-995-3821

Interrupters, Power-4300

§ Electronic Specialists, 171 South Main St., Natick, MA 01760 ..... 617-655-1532; 800-225-4876

† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025

Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621

Schaffner EMC, Inc., Instr. Div., 825 Lehigh Avenue, Union, NJ 07083 201-851-0644

Interrupters, Vacuum-4300

† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025

† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621

Westinghouse Electric Corp., Indl. Govt. Tube Div., Westinghouse Circle, Horseheads, NY 14845 607-796-3211

Intervalometers — See Timers (Vol. D)

Inverters, DC to AC — See Power Supplies, AC Output (Vol. D)

Isolators, Antenna-1900 — *See Vol. D*

Isolators, Ferrite-3450 — *See Vol. A*

Isolators, Line-4050 — *See Vol. D*

Isolators, Microwave (All Types)-3450 — *See Vol. A*

Isolators, Optoelectronic-3700

Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092, 201-233-7200 ..... B•1204

§ **Clairex Electronics, 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602** ..... **B•1208**

§ **EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ... B•1210**

† **MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496** ..... **B•1121**

§ **Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900** ..... **A•2086**

† **Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901, 518-561-3160 ..... B•1215**

Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254, 617-890-6107 ..... A•2091

Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265, 214-995-3821 ..... B•1217

† **TRW Optoelectronics Div., 1207 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ..... B•1221**

§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 .. 201-722-9800

Allied Precision Elctrns., 1816 C. Ponderosa, College Station, TX 77840 409-693-5397

Amperex Elctrn. Corp., Slatersville Div., Providence Pike, Slatersville, RI 02876 401-762-3800

Amtek Digital Systems, Inc., 12740 28th N.E., Seattle, WA 98125 206-363-0217

§ Collmer Semiconductor, Inc., 14368 Proton Rd., Dallas, TX 75234-3335 214-233-1589

† Dionics, 65 Rushmore St., Westbury, NY 11590 516-997-7474

EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201

Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011

§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321

§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400

§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756 501-636-5000

Hamamatsu Photonics K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141

§ Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.

§ Hobart Engrg., 4143 Cheshire Dr., Cypress, CA 90630 714-827-2135

Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271

IXYS Corp., 142 Charcot Ave., San Jose, CA 95131 408-262-8800

Micropac Inds., 905 E. Walnut St., Garland, TX 75040 214-272-3571

§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 201-748-5089

§ Optek Technology, Inc., 345 Industrial Blvd., McKinney, TX 75069 214-542-9461

§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000

§† Raytheon Co., 465 Centre St., Quincy, MA 02169 617-479-5300

Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100

† Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700

§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910

Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400

§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000

Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707

Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077

Teledyne Solid State Products, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077

§† Texas Instrs., Inc., Box 225012-MS-84, Dallas, TX 75265 214-995-6611

Isolators, Source — See Isolators, Line (Vol. D)

Jack Adapters (All Types)-2100 — *See Vol. C*

Jack Covers-2100 — *See Vol. C*

Jack Panel Assemblies & Access. — See Panels, Jack (Vol. C)

Jacks (All Types)-2100 — *See Vol. C*

Jacks, Modular Telephones-2100 — *See Vol. C*

Jacks (MIL)-2440

Concord Elctrns., 30 Great Jones St., Dept. JE, New York, NY 10012, 212-777-6571 ..... C•1175

Elctrn. Molding Corp., 96 Mill St., Woonsocket, RI 02895, 401-769-3800 .. C•1188

† **Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911** ..... **C•1506,1905**

§† Accessories for Elctrns., Inc., 800 Merrick Rd., Baldwin, NY 11510-3593 516-546-1751

† Accurate Elctrns., 169 S. Abbe Rd., P.O. Box 1287, Elyria, OH 44036 216-365-1211

† ADC Magnetic Controls Co., 4900 W. 78th St., Minneapolis, MN 55435 .. 612-835-6800

Auto-Swage Prods., 726 River Rd., Shelton, CT 06484 203-929-1401

† Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400

† Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050

§† M/A-COM Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054 603-424-4111

§† Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400

Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700

† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020

Jammers (MIL)-3475 — *See Vol. D*

Jammers (MIL), Advanced Self Protection-3475 — *See Vol. D*

Jammers (MIL), Chaff, Flares-3475 — *See Vol. D*

Jammers (MIL), Communications (Commjam)-3475 — *See Vol. D*

Jammers (MIL), Commjam, Truck Mounted-3475 — *See Vol. D*

Jammers (MIL), Drone Borne-3475 — *See Vol. D*

Jammers (MIL), Expendable-3475 — *See Vol. D*

Jammers (MIL), High Band-3475 — *See Vol. D*

Jammers (MIL), Integrated Command-3475 — *See Vol. D*

Jammers (MIL), J-band-3475 — *See Vol. D*

Jammers (MIL), Low Band-3475 — *See Vol. D*

Jammers (MIL), Portable-3475 — *See Vol. D*

Jammers (MIL), Radar-3475 — *See Vol. D*

Jammers (MIL), Shipboard-3475 — *See Vol. D*

Jammers (MIL), Standoff-3475 — *See Vol. D*

Jammers (MIL), Tactical-3475 — *See Vol. D*

Jamming Pods (MIL), ECM-3475 — *See Vol. D*

Jamming Sets (MIL), Multipurpose-3475 — *See Vol. D*

Jamming Systems (MIL)-3475 — *See Vol. D*

Jamming Systems (MIL), Mobile-3475 — *See Vol. D*

Jamming Systems (MIL), Multipurpose-3475 — *See Vol. D*

Jamming Systems (MIL), Tactical Communications (TACJAM)-3475 — *See Vol. D*

Jigs And Fixtures, Chassis & Circuit Board-4100 — *See Vol. D*

Joint Compounds, Semiconductor — See Coatings, Compounds, Lubricants, etc., Heat Conductive (Vol. C)

Joints, Rotary, Fiber Optic-2475

Adams Rite Prods., Inc., 540 W. Chevy Chase Dr., Glendale, CA 91204 .. 818-241-5121
Poly-Scientific, Litton Inds., 1213 N. Main St., Blacksburg, VA 24060 703-552-3014

Joints, Rotary, Microwave-3450 — *See Vol. A*

Joysticks — See Controls, Computer Input (Vol. D)

Jumpers, Bonding-2100 — *See Vol. C*

Jumpers, Circuit Board-2100 — *See Vol. C*

Jumpers, Wire, Terminated — See Cords, Patch (Vol. C)

Junctions, Hybrid, Microwave-3450 — *See Vol. A*

Keyboard Legends and Symbols-5150

§ **Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040** ..... **B•1719,1724,1725**
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051, 313-628-9711 ..... **B•1727**
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... **B•1671**
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Conductive Rubber Technlg., 1235 Coast Village Rd., Santa Barbara, CA 93108 805-969-5805
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 312-279-9110
Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441 612-559-0720
Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
GM Nameplate, Inc., 2040 15th Ave. West, Seattle, WA 98119 206-284-2200
Interface Products, Inc., 2185 S. Grand Ave., Santa Ana, CA 92705 714-549-4977
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 301-239-6777
Keytek Div., 6424 Warren Dr., Norcross, GA 30093 404-449-6040
§ MEC A/S, Industriparken 23, Ballerup, DENMARK DK-2750 452-973366
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645

Keyboards, Address Encoded-5150

§ **Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134, 408-946-6000** ..... **D•1057**
† **Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, 219-747-3121** ..... **B•1707**
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... **B•1708**
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... **B•1732**
† **Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788, 516-435-8300** ..... **B•1735**
† **Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645** ..... **B•1737**
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
Cincinnati Electrosys., 469 Wards Corner Rd., Loveland, OH 45140 513-831-4347
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 312-279-9110
Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 ... 818-787-0311
Innovatek Microsystems, Inc., Smithfield Rd., R1 Box 104, Millerton, NY 12546-9720 914-373-9003
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 301-239-6777
Keytek Div., 6424 Warren Dr., Norcross, GA 30093 404-449-6040
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051 313-628-9711
Maxi-Switch Co., Sub. of EECO, 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070 703-435-9496
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648 ... 312-647-8338
† SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960

Keyboards, Capacitive-5150

Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... **B•1533,1709,1710**
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... **B•1668,1732,1733**
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
§ Amkey, Inc., Sub. American Pwr. Dvs., Inc., 220 Ballardvale St., Wilmington, MA 01887 617-658-7800
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 312-279-9110
Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 301-239-6777
Key Tronic, P.O. Box 14687, Spokane, WA 99214 509-928-8000
§ Sumitronics, Inc., Sumitomo Corporation, 1270 Oakmead Pkwy. Ste. 201, Sunnyvale, CA 94086 408-737-7683

Keyboards, Ferrite Core-5150

Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 312-279-9110
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 301-239-6777
Keytek Div., 6424 Warren Dr., Norcross, GA 30093 404-449-6040

Keyboards, Full Travel-5150

§ **Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134, 408-946-6000** ..... **D•1057**
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... **B•1706**
Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, 219-747-3121 ..... **B•1707**
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... **B•1533,1708,1711**
† **Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930, 617-281-2040** ..... **B•1714**
Frederick Components Intl., 20806 Plummer St., Chatsworth, CA 91311, 818-882-0868;800-354-0660 ..... **B•1717**
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... **B•1668,1732,1733**
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... **B•1671**
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648, 312-647-8338 ..... **B•1736**
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Amkey, Inc., Sub. American Pwr. Dvs., Inc., 220 Ballardvale St., Wilmington, MA 01887 617-658-7800
Conductive Rubber Technlg., 1235 Coast Village Rd., Santa Barbara, CA 93108 805-969-5805
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 312-279-9110
Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 312-354-1040
§ Maxi-Switch Co., Sub. of EECO, 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
† Noble U.S.A., Inc., 151 Stanley St., Elk Grove Village, IL 60007 312-364-6038
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
† Rogers Corp., One Technology Dr., Rogers, CT 06263 203-774-9605
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560

Keyboards, Hall Effect-5150

Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... **B•1668**
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 301-239-6777

Keyboards, Hard Contact-5150

† **Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, 219-747-3121** ..... **B•1707**
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... **B•1533,1709,1710**
Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930, 617-281-2040 ..... **B•1714**
Frederick Components Intl., 20806 Plummer St., Chatsworth, CA 91311, 818-882-0868;800-354-0660 ..... **B•1717**
§ **Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040** ..... **B•1718**
† **Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311** ..... **B•1078,1726**
Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035, 315-655-8050 ..... **B•1622**
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... **B•1671**
Moxness Products, Inc., Versa Technologies, 1914 Indiana St., Racine, WI 53405, 414-554-5050;800-558-5706 ..... **B•1734**
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648, 312-647-8338 ..... **B•1736**
† **Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645** ..... **B•1737**
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
§ Amkey, Inc., Sub. American Pwr. Dvs., Inc., 220 Ballardvale St., Wilmington, MA 01887 617-658-7800

§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 301-239-6777
Key Tronic, P.O. Box 14687, Spokane, WA 99214 509-928-8000
§ Maxi-Switch Co., Sub. of EECO, 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070 703-435-9496
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560

Keyboards, Lighted-5150

COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441, 612-559-3772 ..... B•1535
Frederick Components Intl., 20806 Plummer St., Chatsworth, CA 91311, 818-882-0868;800-354-0660 ..... B•1717
Memtron Technologies, Inc., 1400 Weiss St., Frankenmuth, MI 48734, 517-652-2652 ..... B•1731
Interface Products, Inc., 2185 S. Grand Ave., Santa Ana, CA 92705 714-549-4977
OMNI Switch, Inc., 21630 N. 19th Ave., Suite B-20, Phoenix, AZ 85027 .. 602-582-0629
Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560
† Stacoswitch, 1139 Baker St., Costa Mesa, CA 92626 714-549-3041

Keyboards, Low Profile-5150

§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134, 408-946-6000 ..... D•1057
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... B•1706
† Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, 219-747-3121 ..... B•1707
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1533,1708,1709,1710,1711
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441, 612-559-3772 ..... B•1535
Frederick Components Intl., 20806 Plummer St., Chatsworth, CA 91311, 818-882-0868;800-354-0660 ..... B•1717
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1720
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1726
Memtron Technologies, Inc., 1400 Weiss St., Frankenmuth, MI 48734, 517-652-2652 ..... B•1731
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1668,1732,1733
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... B•1671
Moxness Products, Inc., Versa Technologies, 1914 Indiana St., Racine, WI 53405, 414-554-5050;800-558-5706 ..... B•1734
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648, 312-647-8338 ..... B•1736
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... B•1091
§ Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645 ..... B•1737
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 312-279-9110
Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
§ Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
† Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
† Jay-El Prods., Sub. Ducommun Inc., 1859 W. 169th St., Gardena, CA 90247 213-323-7130
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 301-239-6777
Key Tronic, P.O. Box 14687, Spokane, WA 99214 509-928-8000
§ Maxi-Switch Co., Sub. of EECO, 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
Optical Techniques Intl., 1800 E. Garry, Ste. #214, Santa Ana, CA 92705 714-540-9040
Rogers Corp., One Technology Dr., Rogers, CT 06263 203-774-9605
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
† Stacoswitch, 1139 Baker St., Costa Mesa, CA 92626 714-549-3041
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
Unicorn Engrg. Co., Membrane Keyboard Div., 6201 Harwood Ave., Oakland, CA 94618 415-428-1626

Keyboards, Membrane-5150

AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... B•1706
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ..... B•1561
† Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930, 617-281-2040 ..... B•1714
Frederick Components Intl., 20806 Plummer St., Chatsworth, CA 91311, 818-882-0868;800-354-0660 ..... B•1717
† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1726
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051, 313-628-9711 ..... B•1727
Memtron Technologies, Inc., 1400 Weiss St., Frankenmuth, MI 48734, 517-652-2652 ..... B•1731
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1668,1732,1733
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... B•1671
Moxness Products, Inc., Versa Technologies, 1914 Indiana St., Racine, WI 53405, 414-554-5050;800-558-5706 ..... B•1734
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648, 312-647-8338 ..... B•1736
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
† C.A.M. Graphics Co., Inc., 145 Toledo St., Farmingdale, NY 11735 516-694-1315
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 .. 312-578-3500
Conductive Rubber Technlg., 1235 Coast Village Rd., Santa Barbara, CA 93108 805-969-5805
§ Densitron Corp., 20775 Western Ave., Torrance, CA 90501 213-618-9647
Endicott Resch. Grp., Inc., 2601 Wayne St., P.O. Box 269, Endicott, NY 13760 607-754-9187
GM Nameplate, Inc., 2040 15th Ave. West, Seattle, WA 98119 206-284-2200
GTI/Circuits Div., Box 217, Leesburg, IN 46538 219-453-3261
The Hall Company, 420 East Water St., Urbana, OH 43078 513-652-1376
† Hallmark Nameplate, Inc./Electropanel Co., 1855 New Highway, Farmingdale, NY 11735 516-454-0700
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 301-239-6777
Keytek Div., 6424 Warren Dr., Norcross, GA 30093 404-449-6040
Key Tronic, P.O. Box 14687, Spokane, WA 99214 509-928-8000
Maxi-Switch Co., Sub. of EECO, 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
Methode Elctrns., Inc., 7444 W. Wilson Ave., Chicago, IL 60656 312-867-9600
§† Miller Dial Corp., 4400 N. Temple City Blvd., El Monte, CA 91734 818-283-5111
† Noble U.S.A., Inc., 151 Stanley St., Elk Grove Village, IL 60007 312-364-6038
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
OMNI Switch, Inc., 21630 N. 19th Ave., Suite B-20, Phoenix, AZ 85027 .. 602-582-0629
† Rogers Corp., One Technology Dr., Rogers, CT 06263 203-774-9605
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
SP America Inc., Shin-Etsu Polymer, 1181 N. 4th St., San Jose, CA 95112 408-947-0311
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Unicorn Engrg. Co., Membrane Keyboard Div., 6201 Harwood Ave., Oakland, CA 94618 415-428-1626

Keyboards, Modular-5150

Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, 219-747-3121 ..... B•1707
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1708
Frederick Components Intl., 20806 Plummer St., Chatsworth, CA 91311, 818-882-0868;800-354-0660 ..... B•1717
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1724
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... B•1671
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645 ..... B•1737
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 312-279-9110
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
Keystone Elctrns. Corp., 49 Bleecker St., New York, NY 10012 212-475-4600
§ MEC A/S, Industriparken 23, Ballerup, DENMARK DK-2750 452-973366
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Optical Techniques Intl., 1800 E. Garry, Ste. #214, Santa Ana, CA 92705 714-540-9040
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648 ... 312-647-8338
Rath Microtech Corp., Rath Affiliated Cos., 2505 Foster Ave., Janesville, WI 53545 ..... 608-754-2222;800-356-9464
Secoinsa/Digi Power, 686 E. Gish Rd., San Jose, CA 95112 408-288-5600

Keyboards, Pad-5150

AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... B•1706
† Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, 219-747-3121 ..... B•1707
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1533
† Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930, 617-281-2040 ..... B•1714
Frederick Components Intl., 20806 Plummer St., Chatsworth, CA 91311, 818-882-0868;800-354-0660 ..... B•1717
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1718
† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1078,1726
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051, 313-628-9711 ..... B•1727
Memtron Technologies, Inc., 1400 Weiss St., Frankenmuth, MI 48734, 517-652-2652 ..... B•1731
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1732
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... B•1671
† Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788, 516-435-8300 ..... B•1735
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648, 312-647-8338 ..... B•1736
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... B•1091
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645 ..... B•1737

SP America Inc., Shin-Etsu Polymer, 1181 N. 4th St., San Jose, CA 95112, 408-947-0311 ..... **B•1739**
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
§ Amkey, Inc., Sub. American Pwr. Dvs., Inc., 220 Ballardvale St., Wilmington, MA 01887 617-658-7800
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Conductive Rubber Technlg., 1235 Coast Village Rd., Santa Barbara, CA 93108 805-969-5805
§ Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 301-239-6777
Maxi-Switch Co., Sub. of EECO, 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070 703-435-9496
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
† Orbit Instrument of Cal., 6431 Global Dr., Cypress, CA 90630 714-527-0561
† Rogers Corp., One Technology Dr., Rogers, CT 06263 203-774-9605
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
Unicorn Engrg. Co., Membrane Keyboard Div., 6201 Harwood Ave., Oakland, CA 94618 415-428-1626

Keyboards, Photo-optical-5150

Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 301-239-6777
Optical Techniques Intl., 1800 E. Garry, Ste. #214, Santa Ana, CA 92705 714-540-9040

Keyboards, Reed-5150

Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 301-239-6777
† Key Tronic, P.O. Box 14687, Spokane, WA 99214 509-928-8000
Maxi-Switch Co., Sub. of EECO, 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645

Keyboards, Solid State-5150

Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... **B•1533**
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... **B•1668-1733,1732,1733**
§ Amkey, Inc., Sub. American Pwr. Dvs., Inc., 220 Ballardvale St., Wilmington, MA 01887 617-658-7800
Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 312-279-9110
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 301-239-6777
Keytek Div., 6424 Warren Dr., Norcross, GA 30093 404-449-6040
Key Tronic, P.O. Box 14687, Spokane, WA 99214 509-928-8000
Rath Microtech Corp., Rath Affiliated Cos., 2505 Foster Ave., Janesville, WI 53545 ..... 608-754-2222;800-356-9464

Keyboards & Keypads (MIL)-2440

Interface Products, Inc., 2185 S. Grand Ave., Santa Ana, CA 92705 714-549-4977
† Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560
TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230

Keyers, Tone-1900 — *See Vol. D*

Keypads-5150

AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... **B•1706**
Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, 219-747-3121 ..... **B•1707**
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... **B•1711**
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ..... **B•1561**
Frederick Components Intl., 20806 Plummer St., Chatsworth, CA 91311, 818-882-0868;800-354-0660 ..... **B•1717**
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... **B•1718**
† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... **B•1078,1726**
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051, 313-628-9711 ..... **B•1727**
Memtron Technologies, Inc., 1400 Weiss St., Frankenmuth, MI 48734, 517-652-2652 ..... **B•1731**
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... **B•1668,1732,1733**
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... **B•1671**
Moxness Products, Inc., Versa Technologies, 1914 Indiana St., Racine, WI 53405, 414-554-5050;800-558-5706 ..... **B•1734**
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648, 312-647-8338 ..... **B•1736**
Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... **B•1091**
§ Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645 ..... **B•1737**
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
AME Corp., 101 E. Main St., Little Falls, NJ 07424 201-256-3939
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441 612-559-3772
Conductive Rubber Technlg., 1235 Coast Village Rd., Santa Barbara, CA 93108 805-969-5805
§ Densitron Corp., 20775 Western Ave., Torrance, CA 90501 213-618-9647
§ Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441 612-559-0720
Endicott Resch. Grp., Inc., 2601 Wayne St., P.O. Box 269, Endicott, NY 13760 607-754-9187
Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
Keytek Div., 6424 Warren Dr., Norcross, GA 30093 404-449-6040
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
OMNI Switch, Inc., 21630 N. 19th Ave., Suite B-20, Phoenix, AZ 85027 .. 602-582-0629
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Selec-Key, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103 312-837-7970
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Unicorn Engrg. Co., Membrane Keyboard Div., 6201 Harwood Ave., Oakland, CA 94618 415-428-1626

Kits, Breadboarding (For Engineers)-4200 — *See Vol. C*

Kits, Connector-2100 — *See Vol. C*

Kits, Enclosure Prototyping-1400 — *See Vol. C*

Kits, Fiber Optic-2475

AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... **B•1118**
§† TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007, 312-981-6000 ..... **B•1126**
† Daniels Mfg. Corp., 6103 Anno Ave., Orlando, FL 32809 305-855-6161
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
EOTec Corp., 420 Frontage Road, W. Haven, CT 06516 203-934-7961
EOTec Corporation, Fiber Optic Interconnect Group, 420 Frontage Road, West Haven, CT 06516 203-934-7961
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000
General Fiber Optics, Inc., 98 Commerce Rd., Cedar Grove, NJ 07009 .. 201-239-3400
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
Rehlander Assocs., 118A Bridge St., Beverly, MA 01915 617-922-5961

Kits, Marking (Dial, Instrument, Equipment, etc.)-2400 — *See Vol. C*

Kits, Potentiometer, Rheostat-4750 — *See Vol. A*

Kits, Printed Circuit-1700 — *See Vol. C*

Kits, Programming Board-4200 — *See Vol. C*

Kits, Shielding-4525 — *See Vol. C*

Kits, Terminal-2100 — *See Vol. C*

Kits, Training Aid-4200 — *See Vol. C*

Knobs - Also see Dials, Instrument-2400 — *See Vol. C*

Knobs, Collet-2400 — *See Vol. C*

Knobs, Limit Stop-2400 — *See Vol. C*

Knobs, Locking, Control Shaft-2400 — *See Vol. C*

Knobs, Slip Clutch-2400 — *See Vol. C*

Knobs, Torque, Incremental, Ratio Drive-2400 — *See Vol. C*

Labels, Pressure Sensitive, Adhesive-2400 — *See Vol. C*

Labels, Coatings, Crayons, Pellets, etc., Temperature Indicating-5300

Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI 53201 414-332-8100
§ Everest Interscience, Inc., P.O. Box 345, Tustin, CA 92681 ..... 714-992-4461; 714-730-0747
Frank, B.H., Co., 3733 W. 139th St., Hawthorne, CA 90250 213-675-9182
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
Solder Absorbing Technology (SAT), South End Bridge Circle, Agawam, MA 01001 800-628-8862
§ Tempil Div., Big Three Inds., Hamilton Blvd., S. Plainfield, NJ 07080 201-757-8300
Thermographics Measurements Ltd., 3733 W. 139th St., Hawthorne, CA 90250 213-675-9182
Westemp Corp., Box 767, Cardiff, CA 92007 619-942-9800

Laboratories, Testing — See Services, Electrical Measurement & Test (Vol. D)

Lacing, Cable — See Cords & Tapes, Lacing (Vol. C)

Laminates, Metal Clad (Including Copper)-2500 — *See Vol. C*

Laminates, Plastic Impregnated (Unclad)-2500 — *See Vol. C*

Laminates, Plastic (With Integral Heating Elements)-5300

American Cyanamid Co., Metal Coated Fibers Dept., One Cyanamid Plaza, Wayne, NJ 07470 201-831-3148
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
§ Identatronics, Inc., 425 Lively Blvd., Elk Grove, IL 60007 ..... 312-437-2654; 1-800-323-5403
Keene Laminates, Keene Corp., 199 Amaral St., E. Providence, RI 02914 800-556-7683
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051 313-628-9711

Lamp Adapters-2450

Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
§ Elctrn. Molding Corp., 96 Mill St., Woonsocket, RI 02895 401-769-3800
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700

Lamp Assembly Color Filters, Lens Mountable-2450

Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1020
† AME Corp., 101 E. Main St., Little Falls, NJ 07424 201-256-3939
† APM-Hexseal, 44 Honeck St., Englewood, NJ 07631 201-569-5700
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
§ Industrial Devices, Inc., 7 Hudson St., Edgewater, NJ 07020 201-224-4700
† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 718-392-8800
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Paccom, 3928 148th NE, Redmond, WA 98052 ..... 206-883-9200;800-426-6254
Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092

Lamp Drivers-2450

Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54703 715-834-9595
† Circuit Techn., 160 Smith St., Farmingdale, NY 11735 516-293-8686
Data Display Products, Box 91072, Los Angeles, CA 90009 213-640-0442
Industrial Devices, Inc., 7 Hudson St., Edgewater, NJ 07020 201-224-4700
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 ... 818-787-0311
KMC Systems, Inc., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432 201-447-0007
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248
MICRA Corp., 120 Ricefield Lane, Hauppauge, NY 11788 516-231-8600
SGS Semiconductor Corporation, 1000 E. Bell Road, Phoenix, AZ 85022 602-867-6100
Silicon General, 11861 Western Ave., Garden Grove, CA 92641 714-898-8121
§† Sprague Elec. Co., Integrated Circuit Div., 115 Northeast Cutoff, Worcester, MA 01606 617-853-5000
§ S S A C, Box 395, Liverpool, NY 13088 315-622-1000
Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071 609-589-7500
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
§† Teledyne-Crystalonics, 147 Sherman St., Cambridge, MA 02140 617-491-1670
† Tex-Techs, Inc., 10021 Cayuga, Dallas, TX 75228 214-328-6200
U.S. Scientific Instrs., 61 North Beacon St., Boston, MA 02134 617-787-2411

Lamp Holders — See Sockets, Lamp & Lamp Assemblies (Vol. B)

Lamps, Arc-2450

Canrad-Hanovia, 100 Chestnut St., Newark, NJ 07105 201-589-4300
Christie Elec. Corp., 20665 Manhattan Pl., Torrance, CA 90501 213-320-0808
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
§ Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
§ Gates, Geo. W., & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Sq., NY 11010 516-352-2904
§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
§ GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
ILC Technology, Inc., 399 Java Dr., Sunnyvale, CA 94089 408-745-7900
§† Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
Plasmarc Technologies, Inc., 180 Passaic Avenue, Fairfield, NJ 07006 .. 201-575-0870
† UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778 818-285-3123
Voltarc Tubes, 176 Linwood Ave., Fairfield, CT 06430 203-255-2633
Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325
Xenon Corp., 66 Industrial Way, Wilmington, MA 01887 617-658-8940

Lamps, Edge Lighting, Panel-2450

† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911 ..... B•1094
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
Gilway Technical Lamp, 165 New Boston Street, Woburn, MA 01801 ... 617-935-4442
§† Glar-Ban Div. of Mark IV Inds., Inc., 2937 Alt Blvd., Grand Island, NY 14072 716-773-2871
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
† Hoffman Engineering Corp., P.O. Box 300, Old Greenwich, CT 06870 ... 203-325-8933
JKL Comps., 13343 Paxton St., Pacoima, CA 91331 818-896-0019
Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
§† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 718-392-8800
§† Luxo Lamp, Jac Jacobsen Industries, Inc., P.O. Box 951, Port Chester, NY 10573 914-937-4433
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
† Plasmarc Technologies, Inc., 180 Passaic Avenue, Fairfield, NJ 07006 .. 201-575-0870
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092
† Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560
Wamco, Inc., 11555-A Coley River Cir., Fountain Valley, CA 92708 714-545-5560

Lamps, Electroluminescent-2450

Endicott Resch. Grp., Inc., 2601 Wayne St., P.O. Box 269, Endicott, NY 13760 607-754-9187
† Hoffman Engineering Corp., P.O. Box 300, Old Greenwich, CT 06870 ... 203-325-8933
† Rogers Corp., Box 700, Chandler, AZ 85224 602-963-4584

Lamps, Exciter, Photographic-2450

§ Bulbtronics, Inc., 45 Banfi Plaza, Farmingdale, NY 11735, 516-249-2272 ..... B•1021
Gilway Technical Lamp, 165 New Boston Street, Woburn, MA 01801 ... 617-935-4442
§ GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
§ Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
§ North American Philips Lighting, Bank St., Hightstown, NJ 08520 609-448-4000
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
† Tex-Techs, Inc., 10021 Cayuga, Dallas, TX 75228 214-328-6200
Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325
Xenon Corp., 66 Industrial Way, Wilmington, MA 01887 617-658-8940

Lamps, Flashtube-2450

† Amglo, 5265 Michigan Ave., Rosemont, IL 60018 312-671-4321
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590 516-935-3640
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
ILC Technology, Inc., 399 Java Dr., Sunnyvale, CA 94089 408-745-7900
† Imtronics Inds., 11930 31st Ct., St. Petersburg, FL 33715 813-577-9010
§† Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, IL 60622 312-829-6050
† Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400
U.S. Scientific Instrs., 61 North Beacon St., Boston, MA 02134 617-787-2411
Voltarc Tubes, 176 Linwood Ave., Fairfield, CT 06430 203-255-2633
§ Xenon Corp., 66 Industrial Way, Wilmington, MA 01887 617-658-8940

Lamps, Fluorescent-2450

§ Bulbtronics, Inc., 45 Banfi Plaza, Farmingdale, NY 11735, 516-249-2272 ..... B•1021
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590, 516-935-3640 ..... B•1023
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911 ..... B•1096
§† Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
Hellesens Battery Engrg., Inc., A/S Hellesens, 1636 Hyde Park Ave., Hyde Park, MA 02136 617-361-7555
JKL Comps., 13343 Paxton St., Pacoima, CA 91331 818-896-0019
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 718-392-8800
§† Luxo Lamp, Jac Jacobsen Industries, Inc., P.O. Box 951, Port Chester, NY 10573 914-937-4433
§ Mann, Henry, Inc., 3983 Mann Road, Huntingdon Valley, PA 19006 215-355-7200
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 215-825-4990
Voltarc Tubes, 176 Linwood Ave., Fairfield, CT 06430 203-255-2633

Lamps, Glow — See Lamps, Neon (Vol. B)

Lamps, Incandescent-2450

Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1019
§ Bulbtronics, Inc., 45 Banfi Plaza, Farmingdale, NY 11735, 516-249-2272 ..... B•1021
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590, 516-935-3640 ..... B•1023
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 ..... B•1036
Gilway Technical Lamp, 165 New Boston Street, Woburn, MA 01801, 617-935-4442 ..... B•1053
§ Industrial Devices, Inc., 7 Hudson St., Edgewater, NJ 07020, 201-224-4700 ..... B•1069
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1078
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ..... B•1082
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ..... B•1088

Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1649-1650,1657,1667
Oshino Electric Lamp Works, Ltd., 5-2, Mianami-Shinagawa 2-chome, Shinagawa-Ku, Tokyo, JAPAN, 03-471-8548 ..... B•1090
Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911 ..... B•1094
Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 ..... B•1098
Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114, 203-527-3092 ..... B•1103
Visual Communications Co., Inc., P.O. Box 986, El Segundo, CA 90245, 213-822-4727 ..... B•1114
Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§† Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§† Glar-Ban Div. of Mark IV Inds., Inc., 2937 Alt Blvd., Grand Island, NY 14072 716-773-2871
GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
Hellesens Battery Engrg., Inc., A/S Hellesens, 1636 Hyde Park Ave., Hyde Park, MA 02136 617-361-7555
§ Jensen Tools, Inc., Axia, Inc., 7815 S. 46th St., Phoenix, AZ 85040 602-968-6241
JKL Comps., 13343 Paxton St., Pacoima, CA 91331 818-896-0019
† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
§ Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 718-392-8800
† Lumitron, P.O. Box 12, Summit, NJ 07901 201-273-8998
§† Luxo Lamp, Jac Jacobsen Industries, Inc., P.O. Box 951, Port Chester, NY 10573 914-937-4433
§ Mann, Henry, Inc., 3983 Mann Road, Huntingdon Valley, PA 19006 215-355-7200
Micro Lamps, Inc., 1N111 Linlar Rd., La Fox, IL 60147 312-232-6001
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Oxley, Inc., 6290 Sunset Blvd., Ste. 1126, Los Angeles, CA 90028 213-463-5120
§† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§† Sylvania Miniature Lighting, GTE Corporation, W. Main St., Hillsboro, NH 03244 603-464-5533
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 215-825-4990
§† Wamco, Inc., 11555-A Coley River Cir., Fountain Valley, CA 92708 714-545-5560
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791

Lamps, Indicator — See Lamps, Miniature & Subminiature (Vol. B)

Lamps, Infrared-2450

§ Bulbtronics, Inc., 45 Banfi Plaza, Farmingdale, NY 11735, 516-249-2272 ..... B•1021
Advanced Kinetics, 1231 Victoria St., Costa Mesa, CA 92627 714-646-7165
† Canrad-Hanovia, 100 Chestnut St., Newark, NJ 07105 201-589-4300
§† Casso-Solar, P.O. Box 163, U.S. Route 202, Pomona, NY 10970 914-354-2500
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
ElectroPhysics Corp., 48 Spruce St., Nutley, NJ 07110 201-667-2262
Gamma Scientific Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034
§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
ILC Technology, Inc., 399 Java Dr., Sunnyvale, CA 94089 408-745-7900
Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248 415-960-6000
NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000
§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 201-748-5089
§ North American Philips Lighting, Bank St., Hightstown, NJ 08520 609-448-4000
OAL Assocs., P.O. Box J, Escondido, CA 92025 619-743-7143
§ Optek Technology, Inc., 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 408-725-1220
Oxley, Inc., 6290 Sunset Blvd., Ste. 1126, Los Angeles, CA 90028 213-463-5120
Plasmarc Technologies, Inc., 180 Passaic Avenue, Fairfield, NJ 07006 201-575-0870
Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325

Lamps, LED & LCD — See Diodes, Light Emitting (Vol. B), Diodes, Liquid Crystal (Vol. B)

Lamps, Magnifying, Inspection-4100 — *See Vol. D*

Lamps, Mercury Vapor-2450

§ Bulbtronics, Inc., 45 Banfi Plaza, Farmingdale, NY 11735, 516-249-2272 ..... B•1021
Advanced Kinetics, 1231 Victoria St., Costa Mesa, CA 92627 714-646-7165
§ American Ultraviolet, 320 Commerce St., Chatham, NJ 07928 201-635-8355
Aristo Grid Lamp Prods., 65 Harbor Rd., Port Washington, NY 11050 516-944-3030
† Canrad-Hanovia, 100 Chestnut St., Newark, NJ 07105 201-589-4300
Christie Elec. Corp., 20665 Manhattan Pl., Torrance, CA 90501 213-320-0808
§ Gates, Geo. W., & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Sq., NY 11010 516-352-2904
§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
§ GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
Hamamatsu Photonics K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, IL 60622 312-829-6050
§ Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
§ North American Philips Lighting, Bank St., Hightstown, NJ 08520 609-448-4000
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§† Spectronics Corp., 956 Brush Hollow Rd., Westbury, NY 11590 516-333-4840
† UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778 818-285-3123
Voltarc Tubes, 176 Linwood Ave., Fairfield, CT 06430 203-255-2633
Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325

Lamps, Miniature & Subminiature-2450

§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1018
§ Bulbtronics, Inc., 45 Banfi Plaza, Farmingdale, NY 11735, 516-249-2272 ..... B•1021
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590, 516-935-3640 ..... B•1023
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 ..... B•1032
Gilway Technical Lamp, 165 New Boston Street, Woburn, MA 01801, 617-935-4442 ..... B•1053
§ Industrial Devices, Inc., 7 Hudson St., Edgewater, NJ 07020, 201-224-4700 ..... B•1057-1077
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ..... B•1082
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505, 213-534-1505 ..... B•1083
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101, 718-392-8800 ..... B•1085
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ..... B•1088
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1649-1650,1657,1667
§† Oshino Electric Lamp Works, Ltd., 5-2, Mianami-Shinagawa 2-chome, Shinagawa-Ku, Tokyo, JAPAN, 03-471-8548 ..... B•1090
§† Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911 ..... B•1094
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530, 914-681-0700 ..... D•1039
§ Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 ..... B•1098
§† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114, 203-527-3092 ..... B•1103
§† Sylvania Miniature Lighting, GTE Corporation, W. Main St., Hillsboro, NH 03244, 603-464-5533 ..... B•1109
§ Visual Communications Co., Inc., P.O. Box 986, El Segundo, CA 90245, 213-822-4727 ..... B•1114
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
§ AND, 770 Airport Blvd., Burlingame, CA 94010 415-347-9916
Data Display Products, Box 91072, Los Angeles, CA 90009 213-640-0442
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
† Dupree, Inc., 9835 Dupree St., So. El Monte, CA 91733 818-442-4700
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
§† Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
§ Glar-Ban Div. of Mark IV Inds., Inc., 2937 Alt Blvd., Grand Island, NY 14072 716-773-2871
Golden Pacific Elctrns., Inc., 1020 N. Batavia St., Ste. Q, Orange, CA 92667 ..... 714-538-9752/9753
† Hoffman Engineering Corp., P.O. Box 300, Old Greenwich, CT 06870 203-325-8933
† Imtronics Inds., 11930 31st Ct., St. Petersburg, FL 33715 813-577-9010
§† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 818-787-0311
ISL Products Int'l, Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 516-822-9601
§† JKL Comps., 13343 Paxton St., Pacoima, CA 91331 818-896-0019
† Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
§ Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
† Lenox Instr., 265 Andrews Rd., Trevose, PA 19047 215-322-9990
† Lumitron, P.O. Box 12, Summit, NJ 07901 201-273-8998
Micro Lamps, Inc., 1N111 Linlar Rd., La Fox, IL 60147 312-232-6001

§ Multi Prods. Intl., 218 Little Falls Rd., P.O. Box 238, Cedar Grove, NJ 07009 201-239-8183
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260 602-991-0942
§† Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Paccom, 3928 148th NE, Redmond, WA 98052 ..... 206-883-9200;800-426-6254
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
§† Precision Lamp, Inc., 480 Aaron Dr., Cotati, CA 94928 707-792-0333
§† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ..201-797-3313;800-526-5376
Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
† Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 215-825-4990
§† Wamco, Inc., 11555-A Coley River Cir., Fountain Valley, CA 92708 714-545-5560
Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Lamps, Neon-2450

§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1018
§ Bulbtronics, Inc., 45 Banfi Plaza, Farmingdale, NY 11735, 516-249-2272 ..... B•1021
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590, 516-935-3640 ..... B•1023
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 ..... B•1036
§ Industrial Devices, Inc., 7 Hudson St., Edgewater, NJ 07020, 201-224-4700 ..... B•1068
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ..... B•1082
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101, 718-392-8800 ..... B•1086
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ..... B•1088
§† Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 ..... B•1098
§† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114, 203-527-3092 ..... B•1103
§ Sylvania Miniature Lighting, GTE Corporation, W. Main St., Hillsboro, NH 03244, 603-464-5533 ..... B•1109
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
Aristo Grid Lamp Prods., 65 Harbor Rd., Port Washington, NY 11050 516-944-3030
Data Display Products, Box 91072, Los Angeles, CA 90009 213-640-0442
Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§† Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
† Imtronics Inds., 11930 31st Ct., St. Petersburg, FL 33715 813-577-9010
§† JKL Comps., 13343 Paxton St., Pacoima, CA 91331 818-896-0019
§† Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, IL 60622 312-829-6050
† Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
§ Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
Micro Lamps, Inc., 1N111 Linlar Rd., La Fox, IL 60147 312-232-6001
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Oshino Electric Lamp Works, Ltd., 5-2, Mianami-Shinagawa 2-chome, Shinagawa-Ku, Tokyo, JAPAN 03-471-8548
§ Paccom, 3928 148th NE, Redmond, WA 98052 ..... 206-883-9200;800-426-6254
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
§ UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 501, San Gabriel, CA 91778 818-285-3123
Voltarc Tubes, 176 Linwood Ave., Fairfield, CT 06430 203-255-2633
Wamco, Inc., 11555-A Coley River Cir., Fountain Valley, CA 92708 714-545-5560
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Lamps, Oil Tight-2450

§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587 718-497-7600
§ Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600

Lamps, Press-to-Test-2450

Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600

Lamps, Projection-2450

§ Bulbtronics, Inc., 45 Banfi Plaza, Farmingdale, NY 11735, 516-249-2272 ..... B•1021
§ Alan Gordon Entprs., Inc., P.O. Box 3914, 5362 Cahuenga Blvd., N. Hollywood, CA 91605 818-985-5500
† Canrad-Hanovia, 100 Chestnut St., Newark, NJ 07105 201-589-4300
§ Christie Elec. Corp., 20665 Manhattan Pl., Torrance, CA 90501 213-320-0808
§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
§ Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
§ GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
§ Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
§ North American Philips Lighting, Bank St., Hightstown, NJ 08520 609-448-4000
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
† UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778 818-285-3123
Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325

Lamps, Solid State — See Diodes, Light Emitting (Vol. B), Diodes, Liquid Crystal (Vol. B)

Lamps, Stroboscopic Source-2450

§ Bulbtronics, Inc., 45 Banfi Plaza, Farmingdale, NY 11735, 516-249-2272 ..... B•1021
Alpha-M Corp., 3009 Wildflower Dr., Dallas, TX 75229 214-620-0021
Amglo, 5265 Michigan Ave., Rosemont, IL 60018 312-671-4321
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
Electro Scientific Inds., 13900 N.W. Science Pk. Dr., Portland, OR 97229 503-641-4141
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, IL 60622 312-829-6050
Video Logic Corp., 597 No. Mathilda Ave., Sunnyvale, CA 94086 408-245-8622

Lamps, Tritium (Hydrogen 3) Powered-2450

† NRD, Mark IV Ind., Inc., 2937 Alt Blvd. N., Grand Island, NY 14072, 716-773-7634 ..... D•1983

Lamps, Tungsten Halogen-2450

§ Bulbtronics, Inc., 45 Banfi Plaza, Farmingdale, NY 11735, 516-249-2272 ..... B•1021
Gilway Technical Lamp, 165 New Boston Street, Woburn, MA 01801, 617-935-4442 ..... B•1055
American Ultraviolet, 320 Commerce St., Chatham, NJ 07928 201-635-8355
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
EG&G Gamma Scientific, Div. of EG&G Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034
Gamma Scientific Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034
§ Gates, Geo. W., & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Sq., NY 11010 516-352-2904
§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
§ GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
JKL Comps., 13343 Paxton St., Pacoima, CA 91331 818-896-0019
† Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 718-392-8800
§ North American Philips Lighting, Bank St., Hightstown, NJ 08520 609-448-4000
Plasmarc Technologies, Inc., 180 Passaic Avenue, Fairfield, NJ 07006 201-575-0870
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700

Lamps, Ultraviolet-2450

§ Bulbtronics, Inc., 45 Banfi Plaza, Farmingdale, NY 11735, 516-249-2272 ..... B•1021
§ American Ultraviolet, 320 Commerce St., Chatham, NJ 07928 201-635-8355
Aristo Grid Lamp Prods., 65 Harbor Rd., Port Washington, NY 11050 516-944-3030
† Canrad-Hanovia, 100 Chestnut St., Newark, NJ 07105 201-589-4300
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
Electro Scientific Inds., 13900 N.W. Science Pk. Dr., Portland, OR 97229 503-641-4141
§ Gates, Geo. W., & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Sq., NY 11010 516-352-2904
§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
Hamamatsu Photonics K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
§† Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, IL 60622 312-829-6050
§ Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
§ Luxo Lamp, Jac Jacobsen Industries, Inc., P.O. Box 951, Port Chester, NY 10573 914-937-4433
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§† Spectronics Corp., 956 Brush Hollow Rd., Westbury, NY 11590 516-333-4840
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 215-825-4990
† UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778 818-285-3123
Vactronic Lab. Equip., 65 Brightside Ave., E. Northport, NY 11731 ..... 516-AN1-2660
Voltarc Tubes, 176 Linwood Ave., Fairfield, CT 06430 203-255-2633

Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325
§ Xenon Corp., 66 Industrial Way, Wilmington, MA 01887 617-658-8940

Lamps, Xenon-2450

§ Bulbtronics, Inc., 45 Banfi Plaza, Farmingdale, NY 11735, 516-249-2272 ..... B•1021
§ Alan Gordon Entprs., Inc., P.O. Box 3914, 5362 Cahuenga Blvd., N. Hollywood, CA 91605 818-985-5500
Amglo, 5265 Michigan Ave., Rosemont, IL 60018 312-671-4321
† Canrad-Hanovia, 100 Chestnut St., Newark, NJ 07105 201-589-4300
§ Christie Elec. Corp., 20665 Manhattan Pl., Torrance, CA 90501 213-320-0808
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590 ... 516-935-3640
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
Electro Scientific Inds., 13900 N.W. Science Pk. Dr., Portland, OR 97229 503-641-4141
§ Gates, Geo. W., & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Sq., NY 11010 516-352-2904
§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
Hamamatsu Photonics K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
ILC Technology, Inc., 399 Java Dr., Sunnyvale, CA 94089 408-745-7900
† Imtronics Inds., 11930 31st Ct., St. Petersburg, FL 33715 813-577-9010
JKL Comps., 13343 Paxton St., Pacoima, CA 91331 818-896-0019
§† Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, IL 60622 312-829-6050
§ Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
§ North American Philips Lighting, Bank St., Hightstown, NJ 08520 609-448-4000
Plasmarc Technologies, Inc., 180 Passaic Avenue, Fairfield, NJ 07006 .. 201-575-0870
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400
Spectrolab, Inc., 12500 Gladstone Ave., Sylmar, CA 91342 213-365-4611
U.S. Scientific Instrs., 61 North Beacon St., Boston, MA 02134 617-787-2411
† UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778 818-285-3123
Voltarc Tubes, 176 Linwood Ave., Fairfield, CT 06430 203-255-2633
Xenon Corp., 66 Industrial Way, Wilmington, MA 01887 617-658-8940

Laser Systems-4100 — *See Vol. D*

Laser Components & Laser Accessories-3700

Analog Modules, Inc., 126 Baywood Avenue, Longwood, FL 32750, 305-339-4356/4355 ..... D•1004
† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1121
§ Power Technology, Inc., P.O. Box 9769, Little Rock, AR 72219, 501-568-1995 ..... B•1125
Advanced Kinetics, 1231 Victoria St., Costa Mesa, CA 92627 714-646-7165
§ Aerotech, Inc., 101 Zeta Dr., Pittsburgh, PA 15238 412-963-7470
§ Apollo Lasers, Inc., 9201 Independence Ave., Chatsworth, CA 91311 213-709-1111
§ Atomergic Chemetals Corp., 100 Fairchild Ave., Plainview, NY 11803 ... 516-349-8800
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
Chicago Laser Systems, Inc., 4034 N. Nashville Ave., Chicago, IL 60634 312-282-2710
Cleveland Crystals, Box 17157, Euclid, OH 44117 216-486-6100
Coherent, Inc., 3210 Porter Dr., Palo Alto, CA 94304 415-493-2111
† Control Laser Corp., 11222 Astronaut, Orlando, FL 32821 305-851-2540
† D. O. Industries, 317 E. Chestnut St., E. Rochester, NY 14445 716-385-4920
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
ElectroPhysics Corp., 48 Spruce St., Nutley, NJ 07110 201-667-2262
Electro Scientific Inds., 13900 N.W. Science Pk. Dr., Portland, OR 97229 503-641-4141
Eltec Instruments Inc., P.O. Box 9610, Daytona Bch., FL 32020 904-253-5328
§† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
GTE Sys.-Sylvania Sys. Grp., Western Div., P.O. Box 7188, Mountain View, CA 94039 415-966-2000
Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
High Voltage Engrg. Corp., S. Bedford St., Burlington, MA 01803 617-272-1313
Hitachi America, 1800 Bering Dr., San Jose, CA 95112 408-292-6404
§† International Laser Sys., 3404 N. Orange Blossom Trail, Orlando, FL 32804 305-295-4010
† KLC/Karl Lambrecht Corp., 4204 N. Lincoln Ave., Chicago, IL 60618 312-472-5442
§† Laakmann Electro-Optics, Inc., 33052 Calle Aviador, San Juan Capistrano, CA 92675 714-493-6624
Laser Applications, 91 Carver Ave., Westwood, NJ 07675 201-664-7636
§† Laser Concepts, Omega Organization Intl., P.O. Box 687, Mercer Island, WA 98040 206-232-6256
† Laser Diode Labs, 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
† Laser Inc., Laser Lane, Box 537, Sturbridge, MA 01566 617-347-7314
† Lenox Laser, 504 Pittsfield Rd., Lenox, MA 01240 413-637-0444
Lincoln Laser Co., 234 East Mohave, Phoenix, AZ 85004 602-257-0407
§ Macrodyne, 1004 Princetown Rd., Schenectady, NY 12301 518-356-3500
Maxwell Labs., 8835 Balboa Ave., San Diego, CA 92123 619-279-5100
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-261-5600
§ Photon Sources, Inc., 12163 Globe Rd., Livonia, MI 48150 313-591-0101
Noll, J. A. Co., P.O. Box 312, Monroeville, PA 15146 412-733-1009
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 818-281-3636
† Penn Resch. Corp. (PRC), 2652 South Main St., P.O. Box 3357, Kennesaw, GA 30144 404-429-9061
Photon, Inc., 14125 Capri Dr. #4, Los Gatos, CA 95030 408-866-0566
Quantronix, 225 Engineers Rd., Smithtown, NY 11787 516-273-6900
Raytheon Co., Laser Products, Fourth Ave., Burlington, MA 01803 617-272-6402
RMF Prods., Inc., 1275 Paramount Pkwy., P.O. Box 520, Batavia, IL 60510 312-879-0020
Staffall Inc., 7 Woodland St., Providence, RI 02908 401-351-8282
§ Sun Research, Inc., Box 210, Old Bay Rd., New Durham, NH 03855 603-859-7110
Thermal Amer. Fused Quartz, Change Bridge Rd., Montville, NJ 07045 .. 201-334-7770
† Tobe Deutschmann Labs., Inc., 550 Turnpike St., Canton, MA 02021 617-828-3366
† Union Carbide Corporation, Elctrns. Div., Crystal Prods. Dept., 9320 Chesapeake Dr., Ste. 104, San Diego, CA 92123 619-279-4500
† Unique Optical Co., Diversified Optical Corp., P.O. Box 585, Farmingdale, NY 11735 516-420-0288

Laser Diodes — See Diodes, Laser

LCDs — See Diodes, Liquid Crystal (Vol. B)

Lead Assemblies, High Voltage-Also See Connectors; Cable Assemblies & Harnesses-6000 — *See Vol. C*

Leads, Test & Adapters-2900 — *See Vol. D*

LEDs — See Diodes, Light Emitting (LEDs) (Vol. B)

Lenses, Filters, Windows, Infrared - Also see Filters, Color, Panel light; Lenses, Readout & Display-3700

† JMJ Technical Prods., 50 Wheeler Point Rd., Newark, NJ 07105, 201-589-4257 ..... C•1613
RMF Prods., Inc., 1275 Paramount Pkwy., P.O. Box 520, Batavia, IL 60510, 312-879-0020 ..... C•1616
† Angenieux Inc., 120 Derry Rd., Hudson, NH 02051 603-889-2116
† Applied Instrs., Inc., 25 Will Place, Brooklyn, NY 11207 212-257-0885
† Balzers Optical Grp., 170 Locke Dr., Marlboro, MA 01752 617-481-9860
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
Cleveland Crystals, Box 17157, Euclid, OH 44117 216-486-6100
Coherent, Inc., 3210 Porter Dr., Palo Alto, CA 94304 415-493-2111
† D. O. Industries, 317 E. Chestnut St., E. Rochester, NY 14445 716-385-4920
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
Fresnel Optics, Div. of Alliance Tool Corp., 1300 Mt. Read Blvd., Rochester, NY 14606 716-647-1140
Infrared Inds., Inc., P.O. Box 14200, Orlando, FL 32857 305-282-7700
§ IR Scientific, Box 110, Carlisle, MA 01741 617-369-7118
† Keyan Inds., Inc., P.O. Box 1228, Middleboro, MA 02346 617-947-7719
† KLC/Karl Lambrecht Corp., 4204 N. Lincoln Ave., Chicago, IL 60618 312-472-5442
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
3M Co., Carbonless/Related Prods Div Ind'l Optics, 3M Center, Bldg. 225-3S, St. Paul, MN. 55144 612-733-4403
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-261-5600
§ Optics for Research, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4480
† Panelgraphic Corp., 10 Henderson Dr., W. Caldwell, NJ 07006 201-227-1500
† Plumer Precision Optics, 601 Montgomery Ave., Pennsburg, PA 18073 .. 215-679-6272
† Saphikon, 51 Powers St., Milford, NH 03055 603-673-5831
§ Schott Elctrns., Hershey Dr., Ansonia, CT 06401 203-736-2677
Schott Glass Technologies, Inc., 400 York Ave., Duryea, PA 18642 717-457-7485
† Teledyne Camera Sys., 131 N. Fifth Ave., Arcadia, CA 91006 818-359-6691
† Unique Optical Co., Diversified Optical Corp., P.O. Box 585, Farmingdale, NY 11735 516-420-0288
§ Carl Zeiss, Inc., One Zeiss Drive, Thornwood, NY 10594 914-681-7670

Lenses, Optical & Camera-3700

AGFA-Gevaert, Inc., 275 North St., Teterboro, NJ 07608 201-288-4100
Alan Gordon Entprs., Inc., P.O. Box 3914, 5362 Cahuenga Blvd., N. Hollywood, CA 91605 818-985-5500
† Angenieux Inc., 120 Derry Rd., Hudson, NH 02051 603-889-2116
† Applied Instrs., Inc., 25 Will Place, Brooklyn, NY 11207 212-257-0885
† Balzers Optical Grp., 170 Locke Dr., Marlboro, MA 01752 617-481-9860
§ BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420
§† CAI, 550 W. Northwest Hwy., Barrington, IL 60010 312-381-2400
Coherent, Inc., 3210 Porter Dr., Palo Alto, CA 94304 415-493-2111
Corning Glass Works, Telecomm Prods Dept., BH-5, Corning, NY 14830 607-974-9000
† D. O. Industries, 317 E. Chestnut St., E. Rochester, NY 14445 716-385-4920
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
Fresnel Optics, Div. of Alliance Tool Corp., 1300 Mt. Read Blvd., Rochester, NY 14606 716-647-1140
§ General Hardware Mfg., 80 White St., New York, NY 10013 212-431-6100
Heitz, Karl, Inc., P.O. Box 427, Woodside, NY 11377 718-565-0004
Infrared Inds., Inc., P.O. Box 14200, Orlando, FL 32857 305-282-7700
† Keyan Inds., Inc., P.O. Box 1228, Middleboro, MA 02346 617-947-7719
† KLC/Karl Lambrecht Corp., 4204 N. Lincoln Ave., Chicago, IL 60618 312-472-5442
§ Laser Inc., Laser Lane, Box 537, Sturbridge, MA 01566 617-347-7314
† Lenox Instr., 265 Andrews Rd., Trevose, PA 19047 215-322-9990
3M Co., Carbonless/Related Prods Div Ind'l Optics, 3M Center, Bldg. 225-3S, St. Paul, MN. 55144 612-733-4403
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-261-5600
Metavac, Inc., 45-68 162nd St., Flushing, NY 11358 ..... 212-HI5-0400
§ Optics for Research, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4480
§ Optics International, Box 101, Tenafly, NJ 07670 201-567-4799
† Plumer Precision Optics, 601 Montgomery Ave., Pennsburg, PA 18073 .. 215-679-6272
Rolyn Optics Co., 738 Arrowgrand Cir., Covina, CA 91722-2199 ... 818-915-5707/5717
Schott Glass Technologies, Inc., 400 York Ave., Duryea, PA 18642 717-457-7485
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Stenning Instrments, Inc., 671 Enchanted Way, Pacific Palisades, CA 90272 213-459-2930
Sumita Optical Glass Mfg. Co., Ltd., Box 105, 1766 Front Street, Yorktown Heights, NY 10598 914-962-2055
† Teledyne Camera Sys., 131 N. Fifth Ave., Arcadia, CA 91006 818-359-6691

† Unique Optical Co., Diversified Optical Corp., P.O. Box 585, Farmingdale, NY 11735 516-420-0288
§ Vicon Industries, Inc., 525 Broad Hollow Rd., Melville, NY 11747 516-293-2200
§ Carl Zeiss, Inc., One Zeiss Drive, Thornwood, NY 10594 914-681-7670

Lenses, Readout & Display - Also see Filters, Color, Panel light; Lenses, filters, Windows, Infrared-2450

† JMJ Technical Prods., 50 Wheeler Point Rd., Newark, NJ 07105, 201-589-4257 ..... C•1613
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101, 718-392-8800 ..... B•1086
RMF Prods., Inc., 1275 Paramount Pkwy., P.O. Box 520, Batavia, IL 60510, 312-879-0020 ..... C•1616
† Angenieux Inc., 120 Derry Rd., Hudson, NH 02051 603-889-2116
† Applied Instrs., Inc., 25 Will Place, Brooklyn, NY 11207 212-257-0885
Atlantic Optical Moulding, Ellis St., P.O. Box 309, Dudley, MA 01570 617-943-1746
† Balzers Optical Grp., 170 Locke Dr., Marlboro, MA 01752 617-481-9860
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 414-332-8100
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
§ Duralith, 525 Orange St., Millville, NJ 08332 609-825-6900
Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011
Fresnel Optics, Div. of Alliance Tool Corp., 1300 Mt. Read Blvd., Rochester, NY 14606 716-647-1140
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§ Industrial Devices, Inc., 7 Hudson St., Edgewater, NJ 07020 201-224-4700
† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 ... 818-787-0311
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-261-5600
Metavac, Inc., 45-68 162nd St., Flushing, NY 11358 ..... 212-HI5-0400
† Moldtronics, Inc., 703 Rogers St., Downers Grove, IL 60515 312-968-7000
§ NOBEX Div., Griffith Plastics Corp., 1027 California Dr., Box 4365, Burlingame, CA 94010 415-342-8170
Noll, J. A. Co., P.O. Box 312, Monroeville, PA 15146 412-733-1009
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Optics for Research, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4480
Panelgraphic Corp., 10 Henderson Dr., W. Caldwell, NJ 07006 201-227-1500
Pannier Corp., Graphics Div., John Fitch Industrial Park, Warminster, PA 18974 215-672-3600
Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
Photo Chem. Prods. Cal., 18031 Susana Rd., Compton, CA 90224 213-603-0400
§ Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680 714-669-9850
Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367 213-875-1123
§† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092
§ Visual Communications Co., Inc., P.O. Box 986, El Segundo, CA 90245 .. 213-822-4727

Light Choppers-3700

Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
EG&G Gamma Scientific, Div. of EG&G Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034
† Electro-Optical Inds., Box 3770, Santa Barbara, CA 93130 805-964-6701
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377 212-458-5811
ITHACO, Inc., Meas. & Control Instrs. Div., 735 W. Clinton St., P.O. Box 6437, Ithaca, NY 14851-6437 607-272-7640
† Millivac Instrs., Box 997, Curry Rd. Ext., Schenectady, NY 12301 518-355-8300
† Philamon, Inc., 33 Dubon Ct., Farmingdale, NY 11735 516-249-2700
Photon, Inc., 14125 Capri Dr. #4, Los Gatos, CA 95030 408-866-0566
† UCE, Inc., 24 Fitch St., Norwalk, CT 06855 203-838-7509

Light Pens-2000 — *See Vol. D*

Light Sources, Fiber Optic-2475

American Volpi Corp., 26 Aurelius Ave., Auburn, NY 13021 315-253-9707
§ Banner Engrg. Corp., 9714 - 10th Ave. N., Minneapolis, MN 55441 612-544-3164
Berkeley Nucleonics Corp., 1198 Tenth St., Berkeley, CA 94710 415-527-1121
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
Fiberoptics Technlg., Inc., Quassett Rd., Pomfret, CT 06258 203-928-0443
Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
Incom, Inc., 205 Chapin St., P.O. Drawer G, Southbridge, MA 01550 617-765-9151
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
§† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
§ Laser Precision Corp., 1231 Hart St., Utica, NY 13502 315-797-4449
§† M/A-COM Laser Diode, Inc., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900
NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 818-281-3636
Rehlander Assocs., 118A Bridge St., Beverly, MA 01915 617-922-5961
Stenning Instrments, Inc., 671 Enchanted Way, Pacific Palisades, CA 90272 213-459-2930
Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265 214-995-3821

Light Sources, Infrared-3700

Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265, 214-995-3821 ..... B•1218
Analog Modules, Inc., 126 Baywood Avenue, Longwood, FL 32750 ..... 305-339-4356/4355
§ Banner Engrg. Corp., 9714 - 10th Ave. N., Minneapolis, MN 55441 612-544-3164
Berkeley Nucleonics Corp., 1198 Tenth St., Berkeley, CA 94710 415-527-1121
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
EG&G Gamma Scientific, Div. of EG&G Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034
§ IR Scientific, Box 110, Carlisle, MA 01741 617-369-7118
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
§† M/A-COM Laser Diode, Inc., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 818-281-3636
Plasmarc Technologies, Inc., 180 Passaic Avenue, Fairfield, NJ 07006 .. 201-575-0870
Zexco, 7661 Densmore, #8, Van Nuys, CA 91406 818-997-7895

Light Sources, Photoelectric-3700

§ EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ... B•1210
TRW Optoelectronics Div., 1207 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ..... B•1222
§ Banner Engrg. Corp., 9714 - 10th Ave. N., Minneapolis, MN 55441 612-544-3164
§ Dolan-Jenner Inds., Box 1020, Woburn, MA 01801 617-935-7444
EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
Fork Standards, Inc., 666 Western Ave., Lombard, IL 60148 312-932-9380
FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 .....312-231-3511; 312-932-9380
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 718-392-8800
M/A-COM Laser Diode, Inc., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
Photobell, 26 Just Rd., Fairfield, NJ 07006 201-227-3613
§† Photo Resch., Kollmorgen Corp., 3000 N. Hollywood Way, Burbank, CA 91505 818-843-6100
† Power Instrs. Products, Amatek/Mansfield & Green Div., 8600 Somerset Dr., Largo, FL 33543 813-536-7831
Rehlander Assocs., 118A Bridge St., Beverly, MA 01915 617-922-5961
Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961
Tri-Tronics Co. Inc., 13420 Wright Cir., Tampa, FL 33624 813-855-4453

Light Sources, Stroboscopic-3700

American Volpi Corp., 26 Aurelius Ave., Auburn, NY 13021 315-253-9707
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
Video Logic Corp., 597 No. Mathilda Ave., Sunnyvale, CA 94086 408-245-8622

Light Sources, Ultraviolet-3700

American Volpi Corp., 26 Aurelius Ave., Auburn, NY 13021 315-253-9707
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
EG&G Gamma Scientific, Div. of EG&G Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034
§ Electronic Trend Prods., 10080 N. Wolfe Rd., Ste. 372, Cupertino, CA 95014 408-996-7401
§ Gates, Geo. W., & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Sq., NY 11010 516-352-2904
GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
Plasmarc Technologies, Inc., 180 Passaic Avenue, Fairfield, NJ 07006 .. 201-575-0870
§† Spectronics Corp., 956 Brush Hollow Rd., Westbury, NY 11590 516-333-4840
Stenning Instrments, Inc., 671 Enchanted Way, Pacific Palisades, CA 90272 213-459-2930

Lights, Indicator-2450

§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1018
Crosspoint, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ..... B•1539
§† Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 ..... B•1032
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ..... B•1046
Gilway Technical Lamp, 165 New Boston Street, Woburn, MA 01801, 617-935-4442 ..... B•1053
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211, 408-747-0550 ..... B•1056
§ Industrial Devices, Inc., 7 Hudson St., Edgewater, NJ 07020, 201-224-4700 ..... B•1057-1076
§† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1078
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ..... B•1082
§† Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101, 718-392-8800 ..... B•1085
§† Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ..... B•1088
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1649-1657
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ..... B•1676
§ Oslo Controls, 328 Industrial Ave, Cheshire, CT 06410, 203-272-2794 ... B•1685
§† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... B•1091

§† **Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093**
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911 ..... B•1096
§ **Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 ..... B•1098**
§† **Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114, 203-527-3092 ..... B•1103**
§† **Sylvania Miniature Lighting, GTE Corporation, W. Main St., Hillsboro, NH 03244, 603-464-5533 ..... B•1109**
§ **Visual Communications Co., Inc., P.O. Box 986, El Segundo, CA 90245, 213-822-4727 ..... B•1114**
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
§ AND, 770 Airport Blvd., Burlingame, CA 94010 415-347-9916
APM-Hexseal, 44 Honeck St., Englewood, NJ 07631 201-569-5700
§† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
§† Audiosone, Inc., 617 Fan Hill Rd., Monroe, CT 06468 ..... 203-268-4372;203-268-6703
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 914-425-7460
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590 516-935-3640
Data Display Products, Box 91072, Los Angeles, CA 90009 213-640-0442
† Devco Engrg., Control Sys. Div., 36 Pier Lane West, Fairfield, NJ 07006 ..... 201-CA8-0321
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087 ..... 312-662-7667; 800-323-9605
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8300
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460 203-877-4577
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011
§† FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852 ..... 301-881-8124;800-638-6594
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§† Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
§† Glar-Ban Div. of Mark IV Inds., Inc., 2937 Alt Blvd., Grand Island, NY 14072 716-773-2871
GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
† Imtronics Inds., 11930 31st Ct., St. Petersburg, FL 33715 813-577-9010
ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ JKL Comps., 13343 Paxton St., Pacoima, CA 91331 818-896-0019
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 ..... 201-291-3334; 800-221-0714
Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
§† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
§ Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
§ Merix Chem. Co., 2234 East 75th St., Chicago, IL 60649 312-221-8242
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
Micro Lamps, Inc., 1N111 Linlar Rd., La Fox, IL 60147 312-232-6001
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
§† Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Oshino Electric Lamp Works, Ltd., 5-2, Mianami-Shinagawa 2-chome, Shinagawa-Ku, Tokyo, JAPAN 03-471-8548
§ Paccom, 3928 148th NE, Redmond, WA 98052 ..... 206-883-9200;800-426-6254
Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
† Plasmarc Technologies, Inc., 180 Passaic Avenue, Fairfield, NJ 07006 201-575-0870
§† Precision Lamp, Inc., 480 Aaron Dr., Cotati, CA 94928 707-792-0333
Pyle-National, Brand-Rex Company, 1334 N. Kostner Ave., Chicago, IL 60651 312-342-6300
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265 214-995-3821
Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Lights, Panel — See Lights, Indicator (Vol. B)

Lights, Pilot — See Lights, Indicator (Vol. B)

Limit Stops — See Knobs, Limit Stop (Vol. C)

Limit Stops, Mechanical-2500 — *See Vol. C*

Limiters, Current-4300
Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 .. B•1752
§ **Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 ..... B•1759-1765**
NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505, 609-298-7300 ..... D•1735
† NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505, 609-298-7300 ..... D•1735
§ Burndy Corporation, Richards Ave., Norwalk, CT 06852 203-838-4444
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
§ FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852 ..... 301-881-8124;800-638-6594
Hitran Corp., Agex, Rte. 31, RD 5-65, Flemington, NJ 08822 201-782-5525
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
Silicon General, 11861 Western Ave., Garden Grove, CA 92641 714-898-8121
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Limiters, Microwave-3450 — *See Vol. A*

Limiters, Surge — See Suppressors, Transient Voltage

Line Assemblies (MIL), RF Transmission-2440
† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020

Line Conditioners-4050 — *See Vol. D*

Line Controlled Switches — See Switches, Data (Vol. D)

Line Stretchers, Microwave-3450 — *See Vol. A*

Liners, Tube Shield — See Shields, Tube (Vol. C)

Loads, Electronic, Variable-Also See Dummy Loads-2900 — *See Vol. D*

Locators, Static-2900 — *See Vol. D*

Locators, Open Short-2900 — *See Vol. D*

Locks, Dial & Shaft-2400 — *See Vol. C*

Logic Cards (without Components) — See Boards, Plug-in (Vol. C)

Logic Circuits — See Cards, Logic (Vol. D), Modules, Logic (Vol. A)

Loudspeakers — See Speakers (Vol. D)

Louvers, Vents, & Windows (For Equipment) — See Enclosures, Equipment & Panel Mounting (Vol. C)

Lubricants-1600 — *See Vol. C*

Lugs, Terminal — See Terminals, Lug (Vol. C)

LVDTs — See Transducers, Displacement (Vol. B)

Machines & Accessories, Semiconductor Manufacturing-4100 — *See Vol. D*

Machines & Tools, Crimping — See Tools, Crimping & Swaging (Vol. C)

Machines, Cleaning & Degreasing-Also See Cleaners, Ultrasonic-4100 — *See Vol. D*

Machines, Coil Winding-4100 — *See Vol. D*

Machines, Component Handling, Feeding, Insertion & Sorting-4100 — *See Vol. D*

Machines, Hermetic Sealing-4100 — *See Vol. D*

Machines, Induction Heating (Electronic)-4100 — *See Vol. D*

Machines, Lead Cutting & Forming-4100 — *See Vol. D*

Machines, Magnet Wire Twisting-4100 — *See Vol. D*

Machines, Marking & Numbering-4100 — *See Vol. D*

Machines, Mask Alignment & Exposure-4100 — *See Vol. D*

Machines, Metallizing, Vacuum — See Deposition Equipment, Vacuum & Accessories (Vol. D)

Machines, Plastic Molding-4100 — *See Vol. D*

Machines, Plating-4100 — *See Vol. D*

Machines, Printed Circuit Drilling, Etching & Punching-4100 — *See Vol. D*

Machines, Terminal Installing-4100 — *See Vol. D*

Machines, Ultrasonic Bonding-4100 — *See Vol. D*

Machines, Vibration Fatigue Testing — See Testers, Vibration (Vol. D)

Machines, Wafer Alignment — See Machines, Mask Alignment & Exposure (Vol. D)

Machines, Wire Marking, Manual & Automatic-4100 — *See Vol. D*

Machines, Wire Measuring & Cutting-4100 — *See Vol. D*

Machines, Wire Wrapping — See Tools, Wire Wrapping (Vol. C)

Magnetic Materials — See Cores, Magnetic (All Types) (Vol. C), Ferrite Material & Parts (Vol. C)

Magnetizers-2900 — *See Vol. D*

Magnetodiodes — See Magnetoresistors, Hall (Vol. A)

Magnetometers-2900 — *See Vol. D*

Magnetoresistors, Hall-4800 — *See Vol. A*

Magnetrons — See Tubes, Microwave (Vol. A)

Magnets, Focusing — See Magnets, Permanent (Vol. C)

Magnets (Lab. Type)-1850 — *See Vol. A*

Magnets, Permanent-1850 — *See Vol. A*

Magnets, Superconducting-1850 — *See Vol. A*

Magnets (MIL), Permanent-2440

Jobmaster Corp., 9008 Liberty Rd., Randallstown, MD 21133 301-655-1400
†Magnet Sales & Mfg. Co. Inc., 11250 Playa Court, Culver City, CA 90230-6127 ..... 213-391-7213;800-421-6692
†Ogallala Elctrns., Div. Arnold Engrg. Co., Box 59, Ogallala, NE 69153 308-284-4093
†Permanent Magnet, 4437 Bragdon St, Indianapolis, IN 46226 317-547-1336
Steward, D. M., Mfg. Co., P.O. Box 510, Chattanooga, TN 37401 615-867-4100
†Thomas & Skinner, Box 150 B, Indianapolis, IN 46206 317-923-2501
Varian Associates, Inc., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000

Magnifying Glasses, Inspection-4100 — *See Vol. D*

Mainteance, Self, Computers-2000 — *See Vol. D*

Markers, Dry Transfer — See Kits, Marking (Vol. C)

Markers, Identification — See Labels (Vol. C), Nameplates (Vol. B), Machines, Marking and Numbering (Vol. D)

Markers, RF — See Generators, Marker (Vol. D)

Markers, Terminal — See Kits, Marking, etc. (Vol. C)

Markers, Wire, Tab & Sleeve — See Wire Markers (Vol. C)

Mark Recognition Equipment, Optical-2000 — *See Vol. D*

Mask Alignment & Exposure Systems — See Machines, Mask Alignment & Exposure (Vol. D)

Material, Permanent Magnet-1850 — *See Vol. A*

Materials, Shock, Noise, & Vibration Control-2500 — *See Vol. C*

Matrices, Switching-Also See Boards, Programming-2000 — *See Vol. D*

Measuring Equipment, Fiber Optic, Attenuation & Bandwidth-2200 — *See Vol. D*

Media, Magnetic — See Disks, Magnetic (Vol. D), Tape, Magnetic (Vol. D)

Megaphones — See Amplifiers (Vol. D)

Memory Devices/Controllers, Bipolar, Add-in-2000 — *See Vol. D*

Memory Devices/Controllers, Bipolar, Add-on-2000 — *See Vol. D*

Memory Devices/Controllers, Bubble, Add-in-2000 — *See Vol. D*

Memory Devices/Controllers, Bubble, Add-on-2000 — *See Vol. D*

Memory Devices/Controllers, Magnetic Core, Add-in-2000 — *See Vol. D*

Memory Devices/Controllers, Magnetic Core, Add-on-2000 — *See Vol. D*

Memory Devices/Controllers, MOS, Add-in-2000 — *See Vol. D*

Memory Devices/Controllers, MOS, Add-on-2000 — *See Vol. D*

Memory Systems, Bubble-2000 — *See Vol. D*

Memory Systems, Core-2000 — *See Vol. D*

Memory Systems, Delay Line-2000 — *See Vol. D*

Memory Systems, Disk-2000 — *See Vol. D*

Memory Systems, Disk, Flexible-2000 — *See Vol. D*

Memory Systems, Tape-2000 — *See Vol. D*

Memory Systems, Semiconductor-2000 — *See Vol. D*

Meter Cases — See Enclosures, Equipment & Panel Mounting (Vol. C)

Meter Controllers — See Relays, Meter (Vol. B)

Meter Expanders — See Multipliers, Meter (Vol. D)

Meters, Acceleration — See Accelerometers

Meters, Admittance-2900 — *See Vol. D*

Meters, Ampere, AC-2900 — *See Vol. D*

Meters, Ampere, DC-2900 — *See Vol. D*

Meters, Ampere, RF-2900 — *See Vol. D*

Meters, Ampere, True RMS-2900 — *See Vol. D*

Meters, Ampere Hour-2900 — *See Vol. D*

Meters, Attenuation-2900 — *See Vol. D*

Meters, Audio Level-2900 — *See Vol. D*

Meters, Bar Graph-2950 — *See Vol. D*

Meters, Battery Capacity-2900 — *See Vol. D*

Meters, Capacitance, Inductance-2900 — *See Vol. D*

Meters, Clamp-on-2900 — *See Vol. D*

Meters, Conductance-2900 — *See Vol. D*

Meters, Counting Rate, Nuclear-2900 — *See Vol. D*

Meters, Decibel Indicating-2900 — *See Vol. D*

Meters, Deviation-2900 — *See Vol. D*

Meters, Digital ESR-2900 — *See Vol. D*

Meters, Digital, 2-wire, 4-20 mA Current Loop-2950 — *See Vol. D*

Meters, Distortion & Noise-2900 — *See Vol. D*

Meters, Edgewise-2950 — *See Vol. D*

Meters, Elapsed Time — See Indicators, Elapsed Time (Vol. D)

Meters, Electrometer-2900 — *See Vol. D*

Meters, EMC — See Meters, RFI (Vol. D)

Meters, FM Deviation-2900 — *See Vol. D*

Meters, Field Strength-2900 — *See Vol. D*

Meters, Fluid Flow-2200 — *See Vol. D*

Meters, Flux-2900 — *See Vol. D*

Meters, Frequency-2900 — *See Vol. D*

Meters, Frequency Deviation-2900 — *See Vol. D*

Meters, Galvanometer-2900 — *See Vol. D*

Meters, Gauss-2900 — *See Vol. D*
Meters, Hand Held-2900 — *See Vol. D*
Meters, Humidity-2900 — *See Vol. D*
Meters, Illuminated Scale-2950 — *See Vol. D*
Meters, Impedance-2900 — *See Vol. D*
Meters, Kilovolt-2900 — *See Vol. D*
Meters, Laser Energy — See Monitors, Laser Energy (Vol. D)
Meters, Light (Nonphotographic)-2900 — *See Vol. D*
Meters, Megohm-2900 — *See Vol. D*
Meters, Microampere — See Meters, Ampere (Vol. D)
Meters, Microwave-2900 — *See Vol. D*
Meters, Modulation-2900 — *See Vol. D*
Meters, Moving Coil-2950 — *See Vol. D*
Meters, Moving Iron-2950 — *See Vol. D*
Meters, Moving Scale-2950 — *See Vol. D*
Meters, Multifunction (Analog)-2900 — *See Vol. D*
Meters, Multifunction (Digital)-2900 — *See Vol. D*
Meters, Noise & Sound Level-2900 — *See Vol. D*
Meters, Null-2950 — *See Vol. D*
Meters, Ohm-2900 — *See Vol. D*
Meters, Panel (Analog)-2950 — *See Vol. D*
Meters, Panel, Bargraph — See Meters, Bargraph (Vol. D)
Meters, Panel (Digital)-2950 — *See Vol. D*
Meters, Peak Power-2900 — *See Vol. D*
Meters, PH-2900 — *See Vol. D*
Meters, Phase-2900 — *See Vol. D*
Meters, Power — See Meters, Watt
Meters, Power Factor-2900 — *See Vol. D*
Meters, Q-2900 — *See Vol. D*
Meters, Rate (Pulsed)-2900 — *See Vol. D*
Meters, Ratio-2900 — *See Vol. D*
Meters, Reflectometer-2900 — *See Vol. D*
Meters, Relay — See Relays, Meter (Vol. B)
Meters, Resistance-2900 — *See Vol. D*
Meters, RFI-2900 — *See Vol. D*
Meters, S Unit-2900 — *See Vol. D*
Meters, Slope — See Inclinometer
Meters, Snap-around — See Meters, Clamp-on (Vol. D)
Meters, Standing Wave Ratio-2900 — *See Vol. D*
Meters, Static Decay-2900 — *See Vol. D*
Meters, Taut Band-2950 — *See Vol. D*
Meters, Temperature (Contacting)-2900 — *See Vol. D*
Meters, Temperature, Dial type (Noncontacting) — See Pyrometers (Vol. D)
Meters, Temperature, Infrared-2900 — *See Vol. D*
Meters, Thermal Transfer-2900 — *See Vol. D*
Meters, Time Interval — See Timers, Interval (Vol. D)
Meters, Vacuum Tube Volt (VTVM)-2900 — *See Vol. D*
Meters, VAR-2900 — *See Vol. D*
Meters, Vibration-2900 — *See Vol. D*
Meters, Volt, AC-2900 — *See Vol. D*
Meters, Volt/Ampere — See Meters, Watt
Meters, Volt, DC-2900 — *See Vol. D*
Meters, Volt, Differential — See Meters, Volt (Vol. D)
Meters, Volt, Digital-2900 — *See Vol. D*
Meters, Volt, Potentiometric-2900 — *See Vol. D*
Meters, Volt, RF-2900 — *See Vol. D*
Meters, Volt, Sampling-2900 — *See Vol. D*
Meters, Volt, True RMS-2900 — *See Vol. D*
Meters, VU-2900 — *See Vol. D*
Meters, Watt-2900 — *See Vol. D*
Meters, Watt Hour-2900 — *See Vol. D*
Meters, Watt, RF-2900 — *See Vol. D*
Meters, Wave-2900 — *See Vol. D*
Meters, Waveguide — See Meters, Microwave (Vol. D)

Meters (MIL)-2440

† Bowmar/ALI, Bowmar Instr. Corp., 531 Main St., Acton, MA 01720, 617-263-8365 ..... D•1331
† Gralex Inds., 295 Community Dr., Great Neck, NY 11021, 516-487-7289;800-645-6535 ..... D•1356
International Instruments, General Resistance, Inc., Twin Lakes Rd, P.O. Box 185, N. Branford, CT 06471, 203-481-3450 ..... D•1357
Triplett Corp.-A Penril Co., One Triplett Dr., Bluffton, OH 45817-9987, 419-358-5015 ..... D•1381
† Ideal Precision Meter, 214 Franklin St, Brooklyn, NY 11222 212-383-6904
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Simpson Elec. Co., 853 Dundee Ave., Elgin, IL 60120 312-697-2260

Microcircuit Production Equip.-4100 — *See Vol. D*

Microcircuits — See Integrated Circuits (Specific Types) (Vol. A)

Microcircuits, Thick Film — See Circuits, Hybrid, Thick Film (Vol. A)

Microcircuits (MIL)-2440

† Aeroflex Labs., Microelctrns. Div., 35 S. Service Rd., Plainview, NY 11803, 516-694-6700 ..... A•1660
§† Dale Electronics, Inc., El Paso Div., P.O. Box 26728, El Paso, TX 79926, 915-592-3253 ..... A•1847
Hytek Microsystems, 980 University Ave., Los Gatos, CA 95030, 408-395-2300 ..... A•1671
Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ..... A•1379
Ohmtek, Inc., 2160 Liberty Dr., Niagara Falls, NY 14304, 716-283-4025 ... A•1923
† Allied Corp. Aerospace Sector, Bendix Communications Div., East Joppa Rd., Towson, MD 21204 301-583-4000
† Andrich Sys., Inc., 1699 Roosevelt Ave., Bohemia, NY 11716 516-589-5656
§† Fairchild Microcontroller Div., Fairchild Camera & Instr. Corp., 450 National Ave., Mountain View, CA 94042 415-962-3838
§ General Instrument Corp., Microelectronics Div., 600 W. John St, Hicksville, NY 11802 516-733-3107
† Mel Tec, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090 .. 617-329-1508
† Piconics, 26 Cummings Road, Tyngsboro, MA 01879 617-649-7501
§† Raytheon Semiconductor, 350 Ellis St, Mountain View, CA 94043 415-968-9211
† Teledyne Microelectronics, 12964 Panama St, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
Texas Instrs., Data Sys. Group, P. O. Box 809063, Dallas, TX 75380-9063 1-800-527-3500

Microcircuits (MIL), Linear-2440

† Andrich Sys., Inc., 1699 Roosevelt Ave., Bohemia, NY 11716 516-589-5656
§† Fairchild Camera & Instr. Corp., Linear Div., 313 Fairchild Dr., Mountain View, CA 94139 415-962-4011
† Mel Tec, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090 .. 617-329-1508
§† Precision Monolithics, Inc., 1500 Space Dr., Santa Clara, CA 95054 408-727-9222
§† Raytheon Semiconductor, 350 Ellis St, Mountain View, CA 94043 415-968-9211
§† Silicon General, 11861 Western Ave., Garden Grove, CA 92641 714-898-8121
† Teledyne Microelectronics, 12964 Panama St, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
Texas Instrs., Data Sys. Group, P. O. Box 809063, Dallas, TX 75380-9063 1-800-527-3500
† Third Domain, P.O. Box 35400, Tucson, AZ 85740-5400 602-293-6310

Microcircuits (MIL), Low Power Schottky-2440

† Andrich Sys., Inc., 1699 Roosevelt Ave., Bohemia, NY 11716 516-589-5656
† Mel Tec, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090 .. 617-329-1508
† Teledyne Microelectronics, 12964 Panama St, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
Texas Instrs., Data Sys. Group, P. O. Box 809063, Dallas, TX 75380-9063 1-800-527-3500

Microcircuits (MIL), Memories, CMOS, Hybrids-2440

† **Integrated Circuits, Inc., 10301 Willows Road, Redmond, WA 98052, 206-882-3100** ..... **A•1673**
† **International Sensor Systems, Inc., Aurora Industrial Pk., Box 345, Aurora, NE 68818, 402-694-6111** ..... **A•1677**
† Andrich Sys., Inc., 1699 Roosevelt Ave., Bohemia, NY 11716 516-589-5656
Array Technology, 992 S. Saratoga-Sunnyvale Rd., San Jose, CA 95129 408-252-9900
† Cincinnati Elctrns., 2630 Glendale Milford Rd., Cincinnati, OH 45241 513-733-6100
Holt Inc., 9351 Jeronimo Rd., Irvine, CA 92718 714-859-8800
§† Integrated Device Technlg., Inc., 3236 Scott Blvd., Santa Clara, CA 95054-3090 408-727-6116
† Mel Tec, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090 .. 617-329-1508
† Northwest Microcircuits, Inc., 2115 N. College, Newberg, OR 97132 503-538-7081
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
† Piconics, 26 Cummings Road, Tyngsboro, MA 01879 617-649-7501
† Teledyne Microelectronics, 12964 Panama St., Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831

Microcircuits (MIL), TTL, Schottky, Microprocessor-2440

† Andrich Sys., Inc., 1699 Roosevelt Ave., Bohemia, NY 11716 516-589-5656
§† Fairchild Microcontroller Div., Fairchild Camera & Instr. Corp., 450 National Ave., Mountain View, CA 94042 415-962-3838
† International Sensor Systems, Inc., Aurora Industrial Pk., Box 345, Aurora, NE 68818 402-694-6111
Texas Instrs., Data Sys. Group, P. O. Box 809063, Dallas, TX 75380-9063 1-800-527-3500

Microcomputer Boards-3130 — *See Vol. A*

Microfilm, Computer Output (COM) Equipment-2000 — *See Vol. D*

Micrometers — See Testers, Thickness (All Types) (Vol. D)

Microphone Accessories (Incl. Stands, Holders, Booms)-1300 — *See Vol. D*

Microphones, Bone Conduction-1300 — *See Vol. D*

Microphones, Carbon-1300 — *See Vol. D*

Microphones, Cardioid-1300 — *See Vol. D*

Microphones, Ceramic-1300 — *See Vol. D*

Microphones, Condenser (Incl. Electret)-1300 — *See Vol. D*

Microphones, Crystal-1300 — *See Vol. D*

Microphones, Dynamic-1300 — *See Vol. D*

Microphones, Lavalier-1300 — *See Vol. D*

Microphones, Magnetic-1300 — *See Vol. D*

Microphones, Omnidirectional-1300 — *See Vol. D*

Microphones, Subminiature-1300 — *See Vol. D*

Microphones, Velocity-1300 — *See Vol. D*

Microphones, Wireless-1300 — *See Vol. D*

Microphones (MIL)-2440

† Telephonics, 770 Park Ave., Huntington, NY 11743 516-549-6000

Microprocessor — See Integrated Circuits, Microprocessor (Vol. A)

Microprocessor Development Systems-3130 — *See Vol. A*

Microscopes-3700

American Volpi Corp., 26 Aurelius Ave., Auburn, NY 13021 315-253-9707
Bausch & Lomb, 820 Linden Ave., Rochester, NY 14625 716-338-6000
Bausch & Lomb, 820 Linden Ave., Rochester, NY 14625 716-338-6314
§ Bausch & Lomb, O.S.D. Div., 1400 N. Goodman St., Rochester, NY 14692 716-338-6000
§ BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, NJ 07410 201-797-4200
ElectroPhysics Corp., 48 Spruce St., Nutley, NJ 07110 201-667-2262
Excel Technology Intl. Corp., 4-5 Stryker La., Hillsborough Indl. Pk., Belle Mead, NJ 08502 201-874-4747
§ Hacker Instrs., Box 657, Fairfield, NJ 07007 201-226-8450
Jonard Industries Corp., 134 Marbledale Rd., Tuckahoe, NY 10707 914-793-0700
† Keyan Inds., Inc., P.O. Box 1228, Middleboro, MA 02346 617-947-7719
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-261-5600
§ Pacific Transducer, 2301 Federal, Los Angeles, CA 90064 213-478-1134
§ Solder Absorbing Technology (SAT), South End Bridge Circle, Agawam, MA 01001 800-628-8862
Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 215-825-4990
3D Optics, Box 224, 4 Strathmore Cir., Braintree, MA 02184 617-848-8002
Vickers Inst., Inc., Vickers Instruments, P.O. Box 99, Malden, MA 02148 .. 617-324-0350
§ Vision Engrg., Inc., 570 Danbury Rd., New Milford, CT 06776 203-355-3776
§ Carl Zeiss, Inc., One Zeiss Drive, Thornwood, NY 10594 914-681-7670
ZI-TECH Instr. Corp., 2151 Park Blvd., Box 60490, Palo Alto, CA 94306 415-326-2151

Microscopes, Measuring-2900 — *See Vol. D*

Microwave Comb Generator — See Generators, Microwave (Vol. D)

Microwave Integrated Circuits (MICs)-3450 — *See Vol. A*

Microwave Receivers — See Receivers, Microwave

Mirrors, Cold-3700

Liberty Mirror, Libbey-Owens-Ford Co., 851 Third Ave., Brackenridge, PA 15014, 412-224-1800 ..... **B•1212**

Mixers, Audio-1300 — *See Vol. D*

Mixers, Microwave-3450 — *See Vol. A*

Mixers, RF-3450 — *See Vol. A*

Modems — See Modulator/Demodulators, Data (Vol. D)

Modems, Broadband RF-1900 — *See Vol. D*

Modems, Communications, Eliminator/Line Driver-1900 — *See Vol. D*

Modems, Communications, Line Receivers-1900 — *See Vol. D*

Modems, Communications, Long Haul-1900 — *See Vol. D*

Modems, Communications, Short Haul (Limited Distance)-1900 — *See Vol. D*

Modular Telephone Cords — See Cable, Telephone (Vol. D)

Modulation Transfer Analyzers — See Analyzers, Transfer Function (Vol. D)

Modulator/Demodulators, Data-2000 — *See Vol. D*

Modulator/Demodulators, Laser-3700

† Andersen Labs., 1280 Blue Hills Ave., Bloomfield, CT 06002 203-242-0761
† CATEL Telecommunications, United Scientific Corp., 4800 Patrick Henry Dr., Santa Clara, CA 95054 408-988-7722
Coherent, Inc., 3210 Porter Dr., Palo Alto, CA 94304 415-493-2111
Data-Design Labs., P.O. Box 711, 7925 Center Ave., Cucamonga, CA 91730 714-987-2511
§ International Laser Sys., 3404 N. Orange Blossom Trail, Orlando, FL 32804 305-295-4010
Kappa Scientific Corp., Box 30585, Santa Barbara, CA 93105 805-687-9648
Penn Resch. Corp. (PRC), 2652 South Main St., P.O. Box 3357, Kennesaw, GA 30144 404-429-9061
RE Instruments Corp., 31029 Center Ridge Rd., Westlake, OH 44145 ... 216-871-7617

Modulators, AM-1900 — *See Vol. D*

Modulators, FM-1900 — *See Vol. D*

Modulators, Light-3700

Andersen Labs., 1280 Blue Hills Ave., Bloomfield, CT 06002, 203-242-0761 ..... **A•1591**
Cleveland Crystals, Box 17157, Euclid, OH 44117 216-486-6100
Data-Design Labs., P.O. Box 711, 7925 Center Ave., Cucamonga, CA 91730 714-987-2511
† Electro-Optical Inds., Box 3770, Santa Barbara, CA 93130 805-964-6701
FG Engrg., Box 476, Fredonia, AZ 86022 602-643-7375
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377 212-458-5811
RE Instruments Corp., 31029 Center Ridge Rd., Westlake, OH 44145 ... 216-871-7617
Times Fiber Communications, Inc., 358 Hall Ave., P.O. Box 384, Wallingford, CT 06492-0384 203-265-8500

Modulators, Magnetic-2200 — *See Vol. D*

Modulators, Microwave-3400 — *See Vol. D*

Modulators, Phase-1900 — *See Vol. D*

Modulators, Pulse-3400 — *See Vol. D*

Modulators, RF-1900 — *See Vol. D*

Modulators, Video-2200 — *See Vol. D*

Modules, Amplifier-Also See Amplifiers, Specific Types-3130 — *See Vol. A*

Modules, Analog Multiplier-3130 — *See Vol. A*

Modules, Analog-to-Digital Conversion-3130 — *See Vol. A*

Modules, Arithmetic (Binary)-3130 — *See Vol. A*

Modules, Control & Switching-2200 — *See Vol. D*

Modules, Data Acquisition-2325 — *See Vol. D*

Modules, Data Retention-2325 — *See Vol. D*

Modules Delay Line-2350 — *See Vol. A*

Modules, Digital-to-Analog Conversion-3130 — *See Vol. A*

Modules, Display — See Display Modules

Modules, Encoding/Decoding-3130 — *See Vol. A*

Modules, Filter-3130 — *See Vol. A*

Modules, I/O Relay-3130 — *See Vol. A*

Modules, Logic-Also See Cards; Circuits; Networks-3130 — *See Vol. A*

Modules, Oscillator-2300 — *See Vol. A*

Modules, RMS-to-DC Conversion-3130 — *See Vol. A*

Modules, Sample & Hold-3130 — *See Vol. A*

Modules, Switching-5100

Advanced Sys. Concepts, 435 N. Lake Ave., Pasadena, CA 91101, 818-793-8971 ..... **D•1137**
CYTEC Corp., 107 N. Washington St., E. Rochester, NY 14445, 716-381-4740 ..... **D•1207**
Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052, 201-762-6886 ..... **A•1628**
Racal-Dana Instrs. Inc., 4 Goodyear St., Irvine, CA 92715 714-859-8999

Modules (MIL), Electronic-2440

† ILC Data Device Corp., 105 Wilbur Pl., Bohemia, NY 11716, 516-567-5600 ..... **D•1151**
§ Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
Modular Devices, 50 Orville Dr., Bohemia, NY 11716 516-567-9620
† Natel Engrg. Co., Inc., 4550 Runway St., Simi Valley, CA 93063 805-581-3950
† Raytheon Co., Submarine Signal Div., 1847 W. Main Rd., P.O. Box 360, Portsmouth, RI 02871 401-847-8000
Teledyne Microelectronics, 12964 Panama St., Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
† Transmagnetics, 210 Adams Blvd., Farmingdale, NY 11735 516-293-3100

Modules (MIL), Standard Electronic-2440

ILC Data Device Corp., 105 Wilbur Pl., Bohemia, NY 11716, 516-567-5600 ..... **D•1151**
§ Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
† Koep Precision Standards, Inc., P. O. Box 191, So. Plainfield, NJ 07080 201-549-9280
† Raytheon Co., Submarine Signal Div., 1847 W. Main Rd., P.O. Box 360, Portsmouth, RI 02871 401-847-8000
Teledyne Microelectronics, 12964 Panama St., Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831

Molding Services — See Services, Molding (Vol. D)

Monitors, Current-2200 — *See Vol. D*

Monitors, Data Link-1900 — *See Vol. D*

Monitors, Error Rate-1900 — *See Vol. D*

Monitors, Frequency-2900 — *See Vol. D*

Monitors, Laser Energy-2200 — *See Vol. D*

Monitors, Line & Program-1900 — *See Vol. D*

Monitors, Modulation-2900 — *See Vol. D*

Monitors, Phase & Phase Angle-2900 — *See Vol. D*

Monitors, Phase Sequence & Loss-2200 — *See Vol. D*

Monitors, Power, AC & DC-2200 — *See Vol. D*

Monitors, Power, AF-1300 — *See Vol. D*

Monitors, Power Failure-2200 — *See Vol. D*

Monitors, Power, Microwave-2900 — *See Vol. D*

Monitors, Power, RF-2900 — *See Vol. D*

Monitors, Response Time-2900 — *See Vol. D*

Monitors, Television, Fiberoptic-2475

Video Logic Corp., 597 No. Mathilda Ave., Sunnyvale, CA 94086 408-245-8622

Monitors, Temperature-Also See Controls, Temperature-5300

§ **Digitec Corp., 918 Woodley Rd., P.O. Box 458, Dayton, OH 45401, 513-254-6251** ..... **D•1348**
§ **Hafstrom Technical Products, Inc., P.O. Box 9829, San Diego, CA 92109, 619-274-8822** ..... **D•1169**
Harrel, Inc., 16 Fitch St., E. Norwalk, CT 06855, 203-866-2573 ..... **D•1122**
Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 ..... **B•1762**
§ **NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110, 312-426-5900** ..... **D•1069-1925,1127,1159**
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..... **B•1683,1820,1821, D•1375,1407**
PPM, Inc., 4521 Emery Ind. Pkwy., Cleveland, OH 44128, 216-292-6006 .. **D•1291**
† Acromag, 30765 Wixom Rd., Wixom, MI 48096 313-624-1541
§ Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726
Active Control Instrmn., P.O. Box 243-Wildwood Circle, Key Largo, FL 33037 305-451-1000
§ Acurex-Autodata, 555 Clyde, Mountain View, CA 94039 415-964-3200
Advanced Techn. Research Labs., 5645 K General Washington Dr., Alexandria, VA 22312 703-750-2920
† Amprobe Instr., 630 Merrick Rd., Lynbrook, NY 11563 ..... 516-LY3-5600
Analogic Corp., 8 Centennial Dr., Peabody, MA 01961 .....617-532-5660;617-777-4500; 617-246-0300;800-451-1
§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
Applied Sys., 26401 Harper Ave., St. Clair Shores, MI 48081 313-779-8700
ARGA Controls, 35 E. Glenarm St., Pasadena, CA 91105 213-682-3314
§ Atkins Tech., 3321 S.W. 40th Blvd., Gainesville, FL 32608 904-378-5555
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
† Barnes Engrg., 44 Commerce Rd., P.O. Box 53, Stamford, CT 06904 203-348-5381
Basic Measuring Insts., 402 Lincoln Centre Dr., Foster City, CA 94404 ... 415-570-5355
§ Beede Electrical Instr. Co., S. Main St., Penacook, NH 03303 603-753-6362
Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611
Burling Instr., P.O. Box 298, Chatham, NJ 07928 201-635-9481
Capintec Instrs., 6 Arrow Rd., Ramsey, NJ 07446 201-825-9500
† Cardion Elctrns., Div. of Gen. Sig. Conts., Inc. Unit of Gen. Sig. Corp., Long Island Expwy., Woodbury, NY 11797 516-921-7300
CDS - Colorado Data Sys., 3301 W. Hampden, Unit C, Englewood, CO 80110 303-762-1640
† Chatham Controls, 33 River Rd., Chatham, NJ 07928 201-635-8892
Chromalox Instrs. & Controls, 100 Heil-Quaker Blvd., La Vergne, TN 37086-3536 615-793-3900
† Climatronics, 140 Wilbur Pl., Bohemia, NY 11716 516-567-7300
† CML MACARR Div., Marine Electric RPD, Inc., 666 Pacific St., Brooklyn, NY 11217 718-857-2400
Continental Resources, Inc., 175 Middlesex Tpke., Bedford, MA 01730 .. 617-275-0850
† Control Technology Co., 41-16 29th St., Long Island City, NY 11101 718-361-2133
Crompton Instrs., Hawker Siddley, 2763 Old Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
Cybernetic Micro Sys., P.O. Box 3000, 3000 Hwy. 84, San Gregorio, CA 94074 415-726-3000
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
DCI Inc., 14812 W. 117th Street, P.O. Box 215, Olathe, KS 66061 913-782-5672
† Dranetz Technologies, Inc, Computer Products Division, 1000 New Durham Rd., P.O. Box 4019, Edison, NJ 08818-4019 201-287-3680
Electric Tachometer, 68th & Upland Sts., Philadelphia, PA 19142 ..... 215-SA6-7723
§ Electromatic Controls Corp., 2495 Pembroke Road, Hoffman Estates, IL 60195-2010 312-882-5757
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. #5, York, PA 17402 717-767-6517
§ E² Technology Corp., 4475 Dupont Ct #9, Ventura, CA 93003 805-644-9544
Esterline Angus Instr. Corp., Box 24000, Indianapolis, IN 46224 317-244-7611
Fast Feedback Technologies, 1505 Aviation Blvd., Redoudo Beach, CA 90278 213-379-6100
§ Fenwal, Inc., 400 Main St., Ashland, MA 01721 617-881-2000
§ Fluke, John, Mfg. Co., Box C9090, MS 250C, Everett, WA 98206 206-356-5400
Gordon, Claud S., Co., 5710 Kenosha St., Richmond, IL 60071 815-678-2211
Gordon Prods., 67 Del Mar Dr., Brookfield, CT 06804 203-775-4501
§ Gulton Inds., Inc., Graphic Instruments Div., Gulton Ind'l. Pk., E. Greenwich, RI 02818 401-884-6800
§ Helm Instr. Co., Inc., 1387 Dussel Drive, Maumee, OH 43537 419-893-4356
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
Howell Instrs., 3479 W. Vickery Blvd., Ft. Worth, TX 76107 817-336-7411
Hy-Cal Engrg., 9650 Telstar Ave., El Monte, CA 91731 213-444-4000
Inconix Corp., 10 Tech Circle, Natick, MA 01760 617-655-1170
International Instruments, General Resistance, Inc., Twin Lakes Rd, P.O. Box 185, N. Branford, CT 06471 203-481-3450
Kaye Instruments, 15 De Angelo Dr., Bedford, MA 01730 617-275-0300
Keystone Carbon, Thermistor Div., St. Marys, PA 15857 814-781-1591
Kinetic Sys., 11 Maryknoll Dr., Lockport, IL 60441 815-838-0005
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
Mag-Con, 1626 Terrace Dr., St. Paul, MN 55113 612-633-8820
Metra Instrs., 2056 Bering Dr., San Jose, CA 95131 408-297-8530
§ Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131
Metrosonics, Inc., Box 23075, Rochester, NY 14692-3075 716-334-7300
Minco Prods., 7300 Commerce La., Minneapolis, MN 55432 612-571-3121
† Narda Microwave Corp., 435 Moreland Rd., Hauppauge, NY 11788 516-231-1700
§ Newport Electronics, 630 E. Young St., Santa Ana, CA 92705 714-540-4914
§ Non-Linear Systems/Div. of Kaypro Corp., 533 Stevens Ave., Solana Bch., CA 92075 619-481-3900
§ Pacific Transducer, 2301 Federal, Los Angeles, CA 90064 213-478-1134

Princo Instrs., Inc., 1020 Industrial Hwy., Southampton, PA 18966 215-355-1500
Rochester Instr. Sys., 255 N. Union St., Rochester, NY 14605 716-263-7700
Spectral Dynamics, Scientific-Atlanta, Inc., 4255 Ruffin Rd., San Diego, CA 92123-0575 619-268-7100
† Sensortek, Inc., 154 Em Huron Ave., Clifton, NJ 07013 201-779-5577
Serial Lab Prods., Inc., 162 Cook Lane, P.O. Box 766, Marlboro, MA 01752 617-481-1684
S. F. Products Corporation, P. O. Box 369, Southport, CT 06490 203-929-6180
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Solder Absorbing Technology (SAT), South End Bridge Circle, Agawam, MA 01001 800-628-8862
§ Spanta, Inc., Box 193, Franklin Lakes, NJ 07417 201-337-0044
Strawberry Tree Computers, 949 Cascade Dr., Sunnyvale, CA 94087 ... 408-736-3083
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
† Syscon Intl., Inc., 1108 So. High St., So. Bend, IN 46618-1096 ..... 219-232-3900; 800-348-2993
§ Tempil Div., Big Three Inds., Hamilton Blvd., S. Plainfield, NJ 07080 201-757-8300
Texmate, Inc., 348 S. Cedros Ave., P.O. Box 2000, Solana Beach, CA 92075 619-481-7177
† Thermo Electric, 109 Fifth St., Saddle Brook, NJ 07662 201-843-5800
Trans-Met Engrg., 601 S. Palm St., La Habra, CA 90631 213-691-2266
§ TRW, Dynalco Controls Div., 5200 NW 37th, P.O. Box 8187, Ft. Lauderdale, FL 33310 305-739-4300
United States Testing Co., Inc., 1415 Park Ave., Hoboken, NJ 07030 ..... 800-631-3096; 201-792-2400
VirTis Co., Rte. 208, Gardiner, NY 12525 914-255-5000
Warren Comms., 101 Okner Pkwy., Livingston, NJ 07039 201-992-6200
§ Yellow Springs Instr., Box 279, Yellow Springs, OH 45387 513-767-7241
§ Yokogawa Corp. of America, 2 Dart Rd., Shenandoah, GA 30265 404-253-7000

Monitors, Touch — See Touch Monitors

Monitors, Video-1900 — *See Vol. D*

Monitors, Voltage — See Meters, Volt (Vol. D)

Monitors, Waveform — See Oscilloscopes (Vol. D)

Monitors (MIL), Data-3475 — *See Vol. D*

Motor & Generator Armatures, Rotors, Stators-3500

Axial Magnetics, 15922 Strathern, Van Nuys, CA 91406, 818-994-3346 ... B•1139
† Georator Corp., Box 70, Manassas, VA 22110, 703-368-2101 ..... D•1932
Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ... B•1011,1196
† AMETEK, Dynamics Division, AMETEK, Inc., 5649 Peck Rd., Arcadia, CA 91006 818-442-5981
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 80 39th Street, Brooklyn, NY 11232 718-965-0770
† Danmar Inds., 9705 Lurline Ave., Chatsworth, CA 91311 ..... 818-882-7979/5280
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820 603-742-3330
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343 612-931-2700
† Fabricast, 2517 Seaman Ave., P.O. Box 3176, S. El Monte, CA 91733 ... 818-443-3247
Fasco Industries, Inc., Div. of Hawker Siddeley Grp. Plc., 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
Framar Metal Products Co., Inc., 345 Carnegie Avenue, Kenilworth, NJ 07033 201-241-0710
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
Howard Industries, MSL Ind., Inc., Box 287, Milford, IL 60953 815-889-4105
† HTL Electro Kinetics, 402 E. Gutierrez St., Santa Barbara, CA 93101 805-963-2055
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590 .. 516-334-7070
† Inland Motor, Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
Magnetic Metals Co., Hayes Ave. at 21st St., Camden, NJ 08105 609-964-7842
† Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303 818-887-7700
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
§ Powertron, Contraves Goerz Corp., 3821 Barranger Dr., Charlotte, NC 28210 704-525-8962
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506 201-427-3100
† Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008 619-438-3321
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080

Motor Assemblies with Integral Tachometer/Encoder-3500

Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141, 703-639-2495 ..... B•1163
Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 818-887-7700 ..... B•1168
† Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ..... B•1172-1175
Stock Drive Prods., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1191
† AMETEK, Dynamics Division, AMETEK, Inc., 5649 Peck Rd., Arcadia, CA 91006 818-442-5981
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
Data Technology, Inc., 4 Gill St., Woburn, MA 01811 617-935-8820
HHK Ind., Telan Int., Rte. 611, P. O. Box 690, Plumsteadville, PA 18949 .. 215-766-0990
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590 .. 516-334-7070
† Inland Motor Division, Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635 602-459-1150
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Portescap U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490 .. 215-277-0433

Motor Generator Sets-4000 — *See Vol. D*

Motor Speed Drives — See Controls, Motor Speed (Vol. D)

Motors, Brush, DC-3500

Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141, 703-639-2495 ..... B•1163
† Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ..... B•1172-1175
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ..... B•1187
TS Products, Inc., 12455 Branford St., Bldg. 22, Arleta, CA 91331, 818-896-6676 ..... D•1990
† American Elctrns., 1600 E. Valencia Dr., Fullerton, CA 92631 714-871-3020
† AMETEK, Dynamics Division, AMETEK, Inc., 5649 Peck Rd., Arcadia, CA 91006 818-442-5981
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
General Numeric Corporation, 390 Kent Avenue, Elk Grove Village, IL 60007 312-640-1595
Fincor, 3750 E. Market St., York, PA 17402 717-757-4641
General Inds., Taylor & Olive St., Elyria, OH 44035 216-323-3136
HHK Ind., Telan Int., Rte. 611, P. O. Box 690, Plumsteadville, PA 18949 .. 215-766-0990
Howard Industries, MSL Ind., Inc., Box 287, Milford, IL 60953 815-889-4105
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590 .. 516-334-7070
† Inland Motor Division, Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635 602-459-1150
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
PITTMAN, Penn Engrg. & Mfg. Corp., 343 Godshall Dr., Harleysville, PA 19438 215-256-6601
Portescap U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490 .. 215-277-0433
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
§ Westamp, 1542 15th St., Santa Monica, CA 90404 213-393-0401

Motors, Brushless, DC-3500

† Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803, 516-694-6700 ..... B•1131
Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ..... B•1138
Axial Magnetics, 15922 Strathern, Van Nuys, CA 91406, 818-994-3346 ... B•1139
† BEI Motion System Company, Kimco Division, 150 Vallecitos de Oro, San Marcos, CA 92069, 619-744-5671 ..... B•1783
Buehler Products, Inc., P. O. Box 33400, Raleigh, NC 27606, 919-469-8522 ..... B•1142
§ Canon U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, 516-488-6700 ..... B•1143
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 ..... B•1144
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ..... B•1146
Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343, 612-931-2700 ..... B•1147
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ..... B•1161
Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141, 703-639-2495 ..... B•1163
† Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 818-887-7700 ..... B•1168
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ..... B•1172-1175
Motor-Tronics, Inc., 2142 Industrial Ct., Bldg. "F", Vista, CA 92083, 619-727-7430 ..... B•1176
PITTMAN, Penn Engrg. & Mfg. Corp., 343 Godshall Dr., Harleysville, PA 19438, 215-256-6601 ..... B•1179
Portescap U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490, 215-277-0433 ..... B•1181
POWR-UPS Corp., 50 Orville Drive, Bohemia, NY 11716, 516-589-3602 .. B•1183
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 ..... B•1184
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ..... B•1187
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008, 619-438-3321 ..... B•1189
† Stock Drive Prods., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1191
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073, 619-428-5581 ..... B•1199
Aeroflex Labs., Microelctrns. Div., 35 S. Service Rd., Plainview, NY 11803 516-694-6700
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 80 39th Street, Brooklyn, NY 11232 718-965-0770
† Astro Dynamics, Inc., 2 Gill St., Woburn, MA 01801 617-935-4944
† Astrosyn America, 14349 Victory Blvd., Ste. 304, Van Nuys, CA 91401 .. 213-785-2197
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618 312-478-3515
Brailsford & Co., 670 Milton Rd., Rye, NY 10580 914-967-1820
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
General Numeric Corporation, 390 Kent Avenue, Elk Grove Village, IL 60007 312-640-1595
EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
§ EG & G Rotron, Commercial Div., Saugerties, NY 12477 914-246-3615

† EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
† Harowe Servo Controls, Bowmar Inst. Corp., Westtown Rd. at West Chester Pike, W. Chester, PA 19380 215-692-2700
HHK Ind., Telan Int., Rte. 611, P. O. Box 690, Plumsteadville, PA 18949 .. 215-766-0990
Hitachi America, Ltd., 59 Route 17 South, Allendale, NJ 07401 201-825-8000
† HTL Electro Kinetics, 402 E. Gutierrez St., Santa Barbara, CA 93101 805-963-2055
† Inland Motor Division, Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635 602-459-1150
† Inland Motor, Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
§ Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 818-991-6111
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
Namiki Precision Jewel Co., Ltd., 15 Warren Street, Hackensack, NJ 07601 201-343-3080
NMB Corp., Motor Div., 9601 Mason Ave., Chatsworth, CA 91311 213-709-1555
Pacific Scientific Co., 4301 Kishwaukee, Rockford, IL 61105 815-966-3600
Papst Mechatronic Corp., Aquidneck Indl. Pk., Newport, RI 02840 401-849-5930
† Performance Controls Inc., 333-E Byberry Rd., Hatboro, PA 19040 215-675-6500
§ Powertron, Contraves Goerz Corp., 3821 Barranger Dr., Charlotte, NC 28210 704-525-8962
Rapidsyn, 3233 Roymar Rd., Oceanside, CA 92054 619-439-7500
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 .... 800-245-4501;800-245-4497 In Ohio
§ Seiko Instrs. U.S.A., Inc., 2990 W. Lomita Blvd., Torrance, CA 90505 213-530-8777
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
Sterling Instr., Div. Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 516-328-3300
Synektron Corporation, 12000 S. W. Garden Place, Portland, OR 97223 503-684-3090
Tokyo Elec. Co., Ltd., 1-1 Nishiki-Cho, Kanda, Chiyoda-Ku, Tokyo, 101, JAPAN .... (03) 292-1011
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
§ Westamp, 1542 15th St., Santa Monica, CA 90404 213-393-0401
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Clock & Timing-3500

† Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 .... B•1138
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618, 312-478-3515 .... B•1140
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 .... B•1145
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 .... B•1146
IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 .... B•1161
Mabuchi Motor America Corp., 475 Park Ave. South, New York, NY 10016, 212-686-3622 .... B•1167
Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 818-887-7700 .... B•1168
Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Bertsch U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083 619-727-7420
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
§ Cramer Co., Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§† Hurst Mfg. Corp., Emerson Elec. Co., Box 326, Princeton, IN 47670 812-385-2564
IMC/Hansen, Box 23, Princeton, IN 47670 812-385-3415
Inland Motor Division, Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635 602-459-1150
§ Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Mallory Timers, Emhart Elec./Elctrn. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, JAPAN 489-5333
§ Paragon Elect., 606 Parkway Blvd., Two Rivers, WI 54241 414-793-1161
† Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080

Motors, Control-3500

† Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803, 516-694-6700 .... B•1131
† Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 .... B•1138
Axial Magnetics, 15922 Strathern, Van Nuys, CA 91406, 818-994-3346 ... B•1139
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618, 312-478-3515 .... B•1140
Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072, 201-933-0220 .... B•1141
Buehler Products, Inc., P. O. Box 33400, Raleigh, NC 27606, 919-469-8522 .... B•1142
§ Canon U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, 516-488-6700 .... B•1143
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 .... B•1144
Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 .... B•1145
§ Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343, 612-931-2700 .... B•1147
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 .... B•1161
Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141, 703-639-2495 .... B•1163
Mabuchi Motor America Corp., 475 Park Ave. South, New York, NY 10016, 212-686-3622 .... B•1167
† Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 818-887-7700 .... B•1168
Motor-Tronics, Inc., 2142 Industrial Ct., Bldg. "F", Vista, CA 92083, 619-727-7430 .... B•1176
PITTMAN, Penn Engrg. & Mfg. Corp., 343 Godshall Dr., Harleysville, PA 19438, 215-256-6601 .... B•1179
Portescap U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490, 215-277-0433 .... B•1181
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 .... B•1184
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506, 201-427-3100 .... B•1185
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 .... B•1187
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008, 619-438-3321 .... B•1189
§† Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 .... B•1192
Triac Electronic Systems, Inc., 87-27 Myrtle Ave., Glendale, NY 11385, 718-441-4759 .... D•1132
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404, 513-228-3171 .... B•1195
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 .... B•1196
Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073, 619-428-5581 .... B•1199
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§ Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
† AMETEK, Dynamics Division, AMETEK, Inc., 5649 Peck Rd., Arcadia, CA 91006 818-442-5981
Anaheim Automation, 910 E. Orangefair La., Anaheim, CA 92801 714-992-6990
Applied Sys., 26401 Harper Ave., St. Clair Shores, MI 48081 313-779-8700
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 80 39th Street, Brooklyn, NY 11232 718-965-0770
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-973-8900
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
Berkeley Process Control, Inc., 5327-K Jacuzzi St., Richmond, CA 94804 415-526-3333
Bertsch U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083 619-727-7420
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
§ Carter Motor, 2707 W. George St., Chicago, IL 60618-7898 312-588-7700
Centent Co., 3879 S. Main St., Santa Ana, CA 92707 714-979-6491
§ Colman Motor Products, Inc., A Barber-Colman Co., P. O. Box 1240, Rockford, IL 61105-1240 815-968-0660
Cross Elctrns., 100 Commonwealth Dr., Warrendale, PA 15086 412-776-1591
General Numeric Corporation, 390 Kent Avenue, Elk Grove Village, IL 60007 312-640-1595
Datatran Labs, P.O. Box 384, Sussex, NJ 07461 914-856-4313
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820 603-742-3330
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
§† Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
Federal Pacific, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199 .... 800-245-4501;in OH 800-245-4497
Fincor, 3750 E. Market St., York, PA 17402 717-757-4641
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
HHK Ind., Telan Int., Rte. 611, P. O. Box 690, Plumsteadville, PA 18949 .. 215-766-0990
Honeywell Inc., Commercial Div., MN 27-7246, Honeywell Plaza, Minneapolis, MN 55408 612-870-5357
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 .... 800-321-5111, Ext. 596
§ Hurst Mfg. Corp., Emerson Elec. Co., Box 326, Princeton, IN 47670 812-385-2564
† IMC Magnetics Corp., Western Div., 12627 Hiddencreek Way, Cerritos, CA 90701 213-926-0927
§† Inertial Motors, 280 N. Broad St., Doylestown, PA 18901 215-345-1010
Inland Motor Division, Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635 602-459-1150
† Inland Motor, Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
IXYS Corp., 142 Charcot Ave., San Jose, CA 95131 408-262-8800
Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 818-991-6111
Lincoln Laser Co., 234 East Mohave, Phoenix, AZ 85004 602-257-0407
Macrotronix, Inc., 4016 N. Home St., Mishawaka, IN 46545 219-256-5503
Magnum Opus Custom Elctrn. Engrg., 284 Kennedy St., Iselin, NJ 08830 201-283-4925
† Maxon Precision Motors, Inc., 838 Mitten Rd., Burlingame, CA 94010 415-697-9614
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 813-822-2529
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
Rapidsyn, 3233 Roymar Rd., Oceanside, CA 92054 619-439-7500
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 .... 800-245-4501;800-245-4497 In Ohio
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
Sterling Instr., Div. Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 516-328-3300

† Stock Drive Prods., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk, NY 11040 ..... 516-328-0200;328-3300
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
§ Vectrol, Division of Westinghouse Elec. Corp., 110 Douglas Rd, Oldsmar, FL 33557 813-855-4621
§ The Wadsworth Elec. Mfg. Co., Inc., 20 W. 11th St., Covington, KY 41012 606-431-0900
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, DC Timing-3500

Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ..... B•1138
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ..... B•1146
IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ..... B•1161
Mabuchi Motor America Corp., 475 Park Ave. South, New York, NY 10016, 212-686-3622 ..... B•1167
Portescap U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490, 215-277-0433 ..... B•1181
Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Bertsch U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083 619-727-7420
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
IMC/Hansen, Box 23, Princeton, IN 47670 812-385-3415
Inland Motor, Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 ... 813-822-2529
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605 818-764-4266
† Stock Drive Prods., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk, NY 11040 ..... 516-328-0200;328-3300
Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300

Motors, Drag Cup-3500

† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1196
† Aeroflex Labs., Magnetic Prods. Div., 35 South Service Road, Plainview, NY 11803 516-694-6700
† American Elctrns., 1600 E. Valencia Dr., Fullerton, CA 92631 714-871-3020
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-973-8900
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590 .. 516-334-7070
Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 818-991-6111
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300

Motors, Fractional Horsepower-3500

† Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803, 516-694-6700 ..... B•1131
† Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ..... B•1138
Axial Magnetics, 15922 Strathern, Van Nuys, CA 91406, 818-994-3346 ... B•1139
† BEI Motion System Company, Kimco Division, 150 Vallecitos de Oro, San Marcos, CA 92069, 619-744-5671 ..... B•1783
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618, 312-478-3515 ..... B•1140
§ Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072, 201-933-0220 ..... B•1141
Buehler Products, Inc., P. O. Box 33400, Raleigh, NC 27606, 919-469-8522 ..... B•1142
§ Canon U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, 516-488-6700 ..... B•1143
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 ..... B•1144
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ..... B•1146
§ Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343, 612-931-2700 ..... B•1147
IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ..... B•1161
§ Mabuchi Motor America Corp., 475 Park Ave. South, New York, NY 10016, 212-686-3622 ..... B•1167
† Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 818-887-7700 ..... B•1168
† Maxon Precision Motors, Inc., 838 Mitten Rd., Burlingame, CA 94010, 415-697-9614 ..... B•1171
† Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ..... B•1172-1175
Motor-Tronics, Inc., 2142 Industrial Ct., Bldg. "F", Vista, CA 92083, 619-727-7430 ..... B•1176
PITTMAN, Penn Engrg. & Mfg. Corp., 343 Godshall Dr., Harleysville, PA 19438, 215-256-6601 ..... B•1179
Portescap U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490, 215-277-0433 ..... B•1181
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 ..... B•1184
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008, 619-438-3321 ..... B•1189
Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 ..... B•1192
TRW Motor Division, Industrial/Commerical Products, Napierfield Road, Postal Route 6, Box M-30A, Dothan, AL 36303, 205-983-3542 ..... B•1194
§† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404, 513-228-3171 ..... B•1195
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1196
Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073, 619-428-5581 ..... B•1199
Aeroflex Labs., Microelctrns. Div., 35 S. Service Rd., Plainview, NY 11803 516-694-6700
§ Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
† American Elctrns., 1600 E. Valencia Dr., Fullerton, CA 92631 714-871-3020
† AMETEK, Dynamics Division, AMETEK, Inc., 5649 Peck Rd., Arcadia, CA 91006 818-442-5981
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 80 39th Street, Brooklyn, NY 11232 718-965-0770
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-973-8900
† Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Baldor Electric Company, P.O. Box 2400, Fort Smith, AR 72901 501-646-4711
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
Berger-Lahr Corp., Fitzgerald Dr., Jaffrey, NH 03452 603-532-7701
Bertsch U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083 619-727-7420
§ Carter Motor, 2707 W. George St., Chicago, IL 60618-7898 312-588-7700
§ Colman Motor Products, Inc., A Barber-Colman Co., P. O. Box 1240, Rockford, IL 61105-1240 815-968-0660
§† Cramer Co., Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574
General Numeric Corporation, 390 Kent Avenue, Elk Grove Village, IL 60007 312-640-1595
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
EG & G Rotron, Commercial Div., Saugerties, NY 12477 914-246-3615
† EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
EG & G Torque Systems, 36 Arlington St., Watertown, MA 02172 617-924-6000
† Electro Kinetics Co., Sub. HTL Inds., Inc., 402 E. Gutierrez St., Santa Barbara, CA 93102 805-963-2055
§ Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
Fasco Industries, Inc., Div. of Hawker Siddeley Grp. Plc., 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
Fincor, 3750 E. Market St., York, PA 17402 717-757-4641
General Inds., Taylor & Olive St., Elyria, OH 44035 216-323-3136
Hankscraft Motors, Div. of Gerber Prods. Co., P.O. Box 120, Reedsburg, WI 53959 608-524-4341
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
HHK Ind., Telan Int., Rte. 611, P. O. Box 690, Plumsteadville, PA 18949 .. 215-766-0990
Howard Industries, MSL Ind., Inc., Box 287, Milford, IL 60953 815-889-4105
† HTL Electro Kinetics, 402 E. Gutierrez St., Santa Barbara, CA 93101 805-963-2055
§ Hurst Mfg. Corp., Emerson Elec. Co., Box 326, Princeton, IN 47670 812-385-2564
IMC/Hansen, Box 23, Princeton, IN 47670 812-385-3415
† Inland Motor, Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
§ Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 818-991-6111
† Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-5444
† McLean Engrg., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550 609-799-0100
Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, IL 60008 312-259-8700
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Namiki Precision Jewel Co., Ltd., 15 Warren Street, Hackensack, NJ 07601 201-343-3080
Pacific Scientific Co., 4301 Kishwaukee, Rockford, IL 61105 815-966-3600
Papst Mechatronic Corp., Aquidneck Indl. Pk., Newport, RI 02840 401-849-5930
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
§ Powertron, Contraves Goerz Corp., 3821 Barranger Dr., Charlotte, NC 28210 704-525-8962
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
RTE Aerovox Inc., 740 Belleville Ave., New Bedford, MA 02745 617-994-9661
§ Seiko Instrs. U.S.A., Inc., 2990 W. Lomita Blvd., Torrance, CA 90505 213-530-8777
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605 818-764-4266
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
§ Standard Pneumatic Motor, Box 10530, Reno, NV 89510 702-329-6311
Sterling Instr., Div. Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 516-328-3300
† Stock Drive Prods., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk, NY 11040 ..... 516-328-0200;328-3300
Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
† Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Gearhead-3500

† Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803, 516-694-6700 ..... B•1131
† Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ..... B•1138

§ Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072, 201-933-0220 ..... B•1141
Buehler Products, Inc., P. O. Box 33400, Raleigh, NC 27606, 919-469-8522 ..... B•1142
§ Canon U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, 516-488-6700 ..... B•1143
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ..... B•1145
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ..... B•1146
§ Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343, 612-931-2700 ..... B•1147
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ..... B•1161
Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141, 703-639-2495 ..... B•1163
† Maxon Precision Motors, Inc., 838 Mitten Rd., Burlingame, CA 94010, 415-697-9614 ..... B•1171
† Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ..... B•1172-1175
Motor-Tronics, Inc., 2142 Industrial Ct., Bldg. "F", Vista, CA 92083, 619-727-7430 ..... B•1176
PITTMAN, Penn Engrg. & Mfg. Corp., 343 Godshall Dr., Harleysville, PA 19438, 215-256-6601 ..... B•1179
Portescap U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490, 215-277-0433 ..... B•1181
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 ..... B•1184
† Stock Drive Prods., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1191
TRW Motor Division, Industrial/Commerical Products, Napierfield Road, Postal Route 6, Box M-30A, Dothan, AL 36303, 205-983-3542 ..... B•1194
§† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404, 513-228-3171 ..... B•1195
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1196
† American Elctrns., 1600 E. Valencia Dr., Fullerton, CA 92631 714-871-3020
† AMETEK, Dynamics Division, AMETEK, Inc., 5649 Peck Rd., Arcadia, CA 91006 818-442-5981
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 80 39th Street, Brooklyn, NY 11232 718-965-0770
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-973-8900
Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Baldor Electric Company, P.O. Box 2400, Fort Smith, AR 72901 501-646-4711
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
Berger-Lahr Corp., Fitzgerald Dr., Jaffrey, NH 03452 603-532-7701
Bertsch U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083 619-727-7420
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618 312-478-3515
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
§ Carter Motor, 2707 W. George St., Chicago, IL 60618-7898 312-588-7700
§ Colman Motor Products, Inc., A Barber-Colman Co., P. O. Box 1240, Rockford, IL 61105-1240 815-968-0660
§ Cramer Co., Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574
EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† Electro Kinetics Co., Sub. HTL Inds., Inc., 402 E. Gutierrez St., Santa Barbara, CA 93102 805-963-2055
§ Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
General Inds., Taylor & Olive St., Elyria, OH 44035 216-323-3136
Hankscraft Motors, Div. of Gerber Prods. Co., P.O. Box 120, Reedsburg, WI 53959 608-524-4341
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
HHK Ind., Telan Int., Rte. 611, P. O. Box 690, Plumsteadville, PA 18949 215-766-0990
Howard Industries, MSL Ind., Inc., Box 287, Milford, IL 60953 815-889-4105
† HTL Electro Kinetics, 402 E. Gutierrez St., Santa Barbara, CA 93101 805-963-2055
§† Hurst Mfg. Corp., Emerson Elec. Co., Box 326, Princeton, IN 47670 812-385-2564
§ Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 818-991-6111
† Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-5444
Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, IL 60008 312-259-8700
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
Rapidsyn, 3233 Roymar Rd., Oceanside, CA 92054 619-439-7500
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506 201-427-3100
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605 818-764-4266
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
† Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Gyro-3500

Axial Magnetics, 15922 Strathern, Van Nuys, CA 91406, 818-994-3346 ... B•1139
Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 818-887-7700 ..... B•1168
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1196
† Aeroflex Labs., Magnetic Prods. Div., 35 South Service Road, Plainview, NY 11803 516-694-6700
† Astronautics Corporation of America, P.O. Box 523, Milwaukee, WI 53201-0523 414-447-8200
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-5444
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073 619-428-5581

Motors, Hysteresis-3500

IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ..... B•1161
Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 818-887-7700 ..... B•1168
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ..... B•1187
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1196
† Aeroflex Labs., Magnetic Prods. Div., 35 South Service Road, Plainview, NY 11803 516-694-6700
† American Elctrns., 1600 E. Valencia Dr., Fullerton, CA 92631 714-871-3020
† AMETEK, Dynamics Division, AMETEK, Inc., 5649 Peck Rd., Arcadia, CA 91006 818-442-5981
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 80 39th Street, Brooklyn, NY 11232 718-965-0770
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-973-8900
Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Axial Magnetics, 15922 Strathern, Van Nuys, CA 91406 818-994-3346
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820 603-742-3330
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
General Inds., Taylor & Olive St., Elyria, OH 44035 216-323-3136
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
§† Hurst Mfg. Corp., Emerson Elec. Co., Box 326, Princeton, IN 47670 812-385-2564
IMC/Hansen, Box 23, Princeton, IN 47670 812-385-3415
§ Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 818-991-6111
Lincoln Laser Co., 234 East Mohave, Phoenix, AZ 85004 602-257-0407
† McLean Engrg., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550 609-799-0100
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Papst Mechatronic Corp., Aquidneck Indl. Pk., Newport, RI 02840 401-849-5930
Paragon Elect., 606 Parkway Blvd., Two Rivers, WI 54241 414-793-1161
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008 619-438-3321
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
§† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Incremental, Stepping — See Motors, Stepping (Vol. B)

Motors, Induction-3500

Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ..... B•1146
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ..... B•1161
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 ..... B•1184
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ..... B•1187
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1196
† Aeroflex Labs., Magnetic Prods. Div., 35 South Service Road, Plainview, NY 11803 516-694-6700
† American Elctrns., 1600 E. Valencia Dr., Fullerton, CA 92631 714-871-3020
† AMETEK, Dynamics Division, AMETEK, Inc., 5649 Peck Rd., Arcadia, CA 91006 818-442-5981
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 80 39th Street, Brooklyn, NY 11232 718-965-0770
† Astro Dynamics, Inc., 2 Gill St., Woburn, MA 01801 617-935-4944
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-973-8900
Axial Magnetics, 15922 Strathern, Van Nuys, CA 91406 818-994-3346
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618 312-478-3515
§ Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072 201-933-0220

† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
General Numeric Corporation, 390 Kent Avenue, Elk Grove Village, IL 60007 312-640-1595
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
Electro-Pacific, 5782 Thornwood Dr., Goleta, CA 93017 805-964-0751
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
Fasco Industries, Inc., Div. of Hawker Siddeley Grp. Plc., 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
Howard Industries, MSL Ind., Inc., Box 287, Milford, IL 60953 815-889-4105
† HTL Electro Kinetics, 402 E. Gutierrez St., Santa Barbara, CA 93101 805-963-2055
§† Hurst Mfg. Corp., Emerson Elec. Co., Box 326, Princeton, IN 47670 812-385-2564
§ Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 818-991-6111
Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141 703-639-2495
† Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-5444
† McLean Engrg., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550 609-799-0100
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 813-822-2529
Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, IL 60008 312-259-8700
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Papst Mechatronic Corp., Aquidneck Indl. Pk., Newport, RI 02840 401-849-5930
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008 619-438-3321
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
§† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Linear-3500

Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ..... B•1138
Anorad Corp., 110 Oser Ave., Hauppauge, NY 11788 516-231-1990
† Component Specialties Corp., 9143 E. La Rosa Dr., Temple City, CA 91780 213-283-0015
Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
HHK Ind., Telan Int., Rte. 611, P. O. Box 690, Plumsteadville, PA 18949 215-766-0990
Hurst Mfg. Corp., Emerson Elec. Co., Box 326, Princeton, IN 47670 812-385-2564
Inland Motor, Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
Kaiser ElectroPrecision, Kaiser Aerospace & Elctrns., 1700 S. Redhill Ave., Irvine, CA 92714 714-250-1015
Magnetic Systems, 1021 Pecten Ct., Milpitas, CA 95035 408-263-6680
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010

Motors, Miniature — See Motors, Fractional HP (Vol. B)

Motors, Permanent Magnet-3500

† Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ..... B•1138
† BEI Motion System Company, Kimco Division, 150 Vallecitos de Oro, San Marcos, CA 92069, 619-744-5671 ..... B•1783
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618, 312-478-3515 ..... B•1140
§ Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072, 201-933-0220 ..... B•1141
Buehler Products, Inc., P. O. Box 33400, Raleigh, NC 27606, 919-469-8522 ..... B•1142
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 ..... B•1144
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ..... B•1145
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ..... B•1146
§ Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343, 612-931-2700 ..... B•1147
IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ..... B•1161
§ Mabuchi Motor America Corp., 475 Park Ave. South, New York, NY 10016, 212-686-3622 ..... B•1167
† Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 818-887-7700 ..... B•1168
† Maxon Precision Motors, Inc., 838 Mitten Rd., Burlingame, CA 94010, 415-697-9614 ..... B•1171
† Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ..... B•1172-1175
PITTMAN, Penn Engrg. & Mfg. Corp., 343 Godshall Dr., Harleysville, PA 19438, 215-256-6601 ..... B•1179
Portescap U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490, 215-277-0433 ..... B•1181
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 ..... B•1184
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008, 619-438-3321 ..... B•1189
§† Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 ..... B•1192
TRW Motor Division, Industrial/Commerical Products, Napierfield Road, Postal Route 6, Box M-30A, Dothan, AL 36303, 205-983-3542 ..... B•1194
§† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404, 513-228-3171 ..... B•1195
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1196
† Aeroflex Labs., Magnetic Prods. Div., 35 South Service Road, Plainview, NY 11803 516-694-6700
§ Aerotech, Inc., 101 Zeta Dr., Pittsburgh, PA 15238 412-963-7470
§ Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
† American Elctrns., 1600 E. Valencia Dr., Fullerton, CA 92631 714-871-3020
† AMETEK, Dynamics Division, AMETEK, Inc., 5649 Peck Rd., Arcadia, CA 91006 818-442-5981
§ Anaheim Automation, 910 E. Orangefair La., Anaheim, CA 92801 714-992-6990
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-973-8900
Astrosyn America, 14349 Victory Blvd., Ste. 304, Van Nuys, CA 91401 213-785-2197
† Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Axial Magnetics, 15922 Strathern, Van Nuys, CA 91406 818-994-3346
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
Berger-Lahr Corp., Fitzgerald Dr., Jaffrey, NH 03452 603-532-7701
Bertsch U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083 619-727-7420
§ Carter Motor, 2707 W. George St., Chicago, IL 60618-7898 312-588-7700
§ Colman Motor Products, Inc., A Barber-Colman Co., P. O. Box 1240, Rockford, IL 61105-1240 815-968-0660
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
§ Cramer Co., Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574
General Numeric Corporation, 390 Kent Avenue, Elk Grove Village, IL 60007 312-640-1595
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
EG & G Torque Systems, 36 Arlington St., Watertown, MA 02172 617-924-6000
† Electro Kinetics Co., Sub. HTL Inds., Inc., 402 E. Gutierrez St., Santa Barbara, CA 93102 805-963-2055
§ Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
† Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670
Fincor, 3750 E. Market St., York, PA 17402 717-757-4641
General Inds., Taylor & Olive St., Elyria, OH 44035 216-323-3136
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
Hankscraft Motors, Div. of Gerber Prods. Co., P.O. Box 120, Reedsburg, WI 53959 608-524-4341
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
HHK Ind., Telan Int., Rte. 611, P. O. Box 690, Plumsteadville, PA 18949 215-766-0990
Howard Industries, MSL Ind., Inc., Box 287, Milford, IL 60953 815-889-4105
† HTL Electro Kinetics, 402 E. Gutierrez St., Santa Barbara, CA 93101 805-963-2055
§† Hurst Mfg. Corp., Emerson Elec. Co., Box 326, Princeton, IN 47670 812-385-2564
IMC/Hansen, Box 23, Princeton, IN 47670 812-385-3415
† IMC Magnetics Corp., Western Div., 12627 Hiddencreek Way, Cerritos, CA 90701 213-926-0927
§† Inertial Motors, 280 N. Broad St., Doylestown, PA 18901 215-345-1010
† Inland Motor Division, Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635 602-459-1150
† Inland Motor, Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
§ Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 818-991-6111
† Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141 703-639-2495
§ Landis & Gyr. Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Mallory Timers, Emhart Elec./Elctrn. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353
† McLean Engrg., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550 609-799-0100
Micronel U.S., 2142F Industrial Ct., Sycamore Research Center, Vista, CA 92083 619-727-7400
Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, IL 60008 312-259-8700
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Pacific Scientific Co., 4301 Kishwaukee, Rockford, IL 61105 815-966-3600
Papst Mechatronic Corp., Aquidneck Indl. Pk., Newport, RI 02840 401-849-5930
Paragon Elect., 606 Parkway Blvd., Two Rivers, WI 54241 414-793-1161
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506 201-427-3100
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605 818-764-4266
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Stock Drive Prods., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 ..... 516-328-0200;328-3300
Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
† Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348

§ Westamp, 1542 15th St, Santa Monica, CA 90404 213-393-0401
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Selsyn — See Motors, Synchronous (Vol. B)

Motors, Servo-4900 — *See Vol. D*

Motors, Squirrel Cage-3500

† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1196
† Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803 516-694-6700
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 80 39th Street, Brooklyn, NY 11232 718-965-0770
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618 312-478-3515
§ Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072 201-933-0220
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820 603-742-3330
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† Electro Kinetics Co., Sub. HTL Inds., Inc., 402 E. Gutierrez St., Santa Barbara, CA 93102 805-963-2055
Electro-Pacific, 5782 Thornwood Dr., Goleta, CA 93017 805-964-0751
Fasco Industries, Inc., Div. of Hawker Siddeley Grp. Plc., 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
Howard Industries, MSL Ind., Inc., Box 287, Milford, IL 60953 815-889-4105
† McLean Engrg., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550 609-799-0100
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008 619-438-3321
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Stepping-3500

Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ..... B•1138
Axial Magnetics, 15922 Strathern, Van Nuys, CA 91406, 818-994-3346 ... B•1139
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618, 312-478-3515 ..... B•1140
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 ..... B•1144
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ..... B•1145
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ..... B•1146
Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 818-887-7700 ..... B•1168
Portescap U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490, 215-277-0433 ..... B•1181
§ Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ..... B•1187
† Stock Drive Prods., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1191
§† Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 ..... B•1192
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1011,1196,1197
† Abrams Instr. Corp., P.O. Box 26007, Lansing, MI 48909 517-332-6405
† Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803 516-694-6700
§ Aerotech, Inc., 101 Zeta Dr., Pittsburgh, PA 15238 412-963-7470
§ Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
† American Elctrns., 1600 E. Valencia Dr., Fullerton, CA 92631 714-871-3020
§ Anaheim Automation, 910 E. Orangefair La., Anaheim, CA 92801 714-992-6990
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-973-8900
§ Astrosyn America, 14349 Victory Blvd., Ste. 304, Van Nuys, CA 91401 .. 213-785-2197
Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
Berger-Lahr Corp., Fitzgerald Dr., Jaffrey, NH 03452 603-532-7701
† GAP Instr., 40 Oser Ave., Hauppauge, NY 11787 516-273-0909
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
Howard Industries, MSL Ind., Inc., Box 287, Milford, IL 60953 815-889-4105
§† Hurst Mfg. Corp., Emerson Elec. Co., Box 326, Princeton, IN 47670 812-385-2564
Icon, 156 Sixth St., Cambridge, MA 02142 617-868-5400
IMC/Hansen, Box 23, Princeton, IN 47670 812-385-3415
Inland Motor Division, Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635 602-459-1150
Inland Motor, Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
§ Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 818-991-6111
Matrix Corp., 1639 Green St., Raleigh, NC 27603 919-833-2837
Mesur-Matic Elctrns., 50 Grove St., Salem, MA 01970-2294 617-745-7000
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 ... 813-822-2529
Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, IL 60008 312-259-8700
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Namiki Precision Jewel Co., Ltd., 15 Warren Street, Hackensack, NJ 07601 201-343-3080
NMB Corp., Motor Div., 9601 Mason Ave., Chatsworth, CA 91311 213-709-1555
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
§† Rapidsyn, 3233 Roymar Rd., Oceanside, CA 92054 619-439-7500
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
Tokyo Elec. Co., Ltd., 1-1 Nishiki-Cho, Kanda, Chiyoda-Ku, Tokyo, 101, JAPAN ..... (03) 292-1011
Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080

Motors, Synchronous-3500

† Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ..... B•1138
Axial Magnetics, 15922 Strathern, Van Nuys, CA 91406, 818-994-3346 ... B•1139
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618, 312-478-3515 ..... B•1140
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ..... B•1145
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ..... B•1146
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ..... B•1161
Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141, 703-639-2495 ..... B•1163
Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 818-887-7700 ..... B•1168
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ..... B•1187
§† Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 ..... B•1192
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1196
† Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803 516-694-6700
† American Elctrns., 1600 E. Valencia Dr., Fullerton, CA 92631 714-871-3020
† AMETEK, Dynamics Division, AMETEK, Inc., 5649 Peck Rd., Arcadia, CA 91006 818-442-5981
Anaheim Automation, 910 E. Orangefair La., Anaheim, CA 92801 714-992-6990
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 80 39th Street, Brooklyn, NY 11232 718-965-0770
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-973-8900
Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
Berger-Lahr Corp., Fitzgerald Dr., Jaffrey, NH 03452 603-532-7701
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
§ Cramer Co., Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574
General Numeric Corporation, 390 Kent Avenue, Elk Grove Village, IL 60007 312-640-1595
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
Fasco Industries, Inc., Div. of Hawker Siddeley Grp. Plc., 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
Fincor, 3750 E. Market St., York, PA 17402 717-757-4641
General Inds., Taylor & Olive St., Elyria, OH 44035 216-323-3136
† Harowe Servo Controls, Bowmar Inst. Corp., Westtown Rd. at West Chester Pike, W. Chester, PA 19380 215-692-2700
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
Howard Industries, MSL Ind., Inc., Box 287, Milford, IL 60953 815-889-4105
§† Hurst Mfg. Corp., Emerson Elec. Co., Box 326, Princeton, IN 47670 812-385-2564
§ Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 818-991-6111
§ Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Lincoln Laser Co., 234 East Mohave, Phoenix, AZ 85004 602-257-0407
Mallory Timers, Emhart Elec./Elctrn. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353
† McLean Engrg., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550 609-799-0100
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 ... 813-822-2529
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, JAPAN 489-5333
Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, IL 60008 312-259-8700
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Papst Mechatronic Corp., Aquidneck Indl. Pk., Newport, RI 02840 401-849-5930
§ Paragon Elect., 606 Parkway Blvd., Two Rivers, WI 54241 414-793-1161
§ Rapidsyn, 3233 Roymar Rd., Oceanside, CA 92054 619-439-7500
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008 619-438-3321
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000

† Stock Drive Prods., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk, NY 11040 ..... 516-328-0200;328-3300
§† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Synchronous, Polarized — See Motors, Synchronous (Vol. B)

Motors, Timing — See Motors, Clock & Timing (Vol. B)

Motors, Torque (Incl. Torquers)-3500

† Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803, 516-694-6700 ..... B•1131
Airpax Corp., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ..... B•1138
Axial Magnetics, 15922 Strathern, Van Nuys, CA 91406, 818-994-3346 ... B•1139
Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072, 201-933-0220 ..... B•1141
Buehler Products, Inc., P. O. Box 33400, Raleigh, NC 27606, 919-469-8522 ..... B•1142
Canon U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, 516-488-6700 ..... B•1143
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 ..... B•1144
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ..... B•1146
IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ..... B•1161
† Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141, 703-639-2495 ..... B•1163
† Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 818-887-7700 ..... B•1168
† Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ..... B•1172-1175
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 ..... B•1184
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506, 201-427-3100 ..... B•1185
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ..... B•1187
† Sierracin/Magnedyne, 2250 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008, 619-438-3321 ..... B•1189
Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 ..... B•1192
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073, 619-428-5581 ..... B•1199
Aeroflex Labs., Microelctrns. Div., 35 S. Service Rd., Plainview, NY 11803 516-694-6700
† AMETEK, Dynamics Division, AMETEK, Inc., 5649 Peck Rd, Arcadia, CA 91006 818-442-5981
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 80 39th Street, Brooklyn, NY 11232 718-965-0770
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618 312-478-3515
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
Cramer Co., Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
† Dresser Inds., 1505 Elm St., Dallas, TX 75201 214-746-6000
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343 612-931-2700
§ Harowe Servo Controls, Bowmar Inst. Corp., Westtown Rd. at West Chester Pike, W. Chester, PA 19380 215-692-2700
Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
HHK Ind., Telan Int., Rte. 611, P. O. Box 690, Plumsteadville, PA 18949 .. 215-766-0990
Howard Industries, MSL Ind., Inc., Box 287, Milford, IL 60953 815-889-4105
† Inland Motor Division, Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635 602-459-1150
† Inland Motor, Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
§ Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 818-991-6111
Micronel U.S., 2142F Industrial Ct., Sycamore Research Center, Vista, CA 92083 619-727-7400
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
† Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171

Motors, Universal, AC or DC Operation-3500

† AMETEK, Dynamics Division, AMETEK, Inc., 5649 Peck Rd, Arcadia, CA 91006 818-442-5981
† Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618 312-478-3515
§ Carter Motor, 2707 W. George St., Chicago, IL 60618-7898 312-588-7700
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† Howard Industries, MSL Ind., Inc., Box 287, Milford, IL 60953 815-889-4105
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 ... 813-822-2529
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
† Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
† Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348

Motors, (MIL)-2440

† Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ..... B•1172-1175
Baldor Electric Company, P.O. Box 2400, Fort Smith, AR 72901 501-646-4711
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
† HHK Ind., Telan Int., Rte. 611, P. O. Box 690, Plumsteadville, PA 18949 .. 215-766-0990
† IMC Magnetics Corp., Eastern Div., 570 Main St, Westbury, NY 11590 .. 516-334-7070
Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141 703-639-2495
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010

Mounts, Antenna-1900 — *See Vol. D*

Mounts, CRT & Accessories-2500 — *See Vol. C*

Mounts, Crystal-2300 — *See Vol. A*

Mounts, Integrated Circuit — See Sockets, Integrated Circuit (Vol. C), Boards, Plug-In (Vol. C)

Mounts, Microwave-3450 — *See Vol. A*

Mounts, Mobile Antenna — See Mounts, Antenna (Vol. D)

Mounts, Satellite Antennas-1900 — *See Vol. D*

Mounts, Shock & Vibration-2825 — *See Vol. C*

Mounts, Thermistor-5300

Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..... B•1683
§† Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701 617-872-8841
§† Globe Plastics, 1342 S. Signal Dr., Pomona, CA 91766 714-623-2747
§† Harris Corp., PRD Elctrns. Div., 6801 Jericho Tpke., Syosset, NY 11791 516-364-0400
Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
M/A-Com Millimeter Products, M/A-Com, Inc., Second Avenue, Burlington, MA 01803 617-272-3000
Maury Microwave, 8610 Helms Ave., Cucamonga, CA 91730 714-987-4715
† Microlab/FXR, 10 Microlab Rd., Livingston, NJ 07039 201-992-7700
Micro Plastics Inc., Hwy 178 North, Flippin, AR 72634 ... 501-453-2261;1-800-643-2356
† Premier Microwave, 35 New Broad St., Port Chester, NY 10573 914-939-8900
Weinschel Engrg., One Weinschel La., Gaithersburg, MD 20877 ..... 301-948-3434; 800-638-2048

Mounts, Transistor (Incl. Kits) — See Pads, Transistor Mounting (Vol. C)

Mouse Devices — See Controls, Computer Input (Vol. D)

Multibus — See Board Computers & Subassemblies, Multibus (Vol. D)

Multiplexers, Analog-2325 — *See Vol. D*

Multiplexers, Digital-2325 — *See Vol. D*

Multiplexers, Fiber Optic-2475

§† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1121
American Photonics Inc., 71 Commerce Dr., Brookfield Center, CT 06805 203-775-8950
Atlantic Scientific Corp., 2711 S. Harbour City Blvd., Melbourne, FL 32901 305-725-8000
Aydin Corp., 700 Dresher Rd., Horsham, PA 19044 215-657-7510
† CATEL Telecommunications, United Scientific Corp., 4800 Patrick Henry Dr., Santa Clara, CA 95054 408-988-7722
§ Coastcom, P.O. Box 27068, Concord, CA 94527 415-825-7500
Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
Kinetic Sys., 11 Maryknoll Dr., Lockport, IL 60441 815-838-0005
Poly-Scientific, Litton Inds., 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
RE Instruments Corp., 31029 Center Ridge Rd., Westlake, OH 44145 ... 216-871-7617
Toyo Comm. Equip. Co., Ltd., No. 8 Mori Bldg., 20-4, Nichi-Shimbashi, 3-Chome Minato-Ku, TOKYO, JAPAN 105 ..... 03-459-7320/03-459-7310

Multiplexers, Frequency Division-1900 — *See Vol. D*

Multiplexers, Statistical-1900 — *See Vol. D*

Multiplexers, Time Division-1900 — *See Vol. D*

Multiplexers, Transmission-1900 — *See Vol. D*

Multiplexers, Video-1900 — *See Vol. D*

Multipliers, Analog-2325 — *See Vol. D*

Multipliers, Channel Electron-2325 — *See Vol. D*

Multipliers, Crystal-1900 — *See Vol. D*

Multipliers, Diode-1900 — *See Vol. D*

Multipliers, Frequency-3450 — *See Vol. A*

Multipliers, Hall-4800 — *See Vol. A*

Multipliers, Magnetic Analog-2200 — *See Vol. D*

Multipliers, Meter-2900 — *See Vol. D*

Multipliers, Servo-4900 — *See Vol. D*

Nameplates-2450

Acromark, 60 Locust/Dept. 397, Berkeley Hgts., NJ 07922 201-464-6474
† Bell Co., Inc., 106 Morrow Ave., Box 92E, Trussville, AL 35173 205-655-2135
§† Berg, W. M., Inc., 499 Ocean Ave., East Rockaway, NY 11518 516-599-5010
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 414-332-8100
§† Brady, W. H., Co., Indl. Prods. Div., 2221 W. Camden Rd., Milwaukee, WI 53201 414-351-6630
† Devco Engrg., Control Sys. Div., 36 Pier Lane West, Fairfield, NJ 07006 ..... 201-CA8-0321
§ Duralith, 525 Orange St., Millville, NJ 08332 609-825-6900
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
† GM Nameplate, Inc., 2040 15th Ave. West, Seattle, WA 98119 206-284-2200
Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
† GraphTec Services, Inc., 1600 N.W. Madrid Way, Boca Raton, FL 33432 305-392-3373
The Hall Company, 420 East Water St., Urbana, OH 43078 513-652-1376
† Hallmark Nameplate, Inc./Electropanel Co., 1855 New Highway, Farmingdale, NY 11735 516-454-0700
† JRW Inds., Inc., 2312 N Second St., Harrisburg, PA 17110 717-236-1418
§† Kepro Circuit Sys., 630 Axminister Dr., Fenton, MO 63026 314-343-1630
§† Mechanical Engraving, 4500 Bullard Ave, Bronx, NY 10470 212-324-4455
Memtron Technologies, Inc., 1400 Weiss St., Frankenmuth, MI 48734 ... 517-652-2652
† The Meyercord Co., 365 E. North Ave., Carol Stream, IL 60188 312-682-6200
§† Miller Dial Corp., 4400 N. Temple City Blvd., El Monte, CA 91734 818-283-5111
† Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
§ PacTec Div., LaFrance Corp., Enterprise & Executive Avenues, Philadelphia, PA 19153 215-365-8400
Pannier Corp., Graphics Div., John Fitch Industrial Park, Warminster, PA 18974 215-672-3600
† Photo Chem. Prods. Cal., 18031 Susana Rd., Compton, CA 90224 213-603-0400
Photronic Labs., Secor Rd., Brookfield Ctr., CT 06805 203-775-0465
† Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Sterling Instr., Div. Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 516-328-3300
† Topflight, 160 East 9th Ave., York, PA 17404 800-233-9386
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 312-585-1212
Won Tronics, Apollo Magnetics Corp., 2720 W. Beverly Blvd., Los Angeles, CA 90057 213-381-2500

Networks, Computer, Local Area-2000 — *See Vol. D*

Networks, Crossover, Attenuator (Audio)-1300 — *See Vol. D*

Networks, Directional Antenna Phasing-1900 — *See Vol. D*

Networks, Hybrid-2000 — *See Vol. D*

Networks, Hybrid Substrates-3130 — *See Vol. A*

Networks, Ladder-4700 — *See Vol. A*

Networks, LC-2700 — *See Vol. A*

Networks, Line Impedance Stabilization-1900 — *See Vol. D*

Networks, Matching-1900 — *See Vol. D*

Networks, Phase-2700 — *See Vol. A*

Networks, Pulse Forming-2700 — *See Vol. A*

Networks, Rejection — See Filters (Vol. A)

Networks, RC-2000 — *See Vol. D*

Networks, Resistance-4700 — *See Vol. A*

Networks, Resistance, Trimmer-4700 — *See Vol. A*

Networks, Resistance, Voltage Divider-4700 — *See Vol. A*

Networks, Video-2700 — *See Vol. A*

Networks, (MIL), Resistance-2440

CTS Corporation, Berne Division, 406 Parr Rd., Berne, IN 46711, 219-589-3111 ..... A•1837,1839,1841,1844
§† Allen-Bradley Co., Electronics Group, Rockwell Corporation, 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
Allen-Bradley Co., Electronics Group, Div.of Rockwell Corp., Microelectronic Products Div., Highway 29 N. Bryan Pk. Exit, Greensboro, NC 27410 919-621-9010
§† Dale Electronics, Inc., El Paso Div., P.O. Box 26728, El Paso, TX 79926 915-592-3253
Kelvin, 5919 Noble Ave., Van Nuys, CA 91411 818-782-6662
† Northwest Microcircuits, Inc., 2115 N. College, Newberg, OR 97132 503-538-7081
† Res-Net, 110 Route 10, Whippany, NJ 07981 ..... 201-887-2260;out of state 800-526-0704

Null Detectors — See Indicators, Null (Vol. D)

Nuts, Metal-2825 — *See Vol. C*

Nuts, Plastic — See Fasteners, Nonmetallic (Vol. C)

Oils — See Lubricants (Vol. C)

Optical Breadboards-4200 — *See Vol. C*

Optical Component Mounts & Accessories-3700

† Math Assocs., 2200 Shames Dr., Westbury, NY 11590, 516-334-6800 .... B•1124
§ Aerotech, Inc., 101 Zeta Dr., Pittsburgh, PA 15238 412-963-7470
Amphenol, An Allied Co., 43 Commerce Ct., Lisle, IL 60532 312-983-3500
Angenieux Inc., 120 Derry Rd., Hudson, NH 02051 603-889-2116
† Balzers Optical Grp., 170 Locke Dr., Marlboro, MA 01752 617-481-9860
Barry Controls, Barry Wright Corp., 700 Pleasant St., Watertown, MA 02172 617-923-1150
§ BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
† D. O. Industries, 317 E. Chestnut St., E. Rochester, NY 14445 716-385-4920
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377 212-458-5811
§† General Cable Co., Fiber Optics Div., 160 Fieldcrest Ave., Raritan Ctr., Edison, NJ 08818 201-225-4780
Jan Hardware Mfg. Co., 47-27 36th St., Long Island City, NY 11101 212-361-0800
† KLC/Karl Lambrecht Corp., 4204 N. Lincoln Ave., Chicago, IL 60618 312-472-5442
§† Lenox Laser, 504 Pittsfield Rd., Lenox, MA 01240 413-637-0444
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-261-5600
Noll, J. A. Co., P.O. Box 312, Monroeville, PA 15146 412-733-1009
§ Optics for Research, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4480
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Oriel Corp., 250 Long Beach Blvd., Stratford, CT 06497-0872 203-377-8282
Photobell, 26 Just Rd., Fairfield, NJ 07006 201-227-3613
Photon, Inc., 14125 Capri Dr. # 4, Los Gatos, CA 95030 408-866-0566
† Pomfret Research Optics, 817 Long Ridge Rd., Stamford, CT 06902 203-322-6386
Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961
SpecTran Corp., 50 Hall Road, Sturbridge, MA 01566 617-347-2261
† Teledyne Camera Sys., 131 N. Fifth Ave., Arcadia, CA 91006 818-359-6691
3D Optics, Box 224, 4 Strathmore Cir., Braintree, MA 02184 617-848-8002
† Unique Optical Co., Diversified Optical Corp., P.O. Box 585, Farmingdale, NY 11735 516-420-0288
† Carl Zeiss, Inc., One Zeiss Drive, Thornwood, NY 10594 914-681-7670

Optical-Coupler Isolators — See Isolators, Opto (Vol. B)

Optical Design Service — See Services, Optical Design

Optical Radiation Measuring-2900 — *See Vol. D*

Optical Signal Sources — See Generators, Light Pulse (Vol. D)

Oscillators, Audio (Module)-2300 — *See Vol. A*

Oscillators, Audio (Test) — See Generators, Audio (Vol. D)

Oscillators, Beat Frequency (BFO)-2300 — *See Vol. A*

Oscillators, Bias-2300 — *See Vol. A*

Oscillators, Cavity-2300 — *See Vol. A*

Oscillators, Clock-2300 — *See Vol. A*

Oscillators, Crystal Controlled (Module)-2300 — *See Vol. A*

Oscillators, Digitally Compensated Crystal (DCXO)-2300 — *See Vol. A*

Oscillators, Decade (Test)-2900 — *See Vol. D*

Oscillators, LC-2300 — *See Vol. A*

Oscillators, Low Frequency (Module)-2300 — *See Vol. A*

Oscillators, Microwave-3450 — ***See Vol. A***

Oscillators, Oven-2300 — ***See Vol. A***

Oscillators, Power (Module)-2300 — ***See Vol. A***

Oscillators, Programmable-2300 — ***See Vol. A***

Oscillators, Pulse (Module)-2300 — ***See Vol. A***

Oscillators, Pulse (Test) — See Generators, Pulse (Vol. D)

Oscillators, RC (Module)-2300 — ***See Vol. A***

Oscillators, Reed-2300 — ***See Vol. A***

Oscillators, RF (Module)-2300 — ***See Vol. A***

Oscillators, RF (Test) — See Generators, RF (Vol. D)

Oscillators, Sinusoidal (Module)-2300 — ***See Vol. A***

Oscillators, Sinusoidal (Test) — See Generators, Function (Vol. D)

Oscillators, Square Wave (Module)-2300 — ***See Vol. A***

Oscillators, Square Wave (Test) — See Generators, Function (Vol. D)

Oscillators, Sweep — See Generators, Sweep (Vol. D)

Oscillators, Telemetry-1900 — ***See Vol. D***

Oscillators, Temperature Compensated-2300 — ***See Vol. A***

Oscillators, Test Equipment — See Generators (Specific Types) (Vol. D)

Oscillators, Tuning Fork Controlled - Also see Resonators-2300 — ***See Vol. A***

Oscillators, UHF/VHF (Module)-2300 — ***See Vol. A***

Oscillators, UHF/VHF (Test) — See Generators, UHF/VHF (Vol. D)

Oscillators, Ultrasonic (Module)-2300 — ***See Vol. A***

Oscillators, Ultrasonic (Test) — See Generators, Ultrasonic (Vol. D)

Oscillators, Voltage Controlled Crystal (VCXO)-2300 — ***See Vol. A***

Oscillators (MIL), Crystal & Ovens-2440

Austron, Inc., P.O. Box 14766, Exit 248 N. IH 35, Austin, TX 78761, 512-251-2341 ..... A•1314

† Bliley Elec. Co., 2545 W. Grandview Blvd., Erie, PA 16506, 814-838-3571 ..... A•1323

Comstron Corp., 200 E. Sunrise Hwy., Freeport, NY 11520, 516-546-9700 ..... A•1328

CTS Electronics Corp.,, Knights Division, 400 Reimann Ave., Sandwich, IL 60548, 815-786-8411 ..... A•1341-1342,1344,1345,1346,1347,1348,1352,1353,1354

† Frequency and Time Systems, Inc., DATUM, INC., 34 Tozer Rd., Beverly, MA 01915, 617-927-8220 ..... A•1364, D•1148

† Frequency Elctrns., 55 Charles Lindbergh Blvd., Mitchel Field, NY 11553, 516-794-4500 ..... A•1367

† Hughes Solid State Products, 500 Superior Ave., Dept. E8, Newport Bch., CA 92658-8903, 714-759-2411 ..... A•1370

Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ..... A•1378

McCoy Electronics Co., Sub. Oak Technology Inc., 100 Watts St., P.O. Box B, Mt. Holly Springs, PA 17065, 717-486-3411 ..... A•1382

MF Elctrns. Corp., 10 Renewal Pl., New Rochelle, NY 10801, 914-576-6570 ..... A•1384

Microsonics Inc., 60 Winter St., Weymouth, MA 02188, 617-337-4200 .... A•1386

§† Monitor Prods. Co., Inc., Post Office Box 1966, Oceanside, CA 92054, 619-433-4510 ..... A•1388

† Piezo Technology Inc., 2525 Shader Rd., Orlando, FL 32804, 305-298-2000 ..... A•1413

† Q-Tech Corp., 2201 Carmelina Ave., Los Angeles, CA 90064, 213-820-4921 ..... A•1420

Spectrum Technology, Inc., 300 Lopez Rd., Goleta, CA 93116, 805-964-7791 ..... A•1438

† Vectron Labs., 166 Glover Ave., Norwalk, CT 06850, 203-853-4433 ..... A•1450-1451,1453,1454

Xsis Electronics, Inc., 12620 W. 63rd St., Shawnee, KS 66216, 913-631-0448 ..... A•1457

† Connor-Winfield Corp., 109 Turner Ct., POB L, W. Chicago, IL 60185 312-231-5270

Datum Inc., Timing/Aacom Divisions, 1363 S. State College Blvd., Anaheim, CA 92806 714-533-6333

Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377 212-458-5811

† FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 ..... 312-231-3511; 312-932-9380

† Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, PA 17055 717-766-0223

HDS Inc., 12310 Pinecrest Rd., Reston, VA 22091 703-620-6200

K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424

† Microwave/Sys., 1 Adler Dr., E. Syracuse, NY 13057 315-437-9951

† Ovenaire, Electronic Technologies Inc., 706 Forrest St., Charlottesville, VA 22901 804-977-8050

† Reeves-Hoffman Div., 400 W. North St., Carlisle, PA 17013 717-243-5929

† Valpey-Fisher, 75 South St, Hopkinton, MA 01748 617-435-6831

Oscillators (MIL), VCO, Solid State, RF-2440

Comstron Corp., 200 E. Sunrise Hwy., Freeport, NY 11520, 516-546-9700 ..... A•1328

† Frequency Elctrns., 55 Charles Lindbergh Blvd., Mitchel Field, NY 11553, 516-794-4500 ..... A•1367

Hughes Solid State Products, 500 Superior Ave., Dept. E8, Newport Bch., CA 92658-8903, 714-759-2411 ..... A•1370

Microsonics Inc., 60 Winter St., Weymouth, MA 02188, 617-337-4200 .... A•1386

† Q-Tech Corp., 2201 Carmelina Ave., Los Angeles, CA 90064, 213-820-4921 ..... A•1421

Andersen Labs., 1280 Blue Hills Ave., Bloomfield, CT 06002 203-242-0761

§† Avantek, Inc., 3175 Bowers Ave., Santa Clara, CA 95054 408-496-6710

† Aydin Corp., 700 Dresher Rd., Horsham, PA 19044 215-657-7510

† Central Microwave Co., Alpha Inds., Inc., 12180 Prichard Farm Rd., Maryland Heights, MO 63043 314-291-5270

† Communication Techniques Inc., 36 Route 10, East Hanover, NJ 07936 201-884-2580

Connor-Winfield Corp., 109 Turner Ct., POB L, W. Chicago, IL 60185 312-231-5270

Damon/Elctrns. Div., 80 Wilson Way, Westwood, MA 02090 617-329-2460

EFRATOM, a division of Ball Corp., 18851 Bardeen Ave, Irvine, CA 92715 714-752-2891

† Epsilon-Lambda Elctrns. Corp., 427 Stevens St., Geneva, IL 60134 312-232-9611

† Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, PA 17055 717-766-0223

HDS Inc., 12310 Pinecrest Rd., Reston, VA 22091 703-620-6200

K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424

† K & L Quartztek, K & L Microwave, 20 S. 48th Ave., Phoenix, AZ 85043 602-272-7944

† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620 714-739-0770

M/A-COM OSW, Inc., 2626 S. Hardy Dr., Tempe, AZ 85282 602-966-1471

§† Magnum Microwave Corp., 365 Ravendale Dr., Mountain View, CA 94043 415-968-9281

McCoy Electronics Co., Sub. Oak Technology Inc., 100 Watts St., P.O. Box B, Mt. Holly Springs, PA 17065 717-486-3411

† Microwave/Sys., 1 Adler Dr., E. Syracuse, NY 13057 315-437-9951

Monitor Prods. Co., Inc., Post Office Box 1966, Oceanside, CA 92054 ... 619-433-4510

† Ovenaire, Electronic Technologies Inc., 706 Forrest St., Charlottesville, VA 22901 804-977-8050

Texas Instrs., Data Sys. Group, P. O. Box 809063, Dallas, TX 75380-9063 1-800-527-3500

† TRAK Microwave, Western Division, 735 Palomar Ave, Dept. E-5, Sunnyvale, CA 94086 408-735-9660

† Valpey-Fisher, 75 South St, Hopkinton, MA 01748 617-435-6831

Varian Associates, Inc., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000

† Vectron Labs., 166 Glover Ave., Norwalk, CT 06850 203-853-4433

Oscillographs, Direct Writing-3000 — ***See Vol. D***

Oscilloscope Plug-ins-2975 — ***See Vol. D***

Oscilloscopes, Digital-2975 — ***See Vol. D***

Oscilloscopes, General Purpose-2975 — ***See Vol. D***

Oscilloscopes, High Frequency (Above 200 MHz)-2975 — ***See Vol. D***

Oscilloscopes, Low Frequency (DC to 3 MHz)-2975 — ***See Vol. D***

Oscilloscopes, Mid Frequency (DC to 200 MHz)-2975 — ***See Vol. D***

Oscilloscopes, Multibeam-2975 — ***See Vol. D***

Oscilloscopes, Multiple Channel-2975 — ***See Vol. D***

Oscilloscopes, Portable, Battery Operated-2975 — ***See Vol. D***

Oscilloscopes, Programmable-2975 — ***See Vol. D***

Oscilloscopes, Sampling-2975 — ***See Vol. D***

Oscilloscopes, Storage-2975 — ***See Vol. D***

Oscilloscopes, Triggered Sweep-2975 — ***See Vol. D***

Outlets, Electrical — See Boxes, Junction, Outlets & Wall Plates (Vol. C)

Outlets, Power, International-2100 — ***See Vol. C***

Ovens, Aging, Burn-in, Life Test-2550 — ***See Vol. D***

Ovens, Drying (for Electronic Instruments)-4100 — *See Vol. D*

Ovens, Crystal & Component-2300 — *See Vol. A*

Ovens, Electric — See Furnaces, Electric (Vol. D)

Ovens, Vacuum-4100 — *See Vol. D*

Packages, Integrated Circuit-3130 — *See Vol. A*

Packaging Materials, Antistatic-3800 — *See Vol. C*

Packaging Materials, Foam & Plastic-3800 — *See Vol. C*

Packaging Panels, Integrated Circuits — See Boards, Plug-in (Vol. C)

Packaging Services — See Services, Packaging (Vol. D)

Pads, L, T, & H — See Attenuators, Audio (Vol. D)

Pads, Transistor Mounting-2100 — *See Vol. C*

Paints, Conductive, Electric — See Coatings, Conductive, Electric (Vol. C)

Paints, Finishing-1600 — *See Vol. C*

Paints, Metallic, Conductive-1600 — *See Vol. C*

Paints, Radioactive — See Coatings, Radioactive (Vol. C)

Paints, Resistive-Also See Inks for Thick Film Microcircuits-1600 — *See Vol. C*

Panel Equipment — See Dials (Vol. C), Connectors (Vol. C), Jacks (Vol. C), Lights, Indicator (Vol. B), etc.

Panel Marking Kits — See Kits, Marking (Vol. C)

Panels, Back Lighted & Edge Lighted-2450

Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ..... **B•1046**

Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54703 715-834-9595
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 414-332-8100
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
Dontech Inc., 601-606 Airport Indl. Blvd., Doylestown, PA 18901 215-348-5010
§ Duralith, 525 Orange St., Millville, NJ 08332 609-825-6900
GM Nameplate, Inc., 2040 15th Ave. West, Seattle, WA 98119 206-284-2200
Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
GraphTec Services, Inc., 1600 N.W. Madrid Way, Boca Raton, FL 33432 305-392-3373
† Hallmark Nameplate, Inc./Electropanel Co., 1855 New Highway, Farmingdale, NY 11735 516-454-0700
Interface Products, Inc., 2185 S. Grand Ave., Santa Ana, CA 92705 714-549-4977
KMC Systems, Inc., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432 201-447-0007
† Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
Lehighton Elctrns., Inc., Box 328, Dept M, Lehighton, PA 18235 ..... 717-386-4156; 215-377-5990
§† Miller Dial Corp., 4400 N. Temple City Blvd., El Monte, CA 91734 818-283-5111
† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
OMNI Switch, Inc., 21630 N. 19th Ave., Suite B-20, Phoenix, AZ 85027 .. 602-582-0629
† Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
Photo Chem. Prods. Cal., 18031 Susana Rd., Compton, CA 90224 213-603-0400
Plasmarc Technologies, Inc., 180 Passaic Avenue, Fairfield, NJ 07006 .. 201-575-0870
† Screenprint/Dow, 271 Ballardvale St., Wilmington, MA 01887 617-935-6395
† Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560
Technical Panels, Inc., 9162 La Rosa Dr., Temple City, CA 91780 818-285-3105
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300

Panels, Electroluminescent-2450

Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ..... **B•1046**

§† Miller Dial Corp., 4400 N. Temple City Blvd., El Monte, CA 91734 818-283-5111
OMNI Switch, Inc., 21630 N. 19th Ave., Suite B-20, Phoenix, AZ 85027 .. 602-582-0629
Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560

Panels, Fuse-4300

Accurate Elctrns., 169 S. Abbe Rd., P.O. Box 1287, Elyria, OH 44036 216-365-1211
† Anchor Specialty Mfg. Inc., 300 Hollister Rd., Teterboro, NJ 07608 201-288-1939
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 ..... 201-428-8400; 800-526-9067
Doran Mfg. Co., 2851 Massachusetts Ave., Cincinnati, OH 45225 513-681-5424
Fil-Coil Economy Intl., Inc., 800 Axinn Ave., Garden City, NY 11530 516-228-9445
† GRIM Corporation, Box 67, Medford, NJ 08055 609-267-7950
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
§† Mechanical Engraving, 4500 Bullard Ave, Bronx, NY 10470 212-324-4455
National Tel-Tronics, State Road Hill, Meadville, PA 16335 814-724-6440
§ Ratelco, 1260 Mercer, Dept. EEM, Seattle, WA 98109 206-624-7770
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
§ Trimm, Inc., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048 312-362-3700
§ Underwriters Safety Device, Allied Amphenol Prods., 7300 W. Wilson Ave., Chicago, IL 60656 312-867-4600
§ The Wadsworth Elec. Mfg. Co., Inc., 20 W. 11th St., Covington, KY 41012 606-431-0900

Panels, IC Packaging — See Boards, Plug-in (Vol. C)

Panels, Jack-2100 — *See Vol. C*

Panels, Metal — See Enclosures, Circuit Board, Module & Relay Mounting (Vol. C)

Panels, Meter — See Enclosures, Circuit Board, Module, & Relay Mounting (Vol. C)

Panels, Patch — See Panels, Jack (Vol. C)

Panels, Power BUS for ICs-3200 — *See Vol. C*

Panels, Relay Rack — See Enclosures, Circuit Board, Module, & Relay Mounting (Vol. C)

Panels, Touch — See Touch Panels

Paper Tape Equipment, Punch-2000 — *See Vol. D*

Paper Tape Equipment, Reader-2000 — *See Vol. D*

Paper Tape Equipment, Reader/Punch-2000 — *See Vol. D*

Paper, Graphic Recording-3000 — *See Vol. D*

Paper, Thermal-2000 — *See Vol. D*

Patch Boards — See Boards, Programming (Vol. C)

Peak Sense & Hold Amplifiers — See Amplifiers, Peak Sense & Hold

Peltier (Thermoelectric) Heat Pumps — See Cooling/Heating Modules, Thermoelectric (Vol. B)

Perforators, Paper Tape (Electrically Powered)-2000 — *See Vol. D*

Phones — See Handsets, Chestsets, Headphones, Headsets, etc. (Vol. D)

Photocells & Phototubes — See Cells, Photoconductive (Vol. B)

Photodetectors, GaAs-3700

Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265, 214-995-3821 ..... **B•1219**

Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092 201-233-7200
Fiberoptic Fabrications, Inc., 70 Pullman St., Worcester, MA 01606 617-853-6449
Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400

Photoelectric Equipment — See Alarms, Controls, Photoelectric (Vol. B)

Photoelectric Tubes — See Cells, Photoconductive (Vol. B)

Photoemissive Detectors — See Cells, Photoemissive (Vol. B)

Photographic Services — See Services, Photographic (Vol. D)

Photometers — See Meters, Light (Vol. D)

Photomultiplier Tube Housings-5700 — *See Vol. A*

Photoresistors-3700

Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092 201-233-7200
Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400

Pickups, Magnetic, Proximity, Torque, Vibration, etc. — See Transducers, Specific Type (Vol. B)

Pickups, Telephone (For Recording)-1300 — *See Vol. D*

Piezoelectric Ceramics-2300 — ***See Vol. A***

Pilot Lights — See Lights, Indicator (Vol. B)

Pin Grid Arrays — See Sockets, Pin Grid Array

Pin Straighteners, Tube-5700 — ***See Vol. A***

Pins, Cotter, Dowel, Taper, etc.-2825 — ***See Vol. C***

Pins, Electrically Conductive-2100 — ***See Vol. C***

Pins, Mechanical-2825 — ***See Vol. C***

Plastic Raw Materials, Liquids, Pellets, Powders, Resins-1600 — ***See Vol. C***

Plastics, Encapsulating — See Compounds, Encapsulating, Molding, Potting (Vol. C)

Plastics Fabrication — See Services, Plastics Fabrication (Vol. D)

Plastics, Heat Shrinkable — See Caps, Forms & Tapes, Heat Shrinkable (Vol. C), Tubing, Heat Shrinkable (Vol. C)

Plastics, Custom Molding — See Services, Custom Molding, Plastic (Vol. D)

Plated Wire Memory Systems — See Memory Systems (Vol. D)

Plates, Instructional, Name, Silk Screen — See Nameplates (Vol. B)

Platforms, Thermal — See Thermal Platforms (Vol. D)

Plating Services — See Services, Plating (Vol. D)

Players, Magnetic Tape — See Recorders, Magnetic Tape (Vol. D)

Pliers-5400 — ***See Vol. C***

Plotters/Hard-Copy Devices-2000 — ***See Vol. D***

Plotters, X-Y, & Accessories-3000 — ***See Vol. D***

Plug & Jack Sets-2100 — ***See Vol. C***

Plug Adapters-2100 — ***See Vol. C***

Plug Buttons-2825 — ***See Vol. C***

Plug Caps & Shells-2100 — ***See Vol. C***

Plugboard Programming Systems — See Boards, Programming (Vol. C)

Plugs, Electrical (All Types)-2100 — ***See Vol. C***

Plugs, Fused-2100 — ***See Vol. C***

Plugs, Power, International-2100 — ***See Vol. C***

Plugs (MIL)-2440

† ADC Magnetic Controls Co., 4900 W. 78th St., Minneapolis, MN 55435 .. 612-835-6800
† Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
† Lynn Elctrns., 915 Pennsylvania Blvd., Feasterville, PA 19047 215-677-6700
§† M/A-COM Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054 603-424-4111
† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020

Pointers, Dial-2400 — ***See Vol. C***

Position Control Systems, Servo — See Controls, Servo Systems (Vol. D)

Positioning Systems, Multiple Axis, Computer Guided-4100 — ***See Vol. D***

Posts, Binding-2100 — ***See Vol. C***

Posts, Harness Board-6000 — ***See Vol. C***

Potentiometer Elements-4750 — ***See Vol. A***

Potentiometers, Air Operated-4750 — ***See Vol. A***

Potentiometers, Carbon Ceramic-4750 — ***See Vol. A***

Potentiometers, Carbon Film-4750 — ***See Vol. A***

Potentiometers, Ceramic Metal (CERMET)-4750 — ***See Vol. A***

Potentiometers, Composition, Carbon-4750 — ***See Vol. A***

Potentiometers, Conductive Plastic-4750 — ***See Vol. A***

Potentiometers, Hot Molded-4750 — ***See Vol. A***

Potentiometers, Hybrid-4750 — ***See Vol. A***

Potentiometers, Lab Type-4750 — ***See Vol. A***

Potentiometers, Linear-4750 — ***See Vol. A***

Potentiometers, Metal Film-4750 — ***See Vol. A***

Potentiometers, Metal, Glazed — See Potentiometers, Ceramic Metal (Vol. A)

Potentiometers, Motorized-4750 — ***See Vol. A***

Potentiometers, Multiturn-4750 — ***See Vol. A***

Potentiometers, Nonlinear-4750 — ***See Vol. A***

Potentiometers, Power — See Rheostats

Potentiometers, Rectilinear-4750 — ***See Vol. A***

Potentiometers, Servo Mount-4750 — ***See Vol. A***

Potentiometers, Sliding-4750 — ***See Vol. A***

Potentiometers, Trimmer-4750 — ***See Vol. A***

Potentiometers, Trimmer, Carbon Composition — See Potentiometers, Trimmer (Vol. A)

Potentiometers, Trimmer, Carbon Film — See Potentiometers, Trimmer (Vol. A)

Potentiometers, Trimmer, Ceramic Metal (CERMET) — See Potentiometers, Trimmer (Vol. A)

Potentiometers, Trimmer, Conductive Plastic — See Potentiometers, Trimmer (Vol. A)

Potentiometers, Trimmer, Hot Molded — See Potentiometers, Trimmer (Vol. A)

Potentiometers, Trimmer, Metal Film — See Potentiometers, Trimmer (Vol. A)

Potentiometers, Trimmer, Wirewound — See Potentiometers, Trimmer (Vol. A)

Potentiometers, Wirewound-4750 — ***See Vol. A***

Potentiometers (MIL)-2440

Bourns, Inc., Resistive Components Group, 1200 Columbia Ave., Riverside, CA 92507, 714-781-5050 ..... A•2000
Mallory Components Division, Emhart Elec./Elctrn. Grp., 3029 E. Washington St., Indianapolis, IN 46201, 317-261-1361 ..... A•2022
Mepco//Electra, Inc., North American Philips Corp., 11468 Sorrento Valley Rd., San Diego, CA 92121, 619-453-0332 ..... B•1008
† Allen-Bradley Co., Electronics Group, Rockwell Corporation, 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
Allen-Bradley Co., Electronics Group, Div. of Rockwell Corp., Resistive Products Div., 1414 Allen-Bradley Dr., El Paso, TX 79935 915-592-4888
† Carter Mfg. Corp., Sugar Rd., Bolton, MA 01740 617-779-5501
IET Labs, Inc., 534 Main St., Westbury, NY 11590 516-334-5959
† Litton Potentiometer Div., 750 So. Fulton Ave., Mt. Vernon, NY 10551 ... 914-664-7733

Power Amplifiers — See Amplifiers, Power

Power Entry Module — See Adaptors, US to European Power

Power Line Monitor Printers — See Printers, Event (Vol. D)

Power Distribution Modules-4000 — ***See Vol. D***

Power Modules-4000 — ***See Vol. D***

Power Receptacles — See Sockets, Power

Power Supplies, AC to DC Adapter-4000 — ***See Vol. D***

Power Supplies, AC Input, Up to 30 VDC Output-4000 — ***See Vol. D***

Power Supplies, AC Input, 31 to 300 VDC Output-4000 — ***See Vol. D***

Power Supplies, AC Input, 301 to 1,000 VDC Output-4000 — ***See Vol. D***

Power Supplies, AC Input, Greater than 1,000 VDC Output-4000 — *See Vol. D*

Power Supplies, AC Output-4050 — *See Vol. D*

Power Supplies, Bipolar-4000 — *See Vol. D*

Power Supplies, Constant Current-4000 — *See Vol. D*

Power Supplies, Constant Voltage — See Power Supplies, Linear (Vol. D)

Power Supplies, Constant Voltage/Constant Current-4000 — *See Vol. D*

Power Supplies, DC Input, AC Output — See Power Supplies, AC Output (Vol. D)

Power Supplies, DC Input, DC Output — See Converters, DC to DC (Vol. D)

Power Supplies, Encapsulated-4000 — *See Vol. D*

Power Supplies, Enclosed-4000 — *See Vol. D*

Power Supplies, Ferroresonant-4000 — *See Vol. D*

Power Supplies, High Voltage — See Power Supplies, AC Input, Greater than 1,000 VDC Output (Vol. D)

Power Supplies, Isolated-4000 — *See Vol. D*

Power Supplies, Lab (Incl. Metered Units)-4000 — *See Vol. D*

Power Supplies, Laser — See Power Supplies, AC Input, Greater than 1,000 VDC Output (Vol. D)

Power Supplies, Linear-4000 — *See Vol. D*

Power Supplies, Logic Level (Incl. Microprocessor) — See Power Supplies, AC Input, Up to 30 VDC Output (Vol. D)

Power Supplies, Microwave — See Power Supplies, AC Input, Greater than 1,000 VDC Output (Vol. D)

Power Supplies, Multiple Output-4000 — *See Vol. D*

Power Supplies, Open Frame-4000 — *See Vol. D*

Power Supplies, Photomultiplier — See Power Supplies, AC Input, Greater than 1,000 VDC Output (Vol. D)

Power Supplies, Plug In-4000 — *See Vol. D*

Power Supplies, Precision, Low Noise-4000 — *See Vol. D*

Power Supplies, Printed Circuit Card-4000 — *See Vol. D*

Power Supplies, Programmable-4000 — *See Vol. D*

Power Supplies, Proportional (to Input) Output-4000 — *See Vol. D*

Power Supplies, Redundant-4000 — *See Vol. D*

Power Supplies, Standby (Emergency)-4000 — *See Vol. D*

Power Supplies, Submodular-4000 — *See Vol. D*

Power Supplies, Switching-4000 — *See Vol. D*

Power Supplies, Switching, Battery Backup-4000 — *See Vol. D*

Power Supplies, Uninterruptable (UPS)-4050 — *See Vol. D*

Power Supplies, Wall Plug-in — See Power Supplies, Plug-in (Vol. D)

Power Supplies, Welding, Electroplating — See Power Supplies, AC Input, Greater than 1,000 VDC Output (Vol. D)

Power Supplies (MIL), DC-3475 — *See Vol. D*

Power Supplies for Displays — See Converters, DC to DC (Vol. D), Power Supplies, AC Output (Vol. D)

Power Supply Interfaces & Accessories-4000 — *See Vol. D*

Preamplifiers-1100 — *See Vol. D*

Prebonding Etchants — See Chemicals, Etching (Vol. C)

Preforms, Precious Metal-2825 — *See Vol. C*

Prescalers-2900 — *See Vol. D*

Preselector-Mixers-3450 — *See Vol. A*

Preselectors-1900 — *See Vol. D*

Pressure Vessels — See Chambers, Pressure (Vol. D)

Pressure Indicators — See Gauges, Pressure (Vol. D)

Pressurization Units — See Chambers, Pressure (Vol. D)

Printed Circuits & Printed Circuit Materials (MIL)-2440

§† **Injectorall Elctrns., 98-100 Glen St., Glen Cove, NY 11542, 516-671-6010** ..... C•1101

† Advanced Circuitry, Litton Inds., 4811 W. Kearney, Springfield, MO 65803 417-862-0751

Associated Circuits Inc., 621 Old County Rd., San Carlos, CA 94070 415-592-7528

Bally Electronics, Bally Mfg., 10750 W. Grand Ave., Franklin Park, IL 60131 312-451-7223

§† Bud Inds., Inc., 4605 E. 355th St., Willoughby, OH 44094 216-946-3200

† Compunetics, Inc., 2000 Eldo Rd., Monroeville, PA 15146 412-373-8110

† Cuplex, Inc., 1500 E. Hwy. 66, Garland, TX 75040 214-276-0333

† Dynacircuits Inc., 11230 W. Addison, Franklin Park, IL 60131 312-451-1700

† Elco Corp., Interconnect Systems Div., 2250 Park Pl., El Segundo, CA 90245 213-675-3311

§ Electronic Trend Prods., 10080 N. Wolfe Rd., Ste. 372, Cupertino, CA 95014 408-996-7401

† Granite State Circuits, Power Elctrns. Corp., P.O. Box 2208, 96 Milton Rd., Rochester, NH 03867 603-332-3334

† Honeywell Inc., Aerospace & Defense Grp., Honeywell Plaza, Minneapolis, MN 55408 612-870-5186

Lehighton Elctrns., Inc., Box 328, Dept M, Lehighton, PA 18235 .....717-386-4156; 215-377-5990

NAZ-DAR Intl., 1087 N. Branch St., Chicago, IL 60622 312-943-8338

† Parlex Corp., 145 Milk St., Methuen, MA 01844 ..... 617-685-4341, ext. 325

Power Elctrns., 96 Milton Rd., Rochester, NH 03867 603-332-3334

§ Sumitronics, Inc., Sumitomo Corporation, 1270 Oakmead Pkwy. Ste. 201, Sunnyvale, CA 94086 408-737-7683

T.D.S. Circuits, Inc., 6290 Sunset Blvd., #1126, Los Angeles, CA 90028 213-463-5170

† Teknational Inds., Inc., 430 S. Clinton Ave., Rochester, NY 14620 716-232-1291

† West-Tronics, Inc., 215 Park St., Bensenville, IL 60106 312-860-3560

Printer/Plotters-2000 — *See Vol. D*

Printers, Daisywheel-2000 — *See Vol. D*

Printers, Digital-2000 — *See Vol. D*

Printers, Dot Matrix Impact-2000 — *See Vol. D*

Printers, Event-3000 — *See Vol. D*

Printers, Thermal-2000 — *See Vol. D*

Printers, Line — See Printers, Digital (Vol. D)

Printers, Page-2000 — *See Vol. D*

Printers, Serial-2000 — *See Vol. D*

Printing, Dry Transfer — See Kits, Marking (Vol. C)

Probe Cards, Semiconductor Testing-4100 — *See Vol. D*

Probes, Hall-4800 — *See Vol. A*

Probes, High Voltage (1,000 Volts & Over)-2900 — *See Vol. D*

Probes, IC-2900 — *See Vol. D*

Probes, Logic Test-2900 — *See Vol. D*

Probes, Microwave-3450 — *See Vol. A*

Probes, Oscilloscopes-2975 — *See Vol. D*

Probes, RF-2900 — *See Vol. D*

Probes, Temperature-2900 — *See Vol. D*

Probes, Test Lead-2900 — *See Vol. D*

Process Control Systems-2200 — *See Vol. D*

Processors, Array — See Array Processors (Vol. D)

Processors, Communications, Front End-1900 — *See Vol. D*

Processors, Communications, Message Switching-1900 — *See Vol. D*

Processors, Communications, Network Node-1900 — *See Vol. D*

Processors, Communications, Standalone-1900 — *See Vol. D*

Processors, Image-2000 — *See Vol. D*

Program Board Connectors — See Connectors, Plug-in, Program Board (Vol. C)

Programmers, Cam & Drum-2200 — *See Vol. D*

Programmers, Matrix Boards — See Boards, Programming (Vol. C)

Programmers, Power-2200 — *See Vol. D*

Programmers, Power Supply-4000 — *See Vol. D*

Programmers, PROM & Logic Array-3130 — *See Vol. A*

Programmers, Punched Card-2000 — *See Vol. D*

Programmers, Tape-2000 — *See Vol. D*

PROM Programmers — See Programmers, PROM & Logic Array (Vol. A)

Protectors, Brownout-4300

Behlman Engineering, 1142 Mark Ave., Carpinteria, CA 93013, 805-684-8311 ..... D•1898
† Controlled Power Co., 1955 Stephenson Hwy., Troy, MI 48083, 1-800-521-4792 ..... D•1911,1913,1914,1915
§ Displex, Inc., Alexander Place, Glen Cove, NY 11542, 516-671-4400 ..... D•1619
Elgar Corp, An Onan McGraw Edison Co., 9250 Brown Deer Rd., San Diego, CA 92121, 619-450-0085 ..... D•1918
Hipotronics, P.O. Drawer A, Brewster, NY 10509, 914-279-8091 ..... D•1934
Pacific Power Source Corp., 15122 Bolsa Chica St., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•1949,1951,1952
† RTE Deltec Corp., 2727 Kurtz St., San Diego, CA 92110, 619-291-4211;800-854-2659 ..... D•1959
Sola, A Unit of General Sign., 1717 Busse Rd., Elk Grove Village, IL 60007, 312-439-2800 ..... D•1964
Abacus Controls Inc., 89 Readington Rd., Somerville, NJ 08876 201-526-6010
Active Control Instrmn., P.O. Box 243-Wildwood Circle, Key Largo, FL 33037 305-451-1000
Albar, Inc., 19013 36th Ave. W., Lynnwood, WA 98036 206-771-4006
Ansco, 1243 West 134th St, Gardena, CA 90247 .... 1-800-421-1270;1-800-821-3308; 213-532-7780
Automatic Switch Co., 50-60 Hanover Road, Florham Park, NJ 07932 1-201-966-2000
Brooks Mktg. Corp., 3569 Bristol Pike Bldg. 2 Ste 102, Bensalem, PA 19020 ..... 215-244-0264;1-800-523-1551
Clary Corp., Precision Instrs. Div., 320 W. Clary Ave., San Gabriel, CA 91776 818-287-6111
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
EFI Corporation, 350 West 2700 South, Salt Lake City, UT 84115 801-486-5871
§ Elite Electronics, Inc., 1408 Summit - Suite #5, Plano, TX 75074 214-881-0026
Powermark, 3855 Ruffin Rd., San Diego, CA 92123 619-565-8363
§ Power-One, Inc., Power-One Switching Products, 833 Flynn Rd., Camarillo, CA 93010 805-482-0757
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
† Superior Elec. Co., 383 Middle St., Bristol, CT 06010 203-582-9561
Sylvania GTE Control Devices, Rte. 35, Standish, ME 04084 207-642-4535
Topaz Electronics, 9192 Topaz Way, San Diego, CA 92123-1164 619-279-0831

Protectors, Surge — See Suppressors, Transient Voltage

Proximity Transducers — See Current Sensors (Vol.), Transducers, Volt, etc.

Public Address Systems-1300 — *See Vol. D*

Pullers, Circuit Board-5400 — *See Vol. C*

Pullers, Tube-5400 — *See Vol. C*

Pulleys-2500 — *See Vol. C*

Pulsers, Diode — See Power Supplies, AC Input, Greater than 1,000 VDC Output (Vol. D)

Pulsers, Logic Test-2900 — *See Vol. D*

Pumps, Vacuum-4100 — *See Vol. D*

Punches, Chassis-5400 — *See Vol. C*

Pyrometers, Infrared-2900 — *See Vol. D*

Pyrometers, Optical, Noninfrared-5300

J-B-T Instrs., Box 1818, New Haven, CT 06508, 203-776-1111 ..... D•1358
Modutec, 18 Marshall St., Norwalk, CT 06854, 203-853-3636 ..... D•1363
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..... B•1683-1967, D•1374
Triplett Corp.-A Penril Co., One Triplett Dr., Bluffton, OH 45817-9987, 419-358-5015 ..... D•1380
Acme Elec. Heating Corp., 4685 E. 11th, Hialeah, FL 33013 305-685-8326
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
Beede Electrical Instr. Co., S. Main St., Penacook, NH 03303 603-753-6362
§ Capintec Instrs., 6 Arrow Rd., Ramsey, NJ 07446 201-825-9500
§ Epic, Inc., 150 Nassau St., New York, NY 10038 212-349-2470
Gulton Inds., Inc., Graphic Instruments Div., Gulton Ind'l. Pk., E. Greenwich, RI 02818 401-884-6800
† Kollsman Instr., 220 Daniel Webster Hwy., Merrimack, NH 03054 603-889-2500
§ Larson Instr., Greenbush Rd., Orangeburg, NY 10962 914-359-3800
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
Mikron Instr., Box 211, Ridgewood, NJ 07451 201-891-7330
§ Syscon Intl., Inc., 1108 So. High St., So. Bend, IN 46618-1096 ..... 219-232-3900; 800-348-2993

Pyrometers, Recording-2900 — *See Vol. D*

Q Bus — See Board Computers & Subassemblies (Vol. D)

Quartz, Fused-2500 — *See Vol. C*

Quartz, Raw — See Crystals, Quartz (Vol. A)

Racks, Aging — See Ovens, Aging, Burn-in, Life Test (Vol. D)

Racks, Cabinet — See Enclosures, Equipment & Panel Mounting (Vol. C)

Racks, Circuit Board — See Enclosures, Circuit Board, Module & Relay Mounting (Vol. C)

Racks, Desk & Console — See Enclosures, Equipment & Panel Mounting (Vol. C)

Racks, Module — See Enclosures, Circuit Board, Module & Relay Mounting (Vol. C)

Racks, Relay & Mounting — See Enclosures, Circuit Board, Module & Relay Mounting (Vol. C)

Radar Homing & Warning (RHAW) Systems (MIL)-3475 — *See Vol. D*

Radar Forward-Looking Infrared (FLIR) Sets (MIL)-3475 — *See Vol. D*

Radar Intercept (MIL)-3475 — *See Vol. D*

Radar Systems (MIL), Elint-3475 — *See Vol. D*

Radar System Components-3450 — *See Vol. A*

Radio Communications Systems — See Communications Systems (Vol. D)

Radiographic Equip. — See X-ray Inspection Equip. (Vol. D)

Radiometers-2900 — *See Vol. D*

Radomes & Windows, Microwave-3450 — *See Vol. A*

Reactors, Charging-5600 — *See Vol. A*

Reactors, Epitaxial — See Machines & Accessories, Semiconductor Manufacturing (Vol. D)

Reactors, Filter-5600 — *See Vol. A*

Reactors, Loading-5600 — *See Vol. A*

Reactors, Saturable-1800 — *See Vol. A*

Reactors (MIL)-2440

† Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, NY 10550 914-699-2000
† Magnetek, 7315 Red Deer Dr., Boulder, CO 80301-4696 303-442-6700
§† Microtran Co. Inc., 145 E. Mineola Ave., Valley Stream, NY 11580 516-561-6050
† NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
† NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865 201-454-2600
† Oram Electronics, 12 Cranston Rd., Pittsford, NY 14534 716-381-4673
† Torotel Prods. Inc., 13402 S. 71 Hwy., Grandview, MO 64030 816-761-6314

§† Transformer & Coil Products, TRW Electronic Assemblies Division, 150 Varick St, New York, NY 10013 212-255-3500

Readers, Badge-2000 — *See Vol. D*

Readers, Bar Code-2000 — *See Vol. D*

Readers, Character-2000 — *See Vol. D*

Readers, Magnetic Card-2000 — *See Vol. D*

Readers, Magnetic Stripe Card-2000 — *See Vol. D*

Readers, Punched Card-2000 — *See Vol. D*

Readers, Punched Tape-2000 — *See Vol. D*

Readers, Static Card-2000 — *See Vol. D*

Readers, Time Code-2000 — *See Vol. D*

Readouts — See Tubes, Readout (Vol. A)

Reamers-5400 — *See Vol. C*

Receivers, AM/FM (Incl. Precision Test)-2900 — *See Vol. D*

Receivers, Communication-1900 — *See Vol. D*

Receivers, Fiber Optic-2475

† Math Assocs., 2200 Shames Dr., Westbury, NY 11590, 516-334-6800 .... B•1124
† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1121
American Photonics Inc., 71 Commerce Dr., Brookfield Center, CT 06805 203-775-8950
Artel Communications Corp., 93 Grand St, Worcester, MA 01602 617-752-5690
§ Augat Fiberoptics, 710 Narragansett Park Dr., Pawtucket, RI 02861 401-724-4400
Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092 201-233-7200
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Dymec, 8 Lowell Ave., Winchester, MA 01890 617-729-7870
† Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000
† General Optronics, 3005 Hadley Rd., So. Plainfield, NJ 07080 201-549-9000
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
LeCroy Resch. Sys. Corp., 700 S. Main St, Spring Vly., NY 10977 914-425-2000
§† M/A-COM Laser Diode, Inc., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
Manage, Inc., Fibre Optics Elctrns. Sys. Grp., P.O. Box 175, 40 Nichols Rd., Chicopee, MA 01014 ..... 413-598-8204;592-3834
Ortel Corp., 2015 W. Chestnut St, Alhambra, CA 91803 818-281-3636
Photodyne, 1175 Tourmaline Dr., Newbury Park, CA 91320 818-889-8770
† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621
SpecTran Corp., 50 Hall Road, Sturbridge, MA 01566 617-347-2261
Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265 214-995-3821
Times Fiber Communications, Inc., 358 Hall Ave., P.O. Box 384, Wallingford, CT 06492-0384 203-265-8500

Receivers, Field Intensity, Microwave — See Receivers, Microwave (Vol. D)

Receivers, Fixed Frequency-2900 — *See Vol. D*

Receivers, Frequency Shift-1900 — *See Vol. D*

Receivers, Headphone — See Handsets, etc. (Vol. D)

Receivers, Loran & Omega-1900 — *See Vol. D*

Receivers, Microwave-3400 — *See Vol. D*

Receivers, Monitoring, Communications-1900 — *See Vol. D*

Receivers, NBS-2900 — *See Vol. D*

Receivers, Telemetry-1900 — *See Vol. D*

Receivers, Tone-1900 — *See Vol. D*

Receivers, TV — See Monitors, Video (Vol. D)

Receivers (MIL)-3475 — *See Vol. D*

Receivers (MIL), Acoustic Intercept-3475 — *See Vol. D*

Receivers (MIL), Digital Warning-3475 — *See Vol. D*

Receivers, (MIL), ECM-3475 — *See Vol. D*

Receivers (MIL), Elint-3475 — *See Vol. D*

Receivers (MIL), ESM-3475 — *See Vol. D*

Receivers (MIL), Handoff-3475 — *See Vol. D*

Receivers (MIL), IFM-3475 — *See Vol. D*

Receivers (MIL), IR Warning-3475 — *See Vol. D*

Receivers (MIL), Missile Launch Warning-3475 — *See Vol. D*

Receivers (MIL), Radar Warning-3475 — *See Vol. D*

Receivers (MIL), Radio-3475 — *See Vol. D*

Receivers (MIL), Recon-3475 — *See Vol. D*

Receivers (MIL), Search-3475 — *See Vol. D*

Receivers (MIL), Shipboard-3475 — *See Vol. D*

Receivers (MIL), Submarine-3475 — *See Vol. D*

Receivers (MIL), Surveillance-3475 — *See Vol. D*

Receivers (MIL), Warning-3475 — *See Vol. D*

Receptacles — See Connectors (Vol. C), Jacks (Vol.), Sockets

Receptacles, Power — See Sockets, Power

Recognition Equipment, Speech-2000 — *See Vol. D*

Recorders, Computer Data-2000 — *See Vol. D*

Recorders, Electrostatic-3000 — *See Vol. D*

Recorders, Event/Multievent-3000 — *See Vol. D*

Recorders, FM — See Recorders, Magnetic Tape (Vol. D)

Recorders, Graphic — See Recorders, Specific Types (Vol. D)

Recorders, Magnetic Tape-2000 — *See Vol. D*

Recorders, Polar-3000 — *See Vol. D*

Recorders, Program Loading-2000 — *See Vol. D*

Recorders, Pyrometer — See Pyrometers, Recording (Vol. D)

Recorders, Sound Level-1300 — *See Vol. D*

Recorders, Strip Chart-3000 — *See Vol. D*

Recorders, Transient-3000 — *See Vol. D*

Recorders, Vibration-3000 — *See Vol. D*

Recorders, Video-1900 — *See Vol. D*

Recorders, X-Y — See Plotters X-Y (Vol. D)

Recorders (MIL), Magnetic Tape-3475 — *See Vol. D*

Recorders (MIL), RHAW-3475 — *See Vol. D*

Recording Systems (MIL)-3475 — *See Vol. D*

Rectifiers, Bridges & Assemblies-4800 — *See Vol. A*

Rectifiers, Copper Oxide-4800 — *See Vol. A*

Rectifiers, Copper Sulfide-4800 — *See Vol. A*

Rectifiers, Electron Tube — See Tubes, Rectifying (Vol. A)

Rectifiers, Germanium-4800 — *See Vol. A*

Rectifiers, Selenium-4800 — *See Vol. A*

Rectifiers, Silicon-4800 — *See Vol. A*

Rectifiers, Silicon Controlled — See Thyristors (Vol. A)

Rectifiers, Ultrafast-4800 — *See Vol. A*

Rectifiers (MIL), Semiconductor-2440

Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 ..... A•2089
† TRW Optoelectronics Div., 1207 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ..... A•2094
† Voltage Multipliers, Inc., 8711 W. Roosevelt Ave., Visalia, CA 93291, 209-651-1402 ..... A•2097
† Elctrn. Devices, 21 Gray Oaks Ave., Yonkers, NY 10710 914-965-4400
† NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
Philips ECG, Inc., 100 First Ave., Waltham, MA 02254 617-890-6107
Semicon, 10 North Ave., Burlington, MA 01803 617-272-9015
§† Semtech, 652 Mitchell Rd., Newbury Park, CA 91320 213-628-5392
§ Texet Semiconductors, 301 Texet Dr., Allen, TX 75002 214-727-1111

Reducers, Speed — See Gear Heads & Speed Reducers

Reels, Tape — See Tape Recording Accessories (Vol. D)

Reference Books — See Technical Books (Vol. D)

References, DC Voltage-2900 — *See Vol. D*

Refrigerants, Spray-1600 — *See Vol. C*

Refrigerated Cooling Equipment — See Air Conditioners (Vol. C)

Refrigerators, Environmental Test-2550 — *See Vol. D*

Regulators, Current-4000 — *See Vol. D*

Regulators, Frequency-4050 — *See Vol. D*

Regulators & References, Silicon-Also See Diodes, Zener & Stabistors-4800 — *See Vol. A*

Regulators & Stabilizers, Voltage-Also See Transformers, Voltage Regulating-4000 — *See Vol. D*

Relays, Antenna — See Relays, RF (Incl. Antenna & Coaxial) (Vol. B)

Relays, Audio Operated — See Relays, Frequency Selective (Vol. B)

Relays, Coaxial — See Relays, RF (Vol. B)

Relays, Contact — See Relays, Power (Vol. B)

Relays, Cradle-4500

§ Schrack North America Corp., 3 Westchester Plaza, Elmsford, NY 10533, 914-592-1305 ..... B•1444
Telemecanique, Inc., Allied Control Products, 100 Relay Rd., Plantsville, CT 06479, 203-621-6771 ..... B•1450
§ American Zettler, 16881 Hale Ave., Irvine, CA 92714 714-660-1670
§† Aromat Corp., 250 Sheffield St, Mountainside, NJ 07092 201-232-4260
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211 408-747-0550
§ Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376 ... 312-282-5500
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
§ Sigma Instrs., 170 Pearl St, Braintree, MA 02184 617-843-5000

Relays, Crystal Can, 1/2 Crystal Can-4500

§† Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ..... B•1263
American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ..... B•1268
Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 ..... B•1282
§† Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ..... B•1300
§† Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501, 206-574-5000 ..... B•1346
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1471 ..... B•1370
§† Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114, 203-522-8600 ..... B•1398
§† Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
Telemecanique, Inc., Allied Control Products, 100 Relay Rd., Plantsville, CT 06479, 203-621-6771 ..... B•1454
Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
† Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
† Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803 914-738-1611
§† Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620 714-739-0770
Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§† Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
† Sigma Instrs., 170 Pearl St, Braintree, MA 02184 617-843-5000
† Solid State Elctrns. Corp., 18646 Parthenia St, Northridge, CA 91324 ... 818-993-8257

Relays, Current Sensing-4500

§ American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ..... B•1268
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 ..... B•1293
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379, 203-599-2075 ..... B•1323
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1471 ..... B•1370,1372,1373
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376, 312-282-5500 ..... B•1438
Schrack North America Corp., 3 Westchester Plaza, Elmsford, NY 10533, 914-592-1305 ..... B•1444
Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
† Acromag, 30765 Wixom Rd., Wixom, MI 48096 313-624-1541
Airpax Corp., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313 305-587-1100
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
† American Aerospace Controls, 570 Smith St., Farmingdale, NY 11735 .. 516-694-5100
Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
§† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
† Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
Basler Elec., Rte. 143, Highland, IL 62249 618-654-2341
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
Crompton Instrs., 2763 Higgins Road, Elk Grove Village, IL 60007 714-841-2901
Crompton Instrs., Hawker Siddley, 2763 Old Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350 805-252-8330
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5360
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§ Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001 516-328-9292
§† Heinemann Elec. Co., Brunswick Pike, Alt. Rte. # 1, P.O.Box 6800, Lawrenceville, NJ 08648-0800 609-882-4800
INRESCO, Inc., 654 Ocean Road, Pt. Pleasant, NJ 08742 201-892-5881
Instrumentation & Control Sys., 520 Interstate Rd, Addison, IL 60101 312-543-6200
§ ITT Components Electromechanical Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705 714-836-0351
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 .....201-291-3334; 800-221-0714
§ Larson Instr., Greenbush Rd., Orangeburg, NY 10962 914-359-3800
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620 714-739-0770
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
§ Sigma Instrs., 170 Pearl St, Braintree, MA 02184 617-843-5000
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947 219-722-2244
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-864-3700
§ Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191
† Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668

Relays, Differential-4500

§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
§† Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248 213-532-3092
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
Basler Elec., Rte. 143, Highland, IL 62249 618-654-2341
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803 914-738-1611
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379 203-599-2075
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001 516-328-9292
§ La Marche Mfg., 106 Bradrock Dr., Des Plaines, IL 60018 312-299-1188

§ Larson Instr., Greenbush Rd., Orangeburg, NY 10962 914-359-3800
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071 609-589-7500
† Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668

Relays, Frequency Selective-4500

§† Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248 213-532-3092
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
• Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
Crompton Instrs., 2763 Higgins Road, Elk Grove Village, IL 60007 714-841-2901
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379 203-599-2075
Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001 516-328-9292
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620 714-739-0770
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 818-992-6776
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 ... 818-993-8257
† Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-864-3700
§ Tetragenics, Box 1338, Butte, MT 59701 406-782-8606
† Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668

Relays, General Purpose-4500

Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ..... B•1263
§ American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ..... B•1264
Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704, 714-556-6570 ..... B•1275
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 ..... B•1277-1289,1294
§ Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153, 312-865-5200 ..... B•1296
Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ..... B•1305
§ Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ..... B•1298
§ Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470, 201-256-2000 ..... B•1309
§ Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215, 414-671-6800 ... B•1320
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ..... B•1332
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 ..... B•1344
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ..... B•1350
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1471 ..... B•1372
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, 201-743-6800 ..... B•1376,1378,1379
§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756, 501-636-5000 ..... B•1381
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1384
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607, 312-243-1100 ..... B•1386
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 ..... B•1389,1588
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1390
Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114, 203-522-8600 ..... B•1398
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211, 408-747-0550 ..... B•1408
§ IEI-ISKRA Electronics, Inc., 222 Sherwood Ave., Farmingdale, NY 11735, 516-753-0400 ..... B•1413
§ ITT Components Electromechanical Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705, 714-836-0351 ..... B•1414-1417,1419
ITT Components Passive Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705, 714-836-0351 ..... B•1418,1420,1421,1423
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ..... B•1428
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003, 213-232-8221 ..... B•1430
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376, 312-282-5500 ..... B•1438
Microelectronic Relays, Inc., 1300 S. Beacon St., San Pedro, CA 90731, 213-831-2331 ..... B•1439
§ Schrack North America Corp., 3 Westchester Plaza, Elmsford, NY 10533, 914-592-1305 ..... B•1444
§ Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947, 219-722-2244 ..... B•1447
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
Telemecanique, Inc., Allied Control Products, 100 Relay Rd., Plantsville, CT 06479, 203-621-6771 ..... B•1450-1451,1453,1456,1457
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§ Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248 213-532-3092
§† Associated Engrg. Mfg., 546 Valley Rd., Upper Montclair, NJ 07043 201-783-7800
§ ATR Elctrns., Inc., P.O. BOX 7008, St. Paul, MN 55107 ... 612-738-6520;414-297-7374
Automatic Switch Co., 50-60 Hanover Road, Florham Park, NJ 07932 1-201-966-2000
Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
Cardinal Control Co., 110 Kensington Rd, Kensington, CT 06037 203-828-6379
§ Cornell-Dubilier Electronics, 150 Avenue "L", Newark, NJ 07105 201-589-7500
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
Davis Elec. Co., Box 38, Cape Girardeau, MO 63701 314-335-5547
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379 203-599-2075
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8300
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Electromatic Controls Corp., 2495 Pembroke Road, Hoffman Estates, IL 60195-2010 312-882-5757
§† Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501 206-574-5000
Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861 .. 401-727-1300
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§† Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§† Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ Interconnect Devices, Inc., 5101 Richland Ave., Kansas City, KS 66106 .. 913-342-5544
§ International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 .....201-291-3334; 800-221-0714
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 818-992-6776
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
§† Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 ... 818-993-8257
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ Syracuse Elctrns., P.O. Box 4770, Syracuse, NY 13221 315-488-4911
§ Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077
Tran-Trol Co., 2525 N. Alvernon Way, C-6, Tucson, AZ 85712 602-795-8008
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
§ Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000
§ Zenith Controls, 830 West 40th St., Chicago, IL 60609 312-247-6400

Relays, High Voltage (500 Volts & Over)-4500

† Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 ..... B•1307
Coto Corporation, 55 DuPont Drive, Providence, RI 02907, 401-943-2686 ..... B•1310
§ Crydom Division, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245, 213-322-4987 ..... B•1312
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379, 203-599-2075 ..... B•1323,1327
Dow-Key Microwave Corporation, 1110 Mark Ave., Carpenteria, CA 93013-2918, 805-684-4560 ..... A•1710
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ..... B•1337
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, 201-743-6800 ..... B•1375,1377
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 ..... B•1424-1425,1610
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140, 805-684-4560 ... B•1426
§† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008, 408-377-4621 ..... B•1443
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449

Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
Automatic Switch Co., 50-60 Hanover Road, Florham Park, NJ 07932 1-201-966-2000
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, NY 10550 914-699-2000
Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5300
§ Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001 516-328-9292
§† Interconnect Devices, Inc., 5101 Richland Ave., Kansas City, KS 66106 913-342-5544
§ International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
Macrotronix, Inc., 4016 N. Home St., Mishawaka, IN 46545 219-256-5503
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376 312-282-5500
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
MSI Electronics, Inc., 34-32 57th St., Woodside, NY 11377 212-672-6500
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ..... 201-797-3313;800-526-5376
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209 513-871-3777
§ Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077
§ Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191

Relays, Hybrid-4500

§ Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 ..... B•1345
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1471 ..... B•1370
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ..... B•1428
§ Microelectronic Relays, Inc., 1300 S. Beacon St., San Pedro, CA 90731, 213-831-2331 ..... B•1439
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248 213-532-3092
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
† Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Control Engrg., Inc., 1686 Riverdale St., West Springfield, MA 01089 413-781-1330
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379 203-599-2075
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350 805-252-8330
§ Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501 206-574-5000
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 312-354-1040
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§ Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114 203-522-8600
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211 408-747-0550
§ La Marche Mfg., 106 Bradrock Dr., Des Plaines, IL 60018 312-299-1188
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
Macrotronix, Inc., 4016 N. Home St., Mishawaka, IN 46545 219-256-5503
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376 312-282-5500
Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897-0730 203-834-8227
Teledyne Microelectronics, 12964 Panama St., Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
§† Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077
Tran-Trol Co., 2525 N. Alvernon Way, C-6, Tucson, AZ 85712 602-795-8008
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000

Relays, Impulse — See Relays, Stepping (Vol. B)

Relays, I/O Modules — See Modules, I/O Relays (Vol. A)

Relays, Latching-4500

Amerace Corp., Elastimold Div., Newburg Rd., P.O. Box 503, Hackettstown, NJ 07840, 201-852-1122 ..... D•1111
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 ..... B•1280,1282,1283,1285,1286
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ..... B•1304
§ Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215, 414-671-6800 ..... B•1320
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379, 203-599-2075 ..... B•1326
§ Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ..... B•1335
§† Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501, 206-574-5000 ..... B•1346
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1471 ..... B•1370
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1394
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 ..... B•1424
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003, 213-232-8221 ..... B•1430
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376, 312-282-5500 ..... B•1438
§ Schrack North America Corp., 3 Westchester Plaza, Elmsford, NY 10533, 914-592-1305 ..... B•1444
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
Telemecanique, Inc., Allied Control Products, 100 Relay Rd., Plantsville, CT 06479, 203-621-6771 ..... B•1453
A.D. Data Sys., Techtran Industries, 200 Commerce Dr., Rochester, NY 14623 716-334-9649
Advanced Components Inds., Inc., 114 Center St., El Segundo, CA 90245 213-322-4249
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§ Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
§ American Zettler, 16881 Hale Ave., Irvine, CA 92714 714-660-1670
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
AT&T, 1 Oak Way, Berkeley Heights, NJ 07922 1-800-372-2447
† Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§† Communications Instrs., Inc., Box 520, Fairview, NC 28730 704-628-1711
† Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803 914-738-1611
Control Engrg., Inc., 1686 Riverdale St., West Springfield, MA 01089 413-781-1330
§ Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
† Dow-Key Microwave Corporation, 1110 Mark Ave., Carpenteria, CA 93013-2918 805-684-4560
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8300
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electro Design Sys., 100 W. 35th St., Ste. S, National City, CA 92050 619-420-2351
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5300
Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211 408-747-0550
Information Transfer Indl., Box 357, Holcomb, NY 14469 716-657-7074
§ ITT Components Electromechanical Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705 714-836-0351
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140 805-684-4560
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 ..... 201-291-3334; 800-221-0714
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 818-992-6776
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600

§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§† Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ..201-797-3313;800-526-5376
Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
† Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 ... 818-993-8257
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947 219-722-2244
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209 513-871-3777
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897-0730 203-834-8227
§† Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077
Thomson-CSF Comps. Corp., Socapex Div., 6660 Variel Ave., Canoga Pk, CA 91303 213-887-0750
§† Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 203-677-1311
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
§ Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191
§ Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000
§ ZI-TECH Instr. Corp., 2151 Park Blvd., Box 60490, Palo Alto, CA 94306 415-326-2151

Relays, Mercury-Wetted Contacts-4500

§† Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ..... B•1302-1304,1306
Coto Corporation, 55 DuPont Drive, Providence, RI 02907, 401-943-2686 ..... B•1311
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379, 203-599-2075 ..... B•1325
§ Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ..... B•1332-1333,1335,1336
§ Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 ..... B•1344
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ..... B•1368
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, 201-743-6800 ..... B•1375,1377
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 .... B•1339,1588
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376, 312-282-5500 ..... B•1438
§ Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
AT&T, 1 Oak Way, Berkeley Heights, NJ 07922 1-800-372-2447
† Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
† Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803 914-738-1611
§ COSAR, 3121 Benton St., Garland, TX 75042 ..... 214-276-9487;800-527-1207
Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
Electro Design Sys., 100 W. 35th St., Ste. S, National City, CA 92050 619-420-2351
§ Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501 206-574-5000
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001 516-328-9292
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 818-992-6776
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ..201-797-3313;800-526-5376
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
§† Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071 609-589-7500
Thomson-CSF Comps. Corp., Socapex Div., 6660 Variel Ave., Canoga Pk, CA 91303 213-887-0750
§ Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191

Relays, Meter-4500

Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 ..... B•1588
§ Jewell Electrical Instrs., Grenier Field, Manchester, NH 03108, 603-669-6400 ..... D•1359
NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110, 312-426-5900 ..... B•1089, D•1069,1127,1159,1365,1367
§ Simpson Elec. Co., 853 Dundee Ave., Elgin, IL 60120, 312-697-2260 ..... D•1377
Texmate, Inc., 348 S. Cedros Ave., P.O. Box 2000, Solana Beach, CA 92075, 619-481-7177 ..... D•1378
A & D Elec. Instrs., 73-07 88th St., Glendale, NY 11385 718-275-6516
Airpax Corp., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313 305-587-1100
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
Analogic Corp., 8 Centennial Dr., Peabody, MA 01961 .....617-532-5660;617-777-4500; 617-246-0300;800-451-1
§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
ARGA Controls, 35 E. Glenarm St., Pasadena, CA 91105 213-682-3314
§ Beede Electrical Instr. Co., S. Main St., Penacook, NH 03303 603-753-6362
Calex Mfg. Co., Inc., 3355 Vincent Rd., Pleasant Hill, CA 94523 415-932-3911
Crompton Instrs., 2763 Higgins Road, Elk Grove Village, IL 60007 714-841-2901
Crompton Instrs., Hawker Siddley, 2763 Old Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
§ Data Tech, Div. of Penril Corp., 3110 W. Segerstrom, Santa Ana, CA 92704 714-546-7160
DCI Inc., 14812 W. 117th Street, P.O. Box 215, Olathe, KS 66061 913-782-5672
§ Electro Industries, Div. E.I. Elctrns., Inc., 1800 Shames Drive, Westbury, NY 11590 516-334-0870
§† International Instruments, General Resistance, Inc., Twin Lakes Rd, P.O. Box 185, N. Branford, CT 06471 203-481-3450
§ Larson Instr., Greenbush Rd., Orangeburg, NY 10962 914-359-3800
§ LFE, Process Control Div., 55 Green St., Clinton, MA 01510 617-835-1000
Martel Elctrns. Corp., 13 Heritage Hill Rd., Windham, NH 03087 .....800-821-0023; 617-275-5970
§ Newport Electronics, 630 E. Young St., Santa Ana, CA 92705 714-540-4914
Q.V.S., Inc., 20 North 15th St., East Orange, NJ 07017 201-673-3996
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Sigma Instrs., Intl. Instr. Div., 88 Marsh Hill Rd., Orange, CT 06477 203-795-4711
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071 609-589-7500

Relays, Motor Start-4500

Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153, 312-865-5200 ..... B•1297
Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1396
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379 203-599-2075
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861 .. 401-727-1300
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§† Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ ITT Components Electromechanical Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705 714-836-0351
§ KB Elctrns., 73 Wortman Ave., Brooklyn, NY 11207 718-257-3300
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
§ Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
Macrotronix, Inc., 4016 N. Home St., Mishawaka, IN 46545 219-256-5503
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376 ... 312-282-5500
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947 219-722-2244
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071 609-589-7500
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
§ Vectrol, Division of Westinghouse Elec. Corp., 110 Douglas Rd, Oldsmar, FL 33557 813-855-4621
Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000

Relays, Phase Sensing-4500

§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ..... B•1428
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§† Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248 213-532-3092
§† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
† Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
Bluffton Products, Inc., Tegam, Inc., 7230 North Ridge Road, Madison, OH 44057 216-946-3572
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
Crompton Instrs., 2763 Higgins Road, Elk Grove Village, IL 60007 714-841-2901
Crompton Instrs., Hawker Siddley, 2763 Old Higgins Rd., Elk Grove Village, IL 60007 312-593-1107

§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St, Milwaukee, WI 53216 414-449-7487
§ Electromatic Controls Corp., 2495 Pembroke Road, Hoffman Estates, IL 60195-2010 312-882-5757
§† Furnas Elec., 1197 McKee St, Batavia, IL 60510 312-879-6000
§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§† Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114 203-522-8600
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 ..... 201-291-3334; 800-221-0714
† Logitek, Inc., 101 Christopher St., Ronkonkoma, NY 11779 516-467-4200
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ..... 201-797-3313;800-526-5376
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071 609-589-7500
§ Syracuse Elctrns., P.O. Box 4770, Syracuse, NY 13221 315-488-4911
† Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-864-3700
† Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668

Relays, Plug-in-4500

† Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ..... B•1263
§ American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ..... B•1268
Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704, 714-556-6570 ..... B•1275
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 ..... B•1290
§ Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153, 312-865-5200 ..... B•1296
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ..... B•1306
† Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 ..... B•1307
§ Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215, 414-671-6800 ..... B•1320
§† Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501, 206-574-5000 ..... B•1346
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ..... B•1353,1360,1361,1362,1363,1364
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1471 ..... B•1371
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ..... B•1384
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607, 312-243-1100 ..... B•1386
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1391
§ IEI-ISKRA Electronics, Inc., 222 Sherwood Ave., Farmingdale, NY 11735, 516-753-0400 ..... B•1413
ITT Components Passive Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705, 714-836-0351 ..... B•1421
§ Schrack North America Corp., 3 Westchester Plaza, Elmsford, NY 10533, 914-592-1305 ..... B•1444
§† Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
Tapeswitch Corp. of America, 100 Schmitt Blvd., Farmingdale, NY 11735, 516-694-6312 ..... B•1699
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248 213-532-3092
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
† Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§† Communications Instrs., Inc., Box 520, Fairview, NC 28730 704-628-1711
Cornell-Dubilier Electronics, 150 Avenue "L", Newark, NJ 07105 201-589-7500
§ Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379 203-599-2075
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St, Milwaukee, WI 53216 414-449-7487
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5300
§ Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§† Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§† Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211 408-747-0550
Information Transfer Indl., Box 357, Holcomb, NY 14469 716-657-7074
ISL Products Int'l, Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 516-822-9601
§ ITT Components Electromechanical Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705 714-836-0351
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 ..... 201-291-3334; 800-221-0714
§ La Marche Mfg., 106 Bradrock Dr., Des Plaines, IL 60018 312-299-1188
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376 312-282-5500
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 818-992-6776
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 818-993-8257
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947 219-722-2244
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§† Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
Ziatech, 3433 Roberto Ct., San Luis Obispo, CA 93401 805-541-0488

Relays, Power-4500

Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ..... B•1263
§ American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ..... B•1265-1266,1268,1273,1274
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 ..... B•1276-1279,1290,1291,1292,1293,1294
ATR Elctrns., Inc., P.O. BOX 7008, St. Paul, MN 55107, 612-738-6520;414-297-7374 ..... D•1889
§ Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153, 312-865-5200 ..... B•1297
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ..... B•1306
Compac, 279 Skidmore Rd., Deer Park, NY 11729, 516-667-3933 ..... A•1707
§ Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215, 414-671-6800 ..... B•1320
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379, 203-599-2075 ..... B•1326,1329
† Dow-Key Microwave Corporation, 1110 Mark Ave., Carpenteria, CA 93013-2918, 805-684-4560 ..... A•1710
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ..... B•1337
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 ..... B•1345
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ..... B•1359
Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1471 ..... B•1372
§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756, 501-636-5000 ..... B•1380
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ..... B•1384
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1393,1396
Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114, 203-522-8600 ..... B•1398
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211, 408-747-0550 ..... B•1408
ITT Components Passive Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705, 714-836-0351 ..... B•1421
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 ..... B•1424-1425,1610
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140, 805-684-4560 ..... B•1426
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003, 213-232-8221 ..... B•1430
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376, 312-282-5500 ..... B•1438
§ Opto 22, 15461 Springdale St., Huntington Bch., CA 92649, 714-891-5861 ..... B•1441
§† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008, 408-377-4621 ..... B•1443
§ Schrack North America Corp., 3 Westchester Plaza, Elmsford, NY 10533, 914-592-1305 ..... B•1444
§ Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947, 219-722-2244 ..... B•1447
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
Telemecanique, Inc., Allied Control Products, 100 Relay Rd., Plantsville, CT 06479, 203-621-6771 ..... B•1450
Advanced Components Inds., Inc., 114 Center St, El Segundo, CA 90245 213-322-4249
Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371

Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§† Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248 213-532-3092
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
Automatic Switch Co., 50-60 Hanover Road, Florham Park, NJ 07932 1-201-966-2000
† Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
Basler Elec., Rte. 143, Highland, IL 62249 618-654-2341
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§ Communications Instrs., Inc., Box 520, Fairview, NC 28730 704-628-1711
Crompton Instrs., 2763 Higgins Road, Elk Grove Village, IL 60007 714-841-2901
Crompton Instrs., Hawker Siddley, 2763 Old Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
Cross Elctrns., 100 Commonwealth Dr., Warrendale, PA 15086 412-776-1591
§ Crydom Division, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245 213-322-4987
Davis Elec. Co., Box 38, Cape Girardeau, MO 63701 314-335-5547
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501 206-574-5000
§ Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861 401-727-1300
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
Fasco Industries, Inc., Div. of Hawker Siddeley Grp. Plc., 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§† Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
§ ITT Components Electromechanical Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705 714-836-0351
§ ITT General Controls Div., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201 213-842-6131
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 ..... 201-291-3334; 800-221-0714
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§ Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Microelectronic Relays, Inc., 1300 S. Beacon St., San Pedro, CA 90731 213-831-2331
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
§ Power Control, 122 Gamma Dr., Pittsburgh, PA 15238 412-782-3120
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ..... 201-797-3313;800-526-5376
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 818-993-8257
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Syracuse Elctrns., P.O. Box 4770, Syracuse, NY 13221 315-488-4911
Teledyne Microelectronics, 12964 Panama St., Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
§† Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077
Tran-Trol Co., 2525 N. Alvernon Way, C-6, Tucson, AZ 85712 602-795-8008
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
† Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000
Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668
§ Zenith Controls, 830 West 40th St., Chicago, IL 60609 312-247-6400

Relays, Printed Circuit Mounting (Incl. Transistor & DIP Case Types)-4500

§ American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ..... B•1264
Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704, 714-556-6570 ..... B•1275
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 ..... B•1276-1288,1290,1291,1293,1294,1295
§ Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153, 312-865-5200 ..... B•1296
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ..... B•1302
Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ..... B•1298
† Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 ..... B•1307
§ Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470, 201-256-2000 ..... B•1309
Coto Corporation, 55 DuPont Drive, Providence, RI 02907, 401-943-2686 ..... B•1310
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379, 203-599-2075 ..... B•1323
§ Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ..... B•1332
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 ..... B•1344
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638, 609-393-8350 ..... B•1348
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ..... B•1350
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1471 ..... B•1370
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, 201-743-6800 ..... B•1375
§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756, 501-636-5000 ..... B•1381
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ..... B•1384
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607, 312-243-1100 ..... B•1386
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 ..... B•1389
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1390
§† Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114, 203-522-8600 ..... B•1398
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211, 408-747-0550 ..... B•1411
§ ITT Components Electromechanical Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705, 714-836-0351 ..... B•1414-1417,1419
ITT Components Passive Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705, 714-836-0351 ..... B•1418,1420,1421,1423
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376, 312-282-5500 ..... B•1438
§ Opto 22, 15461 Springdale St., Huntington Bch., CA 92649, 714-891-5861 ..... B•1441
§ Schrack North America Corp., 3 Westchester Plaza, Elmsford, NY 10533, 914-592-1305 ..... B•1444
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209, 513-871-3777 ..... B•1448
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
Telemecanique, Inc., Allied Control Products, 100 Relay Rd., Plantsville, CT 06479, 203-621-6771 ..... B•1456
§ Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992, 219-563-2191 ..... B•1460
Advanced Components Inds., Inc., 114 Center St., El Segundo, CA 90245 213-322-4249
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248 213-532-3092
AT&T, 1 Oak Way, Berkeley Heights, NJ 07922 1-800-372-2447
† Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§ Cornell-Dubilier Electronics, 150 Avenue "L", Newark, NJ 07105 201-589-7500
§ COSAR, 3121 Benton St., Garland, TX 75042 ..... 214-276-9487;800-527-1207
§ Crydom Division, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245 213-322-4987
Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215 414-671-6800
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
Electro Design Sys., 100 W. 35th St., Ste. S, National City, CA 92050 619-420-2351
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
§ Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501 206-574-5000
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§† Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
INRESCO, Inc., 654 Ocean Road, Pt. Pleasant, NJ 08742 201-892-5881
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 ..... 201-291-3334; 800-221-0714
Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
Macrotronix, Inc., 4016 N. Home St., Mishawaka, IN 46545 219-256-5503

§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Microelectronic Relays, Inc., 1300 S. Beacon St, San Pedro, CA 90731 .. 213-831-2331
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
MSI Electronics, Inc., 34-32 57th St, Woodside, NY 11377 212-672-6500
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Philips ECG, Inc., 100 First Ave., Waltham, MA 02254 617-890-6107
§† Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Preferred Elctrns., Inc., Main Line Dr, P.O. Box 954, Westfield, MA 01086 413-568-2301
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
Solid State Relays, 213 Eisenhower Lane So., Lombard, IL 60148 312-932-1660
§ Stancor/Hamilton Standard Controls, 131 Godfrey St, Logansport, IN 46947 219-722-2244
§† Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077
Thermosen, P.O. Box 1254, Stamford, CT 06904 203-324-6125
Thomson-CSF Comps. Corp., Socapex Div., 6660 Variel Ave., Canoga Pk, CA 91303 213-887-0750
Vanguard Relay Corp., 225 Cortland St, Lindenhurst, NY 11757 516-226-5000

Relays, Programmable-4500

Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302, 818-992-6776 ..... A•1715
Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
§ American Control Products, Div. of Precision Timer Co., Inc., 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
§ Bristol Saybrook, 97 Coulter St, Old Saybrook, CT 06475 203-388-3414
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
CDS - Colorado Data Sys., 3301 W. Hampden, Unit C, Englewood, CO 80110 303-762-1640
CYTEC Corp., 107 N. Washington St, E. Rochester, NY 14445 716-381-4740
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§ Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114 203-522-8600
Information Transfer Indl., Box 357, Holcomb, NY 14469 716-657-7074
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 203-677-1311

Relays, RF (Incl. Antenna & Coaxial)-4500

§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 ..... B•1278-1461,1295
§† Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ..... B•1298,1301
Compac, 279 Skidmore Rd., Deer Park, NY 11729, 516-667-3933 ..... A•1707
† Daico Inds., Inc., Box 5225, Compton, CA 90224, 213-631-1143 ..... A•1708
§† Dow-Key Microwave Corporation, 1110 Mark Ave., Carpenteria, CA 93013-2918, 805-684-4560 ..... A•1710
§ Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ..... B•1337
§† Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501, 206-574-5000 ..... B•1347
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1471 ..... B•1370
Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1390
Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114, 203-522-8600 ..... B•1398
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 ..... B•1424-1425,1610
Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140, 805-684-4560 ... B•1426
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376, 312-282-5500 ..... B•1438
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302, 818-992-6776 ..... A•1715
§ Automatic Connector, Inc., 400 Moreland Rd., Commack, NY 11725 516-543-5000
CDS - Colorado Data Sys., 3301 W. Hampden, Unit C, Englewood, CO 80110 303-762-1640
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
§ COSAR, 3121 Benton St., Garland, TX 75042 ..... 214-276-9487;800-527-1207
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
CYTEC Corp., 107 N. Washington St, E. Rochester, NY 14445 716-381-4740
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5300
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
INRESCO, Inc., 654 Ocean Road, Pt. Pleasant, NJ 08742 201-892-5881
§† Microwave Filter Inc., 6743 Kinne St., East Syracuse, NY 13057-0486 ....315-437-3953; 800-448-1666
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
Rockwell Intl., Commercial Elctrns. Opers., 1200 N. Alma Rd., Richardson, TX 75081 214-996-5000
§† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§† Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077
Thermosen, P.O. Box 1254, Stamford, CT 06904 203-324-6125
Transco Products, Inc., 4241 Glencoe Ave., Marina del Rey, CA 90295 .. 213-822-0800
Vanguard Relay Corp., 225 Cortland St, Lindenhurst, NY 11757 516-226-5000
§ Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191

Relays, Reed-4500

§ American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ..... B•1273
Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ..... B•1303
† Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 ..... B•1307
Coto Corporation, 55 DuPont Drive, Providence, RI 02907, 401-943-2686 ..... B•1310
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379, 203-599-2075 ..... B•1323
§ Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ..... B•1332
§ Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 ..... B•1344
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ..... B•1365
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, 201-743-6800 ..... B•1375
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 ..... B•1389-1379,1588
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1390
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376, 312-282-5500 ..... B•1438
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209, 513-871-3777 ..... B•1448
§† Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
§ Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992, 219-563-2191 ..... B•1460
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
AT&T, 1 Oak Way, Berkeley Heights, NJ 07922 1-800-372-2447
§ ATR Elctrns., Inc., P.O. BOX 7008, St. Paul, MN 55107 ... 612-738-6520;414-297-7374
† Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
§ COSAR, 3121 Benton St., Garland, TX 75042 ..... 214-276-9487;800-527-1207
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electro Design Sys., 100 W. 35th St., Ste. S, National City, CA 92050 619-420-2351
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
§ Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
§† Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501 206-574-5000
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756 501-636-5000
Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
Information Transfer Indl., Box 357, Holcomb, NY 14469 716-657-7074
INRESCO, Inc., 654 Ocean Road, Pt. Pleasant, NJ 08742 201-892-5881
§ Interconnect Devices, Inc., 5101 Richland Ave., Kansas City, KS 66106 .. 913-342-5544
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 818-992-6776
§ MKS Electronics Corp., 454 E. Donovan Rd., Kansas City, KS 66115 913-371-1351
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
§† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621

§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 ... 818-993-8257
Solid State Relays, 213 Eisenhower Lane So., Lombard, IL 60148 312-932-1660
† SR Engineering, Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Thermosen, P.O. Box 1254, Stamford, CT 06904 203-324-6125
Thomson-CSF Comps. Corp., Socapex Div., 6660 Variel Ave., Canoga Pk, CA 91303 213-887-0750
§† Wheelock, Inc., 273 Branchport Ave., Long Branch, NJ 07740 201-222-6880

Relays, Sealed-4500

§ American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ..... B•1264-1267,1271,1272,1273,1274
Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ..... B•1302,1304
Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 ..... B•1307
§ Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470, 201-256-2000 ..... B•1309
Coto Corporation, 55 DuPont Drive, Providence, RI 02907, 401-943-2686 ..... B•1310
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379, 203-599-2075 ..... B•1323
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ..... B•1336
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ..... B•1353-1337,1360,1365,1366,1367,1368
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1471 ..... B•1370
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607, 312-243-1100 ..... B•1386
Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1390
Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114, 203-522-8600 ..... B•1398
§ ITT Components Electromechanical Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705, 714-836-0351 ..... B•1414-1417,1419
ITT Components Passive Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705, 714-836-0351 ..... B•1418,1420,1423
Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140, 805-684-4560 ... B•1426
Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376, 312-282-5500 ..... B•1438
§ Schrack North America Corp., 3 Westchester Plaza, Elmsford, NY 10533, 914-592-1305 ..... B•1444
Telemecanique, Inc., Allied Control Products, 100 Relay Rd., Plantsville, CT 06479, 203-621-6771 ..... B•1450-1451,1454,1455,1456,1457
Advanced Components Inds., Inc., 114 Center St., El Segundo, CA 90245 213-322-4249
AT&T, 1 Oak Way, Berkeley Heights, NJ 07922 1-800-372-2447
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
Communications Instrs., Inc., Box 520, Fairview, NC 28730 704-628-1711
Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 .....201-291-3334; 800-221-0714
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§† Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897-0730 203-834-8227
Thermosen, P.O. Box 1254, Stamford, CT 06904 203-324-6125

Relay, Solid State-4500

Amerace Corp., Elastimold Div., Newburg Rd., P.O. Box 503, Hackettstown, NJ 07840, 201-852-1122 ..... D•1111
§† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704, 714-556-6570 ..... B•1275
ATR Elctrns., Inc., P.O. BOX 7008, St. Paul, MN 55107, 612-738-6520;414-297-7374 ..... D•1889
§ Crydom Division, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245, 213-322-4987 ..... B•1312
§ Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379, 203-599-2075 ..... B•1328
§ Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ..... B•1339
§ Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 ..... B•1345
§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756, 501-636-5000 ..... B•1380
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1384
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607, 312-243-1100 ..... B•1386
§† Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114, 203-522-8600 ..... B•1398
§ ITT Components Electromechanical Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705, 714-836-0351 ..... B•1422
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ..... B•1428
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376, 312-282-5500 ..... B•1436
§ Microelectronic Relays, Inc., 1300 S. Beacon St., San Pedro, CA 90731, 213-831-2331 ..... B•1439
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..... B•1683
§ Opto 22, 15461 Springdale St., Huntington Bch., CA 92649, 714-891-5861 ..... B•1441
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
Telemecanique, Inc., Allied Control Products, 100 Relay Rd., Plantsville, CT 06479, 203-621-6771 ..... B•1458
Triac Electronic Systems, Inc., 87-27 Myrtle Ave., Glendale, NY 11385, 718-441-4759 ..... D•1132
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
Alpha Comps., 115 Eucalyptus Dr., El Segundo, CA 90245 213-322-7780
§† Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248 213-532-3092
Applied Control, 1275 Bloomfield Ave., Fairfield, NJ 07006-2828 201-227-5454
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
† Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
Basler Elec., Rte. 143, Highland, IL 62249 618-654-2341
Brown Boveri Elec., Norristown Rd., Spring House, PA 19477 215-628-7400
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
Cross Elctrns., 100 Commonwealth Dr., Warrendale, PA 15086 412-776-1591
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§† Digitech Industries, Inc., 66 Grove St., Ridgefield, CT 06877 203-438-3731
† Dionics, 65 Rushmore St., Westbury, NY 11590 516-997-7474
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
Dumont Instrumentation, Inc., 75 Mall Dr., Commack, NY 11725 516-864-8500
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ EDL, Inc., 385 Oser Ave., Hauppauge, NY 11788 ..... 516-435-2808;1-800-DIAL EDL
§ Electromatic Controls Corp., 2495 Pembroke Road, Hoffman Estates, IL 60195-2010 312-882-5757
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. # 5, York, PA 17402 717-767-6517
§ Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501 206-574-5000
Enerco, Inc., 9615 W. Marginal Way S., Seattle, WA 98108 206-762-1422
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
† Genisco Technlg. Corp., Filters Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001 516-328-9292
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
§ International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
† International Sensor Systems, Inc., Aurora Industrial Pk., Box 345, Aurora, NE 68818 402-694-6111
§† Kings Elctrns., 40 Marbledale Rd., Tuckahoe, NY 10707 914-793-5000
Klockner Moeller, 4 Strathmore Rd., Natick, MA 01760 617-655-1910
Macrotronix, Inc., 4016 N. Home St., Mishawaka, IN 46545 219-256-5503
Mag-Con, 1626 Terrace Dr., St. Paul, MN 55113 612-633-8820
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 818-992-6776
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ MKS Electronics Corp., 454 E. Donovan Rd., Kansas City, KS 66115 913-371-1351
MSI Electronics, Inc., 34-32 57th St., Woodside, NY 11377 212-672-6500
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Paragon Elect., 606 Parkway Blvd., Two Rivers, WI 54241 414-793-1161
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Preferred Elctrns., Inc., Main Line Dr, P.O. Box 954, Westfield, MA 01086 413-568-2301
Princo Instrs., Inc., 1020 Industrial Hwy., Southampton, PA 18966 215-355-1500
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
Regent Controls, 39 Fanny St., P.O. Box 767, Shelton, CT 06484-0767 .. 203-736-2924
† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844

§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060
† Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Silicon Power Cube Corp., 2725 Seaboard Lane, Long Beach, CA 90805 213-634-9390
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 ... 818-993-8257
Solid State Relays, 213 Eisenhower Lane So., Lombard, IL 60148 312-932-1660
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ S S A C, Box 395, Liverpool, NY 13088 315-622-1000
Tapeswitch Corp. of America, 100 Schmitt Blvd., Farmingdale, NY 11735 516-694-6312
§ Teccor Elctrns., 1801 Hurd Dr., Irving, TX 75062 214-252-7651
§† Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077
Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-864-3700
§ Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 203-677-1311
† Transco Products, Inc., 4241 Glencoe Ave., Marina del Rey, CA 90295 .. 213-822-0800
§ Vectrol, Division of Westinghouse Elec. Corp., 110 Douglas Rd, Oldsmar, FL 33557 813-855-4621
§ Wheelock, Inc., 273 Branchport Ave., Long Branch, NJ 07740 201-222-6880

Relays, Stepping-4500

Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ..... B•1301
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607, 312-243-1100 ..... B•1386
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
AT&T, 1 Oak Way, Berkeley Heights, NJ 07922 1-800-372-2447
§ Bellofram Corp., A Rexnord Co., 30 Blanchard Rd., Burlington, MA 01803 ..... 617-272-2100;800-225-1031
Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ ITT General Controls Div., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201 213-842-6131
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377 513-898-3621
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071 609-589-7500

Relays, Telephone-4500

Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153, 312-865-5200 ..... B•1297
Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ..... B•1301
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1393,1396
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376, 312-282-5500 ..... B•1438
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
§ American Zettler, 16881 Hale Ave., Irvine, CA 92714 714-660-1670
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
AT&T, 1 Oak Way, Berkeley Heights, NJ 07922 1-800-372-2447
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Davis Elec. Co., Box 38, Cape Girardeau, MO 63701 314-335-5547
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350 805-252-8330
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§† Interconnect Devices, Inc., 5101 Richland Ave., Kansas City, KS 66106 .. 913-342-5544
§ ITT Components Electromechanical Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705 714-836-0351
Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-5444
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
§ Schrack North America Corp., 3 Westchester Plaza, Elmsford, NY 10533 914-592-1305
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
§ Wheelock, Inc., 273 Branchport Ave., Long Branch, NJ 07740 201-222-6880

Relays, Thermal-4500

Coto Corporation, 55 DuPont Drive, Providence, RI 02907, 401-943-2686 ..... B•1310
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
Cambridge Aero Instruments, Inc., 6A Dunham Rd., Billerica, MA 01821 617-275-0889
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Princo Instrs., Inc., 1020 Industrial Hwy., Southampton, PA 18966 215-355-1500
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071 609-589-7500
Sylvania GTE Control Devices, Rte. 35, Standish, ME 04084 207-642-4535
Technar Inc., 205 N. 2nd Ave., Arcadia, CA 91006 818-445-1143
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907 419-756-5911
§ Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191
† Warren Comms., 101 Okner Pkwy., Livingston, NJ 07039 201-992-6200

Relays, Time Delay-4500

Amerace Corp., Elastimold Div., Newburg Rd., P.O. Box 503, Hackettstown, NJ 07840, 201-852-1122 ..... D•1111
Automatic Timing & Controls Co., 201 So. Gulph Rd., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1112
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711, 812-426-2806 ..... B•1322
§ Instrumentation & Control Sys., 520 Interstate Rd, Addison, IL 60101, 312-543-6200 ..... B•1318
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ..... B•1428
Logitek, Inc., 101 Christopher St., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1437
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376, 312-282-5500 ..... B•1438
§† Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
Telemecanique, Inc., Allied Control Products, 100 Relay Rd., Plantsville, CT 06479, 203-621-6771 ..... B•1453
Triac Electronic Systems, Inc., 87-27 Myrtle Ave., Glendale, NY 11385, 718-441-4759 ..... D•1132
§ Air-O-Tronics Prods., Box K, Morrisville, NY 13408 315-684-3705
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
Alpha Comps., 115 Eucalyptus Dr., El Segundo, CA 90245 213-322-7780
§ Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
§ American Control Products, Div. of Precision Timer Co., Inc., 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
§† Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248 213-532-3092
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
Artisan Elctrns., 5 Eastmans Rd., Parsippany, NJ 07054 201-887-7100
† Babcock, Inc., 1717 West Collins Ave., Orange, CA 92667 714-633-3700
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§ Cornell-Dubilier Electronics, 150 Avenue "L", Newark, NJ 07105 201-589-7500
§ Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
§ Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215 414-671-6800
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8300
§ Electromatic Controls Corp., 2495 Pembroke Road, Hoffman Estates, IL 60195-2010 312-882-5757
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. # 5, York, PA 17402 717-767-6517
§† Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501 206-574-5000

§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§† Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ Heinemann Elec. Co., Brunswick Pike, Alt. Rte. #1, P.O.Box 6800, Lawrenceville, NJ 08648-0800 609-882-4800
§† Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114 203-522-8600
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211 408-747-0550
† International Sensor Systems, Inc., Aurora Industrial Pk., Box 345, Aurora, NE 68818 402-694-6111
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
Jay-El Prods., Sub. Ducommun Inc., 1859 W. 169th St., Gardena, CA 90247 213-323-7130
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 ..... 201-291-3334; 800-221-0714
§ La Marche Mfg., 106 Bradrock Dr., Des Plaines, IL 60018 312-299-1188
§ Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ MKS Electronics Corp., 454 E. Donovan Rd., Kansas City, KS 66115 913-371-1351
§ National Controls Corp., 931 N. DuPage Ave., Lombard, IL 60148 312-932-6900
Nolatron, P.O. Box 4042, Harrisburg, PA 17111 717-564-3398
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Pacific Timer Inc., 21739 N.E. 18th Way, Redmond, WA 98052 206-881-1785
Paragon Elect., 606 Parkway Blvd., Two Rivers, WI 54241 414-793-1161
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Regent Controls, 39 Fanny St., P.O. Box 767, Shelton, CT 06484-0767 .. 203-736-2924
† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313; 800-526-5376
Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621
Schrack North America Corp., 3 Westchester Plaza, Elmsford, NY 10533 914-592-1305
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910; 800-221-7060
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† Sigmapower, Inc., 20790 Leapwood Ave., Carson, CA 90746 ..... 213-32-Sigma
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 ... 818-993-8257
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ S S A C, Box 395, Liverpool, NY 13088 315-622-1000
§† Syracuse Elctrns., P.O. Box 4770, Syracuse, NY 13221 315-488-4911
§ Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077
† Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-864-3700
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907 419-756-5911
Timeco, Inc., 1035 - 26th St., P.O. Box 8036, Huntington, WV 25705 304-523-5149
§ Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 203-677-1311
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
§ Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000
Warren Comms., 101 Okner Pkwy., Livingston, NJ 07039 201-992-6200
† Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668
§ Zenith Controls, 830 West 40th St., Chicago, IL 60609 312-247-6400

Relays, Transistor & DIP Case Types — See Relays, Printed Circuit Mounting (Vol. B)

Relays, Vacuum-4500

§† Dow-Key Microwave Corporation, 1110 Mark Ave., Carpenteria, CA 93013-2918, 805-684-4560 ..... A•1710
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 ..... B•1424-1425,1610
§† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140, 805-684-4560 ... B•1426
† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008, 408-377-4621 ..... B•1443
Cambridge Aero Instruments, Inc., 6A Dunham Rd., Billerica, MA 01821 617-275-0889
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071 609-589-7500

Relays, Voltage Sensitive-4500

Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ..... B•1263
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704, 714-556-6570 ..... B•1275
Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 ..... B•1276-1292,1294
Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ..... B•1298
† Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 ..... B•1307
Crydom Division, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245, 213-322-4987 ..... B•1312
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379, 203-599-2075 ..... B•1323
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1471 ..... B•1370,1372,1373
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1384
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607, 312-243-1100 ..... B•1386
Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1390
§† Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114, 203-522-8600 ..... B•1398
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ..... B•1428
Schrack North America Corp., 3 Westchester Plaza, Elmsford, NY 10533, 914-592-1305 ..... B•1444
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
Telemecanique, Inc., Allied Control Products, 100 Relay Rd., Plantsville, CT 06479, 203-621-6771 ..... B•1450
§ American Zettler, 16881 Hale Ave., Irvine, CA 92714 714-660-1670
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
§ Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248 213-532-3092
ARGA Controls, 35 E. Glenarm St., Pasadena, CA 91105 213-682-3314
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
Bluffton Products, Inc., Tegam, Inc., 7230 North Ridge Road, Madison, OH 44057 216-946-3572
† Calex Mfg. Co., Inc., 3355 Vincent Rd., Pleasant Hill, CA 94523 415-932-3911
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Control Engrg., Inc., 1686 Riverdale St., West Springfield, MA 01089 413-781-1330
Crompton Instrs., 2763 Higgins Road, Elk Grove Village, IL 60007 714-841-2901
Crompton Instrs., Hawker Siddley, 2763 Old Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
INRESCO, Inc., 654 Ocean Road, Pt. Pleasant, NJ 08742 201-892-5881
§ ITT Components Electromechanical Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705 714-836-0351
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
Larson Instr., Greenbush Rd., Orangeburg, NY 10962 914-359-3800
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
Mag-Con, 1626 Terrace Dr., St. Paul, MN 55113 612-633-8820
§ Magnecraft Elec. Co., 1910 Techny Road, Northbrook, IL 60062-5376 ... 312-282-5500
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§† Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§† Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077
Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-864-3700
§ Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191
§ Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000
† Warren Comms., 101 Okner Pkwy., Livingston, NJ 07039 201-992-6200
† Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668
§ Zenith Controls, 830 West 40th St., Chicago, IL 60609 312-247-6400

Relays (MIL)-2440

Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 ..... B•1307
† Daico Inds., Inc., Box 5225, Compton, CA 90224, 213-631-1143 ..... A•1708
† Electronic Specialty Div., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501, 206-574-5000 ..... B•1346

§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1471 ..... B•1370
§† Hi-G Company, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114, 203-522-8600 ..... B•1398
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ..... B•1428
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003, 213-232-8221 ..... B•1430
Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ..... B•1449
Telemecanique, Inc., Allied Control Products, 100 Relay Rd., Plantsville, CT 06479, 203-621-6771 ..... B•1454
† Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
Communications Instrs., Inc., Box 520, Fairview, NC 28730 704-628-1711
† Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
† Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140 805-684-4560
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§† Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060
§ Teledyne Relays, 12525 Daphne Ave., Hawthorne, CA 90250 213-777-0077

Rental & Lease Equipment-2900 — *See Vol. D*

Repeaters, Pulse — See Transponders (Vol. D)

Repeaters, Servo-4900 — *See Vol. D*

Resins, Encapsulating — See Compounds, Encapsulating, Molding & Potting (Vol. C)

Resins, Synthetic — See Plastic Raw Materials (Vol. C)

Resistance Comparators — See Bridges, Resistance (Vol. D)

Resistor Hardware-2800 — *See Vol. C*

Resistors, Adjustable-Also See Potentiometers; Rheostats-4700 — *See Vol. A*

Resistors, Ballast (Incl. Tube & Solid State Devices)-4700 — *See Vol. A*

Resistors, Beryllia Core — See Resistors, Integral Heat Dissipator (Vol. A)

Resistors, Bulk Ceramic-4700 — *See Vol. A*

Resistors, Carbon Film-4700 — *See Vol. A*

Resistors, Ceramic Core-4700 — *See Vol. A*

Resistors, Ceramic Metal (Cermet)-4700 — *See Vol. A*

Resistors, Chip (For Microcircuits)-4700 — *See Vol. A*

Resistors, Composition, Carbon-4700 — *See Vol. A*

Resistors, Decade-4700 — *See Vol. A*

Resistors, Deposited Carbon-4700 — *See Vol. A*

Resistors, Disk, Rod & Tube-4700 — *See Vol. A*

Resistors, Film, Metallized & Nonmetallized-4700 — *See Vol. A*

Resistors, Flame Retardant-4700 — *See Vol. A*

Resistors, Flux Sensitive-4700 — *See Vol. A*

Resistors, Foil, Ultraprecision-4700 — *See Vol. A*

Resistos, Four Terminal-4700 — *See Vol. A*

Resistors, Fuse-4300

Colber Corp., 26E Buffington St., Irvington, NJ 07111, 201-371-9500 .... A•1832
ISL Products Int'l, Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093, 516-822-9601 ..... A•1877
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101, 603-669-0054 ..... A•1935
RCL Electronics, Inc., 195 McGregor St., Manchester, NH 03102, 603-627-3831 ..... A•1941
Shallcross, Inc., U.S. 70 East, Smithfield, NC 27577, 919-934-5181 ..... A•1941
§† TRW Resistive Products Div., TRW Electronic Components Grp., 401 N. Broad St., Philadelphia, PA 19108, 215-923-8230 ..... A•1955
§ Allen Co., Inc., Robert G., 7267 Coldwater Canyon, N. Hollywood, CA 91605 ..... 818-765-8300;800-423-3186
§† AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
§† Dale Electronics, Inc., Norfolk Div., 2300 Riverside Blvd., Norfolk, NE 68701 402-371-0080
Elect. Prec. Comp. Corp., 11 W. Sandford Blvd., Mt. Vernon, NY 10550 .. 914-664-2333
§† E-Systems, Memcor Div., 1320 Flaxmill Rd., Huntington, IN 46750 219-356-4300
§ Gamble, Charles T., Inds., 605 Perkins La., Delanco, NJ 08075 609-461-1900
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
General Resistance, Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471 203-481-5721
§ Hi-Tech Components, Mitsubishi International Corp., 520 Madison Ave., New York, NY 10022 212-605-2607
§ IEI-ISKRA Electronics, Inc., 222 Sherwood Ave., Farmingdale, NY 11735 516-753-0400
§ KOA Speer Elctrns., Bolivar Dr., P.O. Box 547, Bradford, PA 16701 814-362-5536
Meissner Inds., 551 Rte. 10, Dover, NJ 07801 201-366-1700
§ Micro-Ohm Corp., 4900 Santa Anita Ave., El Monte, CA 91731 ..... 818-442-3310; 213-686-0535
§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 201-748-5089
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Tel Labs, Inc., 154 Harvey Rd., PO Box 375, Londonderry, NH 03053 ... 603-625-8994
Vishay Resistive Sys. Grp., 63 Lincoln Hwy., Malvern, PA 19355 215-644-1300
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Resistors, Glass-4700 — *See Vol. A*

Resistors, Heat Sink Encased — See Resistors, Integral Heat Dissipator (Vol. A)

Resistors, High Frequency-4700 — *See Vol. A*

Resistors, High Megohm (Over 22 Megohms)-4700 — *See Vol. A*

Resistors, High Temperature (Over 125°C)-4700 — *See Vol. A*

Resistors, High Voltage (1,000 Volts & Over)-4700 — *See Vol. A*

Resistors, Hot Molded-4700 — *See Vol. A*

Resistors, Integral Heat Dissipator-4700 — *See Vol. A*

Resistors, Low Temperature Coefficient-4700 — *See Vol. A*

Resistors, Metal Glazed-4700 — *See Vol. A*

Resistors, Metal Oxide-4700 — *See Vol. A*

Resistors, Microwave-4700 — *See Vol. A*

Resistors, Negative Temperature Coefficient-4700 — *See Vol. A*

Resistors, Noninductive-4700 — *See Vol. A*

Resistors, Oil Filled-4700 — *See Vol. A*

Resistors, Plug-in-4700 — *See Vol. A*

Resistors, Positive Temperature Coefficient-4700 — *See Vol. A*

Resistors, Power-4700 — *See Vol. A*

Resistors, Precision-4700 — *See Vol. A*

Resistors, Pressure Sensitive-4700 — *See Vol. A*

Resistors, Rectilinear-4700 — *See Vol. A*

Resistors, Standards — See Standards, Resistance (Vol. D)

Resistors, Strip-4700 — *See Vol. A*

Resistors, Suppressor-4700 — *See Vol. A*

Resistors, Surge-4700 — *See Vol. A*

Resistors, Tapped-4700 — *See Vol. A*

Resistors, Temperature Sensitive — See Thermistors (Vol. B)

Resistors, Tin Oxide-4700 — *See Vol. A*

Resistors, Variable — See Potentiometers (Vol. A), Rheostats (Vol. A), Resistors, Adjustable (Vol. A)

Resistors, Voltage Sensitive-4700 — *See Vol. A*

Resistors, Wirewound-4700 — *See Vol. A*

Resistors, Zero-Ohm-4700 — *See Vol. A*

Resistors (MIL)-2440

§† Allen-Bradley Co., Electronics Group, Rockwell Corporation, 1201 S. Second St., Milwaukee, WI 53204, 414-671-2000 ..... A•1784,1787,1788,1792
Caddock Electronics, Inc., 1717 Chicago Ave., Riverside, CA 92507, 714-788-1700 ..... A•1808-1809,1813,1827
§† Cal-R, Inc., P.O. Box 1397, Santa Monica, CA 90406, 213-450-1761 ..... A•1830
Dale Electronics, Inc., El Paso Div., P.O. Box 26728, El Paso, TX 79926, 915-592-3253 ..... A•1847,1850,1851,1860,1861,1862,1863
Electro Comp., Inc., 2415 Main St., Stratford, CT 06497, 203-375-5011 ... A•1865
Elect. Prec. Comp. Corp., 11 W. Sandford Blvd., Mt. Vernon, NY 10550, 914-664-2333 ..... A•1868
General Resistance, Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ..... A•1870
Julie Resch. Labs., 211 West 61st St., New York, NY 10023, 212-245-2727 ..... A•1878
KDI Electronics, Inc., Engelmann & Pyrofilm Divisions, 60 S. Jefferson Rd., Whippany, NJ 07981, 201-887-8100 ..... A•1881
§ KOA Speer Elctrns., Bolivar Dr., P.O. Box 547, Bradford, PA 16701, 814-362-5536 ..... A•1884
§† Mepco//Electra, Inc., North American Philips Corp., Columbia Rd., Morristown, NJ 07960, 201-539-2000 ..... A•1890
Micro-Ohm Corp., 4900 Santa Anita Ave., El Monte, CA 91731, 818-442-3310;213-686-0535 ..... A•1893
† Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, WI 53204, 414-271-9900 ..... A•1900
† Mini-Systems, Inc., 20 David Rd., North Attleboro, MA 02761, 617-695-0203 ..... A•1906
§ Nytronics Components Grp., Inc., Orange St., Darlington, SC 29532, 803-393-5421 ..... A•1911
§† Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076, 312-675-2600 ..... A•1912,1914,1915,1920,1921
Ohmtek, Inc., 2160 Liberty Dr., Niagara Falls, NY 14304, 716-283-4025 ..... A•1923,1925
† Pacific Resistor Co., 18300 Oxnard St., Tarzana, CA 91356, 818-345-7811 ..... A•1926
Precision Resistive Prods., Inc., P.O. Box 189, Highway 61 South, Mediapolis, IA 52637, 319-394-9131 ..... A•1929
† Precision Resistor Co., Inc., 10601 75 St. N., Largo, FL 33543, 813-541-5771 ..... A•1931
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101, 603-669-0054 ..... A•1935
§† RCL Electronics, Inc., 195 McGregor St., Manchester, NH 03102, 603-627-3831 ..... A•1936
§† Shallcross, Inc., U.S. 70 East, Smithfield, NC 27577, 919-934-5181 ..... A•1936
Tel Labs, Inc., 154 Harvey Rd., PO Box 375, Londonderry, NH 03053, 603-625-8994 ..... A•1952
TRW Resistive Products Div., TRW Electronic Components Grp., 401 N. Broad St., Philadelphia, PA 19108, 215-923-8230 ..... A•1954
§† Ultronix, Inc., P.O. Box 1090, Grand Junction, CO 81502, 303-242-0810 ..... A•1958-1961,1964,1965
§† Vamistor Corp., 115 Industrial Pk., Sevierville, TN 37862, 615-453-0001 .. A•1967
§† Vishay Resistive Sys. Grp., 63 Lincoln Hwy., Malvern, PA 19355, 215-644-1300 ..... A•1973-1974,1979,1980,1981,1983,1984,1985
Allen-Bradley Co., Electronics Group, Div. of Rockwell Corp., Resistive Products Div., 1414 Allen-Bradley Dr., El Paso, TX 79935 915-592-4888
Bourns, Inc., Resistive Components Group, 1200 Columbia Ave., Riverside, CA 92507 714-781-5050
Corning Glass Works, Corning Elctrns., Houghton Pk., Bldg. A-2, Corning, NY 14830 607-974-8725
§† Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601 402-564-3131
§† Dale Electronics, Inc., Norfolk Div., 2300 Riverside Blvd., Norfolk, NE 68701 402-371-0080
E-Systems, Memcor Div., 1320 Flaxmill Rd., Huntington, IN 46750 219-356-4300
Hybrid Systems Corp., 22 Linnell Circle, Billerica, MA 01821 617-667-8700
† HyComp Inc., 75 Union Ave., Box 377, Sudbury, MA 01776 617-443-4631
§ IEI-ISKRA Electronics, Inc., 222 Sherwood Ave., Farmingdale, NY 11735 516-753-0400
Kelvin, 5919 Noble Ave., Van Nuys, CA 91411 818-782-6662
§† Mepco//Electra, Inc., Airport Road, P.O. Box 760, Mineral Wells, TX 76067 817-325-7871
Microplex, Inc., 1977 State College Blvd., Anaheim, CA 92806 ..... 714-979-8833; 714-634-1535
† Res-Net, 110 Route 10, Whippany, NJ 07981 ..... 201-887-2260;out of state 800-526-0704
§† Techno-Components Corp., 7803 Lemona, Van Nuys, CA 91405 818-781-1642
§† Vishay Angstrohm, 1 Precision Pl., Hagerstown, MD 21740 301-739-8722

Resolvers, Synchro-4900 — *See Vol. D*

Resonators, Ceramic-2700 — *See Vol. A*

Resonators, SAW-2300 — *See Vol. A*

Retainers, Battery-2800 — *See Vol. C*

Retainers, Relay-4500

§ American Zettler, 16881 Hale Ave., Irvine, CA 92714 714-660-1670
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 .....201-291-3334; 800-221-0714
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000

Retainers, Tube-5700 — *See Vol. A*

Retractors & Carriers — See Cable Retractors (Vol. C)

RFI Measuring Equipment-2900 — *See Vol. D*

RFI Shielding — See Shields, RF (Vol. C)

RFI Testing Services — See Services, Electrical Measurement & Test (Vol. D)

Rheostats-4750 — *See Vol. A*

Ribbons for Printers-2000 — *See Vol. D*

Rings, Retaining-2500 — *See Vol. C*

Rivets-2825 — *See Vol. C*

Robotic Pick & Place — See Arms & Manipulators, Robotic

Robotics — See Arms & Manipulators, Robotic (Vol. D), Control Systems, Robotic (Vol. D)

Rods, Ground-2800 — *See Vol. C*

Rotators — See Antenna Rotators (Vol. D)

Rotors, Motor & Generator — See Motor & Generator Armatures, Rotors, Stators (Vol. B)

Rubber, Conductive-1600 — *See Vol. C*

Rubber Guards (For Equipment) — See Bumpers (Vol. C)

Rubber, Silicone-1600 — *See Vol. C*

Satellite Antennas — See Antennas, Satellite

Satellite Earth Stations, Transmit & Receive-1900 — *See Vol. D*

Scale Expanders, Meter — See Multipliers, Meter (Vol. D)

Scalers, Binary, Decade-2325 — *See Vol. D*

Scales, Dial-2400 — *See Vol. C*

Scanners, Bar Code — See Readers, Bar Code

Scanners, Crossbar-1900 — *See Vol. D*

Scanners, Fiber Optic-2475

Dolan-Jenner Inds., Box 1020, Woburn, MA 01801 617-935-7444
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000
General Fiber Optics, Inc., 98 Commerce Rd., Cedar Grove, NJ 07009 .. 201-239-3400
Lightwave Communications, Inc., Sub. of Harbor Electrns., 650 Danbury Rd., Ridgefield, CT 06877 203-438-3591
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
Rehlander Assocs., 118A Bridge St., Beverly, MA 01915 617-922-5961

Scanners, Flying Spot-1900 — *See Vol. D*

Scanners, Infrared-2900 — *See Vol. D*

Scanners, Instrument, Input/Output-2900 — *See Vol. D*

Scanners, Optical-2900 — *See Vol. D*

Scanners, Reed-2900 — *See Vol. D*

Scintillometers-2900 — *See Vol. D*

Scissors-5400 — *See Vol. C*

Scope Dollies — See Carts & Dollies, Instrument & Equipment (Vol. C)

SCRs — See Thyristors (Vol. A)

SCR Firing Controls — See Controls, SCR (Vol. D)

Scramblers, Data-2325 — *See Vol. D*

Scramblers, Speech-1900 — *See Vol. D*

Screens, Printed Circuit-1700 — *See Vol. C*

Screwdrivers-5400 — *See Vol. C*

Screws, Lead, Feed & Translatory — See Drives & Drives Mechanisms (Dial) (Vol. C)

Screws, Fastening-2825 — *See Vol. C*

Scribers-5400 — *See Vol. C*

Scribers, Wafer-Also See Machines & Accessories, Semiconductor Manufacturing-4100 — *See Vol. D*

Sealers — See Coatings (Vol. C)

Sealing Equipment, Metal to Glass/Ceramic-4100 — *See Vol. D*

Seals & Feedthrus, Environmental — See Feedthrus & Seals, Environmental (Vol. C)

Seals, Ceramic To Metal-2500 — *See Vol. C*

Seals, Glass To Metal-2500 — *See Vol. C*

Seals, Hermetic-Also See Services, Hermetic Sealing-2500 — *See Vol. C*

Seals, Microwave — See Gaskets, Shielding, RF (Vol. C), Seals, Waveguide (Vol. A)

Seals, Pressure Sensitive-2500 — *See Vol. C*

Seals, Waveguide-3450 — *See Vol. A*

Search Unit, Magnetic Tape — See Tape Search Equipment (Vol. D)

Security Systems, Data-2325 — *See Vol. D*

Seismographs-2900 — *See Vol. D*

Seizers-5400 — *See Vol. C*

Selsyns — See Motors, Synchronous (Vol. B)

Semiconductor Material — See Crystals, Semiconductor (Vol. A)

Semiconductor Wafer Fabrication, Assembling (Packaging)-4100 — *See Vol. D*

Semiconductor Wafer Fabrication, Designing (Topological)-4100 — *See Vol. D*

Semiconductor Wafer Fabrication, Maskmaking (Tooling)-4100 — *See Vol. D*

Semiconductor Wafer Fabrication, Processing-4100 — *See Vol. D*

Semiconductor Wafer Fabrication, Testing/Trimming-4100 — *See Vol. D*

Semiconductors — See Diodes (Vol. A), Rectifiers (Vol. A), Transistors (Vol. A)

Sensors — See Transducer Listings (Vol. B)

Sensors, Acoustic-2200 — *See Vol. D*

Sensors, Fiber Optic-2475

† **MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496** ..... **B•1121**

Photodyne, 1175 Tourmaline Dr., Newbury Park, CA 91320, 818-889-8770 ..... **B•1123**

Corning Glass Works, Materials Business, Main Plant, MP 21-3, Corning, NY 14831 607-974-4102

Dolan-Jenner Inds., Box 1020, Woburn, MA 01801 617-935-7444

EOTec Corp., 420 Frontage Road, W. Haven, CT 06516 203-934-7961

Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000

FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 ..... 312-231-3511; 312-932-9380

§ Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716 ..... 201-291-0500; 800-631-2165

§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900

NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000

Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

Rehlander Assocs., 118A Bridge St., Beverly, MA 01915 617-922-5961

§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060

Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737

Stenning Instrments, Inc., 671 Enchanted Way, Pacific Palisades, CA 90272 213-459-2930

Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265 214-995-3821

York Technology, Inc., Research Park, 139 Wall Street, Princeton, NJ 08540 609-924-7676

Sensors, Light-3700

Advanced Detector Corp., Applied Solar Energy Corp., 15251 E. Don Julian Rd., Industry, CA 91746, 818-369-6886 ..... **B•1203**

Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092, 201-233-7200 ..... **B•1204**

§ **EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900** ... **B•1210**

§ **Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716, 201-291-0500;800-631-2165** ..... **D•1124**

† **MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496** ..... **B•1121**

Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901, 518-561-3160 ..... **B•1215**

Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265, 214-995-3821 ..... **B•1216**

TRW Optoelectronics Div., 1207 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ..... **B•1222**

† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570

† Applied Solar Energy Corp., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749 818-968-6581

Bluffton Products, Inc., Tegam, Inc., 7230 North Ridge Road, Madison, OH 44057 216-946-3572

§ CCD Imaging, Fairchild Camera & Instr. Corp., 450 National Ave., Mountain View, CA 94043 415-493-8001

General Numeric Corporation, 390 Kent Avenue, Elk Grove Village, IL 60007 312-640-1595

EG&G Gamma Scientific, Div. of EG&G Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034

§ EG&G Reticon, Div. of EG&G, 345 Potrero Ave., Sunnyvale, CA 94086-4197 408-738-4266

EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201

Evershed & Vignoles, Ltd., Acton Lane, Chiswick, London, ENGLAND W4 5HJ 01-994-3670

§ Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011

Femco, Inc., P.O. Box 26710 Parkmoor Sta., San Jose, CA 95159 408-946-1188

Fork Standards, Inc., 666 Western Ave., Lombard, IL 60148 312-932-9380

FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 ..... 312-231-3511; 312-932-9380

§ Grasslin Controls Corp., Dieter Grasslin Feinwerktechnik, 45 Spear Rd., Ramsey, NJ 07446 201-825-9696

Hamamatsu Photonics K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141

§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271

Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515

§ Industrial Computer Designs, Inc., 31264 La Baya Drive, Westlake Village, CA 91362 818-889-3179

LEL Co., 5 Burns Pl., Cresskill, NJ 07626 201-569-8641

§ Optek Technology, Inc., 345 Industrial Blvd., McKinney, TX 75069 214-542-9461

Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 408-725-1220

Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277

Q-Systems, PO Box 35879, Tucson, AZ 85740 602-293-4923

Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991

§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060

Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080

Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737

Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707

Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961

§ Sprague Elec. Co., Integrated Circuit Div., 115 Northeast Cutoff, Worcester, MA 01606 617-853-5000

§ THORN EMI Gencom Inc., 23 Madison Rd., Fairfield, NJ 07006 201-575-5586

§ Tohoku Metal Inds., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, JAPAN ..... Tokyo 03-402-6161

Tri-Tronics Co. Inc., 13420 Wright Cir., Tampa, FL 33624 813-855-4453

United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516

Sensors, Proximity — See Transducers, Proximity

Sensors, Temperature — See Bolometers (Vol. D), Thermistors (Vol. B), Transducers (Vol. A)

Sensors (MIL), Tactical Electronic Reconnaissance-3475 — *See Vol. D*

Sequence Controllers — See Controllers, Programmable (Vol. D)

Services, Assembly & Fabrication (Incl. R&D) - Also see Services, Metal Parts Fabrication; Services, Printed Circuit Products-4100 — *See Vol. D*

Services, Backplane Wiring - Also see Services, Wire Wrapping; Services, Cable Assembly - Also see Services, Crimping; Services, Wire Cutting & Stripping-4100 — *See Vol. D*

Services, Calibration & Instrument Repair-4100 — *See Vol. D*

Services, Coating-4100 — *See Vol. D*

Services, Computer-Aided Design (CAD)-Also See Computers, CAD, CAM, & CAD/CAM-4200 — *See Vol. D*

Services, Computer Programming - Also see Services, Computer Systems, Specific Classification-2050 — *See Vol. D*

Services, Computer Systems, Builders-2050 — *See Vol. D*

Services, Computer Systems, Consulting-2050 — *See Vol. D*

Services, Computer Systems, Integrators-2050 — *See Vol. D*

Services, Computer Systems, Turnkey-2050 — *See Vol. D*

Services, Consulting, Chemical Analysis-4100 — *See Vol. D*

Services, Consulting, Data Processing-4100 — *See Vol. D*

Services, Consulting, Drafting-4100 — *See Vol. D*

Services, Consulting, Engineering-4100 — *See Vol. D*

Services, Consulting, Optical-4100 — *See Vol. D*

Services, Consulting, Patent Development-4100 — *See Vol. D*

Services, Consulting, Production-4100 — *See Vol. D*

Services, Consulting, Research & Development-4100 — *See Vol. D*

Services, Crimping - Also see Services, Wire Cutting & Stripping-4100 — *See Vol. D*

Services, Custom Cable Fabrication-6000 — *See Vol. C*

Services, Custom Molding, Plastics — See Services, Plastic Fabrication & Molding

Services, Data Processing, Consulting — See Services, Consulting, Data Processing

Services, Decapsulation/Encapsulation-4100 — *See Vol. D*

Services, Documentation (Incl. Technical Writing)-4100 — *See Vol. D*

Services, Education/Training-4100 — *See Vol. D*

Services, Electrical Measurement & Test-4100 — *See Vol. D*

Services, Electroplating — See Services, Plating

Services, EMI/RFI Testing-4100 — *See Vol. D*

Services, Encapsulation — See Services, Decapsulation/Encapsulation

Services, Environmental Testing-4100 — *See Vol. D*

Services, Equipment Leasing/Rental-4100 — *See Vol. D*

Services, Failure Analysis — See Services, Reliability

Services, Fiberoptics, Consulting-4100 — *See Vol. D*

Services, Hermetic Sealing-4100 — *See Vol. D*

Services, High Vacuum-4100 — *See Vol. D*

Services, Instrument Calibration — See Services, Calibration & Instrument Repair

Services, Instrument Design (Industrial)-4100 — *See Vol. D*

Services, Integration, Computer Systems — See Services, Computer Systems, Integrators

Services, Laser, Consulting-4100 — *See Vol. D*

Services, Measurement & Test, Electrical — See Services, Electrical Measurements & Test (Vol.), Services, Environmental Testing

Services, Measuring — See Services, Instrument Calibration (Vol.), Services, Testing & Measuring

Services, Metal Etching, Engraving-4100 — *See Vol. D*

Services, Metal Parts Fabrication-4100 — *See Vol. D*

Services, Metallizing (Incl. Electroforming)-4100 — *See Vol. D*

Services, Microprocessor Development - Also see Services, PROM & Array Programming-4100 — *See Vol. D*

Services, Molding/Casting - Also see Services, Plastic Fabrication & Molding-4100 — *See Vol. D*

Services, Optical Design-4100 — *See Vol. D*

Services, Packaging-4100 — *See Vol. D*

Services, Permanent Magnet-1850 — *See Vol. A*

Services, Photographic-4100 — *See Vol. D*

Services, Plastics Fabrication/Molding/Foaming/Finishing-4100 — *See Vol. D*

Services, Plating-4100 — *See Vol. D*

Services, Precious Metal Refining-4100 — *See Vol. D*

Services, Precious Metal Resmelting, Recovery, Recycling-4100 — *See Vol. D*

Services, PC Design/Preparation/Production-4100 — *See Vol. D*

Services, PROM & Array Programming - Also see Services, Microprocessor Development-4100 — *See Vol. D*

Services, Qualification Testing — See Services, Environmental Testing (Vol. D)

Services, Reliability-4100 — *See Vol. D*

Services, Rental, Instruments & Equipment — See Test Equipment, Rental & Lease

Services, Repair, Maintenance — See Services, Calibration & Repair Instrument

Services, RFI Measuring — See Services, Electrical Measurement & Test (Vol. D)

Services, Silicon Foundry — See Silicon Foundry Services

Services, Silk Screening-4100 — *See Vol. D*

Services, Soldering-4100 — *See Vol. D*

Services, Technical Writing — See Services, Documentation

Services, Testing & Measuring — See Services, Electrical Measurement & Test (Vol.), Services, Environmental Testing

Services, Testing, Environmental — See Services, Environmental Testing

Services, Training/Education-4100 — *See Vol. D*

Services, Vibration Surveys-4100 — *See Vol. D*

Services, Wire Cutting & Stripping - Also see Services, Crimping-4100 — *See Vol. D*

Services, Wirewrapping/Soldering/Welding/Brazing - Also See Services, Backplane Wiring-4100 — *See Vol. D*

Servo Systems-4900 — *See Vol. D*

Shaft Encoders, Shaft Position — See Encoders, Shaft Angle (Vol. B)

Shaft Locks — See Locks, Dial & Shaft (Vol. C)

Shafts & Adapters-Also See Couplings, Shaft, Rigid & Flexible-3500

B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
§† Berg, W. M., Inc., 499 Ocean Ave., East Rockaway, NY 11518 516-599-5010
Control Inds. Inc., 530 Burnside Ave., Inwood, NY 11696 212-471-9800
§ Jan Hardware Mfg. Co., 47-27 36th St, Long Island City, NY 11101 212-361-0800
Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 813-822-2529
§† Norelcom Inds., 63 Marine St., Farmingdale, NY 11735 516-249-7245
PIC Design, P.O. Box 1004, Middlebury, CT 06762 203-758-8272
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
§ Vernaline Prods. Div., P.O. Box 6267, Providence, RI 02940 401-739-7600

Shake Tables — See Testers, Vibration (Vol. D)

Shells, Encapsulation — See Cups, Encapsulation (Vol. C)

Shielding, EMI/RFI-4525 — *See Vol. C*

Shielding Beads, Ferrite-4525 — *See Vol. C*

Shields, Cable — See Braid, Cable (Vol. C)

Shields, Cathode-Ray Tube-4525 — *See Vol. C*

Shields, Coil-4525 — *See Vol. C*

Shields, Corona-4525 — *See Vol. C*

Shields, Electrostatic — See Shields, Tube (Vol. C)

Shields, Indicator Light-4525 — *See Vol. C*

Shields, Magnetic-4525 — *See Vol. C*

Shields, Photomultiplier-4525 — *See Vol. C*

Shields, RF-Also See Gaskets, Shielding, RF-4525 — *See Vol. C*

Shields, Transformer-4525 — *See Vol. C*

Shields, Tube-4525 — *See Vol. C*

Shields, Wire — See Braid, Cable (Vol. C)

Shift Registers-2325 — *See Vol. D*

Shifters, Frequency — See Converters, Frequency to Frequency (Vol. D)

Shifters, Phase, Microwave-3450 — *See Vol. A*

Shifters, Phase, RF-3450 — *See Vol. A*

Shifters, Phase 60/400 Hz-4050 — *See Vol. D*

Shrinkable Plastics & Elastomers — See Caps, Forms & Tapes, Heat Shrinkable (Vol. C), Tubing, Heat Shrinkable (Vol. C)

Shunts, Connector-2100 — *See Vol. C*

Shunts, Meter-2900 — *See Vol. D*

Shutters, Microwave-3450 — *See Vol. A*

SIDACs-4800 — *See Vol. A*

Signal Averagers-2900 — *See Vol. D*

Signal Conditioners & Equipment-1100 — *See Vol. D*

Signal Generators — See Generators, Specific Type (Vol. D)

Signal Systems, Fiber Optic-2325 — *See Vol. D*

Signal Tracers — See Testers, Signal Tracing (Vol. D)

Silica, Fused-2500 — *See Vol. C*

Silk Screening Services — See Services, Silk Screening (Vol. D)

Simulation Systems, Electromagnetic Pulse-1100 — *See Vol. D*

Simulators, Data-2900 — *See Vol. D*

Simulators, Motion-2550 — *See Vol. C*

Simulators, Optics-3700

Liberty Mirror, Libbey-Owens-Ford Co., 851 Third Ave., Brackenridge, PA 15014, 412-224-1800 ..... B•1212

Simulators, Power Failure-2900 — *See Vol. D*

Simulators, Powerline Disturbance-2900 — *See Vol. D*

Simulators, Radar-3475 — *See Vol. D*

Simulators, Resolvers-2900 — *See Vol. D*

Simulators, Solar-2900 — *See Vol. D*

Simulators, Thermocouple-2900 — *See Vol. D*

Simulators (MIL), EW-3475 — *See Vol. D*

Simulators (MIL), EW Quick Reaction Capability-3475 — *See Vol. D*

Simulators (MIL), RHAW-3475 — *See Vol. D*

Simulators (MIL), Weapon-3475 — *See Vol. D*

Sinks, Heat — See Heat Sinks, Semiconductor (Vol. C), Heat Sinks, Soldering (Vol. C)

Sleeves — See Tubing (Vol. C)

Slides, Cabinet & Chassis-1400 — *See Vol. C*

Slip Clutch — See Knobs, Slip Clutch (Vol. C)

Slip Rings & Assemblies-3500

Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002, 201-436-2230 ..... B•1132
† Fabricast, 2517 Seaman Ave., P.O. Box 3176, S. El Monte, CA 91733, 818-443-3247 ..... B•1154-1137,1156,1157,1158,1159
† Graphite Metallizing Corp., 1036 Nepperhan Ave., P.O. Box 110, Yonkers, NY 10702, 914-968-8400 ..... B•1160
† Maurey Instr. Corp., 4555 W. 60th St., Chicago, IL 60629, 312-581-4555 .. B•1170
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ..... B•1701
† Danmar Inds., 9705 Lurline Ave., Chatsworth, CA 91311 ..... 818-882-7979/5280
† Engelhard Corp., 70 Wood Ave. S., Iselin, NJ 08830 201-321-5900
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ Hottinger Baldwin Measurements, 139 Newbury St., Framingham, MA 01701 617-875-8282
† IEC Corporation, 3100 Longhorn Blvd., Austin, TX 78759 512-836-0547
† Micro-Products Engrg. Co., 230 Ridgewood Ave., Newark, NJ 07108 201-824-8467
† Poly-Scientific, Litton Inds., 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
§† Superior Carbon Prods., Inc., 9115 George Ave., Cleveland, OH 44105 .. 216-883-4880
Teledyne Kinetics, Div. of Teledyne, Inc., 410 S. Cedros Ave., Solana Beach, CA 92075 619-755-1181
† Unit Inds., 1140 E. Valencia Dr., Fullerton, CA 92631 714-871-4161

Slotted Lines, Microwave-3450 — *See Vol. A*

Socket Adapters-2100 — *See Vol. C*

Sockets, Array-2100 — *See Vol. C*

Sockets, Capacitor-2100 — *See Vol. C*

Sockets, CRT — See Sockets, Tube (Vol. C)

Sockets, Crystal-2100 — *See Vol. C*

Sockets, Diode-2100 — *See Vol. C*

Sockets, DIP and DIL-2100 — *See Vol. C*

Sockets, Integrated Circuit-2100 — *See Vol. C*

Sockets, International-2100 — *See Vol. C*

Sockets, Lamp & Lamp Assemblies-2450

§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1019
§ Bivar, Inc., 4 Thomas, Irvine, CA 92718, 714-951-8808 ..... C•1025
Gilway Technical Lamp, 165 New Boston Street, Woburn, MA 01801, 617-935-4442 ..... B•1053,1055
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... C•1225
§ Industrial Devices, Inc., 7 Hudson St., Edgewater, NJ 07020, 201-224-4700 ..... B•1064-1065,1069,1070,1071,1072,1073,1074,1075,1076,1077
§ Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101, 718-392-8800 ..... B•1086
§† Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ..... B•1088
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1657-1667
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911 ..... C•1506
§ Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 ..... B•1098
§† Sylvania Miniature Lighting, GTE Corporation, W. Main St., Hillsboro, NH 03244, 603-464-5533 ..... B•1110
§ Visual Communications Co., Inc., P.O. Box 986, El Segundo, CA 90245, 213-822-4727 ..... B•1113
§ Alco Elctrn. Prods., Inc., 1551 Osgood St, N. Andover, MA 01845 617-685-4371
Alden Products Co., P.O. Box 860, 117 N. Main St., Brockton, MA 02403 617-583-0160

§ Alpha Products, Inc., 5740 Corsa Ave. # 104, Westlake Village, CA 91362 818-889-9304
§ American Ultraviolet, 320 Commerce St, Chatham, NJ 07928 201-635-8355
§ Amphenol, An Allied Co., 43 Commerce Ct, Lisle, IL 60532 312-983-3500
§ Aries Elctrns., Box 130, Frenchtown, NJ 08825 201-996-6841
§ Asmann Components, Div. of ebm Industries, Inc., 525 New Britain Ave., Unionville, CT 06085 203-674-1515
§† Associated Engrg. Mfg., 546 Valley Rd., Upper Montclair, NJ 07043 201-783-7800
§ Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Auto-Swage Prods., 726 River Rd., Shelton, CT 06484 203-929-1401
§ Westinghouse Elec. Corp., Bryant Circuit Devices Div., 500 Sylvan Ave., Bridgeport, CT 06606 203-334-5561
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 914-425-7460
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
§ Compu-Lite Corp., 711 W. 17th St. #F12, Costa Mesa, CA 92627 714-645-1501
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
Data Display Products, Box 91072, Los Angeles, CA 90009 213-640-0442
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587 718-497-7600
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
† Drawn Metal Products, 6143 W. Howard St, Niles, IL 60648 312-647-8941
Dupree, Inc., 9835 Dupree St, So. El Monte, CA 91733 818-442-4700
Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St, Milwaukee, WI 53216 414-449-7487
§† Elctrn. Molding Corp., 96 Mill St, Woonsocket, RI 02895 401-769-3800
§† Garry Mfg. Co., Div. of Brand-Rex Co., 9 Queen Anne Ct, Laghorne, PA 19047 215-949-2300
§ GC Elctrns., 400 S. Wyman St, Rockford, IL 61101 815-968-9661
General Electric Co., Wire & Cable, 1285 Boston Ave., Bridgeport, CT 06602 203-382-2000
§† Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
† GTI/Elctrns. Div., P.O. Box 96, Hadley, PA 16130 412-253-3161
† Hoffman Engineering Corp., P.O. Box 300, Old Greenwich, CT 06870 203-325-8933
§ Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 818-787-0311
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025 312-729-5330
§ ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
§ Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
Ledtronics, Inc., 4009 Pacific Coast Hwy., Torrance, CA 90505 213-534-1505
† Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
§ Oshino Electric Lamp Works, Ltd., 5-2, Mianami-Shinagawa 2-chome, Shinagawa-Ku, Tokyo, JAPAN 03-471-8548
§ Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
§† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
§ SAMTEC, 810 Progress Blvd., P.O. Box 1147, New Albany, IN 47150 812-944-6733
Schurter, Inc., 1016 Clegg Ct, Petaluma, CA 94952 707-778-6311
§ Sealectro, 225 Hoyt St, Mamaroneck, NY 10543 914-698-5600
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
† Sorenson Lighted Controls, 75 Locust St, Hartford, CT 06114 203-527-3092
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
§ Trimm, Inc., Div. of Newton Instr. Co., 400 W. Lake St, Box 489, Libertyville, IL 60048 312-362-3700
TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007 312-981-6000
§† UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778 818-285-3123
Wall-Able Manufacturing Corp., 1800 N. Clybourn Ave., Chicago, IL 60614 312-440-1000
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Sockets, Leadless Carrier-2100 — *See Vol. C*

Sockets, LIF & ZIF-2100 — *See Vol. C*

Sockets, Miniature & Subminiature — See Sockets, Diode (Vol. C)

Sockets, Pin Grid Array-2100 — *See Vol. C*

Sockets, Power (Receptacles)-2100 — *See Vol. C*

Sockets, Relay-2100 — *See Vol. C*

Sockets, SIP-2100 — *See Vol. C*

Sockets, Test-2100 — *See Vol. C*

Sockets, Transistor-2100 — *See Vol. C*

Sockets, Tube-2100 — *See Vol. C*

Sockets (MIL)-2440

† **Eby Co., 2751 Southampton Rd., Philadelphia, PA 19154, 215-969-4200** ..... **C•1185**
Elctrn. Molding Corp., 96 Mill St., Woonsocket, RI 02895, 401-769-3800 .. **C•1188**
§† **H&T Components Inc., H&T Components Ltd., 35 Carlough Road, Bohemia, NY 11716, 516-567-2282** ..... **C•1226**
† **Jettron Prods., P.O. Box 337, E. Hanover, NJ 07936, 201-887-0571** ..... **C•1409**
† AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
† Mark Eyelet & Stamping, 202 Wakelee Rd., Wolcott, CT 06716 203-756-8847
Texas Instrs., Data Sys. Group, P. O. Box 809063, Dallas, TX 75380-9063 1-800-527-3500
Varian Associates, Inc., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000
§† Wells Elctrns., 1701 S. Main St, South Bend, IN 46613 219-287-5941

Software, Applications-2050 — *See Vol. D*

Software, Communications-2050 — *See Vol. D*

Software, Compilers/Languages-2050 — *See Vol. D*

Software, Computer Performance Measurement-2050 — *See Vol. D*

Software, Data Base Management-2050 — *See Vol. D*

Software, Data Base Management Dictionaries-2050 — *See Vol. D*

Software, Data Base Query Language-2050 — *See Vol. D*

Software, Data Communications Control-2050 — *See Vol. D*

Software, Disk/Tape File Utilities-2050 — *See Vol. D*

Software, Emulation/Simulation-2050 — *See Vol. D*

Software, Information Storage & Retrieval-2050 — *See Vol. D*

Software, Job Scheduling/Accounting-2050 — *See Vol. D*

Software, Librarians-2050 — *See Vol. D*

Software, Operating Systems-2050 — *See Vol. D*

Software, Operating Systems Enhancement-2050 — *See Vol. D*

Software, Programming/Systems Development Aids-2050 — *See Vol. D*

Software, Program Translators-2050 — *See Vol. D*

Software, Report Generators-2050 — *See Vol. D*

Software, Security-2050 — *See Vol. D*

Software, Sort/Merge-2050 — *See Vol. D*

Software, Spoolers-2050 — *See Vol. D*

Software, Utilities-2050 — *See Vol. D*

Solar Cells — See Cells, Photovoltaic (Vol. B)

Solder (All Types)-4600 — *See Vol. C*

Solder Lugs — See Terminals, Lug (All Types) (Vol. C)

Solder Pots & Baths-4600 — *See Vol. C*

Soldering Accessories-4600 — *See Vol. C*

Soldering Equipment, Hot Gas-4100 — *See Vol. D*

Soldering Equipment, Induction Heating-4100 — *See Vol. D*

Soldering Equipment, Infrared-4100 — *See Vol. D*

Soldering Equipment, Printed Circuit-4100 — *See Vol. D*

Soldering Equipment, Resistance-4100 — *See Vol. D*

Soldering Systems, Temperature Controlled-4100 — *See Vol. D*

Soldering Equipment, Ultrasonic-4100 — *See Vol. D*

Soldering Equipment, Vapor Phase-4100 — *See Vol. D*

Soldering Guns, Irons & Desoldering Tools-4600 — *See Vol. C*

Soldering (MIL)-2440

Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§† Chemtronics Inc., 681 Old Willets Path, Hauppauge, NY 11788 516-582-3322
† Fusion Inc., 4658 E. 355th. St., Willoughby, OH 44094 216-946-3300
§† Gardiner Solder Co., Div. of Gardiner Metal Co., 4820 S. Campbell Ave., Chicago, IL 60632 312-847-0100
Kantz Elctrn. Ind., 1804 Wall Church Rd., Wall Township, NJ 07719 201-974-0090
† Miller, L.C., Co., 717 Monterey Pass Rd., Monterey Pk., CA 91754 213-268-3611
Multicore Solders, Cantiague Rock Rd., Westbury, NY 11590 516-334-7997
Penn Resch. Corp. (PRC), 2652 South Main St., P.O. Box 3357, Kennesaw, GA 30144 404-429-9061
Universal Instrs., P.O. Box 825, Binghamton, NY 13902 607-775-1102

Solenoids, Linear-4550

Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ..... B•1263
Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215, 414-671-6800 ... B•1464
Electro-Mechanisms, 2745 E. Huntington Dr., Duarte, CA 91010, 818-359-2535 ..... B•1466
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607, 312-243-1100 ..... B•1387
ITT Components Electromechanical Grp., 1201 E. McFadden Ave., Santa Ana, CA 92705, 714-836-0351 ..... B•1471
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1468
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435, 815-725-2241 ..... B•1472
§† Regdon Corp., 3713 Grand Blvd., Brookfield, IL 60513, 312-485-5152 .... B•1475
TS Products, Inc., 12455 Branford St., Bldg. 22, Arleta, CA 91331, 818-896-6676 ..... D•1990
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St, Milwaukee, WI 53201 414-671-2000
† A.P.W. Co., Inc., 72 W. Main, Rockaway, NJ 07866 201-627-0643
Automatic Switch Co., 50-60 Hanover Road, Florham Park, NJ 07932 1-201-966-2000
† Bicron Elctrns., Box 807, Barlow St., Canaan, CT 06018 203-824-5125
† Component Specialties Corp., 9143 E. La Rosa Dr., Temple City, CA 91780 213-283-0015
§ Densitron Corp., 20775 Western Ave., Torrance, CA 90501 213-618-9647
§† Dormeyer Inds., 3418 N. Milwaukee, Chicago, IL 60641 312-283-4000
Endicott Coil, 22 E. Charlotte St., Binghamton, NY 13905 607-797-1263
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
† IMC Magnetics Corp., Western Div., 12627 Hiddencreek Way, Cerritos, CA 90701 213-926-0927
ITT General Controls Div., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201 213-842-6131
Kogyosha, 179 Riveredge Rd., Tenafly, NJ 07670 201-569-8769
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 .....201-291-3334; 800-221-0714
Linear Motions Co., 17025 Dubesor St., Valinda, CA 91744 818-918-7806
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
† Lisk, G. W., Co., 2 South St., Clifton Springs, NY 14432 315-462-2611
§ Namco Controls, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060 216-946-9900
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
† SR Engineering, Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Tran-Trol Co., 2525 N. Alvernon Way, C-6, Tucson, AZ 85712 602-795-8008
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
† West Coast Elec. Mfg., 14045 Garfield Ave, Paramount, CA 90723 213-633-1010

Solenoids, Proportional-4550

Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215, 414-671-6800 ... B•1464
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1468
Regdon Corp., 3713 Grand Blvd., Brookfield, IL 60513, 312-485-5152 .... B•1475
Automatic Switch Co., 50-60 Hanover Road, Florham Park, NJ 07932 1-201-966-2000
Endicott Coil, 22 E. Charlotte St., Binghamton, NY 13905 607-797-1263
ITT General Controls Div., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201 213-842-6131
† Lisk, G. W., Co., 2 South St., Clifton Springs, NY 14432 315-462-2611
† SR Engineering, Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200

Solenoids, Rotary-4550

† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1468
TS Products, Inc., 12455 Branford St., Bldg. 22, Arleta, CA 91331, 818-896-6676 ..... D•1990
§ Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078 605-665-9301
§ Densitron Corp., 20775 Western Ave., Torrance, CA 90501 213-618-9647
Endicott Coil, 22 E. Charlotte St., Binghamton, NY 13905 607-797-1263
† Ideal Precision Meter, 214 Franklin St., Brooklyn, NY 11222 212-383-6904
† IMC Magnetics Corp., Western Div., 12627 Hiddencreek Way, Cerritos, CA 90701 213-926-0927
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 .....201-291-3334; 800-221-0714
† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
† Lisk, G. W., Co., 2 South St., Clifton Springs, NY 14432 315-462-2611
† Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
† Recyclene Products, 1910 Trade Zone, San Jose, CA 95131 408-945-8600
† SR Engineering, Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Tran-Trol Co., 2525 N. Alvernon Way, C-6, Tucson, AZ 85712 602-795-8008

Solenoids (MIL)-2440

† A.P.W. Co., Inc., 72 W. Main, Rockaway, NJ 07866 201-627-0643
† Bicron Elctrns., Box 807, Barlow St., Canaan, CT 06018 203-824-5125
† Ideal Precision Meter, 214 Franklin St., Brooklyn, NY 11222 212-383-6904
† Lisk, G. W., Co., 2 South St., Clifton Springs, NY 14432 315-462-2611
† SR Engineering, Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200

Solvents — See Cleaners & Solvents (Vol. C)

Sonar Systems-3475 — *See Vol. D*

S100 Bus — See Board Computers & Subassemblies (Vol. D)

Sound Absorbing Materials-2825 — *See Vol. C*

Sound Level Indicators — See Meters, Audio Level (Vol. D)

Sound Recording Equip. — See Microphones (Vol. D), Recorders (Vol. D), etc.

Spacers-2825 — *See Vol. C*

Spaghetti — See Tubing, Spaghetti (Vol. C)

Spark Gaps-4300

Connector Corp., 6025 N. Keystone Ave., Chicago, IL 60646, 312-539-3108 ..... C•1177
Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008, 408-377-4621 ..... B•1443
§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
§ Hobson Bros., 4940 W. Lawrence Ave., Chicago, IL 60630-3884 312-283-3600
Joslyn Elctrn. Sys., P.O. Box 817, Goleta, CA 93116 805-968-3551
Lightning Protection Corp., Box 6086, Santa Barbara, CA 93160 .. 805-967-5089/4577
Maxwell Labs., 8835 Balboa Ave., San Diego, CA 92123 619-279-5100
§ PolyPhaser Corporation, 1425 Industrial Way, P.O. Box 1237, Gardnerville, NV 89410-1237 ..... 702-782-2511;800-325-7170
Pulsar Products Div., 2700 Merced St., San Leandro, CA 94577 415-577-7236

Speakers, Explosion & Flame Proof-1300 — *See Vol. D*

Speakers, Horn-1300 — *See Vol. D*

Speakers, Intercom-1300 — *See Vol. D*

Speakers, Midrange-1300 — *See Vol. D*

Speakers, Musical Instrument-1300 — *See Vol. D*

Speakers, Paging — See Speakers, Intercom (Vol. D)

Speakers, Pillow-1300 — *See Vol. D*

Speakers, Public Address-1300 — *See Vol. D*

Speakers, Replacement (Incl. Aircraft, Automotive & TV)-1300 — *See Vol. D*

Speakers, Submergence Proof-1300 — *See Vol. D*

Speakers, Subminiature-Also See Bells, Buzzers, Gongs, Sirens & Aural Warning Devices-1300 — *See Vol. D*

Speakers, Tweeter-1300 — *See Vol. D*

Speakers, Weatherproof-1300 — *See Vol. D*

Speakers, Woofer-1300 — *See Vol. D*

Speakers (MIL)-2440 — *See Vol. D*

Speaker Systems-1300 — *See Vol. D*

Spectrometers-2900 — *See Vol. D*

Speech Compression & Synthesis Equipment-2325 — *See Vol. D*

Speed Drives, Motor — See Controls, Motor Speed (Vol. D)

Spiral Wrap — See Tubing, Spiral Wrap (Vol. C)

Splices, Fiberoptic-2475

§† General Cable Co., Fiber Optics Div., 160 Fieldcrest Ave., Raritan Ctr., Edison, NJ 08818 201-225-4780
§† TRW Fiber Optic Prods., Connector Div., TRW Elctrn. Comps. Grp., 401 N. Broad St., Philadelphia, PA 19108 215-922-8900

Splicers, Coaxial Cable-5400 — *See Vol. C*

Splicers, Wire (Incl. Butt & Cap Types)-5400 — *See Vol. C*

Splicing Equipment, Magnetic Tape-1300 — *See Vol. D*

Splicing Equipment, Fiber Optic-5400 — *See Vol. C*

Splicers, Fiber Optic-2475
Power Technology, Inc., P.O. Box 9769, Little Rock, AR 72219, 501-568-1995 ..... B•1125
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

Splitters/Combiners, Power — See Dividers, Power (Vol. A)

Spoolers, Printer Buffers-2325 — *See Vol. D*

Spoolers, Punched Tape — See Readers, Punched Tape (Vol. D)

Springs (All Types)-2500 — *See Vol. C*

Stabilizers, Current — See Current Sources (Vol. D), Regulators, Current (Vol. D)

Stabilizers, Line Impedance-4050 — *See Vol. D*

Stabilizers, Voltage — See Regulators & Stabilizers, Voltage (Vol. D), Transformers, Voltage Regulating (Vol. A), Voltage Sources (Vol. D)

Stabilizers, Voltage/Current, Automatic — See Power Supplies, Constant Current (Vol. D)

Stalos (Stabilized Local Oscillators) — See Oscillators, Microwave (Vol. A)

Stampings, Precious Metal — See Preforms, Precious Metal (Vol. C)

Standards, Atomic Beam-2900 — *See Vol. D*

Standards, Capacitance-2900 — *See Vol. D*

Standards, Current-2900 — *See Vol. D*

Standards, Delay Line-2350 — *See Vol. A*

Standards, Frequency-2900 — *See Vol. D*

Standards, Inductance-2900 — *See Vol. D*

Standards, Noise-2900 — *See Vol. D*

Standards, Phase-2900 — *See Vol. D*

Standards, Phase Angle-2900 — *See Vol. D*

Standards, Resistance-2900 — *See Vol. D*

Standards, Temperature-2900 — *See Vol. D*

Standards, Time-2900 — *See Vol. D*

Standards, Voltage-2900 — *See Vol. D*

Standards, Voltage Ratio-2900 — *See Vol. D*

Standoffs — See Bushings, Glass, Plastic, Metal, etc. (Vol. C)

Stands, Instruments-1400 — *See Vol. C*

Stands, Printer/Terminal-1400 — *See Vol. C*

Static Eliminating Materials, Devices, & Equipment-4525 — *See Vol. C*

Stators, Motor & Generator — See Motor & Generator Armatures,Rotors, Stators (Vol. B)

STD Bus — See Board Computers & Subassemblies (Vol. D)

Steppers, Indexing, Motor-3500
†Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
Portescap U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490 .. 215-277-0433
†Superior Elec. Co., 383 Middle St., Bristol, CT 06010 203-582-9561
†Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300

Steppers, Indexing, Switch-5100
§Athena Controls, Inc., 5145 Campus Dr., Whitemarsh Ind. Campus, Plymouth Meeting, PA 19462 215-828-2490
Femco, Inc., P.O. Box 26710 Parkmoor Sta., San Jose, CA 95159 408-946-1188
Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010

Storage Euipment, Cartridge/Cassette-3800 — *See Vol. C*

Storage Equipment, Disk-3800 — *See Vol. C*

Storage Equipment, Flexible Disk-3800 — *See Vol. C*

Storage Equipment, Magnetic Card-3800 — *See Vol. C*

Storage Equipment, Microform-3800 — *See Vol. C*

Storage Equipment, Multifunctional-3800 — *See Vol. C*

Storage Equipment, Paper Tape-3800 — *See Vol. C*

Storage Equipment, Printout-3800 — *See Vol. C*

Storage Equipment, Punched Card-3800 — *See Vol. C*

Storage Equipment, Reel-to-Reel Tape-3800 — *See Vol. C*

Strain Reliefs, Cable & Wire-2800 — *See Vol. C*

Strip-Line Components, Microwave-3450 — *See Vol. A*

Strips, Ground-1900 — *See Vol. D*

Strips, Marker & Fanning-3000 — *See Vol. C*

Stroboscopes — See Lamps, Stroboscopic Source (Vol. B)

Substrates, Ceramic-2800 — *See Vol. C*

Substrates, Flexible-2800 — *See Vol. C*

Substrates, Glass-2800 — *See Vol. C*

Substrates, Metallic-2800 — *See Vol. C*

Substrates, Sapphire-2800 — *See Vol. C*

Surface Acoustic Wave, Delay Line-2350 — *See Vol. A*

Surface Acoustic Wave, Filter-2700 — *See Vol. A*

Suppressors, Arc — See Protectors, Surge (Vol. B)

Suppressors, Noise-2700 — *See Vol. A*

Suppressors, Transient Voltage (All Types)-4300
Arstan Products Intl. Ltd., 99 Jericho Tpke., Jericho, NY 11753, 516-333-8100 ..... A•2120
Cal-R, Inc., P.O. Box 1397, Santa Monica, CA 90406, 213-450-1761 ..... B•1747
§Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ..... B•1302,1304,1306
†Control Concepts Corp., P.O. Box 1380, Binghamton, NY 13902-1380, 607-724-2484 ..... B•1233
†Controlled Power Co., 1955 Stephenson Hwy., Troy, MI 48083, 1-800-521-4792 ..... D•1912
Displax, Inc., Alexander Place, Glen Cove, NY 11542, 516-671-4400 ..... D•1917
DVE/Caltronic Co., Ltd., A Sub. of Dee Van Entrp. Co., Ltd., 407 S. Palm Ave., Alhambra, CA 91803, 818-289-0310 ..... D•1613
Hipotronics, P.O. Drawer A, Brewster, NY 10509, 914-279-8091 ..... D•1934
§Hi-Tech Components, Mitsubishi International Corp., 520 Madison Ave., New York, NY 10022, 212-605-2607 ..... B•1239
Instrument Specialties Co., P.O. Box A, Delaware Water Gap, PA 18327, 717-424-8510 ..... C•1725
JMK, Inc., 15 Caldwell Dr., Amherst, NH 03060, 603-886-4100 ..... A•1611
Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 .. B•1752
†Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1468,1614
Maida Development Co., 20 Libby St., Hampton, VA 23663, 804-723-0785 ..... A•1113
§†MCG Elctrns., 12 Burt Dr., Deer Park, NY 11729, 516-586-5125 ..... B•1248
§Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 ..... B•1759,1762,1763,1764,1765
Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 ..... A•1582,1616,1617
Pacific Power Source Corp., 15122 Bolsa Chica St., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•1949,1951,1952
Perma Power Elctrns., 5615 W. Howard Ave., Chicago, IL 60648, 312-647-9414 ..... B•1256
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... A•1270
§PolyPhaser Corporation, 1425 Industrial Way, P.O. Box 1237, Gardnerville, NV 89410-1237, 702-782-2511;800-325-7170 ..... B•1257
Potter Co., P.O. Box 337, North Hwy. 51, Wesson, MS 39191, 601-643-2215 ..... A•1623
†Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 ..... D•1968
Triad-Utrad, 1124 E. Franklin St., Huntington, IN 46750, 219-356-6500 ... D•1970
Xentek, Inc., 279 S. Pacific St., San Marcos, CA 92069, 619-744-3346 .... D•1872
Atlantic Scientific Corp., 2711 S. Harbour City Blvd., Melbourne, FL 32901 305-725-8000
§Beckman Industrial Corp., Electronic Technologies Div., 2500 Harbor Blvd., Fullerton, CA 92634 714-871-4848
§Brooks Mfg. Co., 2016/24 Amber St., Philadelphia, PA 19125 ..... 215-425-3395; 800-523-0130
Brooks Mktg. Corp., 3569 Bristol Pike Bldg. 2 Ste 102, Bensalem, PA 19020 ..... 215-244-0264;1-800-523-1551
§†Bud Inds., Inc., 4605 E. 355th St., Willoughby, OH 44094 216-946-3200
†California Instruments, A Div. of Amstar Tech. Prods. Co., Inc., 5150-Convoy St., San Diego, CA 92111 ..... 619-279-8620;800-356-2244;800-821-1634

§ Codi Semiconductor, Inc., 350 Hurst Ave., Linden, NJ 07036 201-862-8484
§ Collmer Semiconductor, Inc., 14368 Proton Rd., Dallas, TX 75234-3335 214-233-1589
§ Computerware, Inc., 8480-I Tyco Rd., Vienna, VA 22180 703-821-8200
Corcom, Inc., 1600 Winchester Rd., Libertyville, IL 60048 312-680-7400
Cuesta Systems, Inc., 3440 Roberto Ct., San Luis Obispo, CA 93401 805-541-4160
§ Current Technology, Inc., 1400 S. Sherman, #202, Richardson, TX 75081 214-238-5300
§ Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078 605-665-9301
§ Dyrna Engrg., Box 1535, Los Lunas, NM 87031 505-865-6700
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, NJ 07410 201-797-4200
EFI Corporation, 350 West 2700 South, Salt Lake City, UT 84115 801-486-5871
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. #5, York, PA 17402 717-767-6517
§ Electronic Specialists, 171 South Main St., Natick, MA 01760 .....617-655-1532; 800-225-4876
Electrostatic Consltg. Assocs., 556 Lowell Rd., Groton, MA 01450 617-448-5485
Elgar Corp, An Onan McGraw Edison Co., 9250 Brown Deer Rd., San Diego, CA 92121 619-450-0085
Elin Div., California Instrs. Co., Div. of Norlin Ind., 5150 Convoy St., San Diego, CA 92111 619-279-8620
§ Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
§† General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
§† General Semiconductor Ind., Inc., Square D Company, 2001 W. 10 Pl., Tempe, AZ 85281 602-968-3101
§ Hammond Mfg. Co., 1690 Walden Ave., Buffalo, NY 14225 716-894-5710
§ International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
Inter-Technical Grp., Box 23, Irvington, NY 10533 914-591-8822
Joslyn Elctrn. Sys., P.O. Box 817, Goleta, CA 93116 805-968-3551
Kalglo Elctrns. Co., Inc., 6584 Ruch Rd., E. Allen Twp., Bethlehem, PA 18017 215-837-0700
§ Lea Dynatech, Inc., 12516 Lakeland Rd., Santa Fe Springs, CA 90670-9990 213-944-0916
Lightning Protection Corp., Box 6086, Santa Barbara, CA 93160 .. 805-967-5089/4577
Marway Prods. Inc., 311 N. Clara St., Santa Ana, CA 92703 714-973-1800
§† Micro Semiconductor, 2830 S. Fairview St., Santa Ana, CA 92704 714-979-8220
§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900
§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 201-748-5089
§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052 201-762-6886
† Power Integrity Corp., 1840 Pembroke Rd., P.O. Box 9682, Greensboro, NC 27408 919-379-9773
Powermark, 3855 Ruffin Rd., San Diego, CA 92123 619-565-8363
§ Production Industries, Inc., 12880-E Pierce Street, Pacoima, CA 91331 ..... 818-896-0555;800-423-5618
§ RCA Distr. & Special Prods. Div., RCA Corp., 2000 Clements Bridge Rd., Deptford, NJ 08096 609-541-3636
§ RCA Solid State Div., Transistors, Rte. 202, Somerville, NJ 08876 201-685-6000
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
RFL Inds., A Dowty Grp. Co./Comms. Div., Powerville Rd., Boonton, NJ 07005 201-334-3100
Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621
§ SAFT America, Inc., Elctrns. Sys. Div., 2414 W. 14th St., Tempe, AZ 85281 602-894-6864
Sanford-Miller Corp., 8 John St., Lynbrook, NY 11563 .....516-593-2025;Outside NY 800-645-5900
Sanken Elec. U.S.A. Corp., 3848 Carson St., Ste. 105, Torrance, CA 90503 213-540-2209
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
Semicon, 10 North Ave., Burlington, MA 01803 617-272-9015
§ Semikron, Inc., 11 Executive Dr., P.O. Box 66, Hudson, NH 03051 .....603-883-8102; 1-800-258-1308
Shape Magnetronics, Inc., 901 DuPage Ave., Lombard, IL 60148 312-620-8394
§ Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400
SL Waber, 300 Harvard Ave., Westville, NJ 08093 ..... 609-456-5400;800-257-8384
Spectrum Control, Inc., 2185 W. 8th St., Erie, PA 16505 814-455-0966
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Staffall Inc., 7 Woodland St., Providence, RI 02908 401-351-8282
§ St-Semicon, 415 N. College Ave., P.O. Box 609, Bloomington, IN 47402 812-332-1435
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
§† Surgeonics Ltd., 344 Main St., Mt. Kisco, NY 10549 914-241-3203
Sylvania GTE Control Devices, Rte. 35, Standish, ME 04084 207-642-4535
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 215-825-4990
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ Thomson-CSF Comps. Corp., Semiconductor Div., 6660 Variel Ave., Canoga Pk., CA 91304 213-887-1010
§† Topaz Electronics, 9192 Topaz Way, San Diego, CA 92123-1164 619-279-0831
§ Tripp-Lite, 500 No. Orleans, Chicago, IL 60610 312-329-1777
† Victor Elec. Wire & Cable, 618 Main St., W. Warwick, RI 02893 ....401-821-1700;SALES 401-821-7800
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Surface Mounted Assemblies — See Assembly type: Amplifiers, Rectifiers, etc.

Surveillance Sets (MIL)-3475 — *See Vol. D*

Surveillance Systems (MIL), Optical-3475 — *See Vol. D*

Surveillance Systems (MIL), Radio Frequency-3475 — *See Vol. D*

Surveillance/Warning Systems (MIL), Control-3475 — *See Vol. D*

Surface Acoustic Wave Devices-2350 — *See Vol. A*

Switch Arrays-5100

COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441, 612-559-3772 ..... B•1536
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... B•1671
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087 .....312-662-7667; 800-323-9605
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
LVC Inds., Inc., CO-ORD Switch Div., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
† North Hills Elctrns., 1 Alexander Pl., Glen Cove, NY 11542 516-671-5700

Switches, Backup-5100

Advanced Sys. Concepts, 435 N. Lake Ave., Pasadena, CA 91101, 818-793-8971 ..... D•1137
Bytex Corp., 2 California Ave., Framingham, MA 01701 617-879-5050
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Communication Cables & Connectors, The Dutton Co., 8255 Black Run Rd., Nashport, OH 43830 614-828-2468
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
§ Electro Standards Lab., Inc., P.O. Box 9144, Providence, RI 02940 401-943-1164
Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222

Switches, Cam-5100

Datametrics • Dresser Inds., Inc., 340 Fordham Road, Wilmington, MA 01887, 617-658-5410 ..... B•1791
Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543, 914-698-2026-800-431-2625 (outside NY) ..... B•1690
Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
Allen-Bradley Co., Electronics Group, Rockwell Corporation, 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
§ American Control Products, Div. of Precision Timer Co., Inc., 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
Automatic Timing & Controls Co., 201 So. Gulph Rd., King of Prussia, PA 19406 ..... 215-337-5500;800-441-8245
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 .. 312-578-3500
§ Chicago Lock Co., 4311 W. Belmont Ave., Chicago, IL 60641 312-282-7177
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
§ Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 914-425-7460
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087 .....312-662-7667; 800-323-9605
† Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8300
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
§ General Control Co., 1200 Soldiers Field Rd., Boston, MA 02134 617-782-7440
§† ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§† Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§† Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
† Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
† Poly-Scientific, Litton Inds., 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 ..... 516-ED3-5955
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ..201-797-3313;800-526-5376
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844
§ Sealectro, 225 Hoyt St., Mamaroneck, NY 10543 914-698-5600
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650 201-944-2221
Techniques, Inc., 235 Jackson St., Englewood, NJ 07631 201-569-5900
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Zenith Controls, 830 West 40th St., Chicago, IL 60609 312-247-6400

Switches, Capacitive — See Switches, Touch Actuated (Vol. B)

Switches, Coaxial — See Switches, RF (Vol. B)

Switches, Coded-5100

Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002, 201-436-2230 ..... B•1137
Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... B•1481
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... B•1493

† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103, 603-669-0940 ..... B•1502
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1526
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704, 714-556-3100 ... B•1538
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ..... B•1541
§† EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ..... B•1558
Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441, 612-559-0720 ..... B•1566
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1574
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ..... B•1597
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ..... B•1609
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1612
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ..... B•1680
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507, 312-844-4300 ..... B•1570
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ..... B•1700
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 .... B•1702
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441 612-559-3772
CTS Corporation, Microelectronics Div., 1201 Cumberland Ave., W. Lafayette, IN 47906 317-463-2565
§† Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
† Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§ Interswitch, 770 Airport Blvd., Burlingame, CA 94010 415-347-8217
IVO Inds., Inc., 201 Industrial Way W., P.O. Drawer 917, Eatontown, NJ 07724 201-542-5151
JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705 714-250-8770
Kel-Am, 308 E. 5th, P.O. Box 313, Eldon, MO 65026 314-392-7174
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 818-992-6776
† Maurey Instr. Corp., 4555 W. 60th St., Chicago, IL 60629 312-581-4555
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
SGS Semiconductor Corporation, 1000 E. Bell Road, Phoenix, AZ 85022 602-867-6100
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
Standard Grigsby Inc., W. Gunther GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 51, WEST GERMANY 0911-65521
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
Tansitor Elctrns., West Rd., Bennington, VT 05201 802-442-5473
§ Via West Inc., 534 N. Stone Ave., Tucson, AZ 85705 602-623-5716

Switches, Crossbar — See Switches, Matrix (Vol. B)

Switches, Data, Manual-2325 — *See Vol. D*

Switches, Data, Programmable-2325 — *See Vol. D*

Switches, Decade-5100

§† AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§ AMP Distributor Marketing Div, A Division of AMP Products Corporation, Harrisburg, PA 17105 717-780-7025
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 617-964-6400
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 .. 312-578-3500
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§ Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
Interswitch, 770 Airport Blvd., Burlingame, CA 94010 415-347-8217
Meissner Inds., 551 Rte. 10, Dover, NJ 07801 201-366-1700
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Shallco, Box 1089, Smithfield, NC 27577 919-934-3135
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk, NJ 07650 201-944-2221
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Veeder-Root, 70 Sargeant St., Hartford, CT 06102 203-527-7201

Switches, Diode-3450 — *See Vol. A*

Switches, DIP-5100

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... B•1481
§† American Research & Engineering, 1500 Executive Dr., Elgin, IL 60120, 312-888-7245 ..... B•1486
§† AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... B•1492
§ Aries Elctrns., Box 130, Frenchtown, NJ 08825, 201-996-6841 ..... C•1155-1497,1157
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103, 603-669-0940 ..... B•1502
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... B•1513
§† CTS Electronics Corp., Paso Robles Div., Electromechanical Gp., 500 Linne Rd., Paso Robles, CA 93446, 805-238-0350 ..... B•1542
§ EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ..... B•1560
§† Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1571
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607, 312-243-1100 ..... B•1386
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1590
JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705, 714-250-8770 ..... B•1604
Shelly Associates, Inc., 14201 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
§ AMP Distributor Marketing Div, A Division of AMP Products Corporation, Harrisburg, PA 17105 717-780-7025
§ Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ Circuit Assembly Corp., 18 Thomas St., Irvine, CA 92718-2703 714-855-7887
CTS Corporation, 905 North West Blvd., Elkart, IN 46514 219-293-7511
§ Front Panel Devices, Inc., 530 Burnside Ave., Inwood, NY 11696 212-471-9800
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ Kel-Am, 308 E. 5th, P.O. Box 313, Eldon, MO 65026 314-392-7174
M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 .. 617-272-3000
§ Mallory Capacitor Co., Mallory Comps. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
§† Micro-Products Engrg. Co., 230 Ridgewood Ave., Newark, NJ 07108 201-824-8467
† Minelco Inc. - A Talley Ind., 135 S. Main St., Thomaston, CT 06787-0459 203-283-8261
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260 602-991-0942
§ Robinson-Nugent, Inc., 800 East 8th St., New Albany, IN 47150 812-945-0211
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Sprague Electric Company, Distribution Division, 481 Marshall St., No. Adams, MA 01247 413-664-4481
Switches Inc., 949 Stierlin Rd., Mountain View, CA 94043 415-962-8649
§ VRN International, Div. Vernitron, 2801 72nd St. N., Box 44000, St. Petersburg, FL 33743 813-347-2181
Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 312-585-1212

Switches, Fiber Optic-2475

EOTec Corp., 420 Frontage Road, W. Haven, CT 06516 203-934-7961
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377 212-458-5811
† Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907 419-756-5911

Switches, Float-5100

COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441 612-559-3772
Modern Controls Corp., 4636 Hidden Forest Dr., Sarasota, FL 33580 813-351-3042
† Pressure Controls, Inc., 406 Cortlandt St., Belleville, NJ 07109 201-751-5003
§† Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 203-677-1311

Switches, Foot Pedal, Mat, Ribbon, etc.-5100

§† Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543, 914-698-2026-800-431-2625 (outside NY) ..... B•1690
§ Tapeswitch Corp. of America, 100 Schmitt Blvd., Farmingdale, NY 11735, 516-694-6312 ..... B•1699
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ General Control Co., 1200 Soldiers Field Rd., Boston, MA 02134 617-782-7440
§ Lektralab Technologies, Inc., 129-07 18th Ave., P.O. Box 222, College Point, NY 11356 718-939-7171
§† Linemaster Switch, Box 52, Woodstock, CT 06281 203-974-1000
§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035 315-655-8050
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ..201-797-3313;800-526-5376
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Switches, Hall Effect-5100

§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ..... B•1557
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625-1631,1646,1647,1651
Linemaster Switch, Box 52, Woodstock, CT 06281 203-974-1000
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, OH 43212 ... 614-486-9561
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
SGS Semiconductor Corporation, 1000 E. Bell Road, Phoenix, AZ 85022 602-867-6100
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701

Switches, High Voltage (Over 250 Volts)-5100

C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... B•1513
§† Electro Switch, King Ave., Weymouth, MA 02188, 617-335-5200 ..... B•1564
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1590
Hermetic Switch, Box 1325, Hwy. 92, Chickasha, OK 73018, 405-224-4046 ..... B•1592
† Radio Switch Corp., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, 201-462-6100 ..... B•1691
† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008, 408-377-4621 ..... B•1443
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ..... B•1701
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
† Amphenol, An Allied Co., 43 Commerce Ct., Lisle, IL 60532 312-983-3500
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
§† ASM, 525 Truck La., Smithfield, NC 27577 919-934-3104
Beckman Industrial Corp., Cedar Grove Div., 89 Commerce Rd., Cedar Grove, NJ 07009 201-239-6200
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
CSI Capacitors, CSI Technlgs., 810 Rancheros Dr., San Marcos, CA 92069 619-747-4000
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, NY 10550 914-699-2000
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379 203-599-2075
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087 .....312-662-7667; 800-323-9605
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460 203-877-4577
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
Federal Pacific, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;in OH 800-245-4497
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§ Interswitch, 770 Airport Blvd., Burlingame, CA 94010 415-347-8217
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 818-846-1800
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140 805-684-4560
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Maxwell Labs., 8835 Balboa Ave., San Diego, CA 92123 619-279-5100
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
Millen Components, Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-6951
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§† Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 ..... 516-ED3-5955
Pulsar Products Div., 2700 Merced St., San Leandro, CA 94577 415-577-7236
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209 513-871-3777
§† Supertex, Inc., 1225 Bordeaux Dr., P.O. Box 3607, Sunnyvale, CA 94088 408-744-0100
Teledyne Kinetics, Div. of Teledyne, Inc., 410 S. Cedros Ave., Solana Beach, CA 92075 619-755-1181
§ Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191

Switches, Interlock-5100

§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062, 312-291-1760 ..... B•1510
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1521
Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ..... B•1548
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ..... B•1557
§ Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441, 612-559-0720 ..... B•1566
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 ..... B•1600
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1613
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625,1657,1665
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ..... B•1696
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 .... B•1702
§† Burgess Switch Co., Ltd., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§† Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441 612-559-3772
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590 ... 516-935-3640
† Dow-Key Microwave Corporation, 1110 Mark Ave., Carpenteria, CA 93013-2918 805-684-4560
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087 .....312-662-7667; 800-323-9605
Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
† Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140 805-684-4560
§ Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035 315-655-8050
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
† Noble U.S.A., Inc., 151 Stanley St., Elk Grove Village, IL 60007 312-364-6038
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120

Switches, Keyboard-5150

§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134, 408-946-6000 ..... D•1057
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1712
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441, 612-559-3772 ..... B•1535
Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ..... B•1548
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ..... B•1557
§ Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441, 612-559-0720 ..... B•1566
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1724
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 ..... B•1598
§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035, 315-655-8050 ..... B•1622
§ Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070, 703-435-9496 ..... B•1624,1728,1729
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... B•1671
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... B•1091
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645 ..... B•1737
§ Veetronix, Inc., Sub. Reach Electronics, Box 480, Lexington, NE 68850, 308-324-4600 ..... B•1703
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 414-332-8100
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§ Centralab, Inc., A North American Philips Co., 5855 N. Glen Park Rd., Milwaukee, WI 53209 414-228-7380
§ Corby Inds. Inc., P. O. Box 2838, Allentown, PA 18001 215-433-1412
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 312-279-9110
Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
† Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361

† Hoffman Engineering Corp., P.O. Box 300, Old Greenwich, CT 06870 ... 203-325-8933
International Resource Svcs., 7343 N.W. 79th Terr., Miami, FL 33166 305-884-2924
ITT Thermotech, Div. IT & T, 1203 S. 5th St., Hopkins, MN 55343 612-933-9400
ITW, Cortron Div., 400 W. Grand, Elmhurst, IL 60126 312-279-9110
Keytek Div., 6424 Warren Dr., Norcross, GA 30093 404-449-6040
Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
§ Maxi-Switch Co., Sub. of EECO, 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
§ MEC A/S, Industriparken 23, Ballerup, DENMARK DK-2750 452-973366
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, JAPAN 489-5333
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
Nissei Sangyo America, Ltd., 1701 Golf Rd., Ste. 401, Rolling Meadows, IL 60008 312-981-8989
† Noble U.S.A., Inc., 151 Stanley St., Elk Grove Village, IL 60007 312-364-6038
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Optical Techniques Intl., 1800 E. Garry, Ste. #214, Santa Ana, CA 92705 714-540-9040
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
Selec-Key, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103 312-837-7970
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Standard Grigsby Inc., W. Gunther GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 51, WEST GERMANY 0911-65521
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
Technical Panels, Inc., 9162 La Rosa Dr., Temple City, CA 91780 818-285-3105
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Toko America, Inc., 1250 Feehanville Dr., Mt. Prospect, IL 60056 312-297-0070

Switches, Key Lock-5100

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... B•1481
§ Chicago Lock Co., 4311 W. Belmont Ave., Chicago, IL 60641, 312-282-7177 ..... B•1534
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704, 714-556-3100 ... B•1538
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ..... B•1557
§ Illinois Lock Co., The Eastern Co., 301 W. Hintz Rd., Wheeling, IL 60090, 312-537-1800 ..... B•1593
JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705, 714-250-8770 ..... B•1605
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1468,1612
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625,1656
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052, 201-762-6886 ..... B•1689
§† AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
BLACK BOX Corp., Micom Sys., P.O. Box 12800, Pittsburgh, PA 15241 .. 412-746-5500
§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644 201-796-2886
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 617-964-6400
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 .. 312-578-3500
Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 914-425-7460
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
§ Communication Cables & Connectors, The Dutton Co., 8255 Black Run Rd., Nashport, OH 43830 614-828-2468
§ Corby Inds. Inc., P. O. Box 2838, Allentown, PA 18001 215-433-1412
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 312-354-1040
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 818-846-1800
§ Macom Inds., 8230 Haskell Ave., Van Nuys, CA 91406
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§† Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
§ Schroff UK Ltd., Maylands Ave., Hemel Hempstead, Herts, ENGLAND HP2 4SG 0442-40471/6
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Tansitor Elctrns., West Rd., Bennington, VT 05201 802-442-5473
§ Trimm, Inc., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048 312-362-3700
§ Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701

Switches, Lever-5100

§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134, 408-946-6000 ..... D•1057
§ American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ..... B•1488
Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1499
Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062, 312-291-1760 ..... B•1510
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... B•1513
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1521-1522,1524,1526
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ..... B•1548
Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1590
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1078
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1633-1634,1636,1638,1640
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ..... B•1678
§ Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 ..... B•1686
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§ Alpha Products, Inc., 5740 Corsa Ave. #104, Westlake Village, CA 91362 818-889-9304
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
§ Burgess Switch Co., Ltd., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441 612-559-3772
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 201-887-9400
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§† Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460 203-877-4577
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ General Control Co., 1200 Soldiers Field Rd., Boston, MA 02134 617-782-7440
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§† ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§† J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
§† Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035 315-655-8050
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
† Milli-Switch Corp., Box 67, Gladwyne, PA 19035 ..... 215-MI2-9222
† Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, JAPAN 489-5333
§† Namco Controls, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060 216-946-9900
† Noble U.S.A., Inc., 151 Stanley St., Elk Grove Village, IL 60007 312-364-6038
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
† Radio Switch Corp., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746 201-462-6100
§ Reed Switch Dev. Co. Inc., PO Box 1464, Kerrville, TX 78028 512-896-4444
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Sprague Electric Company, Distribution Division, 481 Marshall St., No. Adams, MA 01247 413-664-4481
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600

§† Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701

Switches, Limit-5100

Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 ..... B•1503
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731, 516-261-3300 ..... D•1140
Datametrics • Dresser Inds., Inc., 340 Fordham Road, Wilmington, MA 01887, 617-658-5410 ..... B•1791
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1668
§ Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 .... B•1702
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062 312-291-1760
§ Burgess Switch Co., Ltd., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 .. 312-578-3500
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 201-887-9400
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§ Dillon, W. C., & Co., National Controls, Inc., 2320 Airport Blvd., Santa Rosa, CA 95401 707-527-5555
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
EOTec Corp., 420 Frontage Road, W. Haven, CT 06516 203-934-7961
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ General Control Co., 1200 Soldiers Field Rd., Boston, MA 02134 617-782-7440
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
Gordon, Claud S., Co., 5710 Kenosha St., Richmond, IL 60071 815-678-2211
Gordon Prods., 67 Del Mar Dr., Brookfield, CT 06804 203-775-4501
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 312-354-1040
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§† ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 818-846-1800
§† Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Magnetoelastic Devices, 326 Springside Ave., Box 625, Pittsfield, MA 01201 413-445-5608
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383 219-465-2200
§† Namco Controls, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060 216-946-9900
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Otto Engrg., 2 E. Main St., Carpentersville, IL 60110 312-428-7171
Parker Hannifin Corp., 17325 Euclid Ave., Cleveland, OH 44112 216-531-3000
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 ..... 516-ED3-5955
§† Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543 ..... 914-698-2026-800-431-2625 (outside NY)
§ Reed Switch Dev. Co. Inc., PO Box 1464, Kerrville, TX 78028 512-896-4444
RE Instruments Corp., 31029 Center Ridge Rd., Westlake, OH 44145 216-871-7617
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Sterling Instr., Div. Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040 516-328-3300
Teledyne Kinetics, Div. of Teledyne, Inc., 410 S. Cedros Ave., Solana Beach, CA 92075 619-755-1181
§ Temposonics, MTS Sys. Corp., 111 East Ames Ct., Plainview, NY 11803 516-349-1950
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ TRW, Dynalco Controls Div., 5200 NW 37th, P.O. Box 8187, Ft. Lauderdale, FL 33310 305-739-4300
§ United Elec. Controls, 85 School St., Watertown, MA 02172 ..... 617-WA6-1000

Switches, Lock — See Switches, Key Lock (Vol. B)

Switches, Matrix-5100

CYTEC Corp., 107 N. Washington St., E. Rochester, NY 14445, 716-381-4740 ..... D•1207
† Daico Inds., Inc., Box 5225, Compton, CA 90224, 213-631-1143 ..... A•1708
Frequency Elctrns., 55 Charles Lindbergh Blvd., Mitchel Field, NY 11553, 516-794-4500 ..... A•1367
† GRIM Corporation, Box 67, Medford, NJ 08055, 609-267-7950 ..... D•1051
Information Transfer Indl., Box 357, Holcomb, NY 14469, 716-657-7074 .. D•1153
† LVC Inds., Inc., CO-ORD Switch Div., 23 Hanse Ave., Freeport, NY 11520, 516-868-1900 ..... B•1619
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302, 818-992-6776 ..... A•1715
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
† Aiken Advanced Sys., Amstar Technical Products Company, Inc., 5901 Edsall Rd., Alexandria, VA 22304-4197 703-370-0900
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
Atec Sys., 107 N. Washington St., E. Rochester, NY 14445 716-381-4740
Bytex Corp., 2 California Ave., Framingham, MA 01701 617-879-5050
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 .. 312-578-3500
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441 612-559-3772
† Condor Systems, Inc., 2605 S. Winchester Blvd., Campbell, CA 95008 ... 408-866-5900
Crosspoint, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
§ Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441 612-559-0720
† Electrospace Sys., Inc., P. O. Box 831359, Richardson, TX 75083-1359 214-783-2004
§ Giltronix, 3780 Fabian Way, Palo Alto, CA 94303 415-493-1300
§ Glasgal Communications, Inc., 207 Washington St., Northvale, NJ 07647 201-768-8082
† Hoffman Engineering Corp., P.O. Box 300, Old Greenwich, CT 06870 ... 203-325-8933
§ ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
§† JFW Inds., Inc., 2719 E. Troy Ave., Indianapolis, IN 46203 317-783-9875
§ Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 .. 617-272-3000
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051 313-628-9711
MarLee Switch Co., 933-D N. Central Ave., Upland, CA 91786 714-982-8988
§ MEC A/S, Industriparken 23, Ballerup, DENMARK DK-2750 452-973366
§ Micom Systems, Inc., 4100 Los Angeles Ave, P.O. Box 8100, Simi Valley, CA 93062-8100 805-583-8600
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
† North Hills Elctrns., 1 Alexander Pl., Glen Cove, NY 11542 516-671-5700
Precision Filters, 240 Cherry St., Ithaca, NY 14850 607-277-3550
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897-0730 203-834-8227
Technical Panels, Inc., 9162 La Rosa Dr., Temple City, CA 91780 818-285-3105
Teledyne Microwave, 1290 Terra Bella Ave., Mountain View, CA 94043 415-968-2211
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Wavetek Corporation, 9191 Towne Centre Drive, San Diego, CA 92122 619-450-9971
† Western DataCom, 5083 Market St., Youngstown, OH 44512 216-788-6583

Switches, Membrane-5150

EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ..... B•1561
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 ..... B•1599
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051, 313-628-9711 ..... B•1727
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... B•1671
Moxness Products, Inc., Versa Technologies, 1914 Indiana St., Racine, WI 53405, 414-554-5050;800-558-5706 ..... B•1734
A.C. Interface, 17911 Sampson, Huntington Beach, CA 92647 714-841-6090
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
† Basic Electronics, Inc., 11762 Western Ave. "O", Stanton, CA 90680 714-530-2400
Bergquist, 5300 Edina Ind'l., Minneapolis, MN 55435 612-835-2322
† Bergquist Switch, Inc., Bergquist Co., 5300 Edina Indl. Blvd., Edina, MN 55435 612-835-2322
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 414-332-8100
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
† C.A.M. Graphics Co., Inc., 145 Toledo St., Farmingdale, NY 11735 516-694-1315
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 617-964-6400
§ Centralab, Inc., A North American Philips Co., 5855 N. Glen Park Rd., Milwaukee, WI 53209 414-228-7380
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 .. 312-578-3500
Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441 612-559-3772
Dorman Bogdonoff Corp., Corp. Center, Willow Pond, Andover, MA 01810 617-470-0001
§ Duralith, 525 Orange St., Millville, NJ 08332 609-825-6900
Endicott Resch. Grp., Inc., 2601 Wayne St., P.O. Box 269, Endicott, NY 13760 607-754-9187
† Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
GraphTec Services, Inc., 1600 N.W. Madrid Way, Boca Raton, FL 33432 305-392-3373
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
The Hall Company, 420 East Water St., Urbana, OH 43078 513-652-1376

† Hallmark Nameplate, Inc./Electropanel Co., 1855 New Highway, Farmingdale, NY 11735 516-454-0700
JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705 714-250-8770
Memtron Technologies, Inc., 1400 Weiss St., Frankenmuth, MI 48734 ... 517-652-2652
§† Miller Dial Corp., 4400 N. Temple City Blvd., El Monte, CA 91734 818-283-5111
Nissei Sangyo America, Ltd., 1701 Golf Rd., Ste. 401, Rolling Meadows, IL 60008 312-981-8989
† Noble U.S.A., Inc., 151 Stanley St., Elk Grove Village, IL 60007 312-364-6038
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
§ RMS Electronics Inc., 50 Antin Pl., Bronx, NY 10462 212-892-6700
§ Robinson-Nugent, Inc., 800 East 8th St., New Albany, IN 47150 812-945-0211
Rogers Corp., Box 700, Chandler, AZ 85224 602-963-4584
Rogers Corp., One Technology Dr., Rogers, CT 06263 203-774-9605
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Technical Panels, Inc., 9162 La Rosa Dr., Temple City, CA 91780 818-285-3105
Unicorn Engrg. Co., Membrane Keyboard Div., 6201 Harwood Ave., Oakland, CA 94618 415-428-1626

Switches, Mercury Displacement-5100

§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
Thordarson Meissner, Components Corp. of Amer., Electronic Center, Mt. Carmel, IL 62863 618-262-5121

Switches, Microwave — See Switches, Diode (Vol. A)

Switches, Momentary Action-5100

Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... B•1481
§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1497
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... B•1513
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1523-1500,1525
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441, 612-559-3772 ..... B•1537
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ..... B•1548
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1537, 718-497-7600 ..... B•1551
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087, 312-662-7667;800-323-9605 ..... B•1555
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ..... B•1557
Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733, 818-442-7180 ..... B•1562
§ Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441, 612-559-0720 ..... B•1566
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1576
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 ..... B•1598
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ..... B•1609
Judco Mfg. Inc., P.O. Box 487-E84, 24030 Frampton Ave., Harbor City, CA 90710, 213-534-0959 ..... B•1611
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1612
§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035, 315-655-8050 ..... B•1622
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 ..... B•1623
§ Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070, 703-435-9496 ..... B•1728
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625,1641,1645,1647,1648,1657
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ..... B•1673-1677,1679,1681
§ Oslo Controls, 328 Industrial Ave, Cheshire, CT 06410, 203-272-2794 ... B•1685
† Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-426-7171 ..... B•1686
§ Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ..... B•1696
Aerospace Optics, Inc., 3201 Sandy La., Fort Worth, TX 76112 817-451-1141
§ Alpha Products, Inc., 5740 Corsa Ave. = 104, Westlake Village, CA 91362 818-889-9304
American Switch Corp., 134 Water St., Wakefield, MA 01880 617-246-1007
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
† Basic Electronics, Inc., 11762 Western Ave. "Q", Stanton, CA 90680 714-530-2400
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062 312-291-1760
§ Burgess Switch Co., Ltd., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5 Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 201-887-9400
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590 ... 516-935-3640
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
§† Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
§ Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
† Hoffman Engineering Corp., P.O. Box 300, Old Greenwich, CT 06870 ... 203-325-8933
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211 408-747-0550
Illinois Lock Co., The Eastern Co., 301 W. Hintz Rd., Wheeling, IL 60090 312-537-1800
§ ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705 714-250-8770
§† J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
§ MEC A/S, Industriparken 23, Ballerup, DENMARK DK-2750 452-973366
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Philmore Mfg., 40 Inip Dr., Inwood, NY 11696 516-239-6161
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052 201-762-6886
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648 ... 312-647-8338
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
Selec-Key, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103 312-837-7970
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092
† Stacoswitch, 1139 Baker St., Costa Mesa, CA 92626 714-549-3041
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897-0730 203-834-8227
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Toko America, Inc., 1250 Feehanville Dr., Mt. Prospect, IL 60056 312-297-0070
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791

Switches, Multiposition-5100

Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... B•1481
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... B•1493
Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1497-1499,1501
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... B•1513
Chicago Lock Co., 4311 W. Belmont Ave., Chicago, IL 60641, 312-282-7177 ..... B•1534
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704, 714-556-3100 ... B•1538
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ..... B•1560
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ..... B•1575,1578,1579,1580,1591,1582,1583,1584,1585,1586,1587
IVO Inds., Inc., 201 Industrial Way W., P.O. Drawer 917, Eatontown, NJ 07724, 201-542-5151 ..... B•1603
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ..... B•1608
Judco Mfg. Inc., P.O. Box 487-E84, 24030 Frampton Ave., Harbor City, CA 90710, 213-534-0959 ..... B•1611
Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1613
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625-1609,1645,1657
Radio Switch Corp., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, 201-462-6100 ..... B•1691
† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008, 408-377-4621 ..... B•1443
§ Shallco, Box 1089, Smithfield, NC 27577, 919-934-3135 ..... B•1692
Spectrol Elctrns., 17070 East Gale Ave., City of Industry, CA 91749, 818-964-6565 ..... A•2046
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507, 312-844-4300 ..... B•1570
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ..... B•1696
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ..... B•1700
§ Alpha Products, Inc., 5740 Corsa Ave. = 104, Westlake Village, CA 91362 818-889-9304
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
§† ASM, 525 Truck La., Smithfield, NC 27577 919-934-3104

Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 .. 312-578-3500
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441 612-559-3772
§† Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
† Dow-Key Microwave Corporation, 1110 Mark Ave., Carpenteria, CA 93013-2918 805-684-4560
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087 .....312-662-7667; 800-323-9605
§ EDL, Inc., 385 Oser Ave., Hauppauge, NY 11788 ..... 516-435-2808;1-800-DIAL EDL
§ Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441 612-559-0720
§† Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
§ Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
Interswitch, 770 Airport Blvd., Burlingame, CA 94010 415-347-8217
ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140 805-684-4560
LVC Inds., Inc., CO-ORD Switch Div., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 .. 617-272-3000
Mallory Timers, Emhart Elec./Elctrn. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353
§ Martin Sound Prods., 28 Alpha Park, Cleveland, OH 44143-2297 216-442-2286
§ MEC A/S, Industriparken 23, Ballerup, DENMARK DK-2750 452-973366
† Microavionics Corp., 3198-K Airport Loop Dr., Costa Mesa, CA 92626 ... 714-957-6904
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Otto Engrg., 2 E. Main St., Carpentersville, IL 60110 312-428-7171
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
Signal Sys. Intl, P.O. Box 198, Holmdel, NJ 07733 201-741-1120
† Teledyne Microwave, 1290 Terra Bella Ave., Mountain View, CA 94043 415-968-2211
† Transco Products, Inc., 4241 Glencoe Ave., Marina del Rey, CA 90295 .. 213-822-0800
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Wavetek Corporation, 9191 Towne Centre Drive, San Diego, CA 92122 619-450-9971
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791

Switches, Optical-3700

Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265, 214-995-3821 ..... B•1218
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
EOTec Corp., 420 Frontage Road, W. Haven, CT 06516 203-934-7961

Switches, Paddle Handle-5100

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... B•1481
American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ..... B•1489
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101, 203-249-8471 ..... B•1507
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641, 203-233-5551 ..... B•1515
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ..... B•1549
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 ..... B•1623
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625,1646,1651,1652,1653,1657,1659,1660,1661,1662
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ..... B•1673-1674,1678
§ Alpha Products, Inc., 5740 Corsa Ave. #104, Westlake Village, CA 91362 818-889-9304
§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304 818-700-1933
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 617-964-6400
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
§† Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087 .....312-662-7667; 800-323-9605
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035 315-655-8050
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052 201-762-6886
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Sprague Electric Company, Distribution Division, 481 Marshall St., No. Adams, MA 01247 413-664-4481
§ Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700

Switches, Peripheral-5100

Advanced Sys. Concepts, 435 N. Lake Ave., Pasadena, CA 91101, 818-793-8971 ..... D•1137
BLACK BOX Corp., Micom Sys., P.O. Box 12800, Pittsburgh, PA 15241 .. 412-746-5500
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Glasgal Communications, Inc., 207 Washington St., Northvale, NJ 07647 201-768-8082
† Terminal Data Corp., 15733 Crabbs Branch Way, Rockville, MD 20855 .. 301-921-8282
§ Via West Inc., 534 N. Stone Ave., Tucson, AZ 85705 602-623-5716

Switches, Photoelectric-3700

§ Clairex Electronics, 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602 ..... B•1209
§ EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ... B•1210
HEI, Inc., 1495 Steiger Lake La., Victoria, MN 55386, 612-443-2500 ..... B•1211
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 ..... B•1623
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1668
TRW Optoelectronics Div., 1207 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ..... B•1223
§ Banner Engrg. Corp., 9714 - 10th Ave. N., Minneapolis, MN 55441 612-544-3164
§ Burgess Switch Co., Ltd., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5
EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
§ Electromatic Controls Corp., 2495 Pembroke Road, Hoffman Estates, IL 60195-2010 312-882-5757
Fork Standards, Inc., 666 Western Ave., Lombard, IL 60148 312-932-9380
§ Grasslin Controls Corp., Dieter Grasslin Feinwerktechnik, 45 Spear Rd., Ramsey, NJ 07446 201-825-9696
Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Optek Technology, Inc., 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Optical Techniques Intl., 1800 E. Garry, Ste. #214, Santa Ana, CA 92705 714-540-9040
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Rehlander Assocs., 118A Bridge St., Beverly, MA 01915 617-922-5961
Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991
§ Sprague Elec. Co., Integrated Circuit Div., 115 Northeast Cutoff, Worcester, MA 01606 617-853-5000
§ Veeder-Root, 70 Sargeant St., Hartford, CT 06102 203-527-7201

Switches, Port Sharing-5100

Advanced Sys. Concepts, 435 N. Lake Ave., Pasadena, CA 91101, 818-793-8971 ..... D•1137
BLACK BOX Corp., Micom Sys., P.O. Box 12800, Pittsburgh, PA 15241 .. 412-746-5500
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Complexx Systems Inc., 4930 Research Dr., Huntsville, AL 35805 205-830-4310
§ Electro Standards Lab., Inc., P.O. Box 9144, Providence, RI 02940 401-943-1164
§ Glasgal Communications, Inc., 207 Washington St., Northvale, NJ 07647 201-768-8082
Information Transfer Indl., Box 357, Holcomb, NY 14469 716-657-7074
§ Micom Systems, Inc., 4100 Los Angeles Ave, P.O. Box 8100, Simi Valley, CA 93062-8100 805-583-8600
§ Terminal Data Corp., 15733 Crabbs Branch Way, Rockville, MD 20855 .. 301-921-8282
§ Via West Inc., 534 N. Stone Ave., Tucson, AZ 85705 602-623-5716
† Western DataCom, 5083 Market St., Youngstown, OH 44512 216-788-6583

Switches, Power-5100

§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134, 408-946-6000 ..... D•1057
American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ..... B•1488
Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1500
Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062, 312-291-1760 ..... B•1510
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... B•1513
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641, 203-233-5551 ..... B•1515
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1523-1491,1525
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ..... B•1548
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087, 312-662-7667;800-323-9605 ..... B•1553
EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ..... B•1557
§† Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733, 818-442-7180 ..... B•1562
§† Electro Switch, King Ave., Weymouth, MA 02188, 617-335-5200 ..... B•1564
Hermetic Switch, Box 1325, Hwy. 92, Chickasha, OK 73018, 405-224-4046 ..... B•1592

§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 ..... B•1601
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ..... B•1608
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625,1632,1633,1634,1639,1642,1643,1644,1646,1647,1653,1657
§ Oslo Controls, 328 Industrial Ave, Cheshire, CT 06410, 203-272-2794 ... B•1685
Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052, 201-762-6886 ..... B•1689
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648, 312-647-8338 ..... A•2034
† Radio Switch Corp., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, 201-462-6100 ..... B•1691
Shallco, Box 1089, Smithfield, NC 27577, 919-934-3135 ..... B•1692
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ..... B•1700
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§ AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Arra Inc., 15 Harold Ct., Bay Shore, NY 11706 516-231-8400
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
§† ASM, 525 Truck La., Smithfield, NC 27577 919-934-3104
BLACK BOX Corp., Micom Sys., P.O. Box 12800, Pittsburgh, PA 15241 .. 412-746-5500
§ Burgess Switch Co., Ltd., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441 612-559-3772
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
§ Compu-Lite Corp., 711 W. 17th St. =F12, Costa Mesa, CA 92627 714-645-1501
§ CTS Corporation, 905 North West Blvd., Elkart, IN 46514 219-293-7511
§† CW Industries, 130 James Way, Southhampton, PA 18966 215-355-7080
† Dow-Key Microwave Corporation, 1110 Mark Ave., Carpenteria, CA 93013-2918 805-684-4560
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441 612-559-0720
§ Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 312-354-1040
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§† Heinemann Elec. Co., Brunswick Pike, Alt. Rte. =1, P.O.Box 6800, Lawrenceville, NJ 08648-0800 609-882-4800
§† ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140 805-684-4560
§ Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Ledex Inc., P.O. Box 427, Vandalia, OH 45377 513-898-3621
§† Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035 315-655-8050
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383 219-465-2200
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
MICRA Corp., 120 Ricefield Lane, Hauppauge, NY 11788 516-231-8600
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260 602-991-0942
† Noble U.S.A., Inc., 151 Stanley St., Elk Grove Village, IL 60007 312-364-6038
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
Otto Engrg., 2 E. Main St., Carpentersville, IL 60110 312-428-7171
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
§† Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
Powermark, 3855 Ruffin Rd., San Diego, CA 92123 619-565-8363
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071 609-589-7500
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
Teledyne Kinetics, Div. of Teledyne, Inc., 410 S. Cedros Ave., Solana Beach, CA 92075 619-755-1181
§ Texas Instrs., Inc., Box 225012-MS-84, Dallas, TX 75265 214-995-6611
§ Underwriters Safety Device, Allied Amphenol Prods., 7300 W. Wilson Ave., Chicago, IL 60656 312-867-4600
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 312-585-1212

Switches, Pressure-5100

Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543, 914-698-2026-800-431-2625 (outside NY) ..... B•1690
Automatic Switch Co., 50-60 Hanover Road, Florham Park, NJ 07932 1-201-966-2000
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
Cambridge Aero Instruments, Inc., 6A Dunham Rd., Billerica, MA 01821 617-275-0889
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
Fasco Industries, Inc., Div. of Hawker Siddeley Grp. Plc., 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 ..... 714-642-2400;800-854-4066
Kulite Semiconductor Prods., Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000
† Pressure Controls, Inc., 406 Cortlandt St., Belleville, NJ 07109 201-751-5003
Reliance Electric Co., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;800-245-4497 In Ohio
Sigma-Netics, Inc., One Washington Ave., Fairfield, NJ 07006 201-227-6372
Technar Inc., 205 N. 2nd Ave., Arcadia, CA 91006 818-445-1143

Switches, Program-5100

Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... B•1481
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... B•1492
§ Aries Elctrns., Box 130, Frenchtown, NJ 08825, 201-996-6841 ..... C•1155-1493,1157
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103, 603-669-0940 ..... B•1502
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1527
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ..... B•1558
Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1575
Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ..... B•1597
IVO Inds., Inc., 201 Industrial Way W., P.O. Drawer 917, Eatontown, NJ 07724, 201-542-5151 ..... B•1603
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1468
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ..... B•1680
§† Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507, 312-844-4300 ..... B•1570
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ..... B•1701
§ Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002 201-436-2230
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
§ Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
§ American Control Products, Div. of Precision Timer Co., Inc., 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
§† American Research & Engineering, 1500 Executive Dr., Elgin, IL 60120 312-888-7245
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Automatic Timing & Controls Co., 201 So. Gulph Rd., King of Prussia, PA 19406 ..... 215-337-5500;800-441-8245
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
CDS - Colorado Data Sys., 3301 W. Hampden, Unit C, Englewood, CO 80110 303-762-1640
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
Crosspoint, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§† CTS Corporation, 905 North West Blvd., Elkart, IN 46514 219-293-7511
Datametrics • Dresser Inds., Inc., 340 Fordham Road, Wilmington, MA 01887 617-658-5410
§† Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
† Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8300
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Grasslin Controls Corp., Dieter Grasslin Feinwerktechnik, 45 Spear Rd., Ramsey, NJ 07446 201-825-9696
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§ Interswitch, 770 Airport Blvd., Burlingame, CA 94010 415-347-8217
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
† Lorch Elctrns., 105 Cedar La., Englewood, NJ 07631 201-569-8282
† LVC Inds., Inc., CO-ORD Switch Div., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
§ MEC A/S, Industriparken 23, Ballerup, DENMARK DK-2750 452-973366

Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052 201-762-6886
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 ..... 516-ED3-5955
† Raymond Engrg. Inc., Raycorder Prods. Div., 217 Smith St., Middletown, CT 06457 203-632-1000
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ..201-797-3313;800-526-5376
§ Sealectro, 225 Hoyt St., Mamaroneck, NY 10543 914-698-5600
§ Siemens Components, Inc., 186 Wood Ave., S., Iselin, NJ 08830 201-321-3400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
Standard Grigsby Inc., W. Gunther GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 51, WEST GERMANY 0911-65521
Techniques, Inc., 235 Jackson St., Englewood, NJ 07631 201-569-5900
§ Tenor, 17020 W. Rogers Dr., New Berlin, WI 53151 414-782-3800
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 312-585-1212
Watkins-Johnson Co., 3333 Hillview Ave., Palo Alto, CA 94304 415-493-4141

Switches, Proximity-5100

Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379, 203-599-2075 ..... B•1324
§ Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716, 201-291-0500;800-631-2165 ..... D•1124
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1668
† Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803 516-694-6700
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§ Alpha Products, Inc., 5740 Corsa Ave. # 104, Westlake Village, CA 91362 818-889-9304
§ Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062 312-291-1760
§ Burgess Switch Co., Ltd., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803 914-738-1611
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Efector, Inc., 201 So. Gulph Rd., King of Prussia, PA 19406 .....215-337-5500; 800-441-8245
† Eldec Corporation, Sensing Systems Div., 16700 13th Ave. West, P.O. Box 100, Lynnwood, WA 98046-0100 206-487-4000
Electric Device, PO Box 337, Canfield, OH 44406 216-533-3060
§ Electromatic Controls Corp., 2495 Pembroke Road, Hoffman Estates, IL 60195-2010 312-882-5757
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 .....312-231-3511; 312-932-9380
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordon Prods., 67 Del Mar Dr., Brookfield, CT 06804 203-775-4501
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
† INRESCO, Inc., 654 Ocean Road, Pt. Pleasant, NJ 08742 201-892-5881
§ Namco Controls, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060 216-946-9900
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. # 205, Richardson, TX 75081 214-235-8332
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
† Raymond Engrg. Inc., Raycorder Prods. Div., 217 Smith St., Middletown, CT 06457 203-632-1000
RDI/Reed Devices, Inc., 525 Randy Rd., Carol Stream, IL 60188 312-682-4100
§ Reed Switch Dev. Co. Inc., PO Box 1464, Kerrville, TX 78028 512-896-4444
Rehlander Assocs., 118A Bridge St., Beverly, MA 01915 617-922-5961
§ Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209 513-871-3777
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471 203-481-5721
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
Tri-Tronics Co. Inc., 13420 Wright Cir., Tampa, FL 33624 813-855-4453
§ Veeder-Root, 70 Sargeant St., Hartford, CT 06102 203-527-7201
† Whittaker Corp., 10880 Wilshire Blvd., Los Angeles, CA 90024 213-475-9411

Switches, Pushbutton, Illuminated-5100

§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134, 408-946-6000 ..... D•1057
American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ..... B•1491
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1525
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ..... B•1549
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 ..... B•1551
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ..... B•1557
§† Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733, 818-442-7180 ..... B•1562
§ Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441, 612-559-0720 ..... B•1566
Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1591
§ Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1078
JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705, 714-250-8770 ..... B•1606
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1468-1563,1612,1613
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ..... B•1616
§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035, 315-655-8050 ..... B•1622
§† Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625,1646,1647,1648,1657,1658,1663,1664,1665
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ..... B•1673,1676,1677
§ Oslo Controls, 328 Industrial Ave, Cheshire, CT 06410, 203-272-2794 ... B•1685
§ Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114, 203-527-3092 ..... B•1103
§ Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ..... B•1696
§ Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 .... B•1702
§ Veetronix, Inc., Sub. Reach Electronics, Box 480, Lexington, NE 68850, 308-324-4600 ..... B•1703
§ Adalet-PLM Div, Div. Scott & Fetzer Co., 4801 W. 150th St., Cleveland, OH 44135 216-267-9000
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
† Aerospace Optics, Inc., 3201 Sandy La., Fort Worth, TX 76112 817-451-1141
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§ Alpha Products, Inc., 5740 Corsa Ave. # 104, Westlake Village, CA 91362 818-889-9304
§ AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304 818-700-1933
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062 312-291-1760
§ Burgess Switch Co., Ltd., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 617-964-6400
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§ Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 914-425-7460
§ Compu-Lite Corp., 711 W. 17th St. # F12, Costa Mesa, CA 92627 714-645-1501
§ CTS Electronics Corp., Paso Robles Div., Electromechanical Gp., 500 Linne Rd., Paso Robles, CA 93446 805-238-0350
§† Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087 .....312-662-7667; 800-323-9605
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
Fork Standards, Inc., 666 Western Ave., Lombard, IL 60148 312-932-9380
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ General Control Co., 1200 Soldiers Field Rd., Boston, MA 02134 617-782-7440
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 312-354-1040
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211 408-747-0550
Interface Products, Inc., 2185 S. Grand Ave., Santa Ana, CA 92705 714-549-4977
ISL Products Int'l, Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 .. 516-822-9601
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§† ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 818-846-1800
† Jay-El Prods., Sub. Ducommun Inc., 1859 W. 169th St., Gardena, CA 90247 213-323-7130
§ J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
† Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 .....201-291-3334; 800-221-0714
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 718-392-8800
§† Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ Maxi-Switch Co., Sub. of EECO, 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
§ McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383 219-465-2200
§ MEC A/S, Industriparken 23, Ballerup, DENMARK DK-2750 452-973366
§ Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070 703-435-9496

Methode Elctrns., Inc., 7444 W. Wilson Ave., Chicago, IL 60656 312-867-9600
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
† Microavionics Corp., 3198-K Airport Loop Dr., Costa Mesa, CA 92626 ... 714-957-6904
† Milli-Switch Corp., Box 67, Gladwyne, PA 19035 ..... 215-MI2-9222
§ MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532 312-969-4550
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648 ... 312-647-8338
§ Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543 ..... 914-698-2026-800-431-2625 (outside NY)
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§† Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
Sprague Electric Company, Distribution Division, 481 Marshall St., No. Adams, MA 01247 413-664-4481
† Stacoswitch, 1139 Baker St., Costa Mesa, CA 92626 714-549-3041
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Toko America, Inc., 1250 Feehanville Dr., Mt. Prospect, IL 60056 312-297-0070
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
§ Trimm, Inc., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048 312-362-3700
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 312-585-1212
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Switches, Pushbutton, Nonilluminated-5100

Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... **B•1481**

§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134, 408-946-6000 ..... **D•1057**

§ American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ..... **B•1490**

§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... **B•1500**

§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... **B•1513**

§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... **B•1523,1525,1526**

COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441, 612-559-3772 ..... **B•1535**

§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ..... **B•1548**

Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 ..... **B•1550**

§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087, 312-662-7667;800-323-9605 ..... **B•1555**

§ EAO Switch Corp., 198 Peps's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ..... **B•1557**

§ Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441, 612-559-0720 ..... **B•1566**

§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... **B•1576**

Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607, 312-243-1100 ..... **B•1386**

§ Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... **B•1078**

ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 ..... **B•1600**

§ IVO Inds., Inc., 201 Industrial Way W., P.O. Drawer 917, Eatontown, NJ 07724, 201-542-5151 ..... **B•1603**

§† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ..... **B•1609**

Judco Mfg. Inc., P.O. Box 487-E84, 24030 Frampton Ave., Harbor City, CA 90710, 213-534-0959 ..... **B•1611**

† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... **B•1468,1612,1613**

§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035, 315-655-8050 ..... **B•1622**

§† Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... **B•1641,1647,1648,1657,1658,1663,1665**

§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ..... **B•1674-1677,1679,1681**

§ Oslo Controls, 328 Industrial Ave, Cheshire, CT 06410, 203-272-2794 ... **B•1685**

§† Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 ..... **B•1686**

Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543, 914-698-2026-800-431-2625 (outside NY) ..... **B•1690**

† Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645 ..... **B•1737**

§ Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... **B•1093**

Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ..... **B•1696**

Tapeswitch Corp. of America, 100 Schmitt Blvd., Farmingdale, NY 11735, 516-694-6312 ..... **B•1699**

§ Veetronix, Inc., Sub. Reach Electronics, Box 480, Lexington, NE 68850, 308-324-4600 ..... **B•1703**

Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Alpha Products, Inc., 5740 Corsa Ave. #104, Westlake Village, CA 91362 818-889-9304
§ AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
§ Amptronix, Inc., P.O. Box 8146, Rowland Heights, CA 91748 714-595-5814
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062 312-291-1760
§ Burgess Switch Co., Ltd., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
§ Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 914-425-7460
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590 ... 516-935-3640
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§† Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
† Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8300
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Edwards Co., Signaling Prods. Div., P.O. Box 1188, Farmington, CT 06034 203-678-0410
§† Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
§ Gaynor Elec. Co., 135 South Main St, P.O. Box 316, Thomaston, CT 06787-0316 203-283-4388
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§ IDEC Systems & Controls Corp., 1213 Elko Drive, Sunnyvale, CA 94089-2211 408-747-0550
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025 312-729-5330
International Resource Svcs., 7343 N.W. 79th Terr., Miami, FL 33166 305-884-2924
§† ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705 714-250-8770
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
† Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
§† Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Maxi-Switch Co., Sub. of EECO, 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383 219-465-2200
§ MEC A/S, Industriparken 23, Ballerup, DENMARK DK-2750 452-973366
§ Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070 703-435-9496
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, JAPAN 489-5333
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Paccom, 3928 148th NE, Redmond, WA 98052 ..... 206-883-9200;800-426-6254
Philmore Mfg., 40 Inip Dr., Inwood, NY 11696 516-239-6161
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648 ... 312-647-8338
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
Selec-Key, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103 312-837-7970
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
§ SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
Spectrol Elctrns., 17070 East Gale Ave., City of Industry, CA 91749 818-964-6565
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Standard Grigsby Inc., W. Gunther GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 51, WEST GERMANY 0911-65521
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897-0730 203-834-8227

§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
§ Tektone Sound & Signal, 1331 S. Killian Dr., Lake Park, FL 33403 305-844-2383
† Thermo Electric, 109 Fifth St., Saddle Brook, NJ 07662 201-843-5800
Toko America, Inc., 1250 Feehanville Dr., Mt. Prospect, IL 60056 312-297-0070
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
§ UID Switches Inc., Sub. of ITW, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791

Switches, Reed-5100

Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379, 203-599-2075 ..... B•1324
§† Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1390
Hermetic Switch, Box 1325, Hwy. 92, Chickasha, OK 73018, 405-224-4046 ..... B•1592
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209, 513-871-3777 ..... B•1448
§ Veetronix, Inc., Sub. Reach Electronics, Box 480, Lexington, NE 68850, 308-324-4600 ..... B•1703
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 617-685-4371
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electric Device, PO Box 337, Canfield, OH 44406 216-533-3060
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
§† Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§ INRESCO, Inc., 654 Ocean Road, Pt. Pleasant, NJ 08742 201-892-5881
§ Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716 ..... 201-291-0500; 800-631-2165
§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035 315-655-8050
§ Maxi-Switch Co., Sub. of EECO, 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443 616-777-2602
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ Tohoku Metal Inds., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, JAPAN ..... Tokyo 03-402-6161
§ Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191

Switches, RF-5100

§ Compac, 279 Skidmore Rd., Deer Park, NY 11729, 516-667-3933 ..... A•1707
CYTEC Corp., 107 N. Washington St., E. Rochester, NY 14445, 716-381-4740 ..... D•1207
† Daico Inds., Inc., Box 5225, Compton, CA 90224, 213-631-1143 ..... A•1708
§† Dow-Key Microwave Corporation, 1110 Mark Ave., Carpenteria, CA 93013-2918, 805-684-4560 ..... A•1710
Frequency Elctrns., 55 Charles Lindbergh Blvd., Mitchel Field, NY 11553, 516-794-4500 ..... A•1367
† General Microwave Corp., 155 Marine St., Farmingdale, NY 11735, 516-694-3600 ..... A•1712
Information Transfer Indl., Box 357, Holcomb, NY 14469, 716-657-7074 .. D•1153
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 ..... B•1424
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, NJ 07058-9797, 201-227-2000 ..... A•1713
Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140, 805-684-4560 ... B•1426
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302, 818-992-6776 ..... A•1715
Mini-Circuits Lab., 2625 E. 14th St., P.O. Box 166, Brooklyn, NY 11235, 718-934-4500 ..... A•1719-1720,1768
† Radio Switch Corp., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, 201-462-6100 ..... B•1691
† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008, 408-377-4621 ..... B•1443
† Adams-Russell, Anzac Div., 80 Cambridge St., Burlington, MA 01803 671-273-3333
† Aiken Advanced Sys., Amstar Technical Products Company, Inc., 5901 Edsall Rd., Alexandria, VA 22304-4197 703-370-0900
† Alan Inds., P.O. Box 1203, Columbus, IN 47201 812-372-8869
Alford Mfg. Co., P.O. Box 2116, 32 Sixth Rd., Woburn, MA 01888 617-935-8610
† Alpha Inds., Inc.-Microelectronic Div., 2800 Crystal Drive, Hatfield, PA 19440 215-822-1311
• Alpha Inds., Inc., Microwave Comp. Div., 90 Glenn St., Lawrence, MA 01843 617-681-8520
Alpha Inds., Inc.-MSD Div., 20 Sylvan Rd., Woburn, MA 01801 617-935-5150
§ Amphenol, An Allied Co., 43 Commerce Ct., Lisle, IL 60532 312-983-3500
† Applied Research, Inc., 160 Dupont St., Plainview, NY 11803 516-349-9200
† Arra Inc., 15 Harold Ct., Bay Shore, NY 11706 516-231-8400
Atec Sys., 107 N. Washington St., E. Rochester, NY 14445 716-381-4740
† Avantek, Inc., 3175 Bowers Ave., Santa Clara, CA 95054 408-496-6710
§ Bell Inds., J. W. Miller Div., 19070 Reyes Ave., P.O. Box 5825, Rancho Dominguez, CA 90224 213-537-5200
Bird Elctrn., 30303 Aurora Rd., Cleveland, OH 44139 216-248-1200
Coaxial Dynamics, 15210 Industrial Parkway, Cleveland, OH 44135 216-267-2233
§ Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
§† CW Industries, 130 James Way, Southhampton, PA 18966 215-355-7080
§† Dielectric Communications, General Signal, Tower Hill Rd., Raymond, ME 04071 ..... 207-655-4555;800-341-9678
† Eaton Corp., Microwave Components Div., 680 W. Maude Ave., Sunnyvale, CA 94086 408-733-3883
§ EH Electronics, Inc., Sub. EH Intl., Inc., 48507 Milmont Drive, Fremont, CA 94538 415-651-2340
Engelmann Microwave Co., KDI Pyrofilm, 60 S. Jefferson Rd., Whippany, NJ 07981 201-887-5700
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ Glasgal Communications, Inc., 207 Washington St., Northvale, NJ 07647 201-768-8082
§† Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
Hermetic Switch, Box 1325, Hwy. 92, Chickasha, OK 73018 405-224-4046
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 818-846-1800
§† JFW Inds., Inc., 2719 E. Troy Ave., Indianapolis, IN 46203 317-783-9875
K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424
KDI Electronics, Inc., Engelmann & Pyrofilm Divisions, 60 S. Jefferson Rd., Whippany, NJ 07981 201-887-8100
† Lorch Elctrns., 105 Cedar La., Englewood, NJ 07631 201-569-8282
Macom Inds., 8230 Haskell Ave., Van Nuys, CA 91406
M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 .. 617-272-3000
M/A-Com Microwave Components, Inc., M/A-Com, South Avenue, Burlington, MA 01803 617-272-3000
MarLee Switch Co., 933-D N. Central Ave., Upland, CA 91786 714-982-8988
MEC A/S, Industriparken 23, Ballerup, DENMARK DK-2750 452-973366
§† Micronetics, 36 Oak St., Norwood, NJ 07648 201-767-1320
§ Millen Components, Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-6951
§ Namco Controls, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060 216-946-9900
† Narda Microwave Corp., 435 Moreland Rd., Hauppauge, NY 11788 516-231-1700
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Peca, Inc., 592 Winks Lane, Bensalem, PA 19020 215-245-1550
Reeve Electronics, Mellish E. Murray, 1720 W. Fulton St., Chicago, IL 60612 312-670-0150
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
§ RMS Electronics Inc., 50 Antin Pl., Bronx, NY 10462 212-892-6700
† Sivers IMA, 5669 Selmaraine Drive, Culver City, CA 90230 213-390-7477
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Summit Engineering Corp., Box 938, Bozeman, MT 59715 406-587-4511
† Teledyne Microwave, 1290 Terra Bella Ave., Mountain View, CA 94043 415-968-2211
Telonic/Berkeley, 2825 Laguna Canyon Rd., Laguna Beach, CA 92652 714-494-9401
† Transco Products, Inc., 4241 Glencoe Ave., Marina del Rey, CA 90295 .. 213-822-0800
† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020
† TRW Microwave, 825 Stewart Dr., Sunnyvale, CA 94086 408-732-0880
† Vectronics Microwave Corp., 276 Lincoln Blvd., Middlesex, NJ 08846 ... 201-356-2377
§ Wabash Relay &'Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191
† Watkins-Johnson Co., 3333 Hillview Ave., Palo Alto, CA 94304 415-493-4141
† Wavecom, 9036 Winnetka Ave., Northridge, CA 91324 818-882-3010
† Waveline, Box 718, W. Caldwell, NJ 07006 201-226-9100
§ Wavetek Corporation, 9191 Towne Centre Drive, San Diego, CA 92122 619-450-9971
Weinschel Engrg., One Weinschel La., Gaithersburg, MD 20877 ..... 301-948-3434; 800-638-2048
Wide Band Engrg. Co., Inc., Box 21652, Phoenix, AZ 85036 602-254-1570

Switches, Rocker-5100

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... B•1481
§ American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ..... B•1489
§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1497
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101, 203-249-8471 ..... B•1507
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... B•1513
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641, 203-233-5551 ..... B•1514
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ..... B•1541
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ..... B•1548
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 ..... B•1550
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087, 312-662-7667;800-323-9605 ..... B•1553
Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1571

Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1590
§ Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ..... B•1078
Judco Mfg. Inc., P.O. Box 487-E84, 24030 Frampton Ave., Harbor City, CA 90710, 213-534-0959 ..... B•1611
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ..... B•1616
§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035, 315-655-8050 ..... B•1622
§ McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 ..... B•1623
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625,1641,1646,1651,1652,1653,1657,1659,1660,1661,1662
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ..... B•1673-1674,1678,1681
§ Oslo Controls, 328 Industrial Ave, Cheshire, CT 06410, 203-272-2794 ... B•1684
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530, 914-681-0700 ..... D•1039
§ Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ..... B•1696
§ Alpha Products, Inc., 5740 Corsa Ave. #104, Westlake Village, CA 91362 818-889-9304
§ Alps Electric (USA), Inc., 3553 N. First St, San Jose, CA 95134 408-946-6000
§ AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441 612-559-3772
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
CTS Corporation, 905 North West Blvd., Elkart, IN 46514 219-293-7511
§† CW Industries, 130 James Way, Southhampton, PA 18966 215-355-7080
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441 612-559-0720
§ Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
§ Front Panel Devices, Inc., 530 Burnside Ave., Inwood, NY 11696 212-471-9800
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
General Electric Co., Wire & Cable, 1285 Boston Ave., Bridgeport, CT 06602 203-382-2000
§† Heinemann Elec. Co., Brunswick Pike, Alt. Rte. #1, P.O.Box 6800, Lawrenceville, NJ 08648-0800 609-882-4800
International Resource Svcs., 7343 N.W. 79th Terr., Miami, FL 33166 305-884-2924
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§ ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 718-392-8800
§ Macom Inds., 8230 Haskell Ave., Van Nuys, CA 91406
† Measurement Sys., Inc., 121 Water St., Norwalk, CT 06854 203-838-5561
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
Otto Engrg., 2 E. Main St., Carpentersville, IL 60110 312-428-7171
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
§† Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052 201-762-6886
Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ..201-797-3313;800-526-5376
Selec-Key, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103 312-837-7970
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
SL Waber, 300 Harvard Ave., Westville, NJ 08093 ..... 609-456-5400;800-257-8384
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Sprague Electric Company, Distribution Division, 481 Marshall St., No. Adams, MA 01247 413-664-4481
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ UID Switches Inc., Sub. of ITW, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040

Switches, Rotary-5100

§ Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002, 201-436-2230 ..... B•1137
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... B•1481
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134, 408-946-6000 ..... D•1057
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... B•1493
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103, 603-669-0940 ..... B•1502
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... B•1513
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704, 714-556-3100 ... B•1538
§ CTS Electronics Corp., Paso Robles Div., Electromechanical Gp., 500 Linne Rd., Paso Robles, CA 93446, 805-238-0350 ..... B•1545
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087, 312-662-7667;800-323-9605 ..... B•1555
§† Electro Switch, King Ave., Weymouth, MA 02188, 617-335-5200 ..... B•1564
§† Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1578
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 ..... B•1602
JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705, 714-250-8770 ..... B•1604
§† Janco Corp., Box 3039-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ..... B•1608
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1468,1612,1613,1614
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ..... B•1680
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052, 201-762-6886 ..... B•1689
† Radio Switch Corp., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, 201-462-6100 ..... B•1691
§† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008, 408-377-4621 ..... B•1443
§ Shallco, Box 1089, Smithfield, NC 27577, 919-934-3135 ..... B•1692
Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 ..... B•1093
§ Spectrol Elctrns., 17070 East Gale Ave., City of Industry, CA 91749, 818-964-6565 ..... A•2046
§† Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507, 312-844-4300 ..... B•1568
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ..... B•1700
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§ Alpha Products, Inc., 5740 Corsa Ave. #104, Westlake Village, CA 91362 818-889-9304
§† AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
§ AMP Distributor Marketing Div, A Division of AMP Products Corporation, Harrisburg, PA 17105 717-780-7025
§† Amphenol, An Allied Co., 43 Commerce Ct., Lisle, IL 60532 312-983-3500
Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304 818-700-1933
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
§† ASM, 525 Truck La., Smithfield, NC 27577 919-934-3104
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153 312-865-5200
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
Carson Mfg. Co., Inc., 5453 N. Rural St., P.O. Box 20464, Indianapolis, IN 46220 317-257-3191
† Carter Mfg. Corp., Sugar Rd., Bolton, MA 01740 617-779-5501
§† Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§† Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
Clarostat Mfg., Washington St., Dover, NH 03820 603-742-1120
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441 612-559-3772
§ Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 914-425-7460
§ Communication Cables & Connectors, The Dutton Co., 8255 Black Run Rd., Nashport, OH 43830 614-828-2468
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590 ... 516-935-3640
§† CTS Corporation, 905 North West Blvd., Elkart, IN 46514 219-293-7511
CTS Corporation, Microelectronics Div., 1201 Cumberland Ave., W. Lafayette, IN 47906 317-463-2565
CTS Electronics Corp., Halex Division, 1202 McGaw Ave., Irvine, CA 92714 714-261-6381
Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
Duncan Electronics, Inc., 2865 Fairview Rd., Costa Mesa, CA 92626 714-545-8261
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460 203-877-4577
§ EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
Electro Natl, Matthews Ave., Canton, MS 39046 601-859-5511
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
General Electric Co., Wire & Cable, 1285 Boston Ave., Bridgeport, CT 06602 203-382-2000
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
Goldwell Comps., 1815 W. 205th St. Ste. 201, Torrance, CA 90501 213-533-1228
Gordon, Claud S., Co., 5710 Kenosha St., Richmond, IL 60071 815-678-2211
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
† Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
Illinois Lock Co., The Eastern Co., 301 W. Hintz Rd., Wheeling, IL 60090 312-537-1800
Interface Products, Inc., 2185 S. Grand Ave., Santa Ana, CA 92705 714-549-4977
§† ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424
§ Kel-Am, 308 E. 5th, P.O. Box 313, Eldon, MO 65026 314-392-7174
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000

Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
M/A-Com Millimeter Products, M/A-Com, Inc., Second Avenue, Burlington, MA 01803 617-272-3000
Mallory Timers, Emhart Elec./Elctrn. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 818-992-6776
† Maurey Instr. Corp., 4555 W. 60th St., Chicago, IL 60629 312-581-4555
MEC A/S, Industriparken 23, Ballerup, DENMARK DK-2750 452-973366
Methode Elctrns., Inc., 7444 W. Wilson Ave., Chicago, IL 60656 312-867-9600
† Microavionics Corp., 3198-K Airport Loop Dr., Costa Mesa, CA 92626 ... 714-957-6904
† Microlab/FXR, 10 Microlab Rd., Livingston, NJ 07039 201-992-7700
§ Microwave Development Labs., 10 Michigan Dr., Natick, MA 01760 617-655-0060
† Minelco Inc. - A Talley Ind., 135 S. Main St., Thomaston, CT 06787-0459 203-283-8261
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, JAPAN 489-5333
New England Instr., Robertshaw Controls, 14 Kendal Lane, Natick, MA 01760 617-875-9711
† Noble U.S.A., Inc., 151 Stanley St., Elk Grove Village, IL 60007 312-364-6038
§† Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
Otto Engrg., 2 E. Main St., Carpentersville, IL 60110 312-428-7171
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
† Poly-Scientific, Litton Inds., 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§† Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
Sprague Electric Company, Distribution Division, 481 Marshall St., No. Adams, MA 01247 413-664-4481
Standard Grigsby Inc., W. Gunther GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 51, WEST GERMANY 0911-65521
Telonic/Berkeley, 2825 Laguna Canyon Rd., Laguna Beach, CA 92652 714-494-9401
Tettex Instruments, Inc., P.O. Box 281, Fairview Village, PA 19409-0281 215-539-6050
† Thermo Electric, 109 Fifth St., Saddle Brook, NJ 07662 201-843-5800
§† UID Switches Inc., Sub. of ITW, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 312-585-1212

Switches, Sealed-5100

Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... B•1481
§† American Research & Engineering, 1500 Executive Dr., Elgin, IL 60120, 312-888-7245 ..... B•1486
American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ..... B•1488
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103, 603-669-0940 ..... B•1502
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101, 203-249-8471 ..... B•1504
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062, 312-291-1760 ..... B•1512
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441, 612-559-3772 ..... B•1537
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704, 714-556-3100 ... B•1538
CTS Electronics Corp., Paso Robles Div., Electromechanical Gp., 500 Linne Rd., Paso Robles, CA 93446, 805-238-0350 ..... B•1545
Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 ..... B•1550
EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ..... B•1557
§ EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ..... B•1558
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638, 609-393-8350 ..... B•1567
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1571
§ Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 ..... B•1590
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ..... B•1608
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1614
§† Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625,1633,1634,1657,1668
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532, 312-969-4550 ..... B•1671
† Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 ..... B•1686
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052, 201-762-6886 ..... B•1689
Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543, 914-698-2026-800-431-2625 (outside NY) ..... B•1690
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... B•1091
Tapeswitch Corp. of America, 100 Schmitt Blvd., Farmingdale, NY 11735, 516-694-6312 ..... B•1699
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ..... B•1700
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 .... B•1702
§ Veetronix, Inc., Sub. Reach Electronics, Box 480, Lexington, NE 68850, 308-324-4600 ..... B•1703
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
† Aerospace Optics, Inc., 3201 Sandy La., Fort Worth, TX 76112 817-451-1141
AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§ Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
§ Burgess Switch Co., Ltd., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 617-964-6400
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 .. 312-578-3500
§† Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
§ Communication Cables & Connectors, The Dutton Co., 8255 Black Run Rd., Nashport, OH 43830 614-828-2468
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 201-887-9400
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
CSI Capacitors, CSI Technlgs., 810 Rancheros Dr., San Marcos, CA 92069 619-747-4000
§† Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441 612-559-0720
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
† Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
§ Front Panel Devices, Inc., 530 Burnside Ave., Inwood, NY 11696 212-471-9800
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
Hermetic Switch, Box 1325, Hwy. 92, Chickasha, OK 73018 405-224-4046
§ Interswitch, 770 Airport Blvd., Burlingame, CA 94010 415-347-8217
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§† ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705 714-250-8770
§† J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424
† Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Macrotronix, Inc., 4016 N. Home St., Mishawaka, IN 46545 219-256-5503
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260 602-991-0942
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
Schroff Inc., 170 Commerce Dr., Warwick, RI 02886 401-732-3770
Selec-Key, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103 312-837-7970
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897-0730 203-834-8227
† Transco Products, Inc., 4241 Glencoe Ave., Marina del Rey, CA 90295 .. 213-822-0800

Switches, Slide-5100

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... B•1481
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134, 408-946-6000 ..... D•1057
§† American Research & Engineering, 1500 Executive Dr., Elgin, IL 60120, 312-888-7245 ..... B•1486
Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1501
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101, 203-249-8471 ..... B•1509
CTS Electronics Corp., Paso Robles Div., Electromechanical Gp., 500 Linne Rd., Paso Robles, CA 93446, 805-238-0350 ..... B•1542
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ..... B•1548
Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441, 612-559-0720 ..... B•1566
Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ..... B•1571-1573,1575
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607, 312-243-1100 ..... B•1386
JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705, 714-250-8770 ..... B•1604

§ **Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ..... B•1696**
Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002 201-436-2230
§ Alpha Products, Inc., 5740 Corsa Ave. #104, Westlake Village, CA 91362 818-889-9304
§† AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§ AMP Distributor Marketing Div, A Division of AMP Products Corporation, Harrisburg, PA 17105 717-780-7025
§ Aries Elctrns., Box 130, Frenchtown, NJ 08825 201-996-6841
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
Arstan Products Intl. Ltd., 99 Jericho Tpke., Jericho, NY 11753 516-333-8100
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 617-964-6400
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 .. 312-578-3500
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
COBA, Inc., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441 612-559-3772
Cord Electronics, Inc., 177 Cantiague Rock Rd., Westbury, NY 11590 ... 516-935-3640
§† CW Industries, 130 James Way, Southhampton, PA 18966 215-355-7080
§ Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Gaynor Elec. Co., 135 South Main St, P.O. Box 316, Thomaston, CT 06787-0316 203-283-4388
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
General Electric Co., Wire & Cable, 1285 Boston Ave., Bridgeport, CT 06602 203-382-2000
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
Illinois Lock Co., The Eastern Co., 301 W. Hintz Rd., Wheeling, IL 60090 312-537-1800
International Resource Svcs., 7343 N.W. 79th Terr., Miami, FL 33166 305-884-2924
ISL Products Int'l, Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 .. 516-822-9601
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§ ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 718-392-8800
† LVC Inds., Inc., CO-ORD Switch Div., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035 315-655-8050
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, JAPAN 489-5333
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260 602-991-0942
† Noble U.S.A., Inc., 151 Stanley St., Elk Grove Village, IL 60007 312-364-6038
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Paccom, 3928 148th NE, Redmond, WA 98052 ..... 206-883-9200;800-426-6254
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052 201-762-6886
Preh Electronics Industries, Inc., 5665 Howard Street, Niles, IL 60648 ... 312-647-8338
Resistance Technology Inc., 1260 Red Fox Rd., St. Paul, MN 55112 612-636-9770
† Roanwell, 180 Varick St., New York, NY 10014 212-989-1090
Sealectro, 225 Hoyt St., Mamaroneck, NY 10543 914-698-5600
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
Sprague Electric Company, Distribution Division, 481 Marshall St., No. Adams, MA 01247 413-664-4481
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ UID Switches Inc., Sub. of ITW, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Switches, Snap Action (All Types)-5100

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... B•1481
§ American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ..... B•1489,1491
§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... B•1500
§ Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 ..... B•1503
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062, 312-291-1760 ..... B•1510
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... B•1513
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... B•1521
Chicago Lock Co., 4311 W. Belmont Ave., Chicago, IL 60641, 312-282-7177 ..... B•1534
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ..... B•1548
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1537, 718-497-7600 ..... B•1550
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ..... B•1557
Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441, 612-559-0720 ..... B•1566
§† Electro Switch, King Ave., Weymouth, MA 02188, 617-335-5200 ..... B•1564
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1576
§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035, 315-655-8050 ..... B•1622
§ McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 ..... B•1623
§† Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625,1632,1633,1634,1635,1636,1637,1638,1639,1640
§† Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 ..... B•1686
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530, 914-681-0700 ..... B•1039
§† Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 .... B•1702
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
Airpax Corp., Woods Rd., Cambridge, MD 21613 301-228-4600
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§ Alpha Products, Inc., 5740 Corsa Ave. #104, Westlake Village, CA 91362 818-889-9304
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
§† AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
§† Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
§ Westinghouse Elec. Corp., Bryant Circuit Devices Div., 500 Sylvan Ave., Bridgeport, CT 06606 203-334-5561
§ Burgess Switch Co., Ltd., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
Columbus Elec. Mfg., Box 289A Rt #2, Piney Flats, TN 37686 615-538-8191
§ Compu-Lite Corp., 711 W. 17th St. #F12, Costa Mesa, CA 92627 714-645-1501
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 201-887-9400
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
CTS Corporation, 905 North West Blvd., Elkart, IN 46514 219-293-7511
§† CW Industries, 130 James Way, Southhampton, PA 18966 215-355-7080
§ Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087 ..... 312-662-7667; 800-323-9605
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
† Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861 .. 401-727-1300
§ Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
† Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
The Hall Company, 420 East Water St., Urbana, OH 43078 513-652-1376
† Hamilton Standard Controls, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§† ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
§ Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 718-392-8800
§† Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Linemaster Switch, Box 52, Woodstock, CT 06281 203-974-1000
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051 313-628-9711
† Milli-Switch Corp., Box 67, Gladwyne, PA 19035 ..... 215-MI2-9222
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, JAPAN 489-5333
§ MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532 312-969-4550
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260 602-991-0942
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§† Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
Potter & Brumfield, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001 812-386-1000
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052 201-762-6886
§ Reed Switch Dev. Co. Inc., PO Box 1464, Kerrville, TX 78028 512-896-4444
§† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376

† Roanwell, 180 Varick St., New York, NY 10014 212-989-1090
Schroff Inc., 170 Commerce Dr., Warwick, RI 02886 401-732-3770
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
SL Waber, 300 Harvard Ave., Westville, NJ 08093 ..... 609-456-5400;800-257-8384
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
Sprague Electric Company, Distribution Division, 481 Marshall St., No. Adams, MA 01247 413-664-4481
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
† Sundstrand Data Control, Overlake Ind'l. Pk., Redmond, WA 98052 206-885-3711
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650 201-944-2221
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907 419-756-5911
§ Torq Corp., 32 W. Monroe St., Bedford, OH 44146 216-232-4100
§ United Elec. Controls, 85 School St., Watertown, MA 02172 ..... 617-WA6-1000
§ The Wadsworth Elec. Mfg. Co., Inc., 20 W. 11th St., Covington, KY 41012 606-431-0900
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 312-585-1212
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Switches, Solid State-5100

Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803, 516-694-6700 ..... B•1779
Cambridge Aero Instruments, Inc., 6A Dunham Rd., Billerica, MA 01821, 617-275-0889 ..... D•1116
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... B•1513
§ Crydom Division, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245, 213-322-4937 ..... B•1312
† Daico Inds., Inc., Box 5225, Compton, CA 90224, 213-631-1143 ..... A•1708
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 ..... B•1551
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ..... B•1557
† Frequency Elctrns., 55 Charles Lindbergh Blvd., Mitchel Field, NY 11553, 516-794-4500 ..... A•1367
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1625-1631,1646,1647,1651,1657,1658
Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254, 617-890-6107 ..... A•2091
Triac Electronic Systems, Inc., 87-27 Myrtle Ave., Glendale, NY 11385, 718-441-4759 ..... D•1132
† Adams-Russell, Anzac Div., 80 Cambridge St., Burlington, MA 01803 671-273-3333
† Aiken Advanced Sys., Amstar Technical Products Company, Inc., 5901 Edsall Rd., Alexandria, VA 22304-4197 703-370-0900
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
Alpha Inds., Inc., Microwave Comp. Div., 90 Glenn St., Lawrence, MA 01843 617-681-8520
American Electronic Labs., Box 552, Lansdale, PA 19446 215-822-2929
Amphenol, An Allied Co., 43 Commerce Ct., Lisle, IL 60532 312-983-3500
† Analog Devices, P.O. Box 280, Norwood, MA 02062 617-329-4700
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Arra Inc., 15 Harold Ct., Bay Shore, NY 11706 516-231-8400
Astro-Geo-Marine, Inc., 202 E. Cota St., Santa Barbara, CA 93101 805-965-7005
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062 312-291-1760
§ Burgess Switch Co., Ltd., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5
Coaxial Dynamics, 15210 Industrial Parkway, Cleveland, OH 44135 216-267-2233
Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
Cross Elctrns., 100 Commonwealth Dr., Warrendale, PA 15086 412-776-1591
† Dionics, 65 Rushmore St., Westbury, NY 11590 516-997-7474
§ Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 06379 203-599-2075
Dynage/Controls, Inc., 2 Willowbrook Rd., Cromwell, CT 06416 203-635-6257
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350 805-252-8330
§ Electromatic Controls Corp., 2495 Pembroke Road, Hoffman Estates, IL 60195-2010 312-882-5757
† Electrospace Sys., Inc., P. O. Box 831359, Richardson, TX 75083-1359 214-783-2004
Enerco, Inc., 9615 W. Marginal Way S., Seattle, WA 98108 206-762-1422
§ Fairchild Camera & Instr. Corp., 464 Ellis St., 20-2271, Mountain View, CA 94042 415-962-5011
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
General Magnetics, 211 Grove St., Bloomfield, NJ 07003 201-743-2700
† General Microwave Corp., 155 Marine St., Farmingdale, NY 11735 516-694-3600
† Genisco Technlg. Corp., Filters Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gordos Arkansas, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
Halmar Electronics, Inc., 900 N. Hague Ave., Columbus, OH 43204 614-275-0131
HEI, Inc., 1495 Steiger Lake La., Victoria, MN 55386 612-443-2500
§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
† Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
§ Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 ... 818-787-0311
§ ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Jay-El Prods., Sub. Ducommun Inc., 1859 W. 169th St., Gardena, CA 90247 213-323-7130
§† JFW Inds., Inc., 2719 E. Troy Ave., Indianapolis, IN 46203 317-783-9875
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620 714-739-0770
Licon Div., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Linemaster Switch, Box 52, Woodstock, CT 06281 203-974-1000
† Lorch Elctrns., 105 Cedar La., Englewood, NJ 07631 201-569-8282
§† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 .. 617-272-3000
M/A-Com Millimeter Products, M/A-Com, Inc., Second Avenue, Burlington, MA 01803 617-272-3000
Macrotronix, Inc., 4016 N. Home St., Mishawaka, IN 46545 219-256-5503
Mag-Con, 1626 Terrace Dr., St. Paul, MN 55113 612-633-8820
† MarLee Switch Co., 933-D N. Central Ave., Upland, CA 91786 714-982-8988
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 818-992-6776
† Merrimac Inds., 41 Fairfield Pl, West Caldwell, NJ 07006 201-575-1300
Microphase, 587 Connecticut Ave., Norwalk, CT 06856 203-866-8000
§† Micro Power Sys. Inc., 3100 Alfred St., Santa Clara, CA 95050 408-727-5350
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
† Norsal Inds., 85 D Hoffman Lane So., Central Islip, NY 11722 516-234-1200
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 408-725-1220
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§† Precision Monolithics, Inc., 1500 Space Dr., Santa Clara, CA 95054 408-727-9222
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
RCA Solid State Div., Linear Integrated Circuits, Rte. 202, Somerville, NJ 08876 201-685-6000
† Reed Switch Dev. Co. Inc., PO Box 1464, Kerrville, TX 78028 512-896-4444
Regent Controls, 39 Fanny St., P.O. Box 767, Shelton, CT 06484-0767 .. 203-736-2924
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Roanwell, 180 Varick St., New York, NY 10014 212-989-1090
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ..... CA 415-965-0910;800-221-7060
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
§† Siliconix, Inc., 2201 Laurelwood Rd., Santa Clara, CA 95054 408-988-8000
§ S S A C, Box 395, Liverpool, NY 13088 315-622-1000
§ Struthers-Dunn, Inc., Lamb's Rd., Pitman, NJ 08071 609-589-7500
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
§ Teccor Elctrns., 1801 Hurd Dr., Irving, TX 75062 214-252-7651
§† Teledyne-Crystalonics, 147 Sherman St., Cambridge, MA 02140 617-491-1670
Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-864-3700
Toko America, Inc., 1250 Feehanville Dr., Mt. Prospect., IL 60056 312-297-0070
† Transco Products, Inc., 4241 Glencoe Ave., Marina del Rey, CA 90295 .. 213-822-0800
† TRW Microwave, 825 Stewart Dr., Sunnyvale, CA 94086 408-732-0880
§ United Elec. Controls, 85 School St., Watertown, MA 02172 ..... 617-WA6-1000
† Watkins-Johnson Co., 3333 Hillview Ave., Palo Alto, CA 94304 415-493-4141
Wide Band Engrg. Co., Inc., Box 21652, Phoenix, AZ 85036 602-254-1570

Switches, Step Type-5100

§ Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ..... B•1301
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... B•1468,1614
Litton Encoder Div., 20745 Nordhoff St., Chatsworth, CA 91311, 818-341-6161 ..... B•1801
Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543, 914-698-2026-800-431-2625 (outside NY) ..... B•1690
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ..... B•1700
§ Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002 201-436-2230
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
§ Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
§† ASM, 525 Truck La., Smithfield, NC 27577 919-934-3104
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
† Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8300
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 818-846-1800

† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
† Noble U.S.A., Inc., 151 Stanley St., Elk Grove Village, IL 60007 312-364-6038
§† Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 .... 312-AL2-2700
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Sealectro, 225 Hoyt St., Mamaroneck, NY 10543 914-698-5600
Shallco, Box 1089, Smithfield, NC 27577 919-934-3135
§ Tenor, 17020 W. Rogers Dr., New Berlin, WI 53151 414-782-3800

Switches, Tap — See Switches, Rotary (Vol. B)

Switches, Thermally Actuated-5300

Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087, 312-662-7667;800-323-9605 .... B•1555
Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861, 401-727-1300 .... B•1750
Micro Devices Product Group, Therm-O-Disc, Inc., 1320 South Main Street, P.O. Box 3538, Mansfield, OH 44907, 419-756-5005 .... B•1775
§ Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 .... B•1759
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907, 419-756-5911 .... B•1775
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§ Aqualarm Inc., 544 W. 182nd, Gardena, CA 90248 213-321-5873
§ Athena Controls, Inc., 5145 Campus Dr., Whitemarsh Ind. Campus, Plymouth Meeting, PA 19462 215-828-2490
Automatic Switch Co., 50-60 Hanover Road, Florham Park, NJ 07932 1-201-966-2000
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
Burling Instr., P.O. Box 298, Chatham, NJ 07928 201-635-9481
Cambridge Aero Instruments, Inc., 6A Dunham Rd., Billerica, MA 01821 617-275-0889
Canadian Thermostats & Control Dev. Ltd., 8415 Mountian Sights, Montreal, PQ, CANADA H4P2B8 514-739-3274
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
† Chatham Controls, 33 River Rd., Chatham, NJ 07928 201-635-8892
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 201-887-9400
† Dresser Inds., 1505 Elm St., Dallas, TX 75201 214-746-6000
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ E² Technology Corp., 4475 Dupont Ct #9, Ventura, CA 93003 805-644-9544
§ Fenwal, Inc., 400 Main St., Ashland, MA 01721 617-881-2000
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
§ Selco Products Co., SEL Sales, Inc., 7580 Stage Rd., Buena Park, CA 90621 714-521-8673
† Sundstrand Data Control, Overlake Ind'l. Pk., Redmond, WA 98052 206-885-3711
Sylvania GTE Control Devices, Rte. 35, Standish, ME 04084 207-642-4535
Technar Inc., 205 N. 2nd Ave., Arcadia, CA 91006 818-445-1143
§ Tohoku Metal Inds., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, JAPAN .... Tokyo 03-402-6161
§ United Elec. Controls, 85 School St., Watertown, MA 02172 .... 617-WA6-1000
Warren Comms., 101 Okner Pkwy., Livingston, NJ 07039 201-992-6200

Switches, Thumbwheel-5100

AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 .... B•1493
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 .... B•1513
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 .... B•1526
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 .... B•1541
§† EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 .... B•1558
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 .... B•1597
IVO Inds., Inc., 201 Industrial Way W., P.O. Drawer 917, Eatontown, NJ 07724, 201-542-5151 .... B•1603
JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705, 714-250-8770 .... B•1607
§ Shelly Associates, Inc., 14281 Chambers Road, Tustin, CA 92680, 714-669-9850 .... B•1093
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 .... B•1700
§ Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 .... B•1702
§ Cincinnati Electrosys., 469 Wards Corner Rd., Loveland, OH 45140 513-831-4347
Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
§† Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ Interswitch, 770 Airport Blvd., Burlingame, CA 94010 415-347-8217
ISL Products Int'l, Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 .. 516-822-9601
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
Tansitor Elctrns., West Rd., Bennington, VT 05201 802-442-5473

Switches, Tilt — See Switches, Mercury Displacement (Vol. B)

Switches, Toggle-5100

Advanced Sys. Concepts, 435 N. Lake Ave., Pasadena, CA 91101, 818-793-8971 .... D•1137
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 .... B•1481
§ American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 .... B•1488
§† Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101, 203-249-8471 .... B•1504
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 .... B•1513
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641, 203-233-5551 .... B•1515
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 .... B•1549
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 718-497-7600 .... B•1550
§ Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441, 612-559-0720 .... B•1566
Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... B•1572
Hasco Components, Inc., 247-40 Jericho Tpke., Bellrose Village, NY 11001, 516-328-9292 .... B•1590
§ Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 .... B•1078
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, NJ 07058-9797, 201-227-2000 .... A•1713
§ Littelfuse, Inc., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 .... B•1617
§ Marquardt Switches Inc., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035, 315-655-8050 .... B•1622
§ McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 .... B•1623
§† Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 .... B•1625,1642,1643,1644,1645
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 .... B•1673-1675,1678
§† Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 .... B•1686
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530, 914-681-0700 .... D•1039
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 .... B•1701
§ Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 .... B•1702
Adams Rite Prods., Inc., 540 W. Chevy Chase Dr., Glendale, CA 91204 .. 818-241-5121
† Airpax Corp., Woods Rd., Cambridge, MD 21613 301-228-4600
Allen-Bradley Co., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201 414-671-2000
§ Alpha Products, Inc., 5740 Corsa Ave. #104, Westlake Village, CA 91362 818-889-9304
§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134 408-946-6000
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§ Amptronix, Inc., P.O. Box 8146, Rowland Heights, CA 91748 714-595-5814
§ Aqualarm Inc., 544 W. 182nd, Gardena, CA 90248 213-321-5873
§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304 818-700-1933
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153 312-865-5200
§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644 201-796-2886
§ Westinghouse Elec. Corp., Bryant Circuit Devices Div., 500 Sylvan Ave., Bridgeport, CT 06606 203-334-5561
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Cole-Hersee Co., 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
§ Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§† CW Industries, 130 James Way, Southhampton, PA 18966 215-355-7080
§† Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Gaynor Elec. Co., 135 South Main St, P.O. Box 316, Thomaston, CT 06787-0316 203-283-4388
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
ISL Products Int'l, Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 .. 516-822-9601
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§† J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
§† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 818-992-6776
§ MEC A/S, Industriparken 23, Ballerup, DENMARK DK-2750 452-973366
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
† Milli-Switch Corp., Box 67, Gladwyne, PA 19035 .... 215-MI2-9222
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, JAPAN 489-5333
§† Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
§ Philmore Mfg., 40 Inip Dr., Inwood, NY 11696 516-239-6161
§ Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052 201-762-6886
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .. 201-797-3313;800-526-5376
Resistance Technology Inc., 1260 Red Fox Rd., St. Paul, MN 55112 612-636-9770

RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844
§ Schroff UK Ltd., Maylands Ave., Hemel Hempstead, Herts, ENGLAND HP2 4SG 0442-40471/6
§† Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
§ SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, Box 386, St. Clair Shores, MI 48080 800-482-2828
§ Sprague Electric Company, Distribution Division, 481 Marshall St., No. Adams, MA 01247 413-664-4481
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897-0730 203-834-8227
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Switches, Touch Actuated-5100

§ Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95134, 408-946-6000 ..... D•1057
§ Electronic Components Groupe, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441, 612-559-0720 ..... B•1566
JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705, 714-250-8770 ..... B•1607
Tapeswitch Corp. of America, 100 Schmitt Blvd., Farmingdale, NY 11735, 516-694-6312 ..... B•1699
Adams Rite Prods., Inc., 540 W. Chevy Chase Dr., Glendale, CA 91204 .. 818-241-5121
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54703 715-834-9595
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 414-332-8100
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
§ Centralab, Inc., A North American Philips Co., 5855 N. Glen Park Rd., Milwaukee, WI 53209 414-228-7380
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 201-887-9400
§ Duralith, 525 Orange St., Millville, NJ 08332 609-825-6900
† Flex-Key Division, Rogers Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
GM Nameplate, Inc., 2040 15th Ave. West, Seattle, WA 98119 206-284-2200
§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520
The Hall Company, 420 East Water St., Urbana, OH 43078 513-652-1376
† Hallmark Nameplate, Inc./Electropanel Co., 1855 New Highway, Farmingdale, NY 11735 516-454-0700
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 ... 818-787-0311
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
§† Miller Dial Corp., 4400 N. Temple City Blvd., El Monte, CA 91734 818-283-5111
MOLEX, Inc., 2222 Wellington Ct., Lisle, IL 60532 312-969-4550
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§† Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543 ..... 914-698-2026-800-431-2625 (outside NY)
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
§ Standard Grigsby, Inc., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Technical Panels, Inc., 9162 La Rosa Dr., Temple City, CA 91780 818-285-3105
Toko America, Inc., 1250 Feehanville Dr., Mt. Prospect, IL 60056 312-297-0070
Topflight, 160 East 9th Ave., York, PA 17404 800-233-9386
Unicorn Engrg. Co., Membrane Keyboard Div., 6201 Harwood Ave., Oakland, CA 94618 415-428-1626

Switches, Vacuum — See Switches, Pressure

Switches (MIL), Non-RF-2440

† Advanced Sys. Concepts, 435 N. Lake Ave., Pasadena, CA 91101, 818-793-8971 ..... D•1137
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103, 603-669-0940 ..... B•1502
Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704, 714-556-3100 ... B•1538
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ..... B•1558
§† Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ..... B•1571-1573,1575,1578,1579,1580,1581,1582,1583,1584,1585,1586,1587
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ..... B•1608
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 ..... B•1623
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1632,1635,1637,1639,1640,1643,1644
† Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 ..... B•1686
Shallco, Box 1089, Smithfield, NC 27577, 919-934-3135 ..... B•1692
Tapeswitch Corp. of America, 100 Schmitt Blvd., Farmingdale, NY 11735, 516-694-6312 ..... B•1699
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 .... B•1702
† Accudyne Corp., P.O. Box 1429, Janesville, WI 53547 608-752-9081
Adams Rite Prods., Inc., 540 W. Chevy Chase Dr., Glendale, CA 91204 .. 818-241-5121
Aerospace Optics, Inc., 3201 Sandy La., Fort Worth, TX 76112 817-451-1141
Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
† Condor Systems, Inc., 2605 S. Winchester Blvd., Campbell, CA 95008 ... 408-866-5900
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 201-887-9400
† Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
† Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
† Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861 .. 401-727-1300
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
ITW Switches, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§† J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93140 805-684-4560
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Microavionics Corp., 3198-K Airport Loop Dr., Costa Mesa, CA 92626 ... 714-957-6904
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
† Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788 516-435-8300
† Orbit Instrument of Cal., 643,1 Global Dr., Cypress, CA 90630 714-527-0561
Power Dynamics, 59 Lakeside Ave., West Orange, NJ 07052 201-762-6886
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650 201-944-2221

Switches (MIL), RF-2440

† Daico Inds., Inc., Box 5225, Compton, CA 90224, 213-631-1143 ..... A•1708
Adams Rite Prods., Inc., 540 W. Chevy Chase Dr., Glendale, CA 91204 .. 818-241-5121
† Alpha Inds., Inc.-Microelectronic Div., 2800 Crystal Drive, Hatfield, PA 19440 215-822-1311
Alpha Inds., Inc., Microwave Comp. Div., 90 Glenn St., Lawrence, MA 01843 617-681-8520
† Automatic Connector, Inc., 400 Moreland Rd., Commack, NY 11725 516-543-5000
Bird Elctrn., 30303 Aurora Rd., Cleveland, OH 44139 216-248-1200
Crosspoint, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
§† Digitran Co., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
† Dow-Key Microwave Corporation, 1110 Mark Ave., Carpenteria, CA 93013-2918 805-684-4560
† Eaton Corp., Microwave Components Div., 680 W. Maude Ave., Sunnyvale, CA 94086 408-733-3883
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
† General Microwave Corp., 155 Marine St., Farmingdale, NY 11735 516-694-3600
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 818-846-1800
† Jennings, 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
§† JFW Inds., Inc., 2719 E. Troy Ave., Indianapolis, IN 46203 317-783-9875
K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
† M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 .. 617-272-3000
† MarLee Switch Co., 933-D N. Central Ave., Upland, CA 91786 714-982-8988
† Norsal Inds., 85 D Hoffman Lane So., Central Islip, NY 11722 516-234-1200
† North Hills Elctrns., 1 Alexander Pl., Glen Cove, NY 11542 516-671-5700
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844
§ Support Systems Intl. Corp., 150 South Second St., Richmond, CA 94804 415-234-9090
† Teledyne Microwave, 1290 Terra Bella Ave., Mountain View, CA 94043 415-968-2211
† Transco Products, Inc., 4241 Glencoe Ave., Marina del Rey, CA 90295 .. 213-822-0800
† TRW Microwave, 825 Stewart Dr., Sunnyvale, CA 94086 408-732-0880

Switch Hardware-2800 — *See Vol. C*

Switching Systems, Audio-1300 — *See Vol. D*

Switching Systems, Test & Measurement-2900 — *See Vol. D*

Switch Seals, Environmental-2800 — *See Vol. C*

Swivel Units, Data Entry Terminals-1400 — *See Vol. C*

Synchronizers (MIL), Antenna-3475 — *See Vol. D*

Synchro Transmitters, Solid State-4900 — *See Vol. D*

Synchros-4900 — *See Vol. D*

Synchros & Resolvers (MIL)-2440

† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731, 516-261-3300 ..... D•1140
† American Elctrns., 1600 E. Valencia Dr., Fullerton, CA 92631 714-871-3020
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-973-8900
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
† Innovatek Microsystems, Inc., Smithfield Rd., R1 Box 104, Millerton, NY 12546-9720 914-373-9003
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
† Natel Engrg. Co., Inc., 4550 Runway St., Simi Valley, CA 93063 805-581-3950
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073 619-428-5581

Synthesizers, Delay Line-2350 — *See Vol. A*

Synthesizers, Frequency-2900 — *See Vol. D*

Synthesizers, Speech-2325 — *See Vol. D*

Synthesizers, Waveform-2900 — *See Vol. D*

Systems Integration — See Services, Systems Integration (Vol. D)

Tables, X-Y Axis — See Simulators, Motion (Vol. D)

Tachometers, Pulse-4900 — *See Vol. D*

Tachometers, Generator-4900 — *See Vol. D*

Tachometers, Stroboscopic-4900 — *See Vol. D*

Tape Decks — See Recorders, Magnetic Tape (Vol. D), Transports, Tape (Vol. D)

Tape Duplicators — See Duplicators, Magnetic Tape (Vol. D), Perforators,Paper Tape (Vol. D)

Tape Recording Accessories-1300 — *See Vol. D*

Tape Search Equipment-2000 — *See Vol. D*

Tape Winders-2000 — *See Vol. D*

Tapes, Electrical Insulation-3100 — *See Vol. C*

Tapes, Films & Foils, Pressure Sensitive-4525 — *See Vol. C*

Tapes, Heat Shrinkable — See Caps, Forms & Tapes, Heat Shrinkable (Vol. C)

Tapes, Recording, Magnetic (All Types)-1300 — *See Vol. D*

Tapes, Magnetic, ¼", 140' Cartridge-2000 — *See Vol. D*

Tapes, Magnetic, ¼", 300' Cartridge-2000 — *See Vol. D*

Tapes, Magnetic, ½", 2400' Reel-2000 — *See Vol. D*

Tapes, Magnetic, ½", 3600' Reel-2000 — *See Vol. D*

Tapes, Magnetic, Digital Cassette-2000 — *See Vol. D*

Tapes, Numerical Control-2000 — *See Vol. D*

Technical Books-4200 — *See Vol. C*

Telephone Cords & Cord Sets — See Cords & Cord Sets, Telephone

Tees, Coaxial-3450 — *See Vol. A*

Tees, Waveguide-3450 — *See Vol. A*

Telecommunication Systems & Equipment — See Communications Systems, Telephone (Vol. D)

Telemetering Systems, Electronic — See Communications Systems, Telemetering (Vol. D)

Telephone Handsets — See Handsets, etc. (Vol. D)

Telephone Ringing Generators — See Generators, Signal (Vol. D)

Telephone Sets, Exclusion Key-1900 — *See Vol. D*

Telephone Systems, Telephones Sound Powered — See Communications Systems, Telephone (Vol. D)

Teleprinters, Auto Send/Receive-1900 — *See Vol. D*

Teleprinters, Keyboard Send/Receive-1900 — *See Vol. D*

Teleprinters, Receive Only-1900 — *See Vol. D*

Teletypewriters & Equipment-1900 — *See Vol. D*

Television Systems & Equipment, Cable (CATV) & Master Antenna (MATV) — See CATV Systems & Equipment (Vol. D)

Television Systems & Equipment Closed Circuit-1900 — *See Vol. D*

Temperature Compensators-5300
Precision Resistor Co., Inc., 10601 75 St. N., Largo, FL 33543, 813-541-5771 ..... B•1770
§ Jumbo Process Control, Inc., 410 Garibaldi Ave., Lodi, NJ 07644 201-779-7744
Thermo Electric, 109 Fifth St, Saddle Brook, NJ 07662 201-843-5800

Temperature Indicators — See Meters, Temperature (Vol. D), Labels, Temperature Indicating (Vol. B)

Temperature Sensors — See Transducers, Temperature (Vol. B)

Tensile Testers — See Testers, Material (Vol. D)

Terminal Blocks (Incl. Barrier Types)-2100 — *See Vol. C*

Terminal Boards-2100 — *See Vol. C*

Terminal Boards, Blocks, Strips (MIL)-2440
Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736, 201-223-9400 ..... C•1427
§ WECO Electrical Connectors, Inc., Rt. 11, Meders, NY 12953, 518-298-4810 ..... C•1573
Alpha-Tek, 7286 Murdy Circle, Huntington Beach, CA 92647 714-847-7515
† D-Cemco, 3200 N. San Fernando Blvd., Burbank, CA 91504 213-849-6341
Reliance Comm/Tec, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199 ..... 800-245-4501;in OH 800-245-4497

Terminal Equipment, Digital-2000 — *See Vol. D*

Terminal Strips (Including Barrier Types)-2100 — *See Vol. C*

Terminals, Communications-2000 — *See Vol. D*

Terminals, Credit Authorization-2000 — *See Vol. D*

Terminals, Crimp-2100 — *See Vol. C*

Terminals, Data Display (Incl. Alphanumeric & Graphic)-2000 — *See Vol. D*

Terminals, Data Entry, Multimedia-2000 — *See Vol. D*

Terminals, Display-2000 — *See Vol. D*

Terminals, Feedthru-2000 — *See Vol. C*

Terminals, Financial-2000 — *See Vol. D*

Terminals, Ferrule, Cable-End-2100 — *See Vol. C*

Terminals, Intelligent/Programmable, Batch-2000 — *See Vol. D*

Terminals, Intelligent/Programmable, Interactive-2000 — *See Vol. D*

Terminals, Intelligent/Programmable, Multiprogramming-2000 — *See Vol. D*

Terminals, Intelligent/Programmable, Multiuser-2000 — *See Vol. D*

Terminals, Intelligent/Programmable, Real Time-2000 — *See Vol. D*

Terminals, Intelligent/Programmable, Transaction Processing-2000 — *See Vol. D*

Terminals, Lug (All Types)-2100 — *See Vol. C*

Terminals, Miniature & Subminiature-2100 — *See Vol. C*

Terminals, Printed Circuit Board-2100 — *See Vol. C*

Terminals, Point-of-Sale-2000 — *See Vol. D*

Terminals, Push-on, Quick Disconnect — See Connectors & Terminals, Push-on, Quick Disconnect (Vol. C)

Terminals, Solderless-2100 — *See Vol. C*

Terminals, Standoff-2100 — *See Vol. C*

Terminals, Threaded-2100 — *See Vol. C*

Terminals, Touch — See Touch Terminals

Terminals, Turret-2100 — *See Vol. C*

Terminals, Wirewrap-2100 — *See Vol. C*

Terminals (MIL), Ground Data-3475 — *See Vol. D*

Terminations, Antenna-Also See Dummy Loads-2000 — *See Vol. C*

Terminations, Cable-2100 — *See Vol. C*

Terminations, Fiber Optic-2475
† Math Assocs., 2200 Shames Dr., Westbury, NY 11590, 516-334-6200 .... B•1124

† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1121
EOTec Corp., 420 Frontage Road, W. Haven, CT 06516 203-934-7961
EOTec Corporation, Fiber Optic Interconnect Group, 420 Frontage Road, West Haven, CT 06516 203-934-7961
Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000
NEC Electronics, Inc., 401 Ellis Street, Mtn. View, CA 94039 415-960-6000
Optical Fiber Technologies, Inc., P.O. Box 148, Nutting Lake, MA 01865 617-663-6629
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

Terminations, Microwave-3450 — *See Vol. A*

Terminations, VHF, Video, Pulse-1900 — *See Vol. D*

Termination Systems, Wire-2100 — *See Vol. C*

Test Assemblies (MIL)-3475 — *See Vol. D*

Test Benches (MIL), ECM-3475 — *See Vol. D*

Test Benches (MIL), Shop-3475 — *See Vol. D*

Test Equipment — See Meters, Acceleration, Admittance, etc. (Vol. D)

Test Equipment, Closed Circuit TV-Also See Television Systems & Equipment, Closed-Circuit-2900 — *See Vol. D*

Test Equipment, Color TV-2900 — *See Vol. D*

Test Equipment, Fiber Optic-2475

Berkeley Nucleonics Corp., 1198 Tenth St., Berkeley, CA 94710, 415-527-1121 ..... D•1196
† Math Assocs., 2200 Shames Dr., Westbury, NY 11590, 516-334-6800 ..... B•1124
Photodyne, 1175 Tourmaline Dr., Newbury Park, CA 91320, 818-889-8770 ..... B•1122
Biddle Instruments, A Thorn EMI Co., 510 Township Line Rd., Blue Bell, PA 19422 215-646-9200
Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
EG&G Gamma Scientific, Div. of EG&G Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034
Everett/Charles Test Equip. Inc., 2887 N. Towne Ave., Pomona, CA 91767 714-621-9511
General Cable Co., Fiber Optics Div., 160 Fieldcrest Ave., Raritan Ctr., Edison, NJ 08818 201-225-4780
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
Orionics, Inc., 34368E Frontage Rd., Bozeman, MT 59715 406-586-8256
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
RE Instruments Corp., 31029 Center Ridge Rd., Westlake, OH 44145 216-871-7617
York Technology, Inc., Research Park, 139 Wall Street, Princeton, NJ 08540 609-924-7676

Test Equipment, Mechanical Impedance-2900 — *See Vol. D*

Test Equipment, Memory Systems, Disk-2900 — *See Vol. D*

Test Equipment, Rental & Lease - Also See Services, Electrical Measurement & Test-2900 — *See Vol. D*

Test Equipment (MIL)-3475 — *See Vol. D*

Test Fixtures, ATC-2900 — *See Vol. D*

Test Methods (MIL)-2440 — *See Vol. D*

Test Sets (MIL)-3475 — *See Vol. D*

Test Sets (MIL), Airborne Radar-3475 — *See Vol. D*

Test Sets (MIL), ECM-3475 — *See Vol. D*

Test Sets (MIL), EW-3475 — *See Vol. D*

Test Sets (MIL), Flight Line-3475 — *See Vol. D*

Test Sets (MIL), IRCM-3475 — *See Vol. D*

Test Systems, Automatic DC-2900 — *See Vol. D*

Test Systems, Board-2900 — *See Vol. D*

Test Systems, Component-2900 — *See Vol. D*

Test Systems, Computer Controlled (Automatic)-2900 — *See Vol. D*

Test Systems, Development Engineering — See Services, Assembly & Fabrication (Vol. D)

Test Systems, Functional-2900 — *See Vol. D*

Test Systems, Hall Effect-2900 — *See Vol. D*

Test Systems, IC-2900 — *See Vol. D*

Testers, Accelerometer — See Calibrators, Accelerometer (Vol. D)

Testers, Armature-2900 — *See Vol. D*

Testers, Battery-2900 — *See Vol. D*

Testers, Bit Rate-2900 — *See Vol. D*

Testers, Burn-in, Aging-2550 — *See Vol. D*

Testers, Cable-2900 — *See Vol. D*

Testers, Capacitor-2900 — *See Vol. D*

Testers, Circuit — See Testers, Signal Tracing (Vol. D)

Testers, Coil & Transformer-2900 — *See Vol. D*

Testers, Communication Equipment (Automatic)-2900 — *See Vol. D*

Testers, Component Linearity-2900 — *See Vol. D*

Testers, Corona-2900 — *See Vol. D*

Testers, CRT-2900 — *See Vol. D*

Testers, Diode-2900 — *See Vol. D*

Testers, Electrical Parameter-2900 — *See Vol. D*

Testers, Electric Power — See Monitors, Power, AC & DC (Vol. D)

Testers, Encoder-2900 — *See Vol. D*

Testers, Fiber Optic-2900 — *See Vol. D*

Testers, Ground Resistance — See Meters, Ohm (Vol. D)

Testers, Heat, Manual-2550 — *See Vol. D*

Testers, Hipot — See Testers, Insulation Breakdown (Vol. D)

Testers, Insulation Breakdown-2900 — *See Vol. D*

Testers, Integrated Circuit (Automatic)-2900 — *See Vol. D*

Testers, Integrated Circuit (Manual)-2900 — *See Vol. D*

Testers, Interface-2900 — *See Vol. D*

Testers, LED & LED Arrays-2900 — *See Vol. D*

Testers, Life, Component-2550 — *See Vol. D*

Testers, Logic Card-2900 — *See Vol. D*

Testers, Loopback-2900 — *See Vol. D*

Testers, Magnetic Core-2900 — *See Vol. D*

Testers, Magnetic Medium-2900 — *See Vol. D*

Testers, Magnetron-2900 — *See Vol. D*

Testers, Material-2550 — *See Vol. D*

Testers, Memory Board-2900 — *See Vol. D*

Testers, Meter-2900 — *See Vol. D*

Testers, Microwave-2900 — *See Vol. D*

Testers, Modem-2900 — *See Vol. D*

Testers, Motor-2900 — *See Vol. D*

Testers, Potentiometer-2900 — *See Vol. D*

Testers, Power Supply-2900 — *See Vol. D*

Testers, Pulse Jitter-2900 — *See Vol. D*

Testers, Relay-2900 — *See Vol. D*

Testers, Resistivity-2900 — *See Vol. D*

Testers, Resistor-2900 — *See Vol. D*

Testers, Servo — See Analyzers, Servo (Vol. D)

Testers, Shock-2550 — *See Vol. D*

Testers, Short Turn — See Testers, Coil (Vol. D)

Testers, Signal Tracing-2900 — *See Vol. D*

Testers, Solderability-4100 — *See Vol. D*

Testers, Synchro/Resolver-2900 — *See Vol. D*

Testers, Thickness (all types)-2900 — *See Vol. D*

Testers, Thyristor-2900 — *See Vol. D*

Testers, Tracking & Erosion Resistance (Insulation)-2900 — *See Vol. D*

Testers, Transistor-2900 — *See Vol. D*

Testers, Transmission & Delay-2900 — *See Vol. D*

Testers, Tube-2900 — *See Vol. D*

Testers, Vibration-Also See Services, Environmental Test-2900 — *See Vol. D*

Testers, Voltage-2900 — *See Vol. D*

Testers, Voltage Breakdown-2900 — *See Vol. D*

Testers, (MIL), ECM Pod-3475 — *See Vol. D*

Testers, (MIL), ECM-3475 — *See Vol. D*

Testers, (MIL), ESM-3475 — *See Vol. D*

Testing, Environmental — See Services, Environmental Testing (Vol. D)

Thermal Converters — See Converters, Thermal (Vol. B)

Thermal Platforms-2900 — *See Vol. D*

Thermal Imagers — See Imagers, Thermal (Vol. D)

Thermistors-5300

Cal-R, Inc., P.O. Box 1397, Santa Monica, CA 90406, 213-450-1761 ..... B•1745
Colber Corp., 26E Buffington St., Irvington, NJ 07111, 201-371-9500 .... A•1832
Dale Electronics, Inc., Norfolk Div., 2300 Riverside Blvd., Norfolk, NE 68701, 402-371-0080 ..... B•1748
§† Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701, 617-872-8841 ..... B•1751
§ Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 .. B•1752
Mepco/Electra, Inc., North American Philips Corp., Columbia Rd., Morristown, NJ 07960, 201-539-2000 ..... A•1891
§ Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 ..... B•1758-1759,1763,1764
† Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 ..... A•1908
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..... B•1683,1766,1767
Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840, 201-548-2800 ..... B•1768
Precision Resistor Co., Inc., 10601 75 St. N., Largo, FL 33543, 813-541-5771 ..... B•1770
§† **RCD Components, Inc., 330 Bedford St., Manchester, NH 03101, 603-669-0054 ..... A•1935**
† **Sohio Engineered Materials Co., Unit of Sohio, P. O. Box 156, Niagara Falls, NY 14302, 716-278-2000 ..... B•1772**
Sylvania GTE Control Devices, Rte. 35, Standish, ME 04084, 207-642-4535 ..... B•1773
§ Allen Co., Inc., Robert G., 7267 Coldwater Canyon, N. Hollywood, CA 91605 ..... 818-765-8300;800-423-3186
§† Ametek/Rodan Div., 2905 Blue Star St., Anaheim, CA 92806 714-630-0081
§ Atkins Tech., 3321 S.W. 40th Blvd., Gainesville, FL 32608 904-378-5555
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
Bluffton Products, Inc., Tegam, Inc., 7230 North Ridge Road, Madison, OH 44057 216-946-3572
Canadian Thermostats & Control Dev. Ltd., 8415 Mountian Sights, Montreal, PQ, CANADA H4P2B8 514-739-3274
§ Carbone Lorraine Inds., 400 Myrtle Ave., Boonton, NJ 07005 ..... 201-DE4-0700
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
Digitec Corp., 918 Woodley Rd., P.O. Box 458, Dayton, OH 45401 513-254-6251
§ EDL, Inc., 385 Oser Ave., Hauppauge, NY 11788 ..... 516-435-2808;1-800-DIAL EDL
† EMCA, Sub. Rohm and Haas Advanced Matls. Co., 605 Center Ave., Mamaroneck, NY 10543 914-698-8434
Extech International Corp., 150 Bear Hill Rd., Waltham, MA 02154 617-890-7440
Fasco Industries, Inc., Div. of Hawker Siddeley Grp. Plc., 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
§ Fenwal, Inc., 400 Main St., Ashland, MA 01721 617-881-2000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
† Gulton Inds., Inc., Piezo Prods. Div., Box 4300, Fullerton, CA 92634 714-871-2150
§† Harris Corp., PRD Elctrns. Div., 6801 Jericho Tpke., Syosset, NY 11791 516-364-0400
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
Hybrilonics, Inc., P.O. Box 217, Lasalle Sta., Niagara Falls, NY 14304 716-731-9080
§ Hy-Cal Engrg., 9650 Telstar Ave., El Monte, CA 91731 213-444-4000
Interelectronics Corp., Interelectronics Park, 550 U.S. Rte. 303, Congers, NY 10920 ..... 914-EL8-8000
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
M/A-Com Millimeter Products, M/A-Com, Inc., Second Avenue, Burlington, MA 01803 617-272-3000
§ Murata Mfg. Co., Ltd., 26-10-2-chome-Tenjin, Nagaoka-Kyo-Shi, Kyoto, Japan, JAPAN 075-951-9111
§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
† Quality Thermistor, 2147 Centurion Pl., Boise, ID 83705 208-377-3373
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
† RdF Corporation, 23 Elm Ave., Hudson, NH 03051 603-882-5195
† Law, R. E. Instrument, Inc., 7735 W. 112th Pl., Palos Hills, IL 60465 312-974-4000
§ RFL Inds., Thermocontrol Div., W. Prospect St., Box 250, Brandon, VT 05733 802-247-6811
Science/Elctrns., 1224-26 McCook Ave., Dayton, OH 45404 513-228-6011
† Sensor Scientific, Inc., 1275 Bloomfield Ave., Fairfield, NJ 07006 201-227-7790
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sprague Elec. Co., 481 Marshall St., No. Adams, MA 01247 413-664-4411
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
§ TDK Corporation of America, 4711 Golf Rd., Skokie, IL 60076 312-679-8200
§ Testoterm, P.O. Box 111509, Nashville, TN 37211 615-834-5082
† Thermometrics, Inc., 808 U.S. Hwy. #1, Edison, NJ 08817-4695 201-287-2870
TRW Resistive Products Div., TRW Electronic Components Grp., 401 N. Broad St., Philadelphia, PA 19108 215-923-8230
§ United Elec. Controls, 85 School St., Watertown, MA 02172 ..... 617-WA6-1000
United States Testing Co., Inc., 1415 Park Ave., Hoboken, NJ 07030 ..... 800-631-3096; 201-792-2400
§† Unitrode Corp., 5 Forbes Rd., Lexington, MA 02173 617-861-6540
§ Victory Engrg. Corp., Victory Rd., Springfield, NJ 07081 201-379-5900
† Weed Instr. Co., Inc., 707 Jeffrey Way, P.O. Box 300, Round Rock, TX 78664-0300 512-255-7043
Weinschel Engrg., One Weinschel La., Gaithersburg, MD 20877 ..... 301-948-3434; 800-638-2048
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242
§† Yellow Springs Instr., Box 279, Yellow Springs, OH 45387 513-767-7241

Thermocouple Devices & Materials — See Cooling/Heating Modules, Thermoelectric (Vol. B)

Thermocouple Interfaces for Personal Computers-2000 — *See Vol. D*

Thermocouples, Elements & Accessories-5300

Alberox, New Bedford Ind'l. Pk., New Bedford, MA 02745, 617-995-1725 ..... C•1617
Best Electrics Div., 400 Boren Ave. North, Seattle, WA 98109, 206-382-1300 ..... B•1743
General Resistance, Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ..... D•1233
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..... B•1683,1766,1767,1820,1021, D•1070,1128,1375
Acme Elec. Heating Corp., 4685 E. 11th, Hialeah, FL 33013 305-685-8326
† Acromag, 30765 Wixom Rd., Wixom, MI 48096 313-624-1541
§ AEMC, 99 Chauncy, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Alpha-M Corp., 3009 Wildflower Dr., Dallas, TX 75229 214-620-0021
§ Alpha Wire Corp., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207 201-925-8000
§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
§ Amphenol, An Allied Co., 43 Commerce Ct., Lisle, IL 60532 312-983-3500
† Analog Devices, P.O. Box 280, Norwood, MA 02062 617-329-4700
§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
§ Athena Controls, Inc., 5145 Campus Dr., Whitemarsh Ind. Campus, Plymouth Meeting, PA 19462 215-828-2490
§ Atkins Tech., 3321 S.W. 40th Blvd., Gainesville, FL 32608 904-378-5555
§† Bailey Controls Co., 29801 Euclid Ave., Wickliffe, OH 44092 216-585-5800
Ballantine Labs., 90 Fanny Rd., Boonton, NJ 07005 201-335-0900
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
§ Bartlett Instrument Co., 14th & Ave. "M", P.O. Box 445, Ft. Madison, IA 52627 319-372-8366
Beckman Instrs., 2500 Harbor Blvd., Fullerton, CA 92634 714-871-4848
Bristol Babcock Inc., 40 Bristol St., Waterbury, CT 06708 203-575-3000
Burling Instr., P.O. Box 298, Chatham, NJ 07928 201-635-9481
Colber Corp., 26E Buffington St., Irvington, NJ 07111 201-371-9500
Corning Glass Works, Telecomm Prods Dept., BH-5, Corning, NY 14830 607-974-9000
Degussa Corp., 104 New Era Drive, So. Plainfield, NJ 07080 201-757-6500
Digitec Corp., 918 Woodley Rd., P.O. Box 458, Dayton, OH 45401 513-254-6251
Ectron Corp., 8159 Engineer Rd., San Diego, CA 92111 619-278-0600
§ EDL, Inc., 385 Oser Ave., Hauppauge, NY 11788 ..... 516-435-2808;1-800-DIAL EDL
Electro Physics, 1910 West Birchwood Ave., Chicago, IL 60626 312-274-9669
† Engelhard Corp., 70 Wood Ave. S., Iselin, NJ 08830 201-321-5900
§ E^2 Technology Corp., 4475 Dupont Ct #9, Ventura, CA 93003 805-644-9544
§ Fenwal, Inc., 400 Main St., Ashland, MA 01721 617-881-2000
† GIC Thermodynamics, 2611 Parmenter, Royal Oak, MI 48073 313-280-1648
Gordon, Claud S., Co., 5710 Kenosha St., Richmond, IL 60071 815-678-2211
§ Gulton Inds., Inc., Graphic Instruments Div., Gulton Ind'l. Pk., E. Greenwich, RI 02818 401-884-6800
Hades Mfg. Corp., 151-A Verdi St., Farmingdale, NY 11735 516-249-4244
§† Heraeus-Volkert Inc., 222-34 96th Ave., Queens Village, NY 11429 212-464-8400

† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
Hy-Cal Engrg., 9650 Telstar Ave., El Monte, CA 91731 213-444-4000
Julie Resch. Labs., 211 West 61st St, New York, NY 10023 212-245-2727
§ Jumbo Process Control, Inc., 410 Garibaldi Ave., Lodi, NJ 07644 201-779-7744
Kaye Instruments, 15 De Angelo Dr., Bedford, MA 01730 617-275-0300
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
Minco Prods., 7300 Commerce La., Minneapolis, MN 55432 612-571-3121
§ Modutec, 18 Marshall St., Norwalk, CT 06854 203-853-3636
† NANMAC Corp., 9 Mayhew St., Framingham, MA 01701 617-872-4811
† Narda Microwave Corp., 435 Moreland Rd., Hauppauge, NY 11788 516-231-1700
National Beryllia Corp., Greenwood Ave., Haskell, NJ 07420 201-839-1600
PPM, Inc., 4521 Emery Ind. Pkwy., Cleveland, OH 44128 216-292-6006
Pyrocom Co., 924 N. 143rd St., Seattle, WA 98133 206-365-3535
† RdF Corporation, 23 Elm Ave., Hudson, NH 03051 603-882-5195
† Law, R. E. Instrument, Inc., 7735 W. 112th Pl., Palos Hills, IL 60465 312-974-4000
§† Revere Corp. of Amer., 845 N. Colony Rd., Wallingford, CT 06492 203-269-7701
§ RFL Inds., Thermocontrol Div., W. Prospect St., Box 250, Brandon, VT 05733 802-247-6811
Richards, Arklay S., Co., Inc., 72 Winchester St., Newton Highlands, MA 02161-1793 617-527-1512
Science/Elctrns., 1224-26 McCook Ave., Dayton, OH 45404 513-228-6011
† Sensortek, Inc., 154 Em Huron Ave., Clifton, NJ 07013 201-779-5577
S. F. Products Corporation, P. O. Box 369, Southport, CT 06490 203-929-6180
Simmonds Precision, P.O. Box 310, Norwich, NY 13815 607-335-5000
Solder Absorbing Technology (SAT), South End Bridge Circle, Agawam, MA 01001 800-628-8862
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
† Syscon Intl., Inc., 1108 So. High St., So. Bend, IN 46618-1096 ..... 219-232-3900; 800-348-2993
§ Temptronic, 55 Chapel St., Newton, MA 02158 617-969-2501
§ Testoterm, P.O. Box 111509, Nashville, TN 37211 615-834-5082
† Thermo Electric, 109 Fifth St., Saddle Brook, NJ 07662 201-843-5800
Tracor Paktronics, 2441 Northeast Pkwy., Ft. Worth, TX 76106 817-625-2311
Trans-Met Engrg., 601 S. Palm St., La Habra, CA 90631 213-691-2266
§ United Elec. Controls, 85 School St., Watertown, MA 02172 ..... 617-WA6-1000
United States Testing Co., Inc., 1415 Park Ave., Hoboken, NJ 07030 ..... 800-631-3096; 201-792-2400
Validyne Engrg. Corp., 8626 Wilbur Ave., Northridge, CA 91324 818-886-2057
Veeco Instruments Inc., Terminal Dr., Plainview, NY 11803 516-349-8300
† Weed Instr. Co., Inc., 707 Jeffrey Way, P.O. Box 300, Round Rock, TX 78664-0300 512-255-7043
§ West Division, Gulton Industries, Inc., 3860 N. River Rd., Schiller Park, IL 60176 312-678-6400
Yellow Springs Instr., Box 279, Yellow Springs, OH 45387 513-767-7241

Thermoelectric, Modules — See Cooling/Heating Modules, Thermolectric (Vol. B)

Thermographs-2900 — *See Vol. D*

Thermometers, Electronic (All Types) — See Meters, Temperature (Vol. D)

Thermometers, Resistance-2900 — *See Vol. D*

Thermostats-Also See Switches, Thermally Actuated; Controls, Temperature-5300

† Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ..... B•1742
Dreefs Switch, Inc., 3782 Hawthorn Ct., Waukegan, IL 60087, 312-662-7667;800-323-9605 ..... B•1555
† Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861, 401-727-1300 ..... B•1750
Micro Devices Product Group, Therm-O-Disc, Inc., 1320 South Main Street, P.O. Box 3538, Mansfield, OH 44907, 419-756-5005 ..... B•1775
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907, 419-756-5911 ..... B•1775
Triac Electronic Systems, Inc., 87-27 Myrtle Ave., Glendale, NY 11385, 718-441-4759 ..... D•1132
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
† BTU Engrg. Corp., Bruce Sys., Esquire Rd., N. Billerica, MA 01862 617-667-4111
§† Bud Inds., Inc., 4605 E. 355th St., Willoughby, OH 44094 216-946-3200
Burling Instr., P.O. Box 298, Chatham, NJ 07928 201-635-9481
Canadian Thermostats & Control Dev. Ltd., 8415 Mountian Sights, Montreal, PQ, CANADA H4P2B8 514-739-3274
† Chatham Controls, 33 River Rd., Chatham, NJ 07928 201-635-8892
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ E^2 Technology Corp., 4475 Dupont Ct #9, Ventura, CA 93003 805-644-9544
Fasco Industries, Inc., Div. of Hawker Siddeley Grp. Plc., 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
§ Fenwal, Inc., 400 Main St., Ashland, MA 01721 617-881-2000
§ Grasslin Controls Corp., Dieter Grasslin Feinwerktechnik, 45 Spear Rd., Ramsey, NJ 07446 201-825-9696
† Honeywell Inc., Commercial Div., MN 27-7246, Honeywell Plaza, Minneapolis, MN 55408 612-870-5357
§ ITT General Controls Div., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201 213-842-6131
§ Jumbo Process Control, Inc., 410 Garibaldi Ave., Lodi, NJ 07644 201-779-7744
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
§ Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443 616-777-2602
Princo Instrs., Inc., 1020 Industrial Hwy., Southampton, PA 18966 215-355-1500
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
Selco Products Co., SEL Sales, Inc., 7580 Stage Rd., Buena Park, CA 90621 714-521-8673
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Texas Instrs., Inc., Box 225012-MS-84, Dallas, TX 75265 214-995-6611
§ United Elec. Controls, 85 School St., Watertown, MA 02172 ..... 617-WA6-1000
§ Vermont Automation Co., Inc., 18 Morse Dr., Essex Junction, VT 05452 802-879-7571
Warren Comms., 101 Okner Pkwy., Livingston, NJ 07039 201-992-6200

Thermowells-5300

Gordon, Claud S., Co., 5710 Kenosha St., Richmond, IL 60071 815-678-2211
† RdF Corporation, 23 Elm Ave., Hudson, NH 03051 603-882-5195
Thermo Electric, 109 Fifth St., Saddle Brook, NJ 07662 201-843-5800

Thin-Film Memory Systems, Planar — See Memory Systems (Vol. D)

Thyristors (Incl. Silicon Controlled Rectifiers) - Also see DIACs; TRIACs, SIDACs-4800 — *See Vol. A*

Thyristors (MIL)-2440

† General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
† NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
§† RCA Distr. & Special Prods. Div., RCA Corp., 2000 Clements Bridge Rd., Deptford, NJ 08096 609-541-3636
§† RCA Solid State Div., Transistors, Rte. 202, Somerville, NJ 08876 201-685-6000

Ties, Wire & Cable — See Wire & Cable Ties (Vol. C)

Time Delays, Precision-2900 — *See Vol. D*

Timer/Counters — See Counter/Timers

Timers, Counting-2200 — *See Vol. D*

Timers, Cycle & Reset-2200 — *See Vol. D*

Timers, Delay-2200 — *See Vol. D*

Timers, Electrolytic Cell-2200 — *See Vol. D*

Timers, Interval-2200 — *See Vol. D*

Timers, Programmed-2200 — *See Vol. D*

Timers, Sequence-2200 — *See Vol. D*

Timers, Solid State-2200 — *See Vol. D*

Timing Systems, Oscillators-2300 — *See Vol. A*

Tool Kits & Sets-5400 — *See Vol. C*

Tools & Assembly, Permanent Magnet-1850 — *See Vol. A*

Tools & Kits, Contact Insertion/Removal-5400 — *See Vol. C*

Tools, Alignment & Tuning-5400 — *See Vol. C*

Tools, Cable Tie-5400 — *See Vol. C*

Tools, Connector-5400 — *See Vol. C*

Tools, Crimping & Swaging-5400 — *See Vol. C*

Tools, Heat Sealing-5400 — *See Vol. C*

Tools, Lead Bending & Insertion-5400 — *See Vol. C*

Tools, Magnetic Pickup-5400 — *See Vol. C*

Tools, Marking, Numbering, Engraving-5400 — *See Vol. C*

Tools, Parts Handling, Vacuum Operated-5400 — *See Vol. C*

Tools, Relay Servicing-5400 — *See Vol. C*

Tools, Resistance Soldering — See Soldering Equip., Resistance (Vol. C)

Tools, Wire Wrapping-5400 — *See Vol. C*

Torches, Soldering, Welding & Accessories-4600 — *See Vol. C*

Toroids — See Coils, Toroidal (Vol. A)

Torque Control — See Knobs, Torque, Incremental, Ratio Drive (Vol. C)

Torquers, Gyro — See Motors, Torque (Vol. B)

Totalizers, Digital-2200 — *See Vol. D*

Touch Monitors-2000 — *See Vol. D*

Touch Panels-2000 — *See Vol. D*

Touch Terminals-2000 — *See Vol. D*

Tracers, Curve-2900 — *See Vol. D*

Tracers, Signal — See Testers, Signal Tracing (Vol. D)

Trackballs, XY Positioning-2200 — *See Vol. D*

Trackers (MIL), Laser-3475 — *See Vol. D*

Tracking Systems (MIL)-3475 — *See Vol. D*

Trainers (MIL), ECM-3475 — *See Vol. D*

Trainers (MIL), Elint-3475 — *See Vol. D*

Trainers (MIL), EW-3475 — *See Vol. D*

Trainers (MIL), Maritime-3475 — *See Vol. D*

Training Systems (MIL)-3475 — *See Vol. D*

Transceivers-1900 — *See Vol. D*

Transceivers (MIL)-2440

† ILC Data Device Corp., 105 Wilbur Pl., Bohemia, NY 11716 516-567-5600

Transducer Elements-5500

Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1476

Spectrol Elctrns., 17070 East Gale Ave., City of Industry, CA 91749, 818-964-6565 ..... A•2047

Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1831

† Channel Inds., 839 Ward Dr., Santa Barbara, CA 93111 805-967-0171

† General Microwave Corp., 155 Marine St., Farmingdale, NY 11735 516-694-3600

§ Hottinger Baldwin Measurements, 139 Newbury St., Framingham, MA 01701 617-875-8282

† Nittany Piezo Ceramics, Box 756, Pine and Mill Streets, Bellefonte, PA 16823 ..... 814-355-1593;814-355-1594

Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660

Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840 201-548-2800

§ Rye Inds., Inc., 125 Spencer Pl., P.O. Box M, Mamaroneck, NY 10543 ... 914-698-0080

† Savoy Elctrns., P.O. Box 5727, Ft. Lauderdale, FL 33310 ..305-563-1333;800-327-1282

† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000

Waters Mfg., Longfellow Ctr., Wayland, MA 01778 617-358-2777

Transducers, Acceleration — See Accelerometers (Vol. B)

Transducers, Audio-5500

† Blatek Inds., Inc., Box 574, Bellefonte, PA 16823, 814-355-4910 ..... B•1787

NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. # 205, Richardson, TX 75081, 214-235-8332 ..... D•1029

§ Star Micronics, Inc., Components Div., 70-D Ethel Rd. W., Piscataway, NJ 08854, 201-572-9512 ..... D•1040

TDK Corporation of America, 4711 Golf Rd., Skokie, IL 60076, 312-679-8200 ..... D•1046

§ AKG Acoustics, Inc., 77 Selleck St., Stamford, CT 06902 203-348-2121

§ Altec Lansing, Altec Corp., 1250 N. Red Gum St., Anaheim, CA 92806 ... 714-632-7117

Bell, Floyd, Assocs., Inc., 897 Higgs Ave., Columbus, OH 43212 614-488-3193

Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000

Dunegan Corporation, P.O. Box 3238, Mission Viejo, CA 92690 714-831-9131

Industrial Computer Designs, Inc., 31264 La Baya Drive, Westlake Village, CA 91362 818-889-3179

International Comps. Corp., 105 Maxess Rd., Melville, NY 11747 516-293-1500

§ Mallory Capacitor Co., Mallory Comps. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353

§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400

§ Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067 404-952-9777

Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840 201-548-2800

Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918

Radio Materials Corp., 4242 W. Bryn Mawr, Chicago, IL 60646 312-478-3600

§ Rye Inds., Inc., 125 Spencer Pl., P.O. Box M, Mamaroneck, NY 10543 ... 914-698-0080

Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911

§ Soundlier, American Trading & Prod. Corp., 9380 Watson Ind'l. Pk., St. Louis, MO 63126 314-962-9870

§ Spanta, Inc., Box 193, Franklin Lakes, NJ 07417 201-337-0044

Stanton Magnetics, Inc., Terminal Dr., Plainview, NY 11803 .....718-445-0063; 516-349-0235

§ Wheelock, Inc., 273 Branchport Ave., Long Branch, NJ 07740 201-222-6880

Transducers, Ceramic-5500

Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000

† Channel Inds., 839 Ward Dr., Santa Barbara, CA 93111 805-967-0171

† International Transducer Corp., Channel Technologies, Inc., 93 Castilian Dr., Goleta, CA 93117 805-685-1441

§† Kyocera Intl., Inc., Elctrn. Comps. Grp., 11425 Sorrento Valley Rd., San Diego, CA 92138 619-454-1800

§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400

Motorola Inc., Auto. & Indl. Elctrns. Grp., 1299 E. Algonquin Rd., Schaumburg, IL 60196 312-576-4850

§ Murata Mfg. Co., Ltd., 26-10-2-chome-Tenjin, Nagaoka-Kyo-Shi, Kyoto, Japan, JAPAN 075-951-9111

† Nittany Piezo Ceramics, Box 756, Pine and Mill Streets, Bellefonte, PA 16823 ..... 814-355-1593;814-355-1594

NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. # 205, Richardson, TX 75081 214-235-8332

Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840 201-548-2800

§† Raytheon Ocean Sys. Co., Submarine Signal Div., Risho Ave., Westminster Pk., E. Providence, RI 02914 401-438-1780

§ Stettner Elctrns., 6135 Airways Blvd., Chattanooga, TN 37421 615-892-0291

Transducers, Displacement-5500

Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Pk., CA 91304, 818-884-6860 ..... B•1788

† Farrand Controls, Div. of Farrand Industries, Inc., 99 Wall St., Valhalla, NY 10595, 914-RO1-2600 ..... B•1796

† Maurey Instr. Corp., 4555 W. 60th St., Chicago, IL 60629, 312-581-4555 .. A•2024

Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1476,1626

Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543, 914-698-2026-800-431-2625 (outside NY) ..... B•1690

Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ..... B•1828

Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1831

† Aeroflex Labs., Magnetic Prods. Div., 35 South Service Road, Plainview, NY 11803 516-694-6700

§ Ametek, 2 Station Square, Paoli, PA 19301 215-355-6900

Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600

Automatic Timing & Controls Co., 201 So. Gulph Rd., King of Prussia, PA 19406 ..... 215-337-5500;800-441-8245

Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611

§ Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433

§ Bourns Instrs., Inc., Industrial Div., 1960 Chicago Ave., Unit F, Riverside, CA 92503 714-781-5147

† Bowmar/TIC, Inc., 850 Lawrence Dr., Newbury Park, CA 91320 805-498-2161

Bristol Babcock Inc., 40 Bristol St., Waterbury, CT 06708 203-575-3000

Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752, ... 617-481-7000

Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355

§ Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, NJ 07006 201-227-4222

† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000

† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 215-532-9464

† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300

Computer Instrs., 100 Madison Ave., Hempstead, NY 11550 516-483-8200

Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300

Disc Instruments, Honeywell, 102 E. Baker St., Costa Mesa, CA 92626 .. 714-979-5300

Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343 612-931-2700

§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840

Giddings & Lewis Elctrns., A Unit of AMCA Intl., 666 S. Military Rd., P.O. Box 1658, Fond du Lac, WI 54935 414-921-7100

§ Gordos Corporation, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800

§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511

Gould Inc., Recording Systems Div., 3631 Perkins Ave., Cleveland, OH 44114 216-361-3315

† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 ..... 714-642-2400;800-854-4066

§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, WEST GERMANY ..... (0)911/65521 or 65520

Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.

† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596

§ Hottinger Baldwin Measurements, 139 Newbury St., Framingham, MA 01701 617-875-8282

† Humphrey, Inc., 9212 Balboa Ave., San Diego, CA 92123 619-565-6631

§† Kavlico Corp., 20869 Plummer St., Chatsworth, CA 91311-5096 ..... 818-882-2400;FAX 818-998-2050

LEL Co., 5 Burns Pl., Cresskill, NJ 07626 201-569-8641

§ Lion Precision, 60 Bridge St., Newton, MA 02195 617-969-4710

† Litton Potentiometer Div., 750 So. Fulton Ave., Mt. Vernon, NY 10551 ... 914-664-7733

Magnetoelastic Devices, 326 Springside Ave., Box 625, Pittsfield, MA 01201 413-445-5608

§† Mechanical Techn., 968 Albany Shaker Rd., Latham, NY 12110 518-785-2353

Modern Controls Corp., 4636 Hidden Forest Dr., Sarasota, FL 33580 813-351-3042

MTS Sys., Box 24012, Minneapolis, MN 55424 612-937-4000

Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800

NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. # 205, Richardson, TX 75081 214-235-8332

Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840 201-548-2800

§ Research, Inc., Box 24064, Minneapolis, MN 55424 612-941-3300

§† Robinson-Halpern, One Apollo Rd., P.O. Box 248, Plymouth Meeting, PA 19462-0248 215-825-9200

Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991

† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000

Spectral Dynamics, Scientific-Atlanta, Inc., 4255 Ruffin Rd., San Diego, CA 92123-0575 619-268-7100
Sensotec, Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
Siltran Digital, 2250 Monterey Rd., Atascadero, CA 93422 805-466-3209
† SR Engineering, Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Technar Inc., 205 N. 2nd Ave., Arcadia, CA 91006 818-445-1143
Teledyne/Geotech, 3401 Shiloh Rd., Garland, TX 75041 214-271-2561
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
§ Temposonics, MTS Sys. Corp., 111 East Ames Ct., Plainview, NY 11803 516-349-1950
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351
§ Veeder-Root, 70 Sargeant St., Hartford, CT 06102 203-527-7201
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01822-5058 617-663-7600
Waters Mfg., Longfellow Ctr., Wayland, MA 01778 617-358-2777

Transducers, Flow-5500

Kurz Instruments, Inc., P.O. Box 849, Carmel Valley, CA 93924, 800-424-7356 ..... B•1800
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1476,1802
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..... B•1820
§† Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543, 914-698-2026-800-431-2625 (outside NY) ..... B•1690
Validyne Engrg. Corp., 8626 Wilbur Ave., Northridge, CA 91324, 818-886-2057 ..... D•1164
§ Ametek, 2 Station Square, Paoli, PA 19301 215-355-6900
§† Bailey Controls Co., 29801 Euclid Ave., Wickliffe, OH 44092 216-585-5800
Bristol Babcock Inc., 40 Bristol St., Waterbury, CT 06708 203-575-3000
Cambridge Aero Instruments, Inc., 6A Dunham Rd., Billerica, MA 01821 617-275-0889
Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Pk., CA 91304 818-884-6860
† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 215-532-9464
Computer Instrs., 100 Madison Ave., Hempstead, NY 11550 516-483-8200
§† Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701 617-872-8841
† Flow Technology, Inc., Box 21346, Phoenix, AZ 85036 602-437-1315
§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
Micronel U.S., 2142F Industrial Ct., Sycamore Research Center, Vista, CA 92083 619-727-7400
Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443 616-777-2602
§† MKS Instrs., Inc., 22 Third Ave., Burlington, MA 01803 617-272-9255
Ocean Resch. Equip., Inc., Box 709, Falmouth, MA 02541 617-548-5800
Panametrics, 221 Cresent St., Waltham, MA 02254 617-899-2740
Q-Systems, PO Box 35879, Tucson, AZ 85740 602-293-4923
Robinson-Halpern, One Apollo Rd., P.O. Box 248, Plymouth Meeting, PA 19462-0248 215-825-9200
Sensym, Inc., 1255 Reamwood Ave., Sunnyvale, CA 94089 408-744-1500
Yokogawa Corp. of America, 2 Dart Rd., Shenandoah, GA 30265 404-253-7000

Transducers, Force-5500

Tedea USA, 7800 Deering Ave., Canoga Park, CA 91304, 818-884-8818 .. B•1827
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ..... B•1828
Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1831
Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726
† A. L. Design, Inc., 4232 Ridge Lea Rd., Amherst, NY 14226 716-833-6272
BLH Elctrns., 75 Shawmut Road, Canton, MA 02021 617-821-2000
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 215-532-9464
Data Instruments, Inc., 4 Hartwell Pl., Lexington, MA 02173 617-861-7450
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§ Dillon, W. C., & Co., National Controls, Inc., 2320 Airport Blvd., Santa Rosa, CA 95401 707-527-5555
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006 201-227-1002
§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511
§ GSE, 23640 Research Dr., Farmington Hills, MI 48024 313-476-7875
§ Helm Instr. Co., Inc., 1387 Dussel Drive, Maumee, OH 43537 419-893-4356
Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
§ Hottinger Baldwin Measurements, 139 Newbury St., Framingham, MA 01701 617-875-8282
§ Interface, 7401 Butherus Dr., Scottsdale, AZ 85260 602-948-5555
† Kulite Semiconductor Prods., Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000
Lebow Products, Eaton Corp., 1728 Maplelawn Rd., Troy, MI 48084 313-643-0220
§ Lion Precision, 60 Bridge St., Newton, MA 02195 617-969-4710
Magnetoelastic Devices, 326 Springside Ave., Box 625, Pittsfield, MA 01201 413-445-5608
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
† PCB Piezotronics, 3425 Walden Ave., Depew, NY 14043-2495 716-684-0001
PPM, Inc., 4521 Emery Ind. Pkwy., Cleveland, OH 44128 216-292-6006
§† Revere Corp. of Amer., 845 N. Colony Rd., Wallingford, CT 06492 203-269-7701
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Sensotec, Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
Stow Labs., Inc., Kane Ind'l. Dr., Hudson, MA 01749 617-562-9347
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01822-5058 617-663-7600
Wilcoxon Resch., P.O. Box 5798, Bethesda, MD 20814 301-770-3790

Transducers, Frequency — See Transducers, Volt, Watt, Current, etc. (Vol. B)

Transducers, Humidity-5500

Marcon America Corp., 310 Era Drive, Northbrook, IL 60062, 312-564-2820 ..... A•1116
† Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
§ Jumbo Process Control, Inc., 410 Garibaldi Ave., Lodi, NJ 07644 201-779-7744
† Thunder Sci. Corp., 623 Wyoming S.E., Albuquerque, NM 87123 505-265-8701

Transducers, Tilt - Also see Inclinometers-5500

Precision Level Vial Co., Warren Industries Inc., 1800-D Mearns Rd., Warminster, PA 18974 215-675-2355

Transducers, Incremental Digital Position, Rotary — See Encoders, Shaft Angle (Vol. B)

Transducers, Magnetic Pickup-5500

† Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803, 516-694-6700 ..... B•1779
† American Aerospace Controls, 570 Smith St., Farmingdale, NY 11735, 516-694-5100 ..... B•1780
† International Electro Magnetics, Inc., 350 N. Eric Dr., Palatine, IL 60067, 312-358-4622 ..... D•1026
† Magnetic Shield Div., Perfection Mica Co., 750 North Thomas Dr., Bensenville, IL 60106, 312-766-7800 ..... C•1729
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1476
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, OH 43212, 614-486-9561 ..... B•1819
§ Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726
Airpax Corp., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313 305-587-1100
§ AKG Acoustics, Inc., 77 Selleck St., Stamford, CT 06902 203-348-2121
§† ALTEK Corp., 2150E Indl. Pkwy., Silver Spring, MD 20904 301-622-3906
Analogic Corp., 8 Centennial Dr., Peabody, MA 01961 .....617-532-5660;617-777-4500; 617-246-0300;800-451-1
§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
§ Bell, F. W., Inc., 6120 Hanging Moss Rd., Orlando, FL 32807 305-678-6900
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
Crompton Instrs., 2763 Higgins Road, Elk Grove Village, IL 60007 714-841-2901
§ C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880 617-246-1720
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§ Dynapar, 1675 Delany Rd., Gurnee, IL 60031 312-662-2666
Giddings & Lewis Elctrns., A Unit of AMCA Intl., 666 S. Military Rd., P.O. Box 1658, Fond du Lac, WI 54935 414-921-7100
§ Grado Labs., 4614 Seventh Ave., Brooklyn, NY 11220 718-435-5340
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716 .....201-291-0500; 800-631-2165
§ NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110 312-426-5900
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
† Piconics, 26 Cummings Road, Tyngsboro, MA 01879 617-649-7501
Q-Systems, PO Box 35879, Tucson, AZ 85740 602-293-4923
§ Richard-Lee Co., Box 724, New Providence, NJ 07974 201-276-0710
§ Rye Inds., Inc., 125 Spencer Pl., P.O. Box M, Mamaroneck, NY 10543 ... 914-698-0080
Spectral Dynamics, Scientific-Atlanta, Inc., 4255 Ruffin Rd., San Diego, CA 92123-0575 619-268-7100
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
§ Veeder-Root, 70 Sargeant St., Hartford, CT 06102 203-527-7201
Wabash Electrical Components Group, A Kearney-National Co., 1375 Swan Street, Huntington, IN 46750 219-356-8300

Transducers, Piezoelectric-5500

Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 ..... D•1028
Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840, 201-548-2800 ..... B•1768
TDK Corporation of America, 4711 Golf Rd., Skokie, IL 60076, 312-679-8200 ..... D•1046
§ Atomergic Chemetals Corp., 100 Fairchild Ave., Plainview, NY 11803 ... 516-349-8800
§ BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420
Blatek Inds., Inc., Box 574, Bellefonte, PA 16823 814-355-4910
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
† Channel Inds., 839 Ward Dr., Santa Barbara, CA 93111 805-967-0171
Endevco, 30700 Rancho Viejo Rd., San Juan Capistrano, CA 92675 714-493-8181
† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 ..... 714-642-2400;800-854-4066
† International Transducer Corp., Channel Technologies, Inc., 93 Castilian Dr., Goleta, CA 93117 805-685-1441
§† Kyocera Intl., Inc., Elctrn. Comps. Grp., 11425 Sorrento Valley Rd., San Diego, CA 92138 619-454-1800
§ Mallory Capacitor Co., Mallory Comps. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353
† Nittany Piezo Ceramics, Box 756, Pine and Mill Streets, Bellefonte, PA 16823 ..... 814-355-1593;814-355-1594
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. #205, Richardson, TX 75081 214-235-8332
† PCB Piezotronics, 3425 Walden Ave., Depew, NY 14043-2495 716-684-0001
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
† Raytheon Co., Submarine Signal Div., 1847 W. Main Rd., P.O. Box 360, Portsmouth, RI 02871 401-847-8000
† Savoy Elctrns., P.O. Box 5727, Ft. Lauderdale, FL 33310 .. 305-563-1333;800-327-1282
§ Stettner Elctrns., 6135 Airways Blvd., Chattanooga, TN 37421 615-892-0291

Taiyo Yuden (USA) Inc., 714 Algonquin Rd., Arlington Heights, IL 60005 312-364-6104
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01822-5058 617-663-7600

Transducers, Position, Linear-5500

Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Pk., CA 91304, 818-884-6360 ..... B•1788
† **Farrand Controls, Div. of Farrand Industries, Inc., 99 Wall St., Valhalla, NY 10595, 914-RO1-2600 ..... B•1796**
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1476,1625,1626,1627,1628,1629,1630
Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543, 914-698-2026-800-431-2625 (outside NY) ..... B•1690
Spectrol Elctrns., 17070 East Gale Ave., City of Industry, CA 91749, 818-964-6565 ..... A•2047
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ..... B•1828
Validyne Engrg. Corp., 8626 Wilbur Ave., Northridge, CA 91324, 818-886-2057 ..... D•1164
Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1831
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
† Component Specialties Corp., 9143 E. La Rosa Dr., Temple City, CA 91780 213-283-0015
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880 617-246-1720
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 ..... 714-642-2400;800-854-4066
† JDK Controls, Inc., 2630 Lavery Ct., Suite F, Newbury Park, CA 91320-1593 805-499-7779
Lion Precision, 60 Bridge St., Newton, MA 02195 617-969-4710
Litton Potentiometer Div., 750 So. Fulton Ave., Mt. Vernon, NY 10551 914-664-7733
Modern Controls Corp., 4636 Hidden Forest Dr., Sarasota, FL 33580 813-351-3042
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. #205, Richardson, TX 75081 214-235-8332
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Sensotec, Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
† Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
Technar Inc., 205 N. 2nd Ave., Arcadia, CA 91006 818-445-1143
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351
Waters Mfg., Longfellow Ctr., Wayland, MA 01778 617-358-2777

Transducers, Position, Rotary-5500

BEI Motion Sys. Co., Computer Prod. Div., 1755 B La Costa Meadows Dr., San Marcos, CA 92069, 619-471-2600 ..... B•1783
BEI Motion Sys. Co., Digital Prods. Div., P.O. Box 3838, Little Rock, AR 72203, 501-851-4000 ..... B•1782
BEI Motion Sys. Co., Industrial Encoder Div., 7230 Hollister Ave., Goleta, CA 93117, 805-968-0782 ..... B•1782
BEI Motion Sys. Co., Position Controls Div., 819 Reddick Ave., Santa Barbara, CA 93103, 805-966-1538 ..... B•1782
Datametrics • Dresser Inds., Inc., 340 Fordham Road, Wilmington, MA 01887, 617-658-5410 ..... B•1791
† **Farrand Controls, Div. of Farrand Industries, Inc., 99 Wall St., Valhalla, NY 10595, 914-RO1-2600 ..... B•1796**
Spectrol Elctrns., 17070 East Gale Ave., City of Industry, CA 91749, 818-964-6565 ..... A•2047
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ..... B•1828
Transmagnetics, 210 Adams Blvd., Farmingdale, NY 11735, 516-293-3100 ..... D•1162
Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1831
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
Bluffton Products, Inc., Tegam, Inc., 7230 North Ridge Road, Madison, OH 44057 216-946-3572
† Clifton Precision, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880 617-246-1720
§ Dynapar, 1675 Delany Rd., Gurnee, IL 60031 312-662-2666
† JDK Controls, Inc., 2630 Lavery Ct., Suite F, Newbury Park, CA 91320-1593 805-499-7779
Litton Potentiometer Div., 750 So. Fulton Ave., Mt. Vernon, NY 10551 914-664-7733
† Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 813-822-2529
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Spectral Dynamics, Scientific-Atlanta, Inc., 4255 Ruffin Rd., San Diego, CA 92123-0575 619-268-7100
† Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073 619-428-5581
Waters Mfg., Longfellow Ctr., Wayland, MA 01778 617-358-2777

Transducers, Power — See Transducers, Volt, Watt, Currents, etc. (Vol. B)

Transducers, Pressure-5500

Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Pk., CA 91304, 818-884-6360 ..... B•1788
Data Instruments, Inc., 4 Hartwell Pl., Lexington, MA 02173, 617-861-7450 ..... B•1790
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006, 201-227-1002 ..... B•1795
§ **Kavlico Corp., 20869 Plummer St., Chatsworth, CA 91311-5096, 818-882-2400;FAX 818-998-2050 ..... B•1798**
† **Kulite Semiconductor Prods., Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657, 201-945-3000 ..... B•1799**
§ **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1476,1630,1802,1803**
§ **Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 ..... A•2087**
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..... B•1683,1767,1820,1021
† **Paine Instrs., 2401 S. Bayview St., Seattle, WA 98144, 800-426-0366 ..... B•1823**
§† **Pres-Air-Trol Corp., 1009 Boston Post Rd., Mamaroneck, NY 10543, 914-698-2026-800-431-2625 (outside NY) ..... B•1690**
Setra Systems, Inc., 45 Nagog Park, Acton, MA 01720, 617-263-1400 ..... B•1826
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ..... B•1828
Validyne Engrg. Corp., 8626 Wilbur Ave., Northridge, CA 91324, 818-886-2057 ..... D•1164
† **Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... B•1011,1196,1830,1831**
Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726
† A. L. Design, Inc., 4232 Ridge Lea Rd., Amherst, NY 14226 716-833-6272
§ Ametek, 2 Station Square, Paoli, PA 19301 215-355-6900
Analogic Corp., 8 Centennial Dr., Peabody, MA 01961 ..... 617-532-5660;617-777-4500; 617-246-0300;800-451-1
API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
§† Bailey Controls Co., 29801 Euclid Ave., Wickliffe, OH 44092 216-585-5800
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
Bell & Howell/CEC Div., 360 Sierra Madre Villa, Pasadena, CA 91109 213-796-9381
§ Bellofram Corp., A Rexnord Co., 30 Blanchard Rd., Burlington, MA 01803 ..... 617-272-2100;800-225-1031
§† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
§ Bourns Instrs., Inc., Industrial Div., 1960 Chicago Ave., Unit F, Riverside, CA 92503 714-781-5147
Bristol Babcock Inc., 40 Bristol St., Waterbury, CT 06708 203-575-3000
Cambridge Aero Instruments, Inc., 6A Dunham Rd., Billerica, MA 01821 617-275-0889
† Channel Inds., 839 Ward Dr., Santa Barbara, CA 93111 805-967-0171
† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 215-532-9464
Computer Instrs., 100 Madison Ave., Hempstead, NY 11550 516-483-8200
† Conrac Corp., System Comps. Div., 1700 S. Mountain Ave., Duarte, CA 91010 213-359-9141
† Consolidated Controls, 15 Durant Ave., Bethel, CT 06801 203-743-6721
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§ Dynisco, 10 Oceana Way, Norwood, MA 02062 617-769-6600
§ Electromatic Controls Corp., 2495 Pembroke Road, Hoffman Estates, IL 60195-2010 312-882-5757
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. #5, York, PA 17402 717-767-6517
§ Endevco, 30700 Rancho Viejo Rd., San Juan Capistrano, CA 92675 714-493-8181
Essex Group, 9933 13th St., Ft. Wayne, IN. 46809 219-478-1521
† Faria, Thomas G., Corp., P.O. Box 0983, Uncasville, CT 06382 203-848-9271
† Genisco Technlg. Corp., Transducers Prods. Div., 650 Easy St., Simi Valley, CA 93065 805-581-3985
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511
Gould Inc., Recording Systems Div., 3631 Perkins Ave., Cleveland, OH 44114 216-361-3315
§ GSE, 23640 Research Dr., Farmington Hills, MI 48024 313-476-7875
† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 ..... 714-642-2400;800-854-4066
Harrel, Inc., 16 Fitch St., E. Norwalk, CT 06855 203-866-2573
Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Honeywell Inc., Aerospace & Defense Grp., Honeywell Plaza, Minneapolis, MN 55408 612-870-5186
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
§ Hottinger Baldwin Measurements, 139 Newbury St., Framingham, MA 01701 617-875-8282
§ International Microtronics Corp., 4016 E. Tennessee St., Tucson, AZ 85714 602-748-7900
§ Jumbo Process Control, Inc., 410 Garibaldi Ave., Lodi, NJ 07644 201-779-7744
† Kollsman Instr., 220 Daniel Webster Hwy., Merrimack, NH 03054 603-889-2500
§† Kyocera Intl., Inc., Elctrn. Comps. Grp., 11425 Sorrento Valley Rd., San Diego, CA 92138 619-454-1800
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
LEL Co., 5 Burns Pl., Cresskill, NJ 07626 201-569-8641
† Litton Potentiometer Div., 750 So. Fulton Ave., Mt. Vernon, NY 10551 914-664-7733
Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443 616-777-2602
§† MKS Instrs., Inc., 22 Third Ave., Burlington, MA 01803 617-272-9255
Motorola Inc., Auto. & Indl. Elctrns. Grp., 1299 E. Algonquin Rd., Schaumburg, IL 60196 312-576-4850

† Nittany Piezo Ceramics, Box 756, Pine and Mill Streets, Bellefonte, PA 16823 ..... 814-355-1593;814-355-1594
Optimum Applied Systems, 145 Palisade St., Dobbs Ferry, NY 10522-1696 914-693-9001
† PCB Piezotronics, 3425 Walden Ave., Depew, NY 14043-2495 716-684-0001
Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840 201-548-2800
Pressure Systems, Inc., 15 Research Dr., Hampton, VA 23666 804-865-1243
Q-Systems, PO Box 35879, Tucson, AZ 85740 602-293-4923
§† Robinson-Halpern, One Apollo Rd., P.O. Box 248, Plymouth Meeting, PA 19462-0248 215-825-9200
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Spectral Dynamics, Scientific-Atlanta, Inc., 4255 Ruffin Rd., San Diego, CA 92123-0575 619-268-7100
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
Sensotec, Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
§† Sensym, Inc., 1255 Reamwood Ave., Sunnyvale, CA 94089 408-744-1500
Stow Labs., Inc., Kane Ind'l. Dr., Hudson, MA 01749 617-562-9347
Technar Inc., 205 N. 2nd Ave., Arcadia, CA 91006 818-445-1143
† Thermometrics, Inc., 808 U.S. Hwy. #1, Edison, NJ 08817-4695 201-287-2870
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01822-5058 617-663-7600
§ Yellow Springs Instr., Box 279, Yellow Springs, OH 45387 513-767-7241

Transducers, Proximity-5500

§ Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716, 201-291-0500;800-631-2165 ..... D•1124
§† Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1476,1668
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. #205, Richardson, TX 75081, 214-235-8332 ..... B•1805
Aeroflex Labs., Magnetic Prods. Div., 35 South Service Road, Plainview, NY 11803 516-694-6700
§ Amerace Corporation, Newburgh Rd., Hackettstown, NJ 07840 201-852-1122
§† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
† Custom Prods. Grp., Sys. Dev. Corp.-A Burroughs Co., P.O. Box 517, Paoli, PA 19301 215-648-7660
Dale Electronics, Inc., Norfolk Div., 2300 Riverside Blvd., Norfolk, NE 68701 402-371-0080
§ Eaton Corp, Durant Products, 901 S. 12th St., Watertown, WI 53094 414-261-4070
EOTec Corp., 420 Frontage Road, W. Haven, CT 06516 203-934-7961
Epsilon-Lambda Elctrns. Corp., 427 Stevens St., Geneva, IL 60134 312-232-9611
FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 ..... 312-231-3511; 312-932-9380
† GIC Thermodynamics, 2611 Parmenter, Royal Oak, MI 48073 313-280-1648
§ Gordon Prods., 67 Del Mar Dr., Brookfield, CT 06804 203-775-4501
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§ Hottinger Baldwin Measurements, 139 Newbury St., Framingham, MA 01701 617-875-8282
Kontes, Kimble Div. of Owens/IL, 1001 Spruce St., Vineland, NJ 08360 609-692-8500
Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620 714-739-0770
§ Lion Precision, 60 Bridge St., Newton, MA 02195 617-969-4710
§ Mechanical Techn., 968 Albany Shaker Rd., Latham, NY 12110 518-785-2353
Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131
Modern Controls Corp., 4636 Hidden Forest Dr., Sarasota, FL 33580 813-351-3042
Princo Instrs., Inc., 1020 Industrial Hwy., Southampton, PA 18966 215-355-1500
§ Redington Counters, 130 Addison Rd., Windsor, CT 06095 203-688-6205
Rehlander Assocs., 118A Bridge St., Beverly, MA 01915 617-922-5961
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Spectral Dynamics, Scientific-Atlanta, Inc., 4255 Ruffin Rd., San Diego, CA 92123-0575 619-268-7100
Siltran Digital, 2250 Monterey Rd., Atascadero, CA 93422 805-466-3209
Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471 203-481-5721
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01822-5058 617-663-7600
Wabash Electrical Components Group, A Kearney-National Co., 1375 Swan Street, Huntington, IN 46750 219-356-8300

Transducers, Sonic-5500

Bell, Floyd, Assocs., Inc., 897 Higgs Ave., Columbus, OH 43212 614-488-3193
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
† International Transducer Corp., Channel Technologies, Inc., 93 Castilian Dr., Goleta, CA 93117 805-685-1441
§† Kyocera Intl., Inc., Elctrn. Comps. Grp., 11425 Sorrento Valley Rd., San Diego, CA 92138 619-454-1800
† Nittany Piezo Ceramics, Box 756, Pine and Mill Streets, Bellefonte, PA 16823 ..... 814-355-1593;814-355-1594
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. #205, Richardson, TX 75081 214-235-8332
† Raytheon Co., Submarine Signal Div., 1847 W. Main Rd., P.O. Box 360, Portsmouth, RI 02871 401-847-8000
§ Stettner Elctrns., 6135 Airways Blvd., Chattanooga, TN 37421 615-892-0291

Transducers, Strain Gauge-5500

Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Pk., CA 91304, 818-884-6860 ..... B•1789
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1476,1802
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..... B•1683,1767,1820,1821
† Paine Instrs., 2401 S. Bayview St., Seattle, WA 98144, 800-426-0366 .... B•1823
Tedea USA, 7800 Deering Ave., Canoga Park, CA 91304, 818-884-8818 .. B•1827
Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
Bell & Howell/CEC Div., 360 Sierra Madre Villa, Pasadena, CA 91109 ... 213-796-9381
BLH Elctrns., 75 Shawmut Road, Canton, MA 02021 617-821-2000
§ Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
§ Bourns Instrs., Inc., Industrial Div., 1960 Chicago Ave., Unit F, Riverside, CA 92503 714-781-5147
† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 215-532-9464
† Consolidated Controls, 15 Durant Ave., Bethel, CT 06801 203-743-6721
Data Instruments, Inc., 4 Hartwell Pl., Lexington, MA 02173 617-861-7450
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§† Dillon, W. C., & Co., National Controls, Inc., 2320 Airport Blvd., Santa Rosa, CA 95401 707-527-5555
§ Dynisco, 10 Oceana Way, Norwood, MA 02062 617-769-6600
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006 201-227-1002
† Genisco Technlg. Corp., Transducers Prods. Div., 650 Easy St., Simi Valley, CA 93065 805-581-3985
§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511
§ GSE, 23640 Research Dr., Farmington Hills, MI 48024 313-476-7875
§ Helm Instr. Co., Inc., 1387 Dussel Drive, Maumee, OH 43537 419-893-4356
Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 ..... Call Local Sls. Off.
§ Hottinger Baldwin Measurements, 139 Newbury St., Framingham, MA 01701 617-875-8282
§ Interface, 7401 Butherus Dr., Scottsdale, AZ 85260 602-948-5555
§† Kistler-Morse, 10201 Willows Road NE, Redmond, WA 98052 206-881-8000
† Kulite Semiconductor Prods., Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000
Lebow Products, Eaton Corp., 1728 Maplelawn Rd., Troy, MI 48084 313-643-0220
Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840 201-548-2800
§† Revere Corp. of Amer., 845 N. Colony Rd., Wallingford, CT 06492 203-269-7701
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Sensotec, Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
§ Sensym, Inc., 1255 Reamwood Ave., Sunnyvale, CA 94089 408-744-1500

Transducers, Temperature-5500

Dale Electronics, Inc., Norfolk Div., 2300 Riverside Blvd., Norfolk, NE 68701, 402-371-0080 ..... B•1748
§† Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701, 617-872-8841 ..... B•1751
† Harrel, Inc., 16 Fitch St., E. Norwalk, CT 06855, 203-866-2573 ..... D•1122
Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 .. B•1752
Kurz Instruments, Inc., P.O. Box 849, Carmel Valley, CA 93924, 800-424-7356 ..... B•1800
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1476,1668,1757
§ Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 ..... B•1758-1761,1763,1764,1765
§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 ..... A•2087
§ Newport Electronics, 630 E. Young St., Santa Ana, CA 92705, 714-540-4914 ..... D•1371
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..... B•1683,1766,1767,1820,1821, D•1375
Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840, 201-548-2800 ..... B•1768
RCL Electronics, Inc., 195 McGregor St., Manchester, NH 03102, 603-627-3831 ..... A•1941
Shallcross, Inc., U.S. 70 East, Smithfield, NC 27577, 919-934-5181 ..... A•1941
Ultronix, Inc., P.O. Box 1090, Grand Junction, CO 81502, 303-242-0810 ..... A•1963
† Acromag, 30765 Wixom Rd., Wixom, MI 48096 313-624-1541
§ Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726
Advanced Techn. Research Labs., 5645 K General Washington Dr., Alexandria, VA 22312 703-750-2920
§ Alpha Wire Corp., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207 201-925-8000
§ Ametek, 2 Station Square, Paoli, PA 19301 215-355-6900
§† Ametek/Rodan Div., 2905 Blue Star St., Anaheim, CA 92806 714-630-0081
† Amprobe Instr., 630 Merrick Rd., Lynbrook, NY 11563 ..... 516-LY3-5600
† Analog Devices, P.O. Box 280, Norwood, MA 02062 617-329-4700
§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
§ Athena Controls, Inc., 5145 Campus Dr., Whitemarsh Ind. Campus, Plymouth Meeting, PA 19462 215-828-2490
§ Atkins Tech., 3321 S.W. 40th Blvd., Gainesville, FL 32608 904-378-5555
§† Bailey Controls Co., 29801 Euclid Ave., Wickliffe, OH 44092 216-585-5800
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611
Bristol Babcock Inc., 40 Bristol St., Waterbury, CT 06708 203-575-3000
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
Burling Instr., P.O. Box 298, Chatham, NJ 07928 201-635-9481
CAL Controls Inc., 1155 Waukegan Rd., Glenview, IL 60025 312-998-5720
Cambridge Aero Instruments, Inc., 6A Dunham Rd., Billerica, MA 01821 617-275-0889
Capintec Instrs., 6 Arrow Rd., Ramsey, NJ 07446 201-825-9500
† Consolidated Controls, 15 Durant Ave., Bethel, CT 06801 203-743-6721
Crompton Instrs., 2763 Higgins Road, Elk Grove Village, IL 60007 714-841-2901
Crompton Instrs., Hawker Siddley, 2763 Old Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300

ECO Instrs. Div., Sea Data Corp., 1 Bridge St., Newton, MA 02158 617-964-8360
§ EDL, Inc., 385 Oser Ave., Hauppauge, NY 11788 ..... 516-435-2808;1-800-DIAL EDL
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. #5, York, PA 17402 717-767-6517
§ E^3 Technology Corp., 4475 Dupont Ct #9, Ventura, CA 93003 805-644-9544
§ Everest Interscience, Inc., P.O. Box 345, Tustin, CA 92681 ..... 714-992-4461; 714-730-0747
† Faria, Thomas G., Corp., P.O. Box 0983, Uncasville, CT 06382 203-848-9271
General Resistance, Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471 203-481-5721
§ Hades Mfg. Corp., 151-A Verdi St., Farmingdale, NY 11735 516-249-4244
Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
Hy-Cal Engrg., 9650 Telstar Ave., El Monte, CA 91731 213-444-4000
§ Industrial Computer Designs, Inc., 31264 La Baya Drive, Westlake Village, CA 91362 818-889-3179
Instrulab, P.O. B. 98, Dayton, OH 45404 513-223-2241
† Kulite Semiconductor Prods., Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000
Larson Instr., Greenbush Rd., Orangeburg, NY 10962 914-359-3800
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
Mag-Con, 1626 Terrace Dr., St. Paul, MN 55113 612-633-8820
Meissner Inds., 551 Rte. 10, Dover, NJ 07801 201-366-1700
Mikron Instr., Box 211, Ridgewood, NJ 07451 201-891-7330
Minco Prods., 7300 Commerce La., Minneapolis, MN 55432 612-571-3121
§ NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110 312-426-5900
PPM, Inc., 4521 Emery Ind. Pkwy., Cleveland, OH 44128 216-292-6006
§† Precision Monolithics, Inc., 1500 Space Dr., Santa Clara, CA 95054 408-727-9222
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
Q-Systems, PO Box 35879, Tucson, AZ 85740 602-293-4923
§ Quality Thermistor, 2147 Centurion Pl., Boise, ID 83705 208-377-3373
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
† RdF Corporation, 23 Elm Ave., Hudson, NH 03051 603-882-5195
† Relco Prods., 5594 E. Jefferson Ave., Denver, CO 80237 303-756-1143
§ RFL Inds., Thermocontrol Div., W. Prospect St., Box 250, Brandon, VT 05733 802-247-6811
Rochester Instr. Sys., 255 N. Union St., Rochester, NY 14605 716-263-7700
Schneider Instr., 8115 Camargo Rd., Cincinnati, OH 45243 513-561-6803
Spectral Dynamics, Scientific-Atlanta, Inc., 4255 Ruffin Rd., San Diego, CA 92123-0575 619-268-7100
Scientific Columbus, Inc., Esterline Corp., 1900 Arlingate La., Columbus, OH 43228 614-274-7160
S. F. Products Corporation, P. O. Box 369, Southport, CT 06490 203-929-6180
Siltran Digital, 2250 Monterey Rd., Atascadero, CA 93422 805-466-3209
Stow Labs., Inc., Kane Ind'l. Dr., Hudson, MA 01749 617-562-9347
Sylvania GTE Control Devices, Rte. 35, Standish, ME 04084 207-642-4535
† Syscon Intl., Inc., 1108 So. High St., So. Bend, IN 46618-1096 ..... 219-232-3900; 800-348-2993
Tektronix, Inc., P. O. Box 500, Y3-314, Beaverton, OR 97077 ..... 800-547-1512;Oregon only 800-452-1877
§ Testoterm, P.O. Box 111509, Nashville, TN 37211 615-834-5082
† Thermo Electric, 109 Fifth St., Saddle Brook, NJ 07662 201-843-5800
§ Tohoku Metal Inds., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, JAPAN ..... Tokyo 03-402-6161
Trans-Met Engrg., 601 S. Palm St., La Habra, CA 90631 213-691-2266
TRW Resistive Products Div., TRW Electronic Components Grp., 401 N. Broad St., Philadelphia, PA 19108 215-923-8230
United States Testing Co., Inc., 1415 Park Ave., Hoboken, NJ 07030 ..... 800-631-3096; 201-792-2400
† Weed Instr. Co., Inc., 707 Jeffrey Way, P.O. Box 300, Round Rock, TX 78664-0300 512-255-7043
§ Yellow Springs Instr., Box 279, Yellow Springs, OH 45387 513-767-7241

Transducers, Thermoelectric — See Transducers, Temperature (Vol. B)

Transducers, Torque-5500

† A. L. Design, Inc., 4232 Ridge Lea Rd., Amherst, NY 14226 716-833-6272
§ Ametek, 2 Station Square, Paoli, PA 19301 215-355-6900
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§ Dillon, W. C., & Co., National Controls, Inc., 2320 Airport Blvd., Santa Rosa, CA 95401 707-527-5555
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
§ GSE, 23640 Research Dr., Farmington Hills, MI 48024 313-476-7875
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
§ Hottinger Baldwin Measurements, 139 Newbury St., Framingham, MA 01701 617-875-8282
§ Interface, 7401 Butherus Dr., Scottsdale, AZ 85260 602-948-5555
Lebow Products, Eaton Corp., 1728 Maplelawn Rd., Troy, MI 48084 313-643-0220
Magnetoelastic Devices, 326 Springside Ave., Box 625, Pittsfield, MA 01201 413-445-5608
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Sensotec, Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
Vibrac, 1 Columbia Dr., Amherst, NH 03031 603-882-6777
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01822-5058 617-663-7600

Transducers, Ultrasonic-5500

† Blatek Inds., Inc., Box 574, Bellefonte, PA 16823, 814-355-4910 ..... B•1787
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. #205, Richardson, TX 75081, 214-235-8332 ..... B•1805
Anders, Inc., 77 Wolcott Rd., Simsbury, CT 06070 203-658-7666
† Channel Inds., 839 Ward Dr., Santa Barbara, CA 93111 805-967-0171
† Dukane Corp., Communications Sys. Div., 2900 Dukane Dr., St. Charles, IL 60174 312-584-2300
† EDO Western Corp., EDO Corp., 2645 South 300 W., Salt Lake City, UT 84115 ..... 801-486-7481/3846
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
† Gulton Inds., Inc., Piezo Prods. Div., Box 4300, Fullerton, CA 92634 714-871-2150
† International Transducer Corp., Channel Technologies, Inc., 93 Castilian Dr., Goleta, CA 93117 805-685-1441
Linden Ultransonics, Inc., 55 Harvey Rd., Londonderry, NH 03053 603-434-4323
§ Murata Mfg. Co., Ltd., 26-10-2-chome-Tenjin, Nagaoka-Kyo-Shi, Kyoto, Japan, JAPAN 075-951-9111
§† National Sonics/Xertex Corp., 250 Marcus Blvd., Hauppauge, NY 11787 516-273-6600
† Nittany Piezo Ceramics, Box 756, Pine and Mill Streets, Bellefonte, PA 16823 ..... 814-355-1593;814-355-1594
Ocean Resch. Equip., Inc., Box 709, Falmouth, MA 02541 617-548-5800
Panametrics, 221 Cresent St., Waltham, MA 02254 617-899-2740
§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
Polaroid Corp., 119 Windsor St., Cambridge, MA 02139 617-577-2237
Radio Materials Corp., 4242 W. Bryn Mawr, Chicago, IL 60646 312-478-3600
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Sonicor Instrument Corp., 1365 Marconi Blvd., Copiague, NY 11726 516-842-3344
§ Sonobond, 200 E. Rosedale Ave., West Chester, PA 19380 215-696-4710
§ TDK Corporation of America, 4711 Golf Rd., Skokie, IL 60076 312-679-8200
§ Tohoku Metal Inds., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, JAPAN ..... Tokyo 03-402-6161
§ Valpey-Fisher, 75 South St, Hopkinton, MA 01748 617-435-6831

Transducers, Velocity-5500

Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Pk., CA 91304, 818-884-6360 ..... B•1788
Kurz Instruments, Inc., P.O. Box 849, Carmel Valley, CA 93924, 800-424-7356 ..... B•1800
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ..... B•1828
Airpax Corp., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313 305-587-1100
§ Ametek, 2 Station Square, Paoli, PA 19301 215-355-6900
Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611
Computer Instrs., 100 Madison Ave., Hempstead, NY 11550 516-483-8200
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866 818-882-0424
Disc Instruments, Honeywell, 102 E. Baker St., Costa Mesa, CA 92626 .. 714-979-5300
Electro Physics, 1910 West Birchwood Ave., Chicago, IL 60626 312-274-9669
§ Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701 617-872-8841
§ Hottinger Baldwin Measurements, 139 Newbury St., Framingham, MA 01701 617-875-8282
† Humphrey, Inc., 9212 Balboa Ave., San Diego, CA 92123 619-565-6631
§ Kavlico Corp., 20869 Plummer St., Chatsworth, CA 91311-5096 ..... 818-882-2400;FAX 818-998-2050
Kinemetrics, Inc., 222 Vista Ave., Pasadena, CA 91107 818-795-2220
§ Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131
§† Robinson-Halpern, One Apollo Rd., P.O. Box 248, Plymouth Meeting, PA 19462-0248 215-825-9200
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Sensotec, Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
§ Spanta, Inc., Box 193, Franklin Lakes, NJ 07417 201-337-0044
§† Systron-Donner Inertial Div., 2700 Systron Dr., Concord, CA 94518 415-682-6161
Teledyne/Geotech, 3401 Shiloh Rd., Garland, TX 75041 214-271-2561
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
§ Temposonics, MTS Sys. Corp., 111 East Ames Ct., Plainview, NY 11803 516-349-1950
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
† Transicoil, Inc., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351
§ Vibra-Metrics, 1014 Sherman Ave., Hamden, CT 06514 ..... 203-288-6158; 1-800-352-2001
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01822-5058 617-663-7600

Transducers, Vibration-5500

Chatsworth Data Corp, Cablemaster Div., 20710 Lassen St., Chatsworth, CA 91311, 818-341-9200 ..... D•1199
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006, 201-227-1002 ..... B•1794
§ Vibra-Metrics, 1014 Sherman Ave., Hamden, CT 06514, 203-288-6158;1-800-352-2001 ..... B•1832
Alpha-M Corp., 3009 Wildflower Dr., Dallas, TX 75229 214-620-0021
Bell & Howell/CEC Div., 360 Sierra Madre Villa, Pasadena, CA 91109 ... 213-796-9381
Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
† Channel Inds., 839 Ward Dr., Santa Barbara, CA 93111 805-967-0171
Chatsworth Data Corp, Impact-o-Graph Div., 20710 Lassen St., Chatsworth, CA 91311 213-341-3000
† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 215-532-9464
Electro Physics, 1910 West Birchwood Ave., Chicago, IL 60626 312-274-9669
§ Endevco, 30700 Rancho Viejo Rd., San Juan Capistrano, CA 92675 714-493-8181
† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 ..... 714-642-2400;800-854-4066
§ Helm Instr. Co., Inc., 1387 Dussel Drive, Maumee, OH 43537 419-893-4356
† HH Controls Co., Inc., 16 Frost St., Arlington, MA 02174 617-646-2626

§ Hottinger Baldwin Measurements, 139 Newbury St, Framingham, MA 01701 617-875-8282
Kinemetrics, Inc., 222 Vista Ave., Pasadena, CA 91107 818-795-2220
Knowles Elctrns., Inc., 3100 N. Mannheim Rd., Franklin Park, IL 60131 ... 312-455-3600
§ Lion Precision, 60 Bridge St., Newton, MA 02195 617-969-4710
§† Mechanical Techn., 968 Albany Shaker Rd., Latham, NY 12110 518-785-2353
§ Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131
Modern Controls Corp., 4636 Hidden Forest Dr., Sarasota, FL 33580 813-351-3042
† PCB Piezotronics, 3425 Walden Ave., Depew, NY 14043-2495 716-684-0001
§ Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Spectral Dynamics, Scientific-Atlanta, Inc., 4255 Ruffin Rd., San Diego, CA 92123-0575 619-268-7100
Sensotec, Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
§† Systron-Donner Inertial Div., 2700 Systron Dr., Concord, CA 94518 415-682-6161
Teledyne/Geotech, 3401 Shiloh Rd., Garland, TX 75041 214-271-2561
§ Tohoku Metal Inds., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, JAPAN ..... Tokyo 03-402-6161
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351
Unholtz-Dickie Corp., 6 Brookside Dr., Wallingford, CT 06492 203-265-3929
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01822-5058 617-663-7600
Wilcoxon Resch., P.O. Box 5798, Bethesda, MD 20814 301-770-3790

Transducers, Volt, Watt, Current VAR, Power Factor, Frequency-5500

Active Control Instrmn., P.O. Box 243-Wildwood Circle, Key Largo, FL 33037, 305-451-1000 ..... B•1109
Aeroflex Labs., Magnetic Prods. Div.,, 35 South Service Road, Plainview, NY 11803, 516-694-6700 ..... B•1779
† American Aerospace Controls, 570 Smith St., Farmingdale, NY 11735, 516-694-5100 ..... B•1780
§ Bell, F. W., Inc., 6120 Hanging Moss Rd., Orlando, FL 32807, 305-678-6900 ..... B•1785
Flex-Core Div., Morlan & Assocs., Inc., 6625 McVey Blvd., Worthington, OH 43085, 614-889-6152 ..... A•2149
Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ..... B•1428
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... B•1476,1668,1804
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, OH 43212, 614-486-9561 ..... B•1806-1811,1813,1814,1815,1816,1817
† Acromag, 30765 Wixom Rd., Wixom, MI 48096 313-624-1541
§ AEMC, 99 Chauncy, Boston, MA 02111 ..... 617-451-0227;800-343-1391
† Amprobe Instr., 630 Merrick Rd., Lynbrook, NY 11563 ..... 516-LY3-5600
ARGA Controls, 35 E. Glenarm St., Pasadena, CA 91105 213-682-3314
§ Best Electrics Div., 400 Boren Ave. North, Seattle, WA 98109 206-382-1300
Bristol Babcock Inc., 40 Bristol St., Waterbury, CT 06708 203-575-3000
Crompton Instrs., 2763 Higgins Road, Elk Grove Village, IL 60007 714-841-2901
Crompton Instrs., Hawker Siddley, 2763 Old Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
Cross Elctrns., 100 Commonwealth Dr., Warrendale, PA 15086 412-776-1591
§† Dielectric Communications, General Signal, Tower Hill Rd., Raymond, ME 04071 ..... 207-655-4555;800-341-9678
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
Electronic Wattmeter Co., 2275 Sixth St., Sarasota, FL 33577 813-953-5355
EWC, Inc., 725 Federal Ave., Kenilworth, NJ 07033 ..... 201-245-3200;800-526-4048
§ Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701 617-872-8841
Halmar Electronics, Inc., 900 N. Hague Ave., Columbus, OH 43204 614-275-0131
North Hills Elctrns., 1 Alexander Pl., Glen Cove, NY 11542 516-671-5700
Pacific Power Source Corp., 15122 Bolsa Chica St., Huntington Bch., CA 92649 ..... 714-898-2691;800-854-2433
Q-Systems, PO Box 35879, Tucson, AZ 85740 602-293-4923
RFL Inds., A Dowty Grp. Co./Comms. Div., Powerville Rd., Boonton, NJ 07005 201-334-3100
RFL Inds., A Dowty Grp. Co./Instr. Div., Powerville Rd., Boontón, NJ 07005 201-334-3100
Rochester Instr. Sys., 255 N. Union St, Rochester, NY 14605 716-263-7700
Scientific Columbus, Inc., Esterline Corp., 1900 Arlingate La., Columbus, OH 43228 614-274-7160
Sensitive Research Instrs., 25 Dock St., Mt. Vernon, NY 10550 914-699-9717
† Sigma Electronics Inc., 10830 Kinghurst Dr., Houston, TX 77099 713-933-4700
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Star Micronics, Inc., Components Div., 70-D Ethel Rd. W., Piscataway, NJ 08854 201-572-9512
Tektronix, Inc., P. O. Box 500, Y3-314, Beaverton, OR 97077 ..... 800-547-1512;Oregon only 800-452-1877
Yokogawa Corp. of America, 2 Dart Rd., Shenandoah, GA 30265 404-253-7000

Transformers, Audio-5600 — *See Vol. A*

Transformers, Autotransformer-5600 — *See Vol. A*

Transformers, Bias — See Transformers, Power (Vol. A)

Transformers, Bridging — See Transformers, Matching (Vol. A)

Transformers, Chip-5600 — *See Vol. A*

Transformers, Chopper-5600 — *See Vol. A*

Transformers, Constant Voltage-5600 — *See Vol. A*

Transformers, Control — See Transformers, Power (Vol. A), Transformers, Synchro, Control (Vol. A)

Transformers, Converter, DC To DC-5600 — *See Vol. A*

Transformers, Current — See Transformers, Instrument (Vol. A)

Transformers, Data — See Transformers, Telephone Coupling (Vol. A)

Transformers, Decade-5600 — *See Vol. A*

Transformers, Differential-5600 — *See Vol. A*

Transformers, Discriminator-5600 — *See Vol. A*

Transformers, Donut — See Transformers, Toroidal (Vol. A)

Transformers, Driver-5600 — *See Vol. A*

Transformers, Ferroresonant-5600 — *See Vol. A*

Transformers, Filament-5600 — *See Vol. A*

Transformers, Flyback-5600 — *See Vol. A*

Transformers, Foil Wound — See Coils, Foil Wound (Vol. A)

Transformers, 400 Hz-5600 — *See Vol. A*

Transformers, High Voltage (1,000 Volts & Over)-5600 — *See Vol. A*

Transformers, Horizontal Sweep-5600 — *See Vol. A*

Transformers, Hybrid-5600 — *See Vol. A*

Transformers, IF-5600 — *See Vol. A*

Transformers, Input-5600 — *See Vol. A*

Transformers, Instrument-5600 — *See Vol. A*

Transformers, Interstage-5600 — *See Vol. A*

Transformers, Inverter-5600 — *See Vol. A*

Transformers, Isolation-5600 — *See Vol. A*

Transformers, Line-5600 — *See Vol. A*

Transformers, Linear Variable-Differential — See Transformers, Differential (Vol. A)

Transformers, Magnetic Amplifier-5600 — *See Vol. A*

Transformers, Matching-5600 — *See Vol. A*

Transformers, Microminiature-5600 — *See Vol. A*

Transformers, Microphone-5600 — *See Vol. A*

Transformers, Mixing-5600 — *See Vol. A*

Transformers, Modulation-5600 — *See Vol. A*

Transformers, Output-5600 — *See Vol. A*

Transformers, Plate-5600 — *See Vol. A*

Transformers, Plug-in-5600 — *See Vol. A*

Transformers, Power-5600 — *See Vol. A*

Transformers, Power Distribution-5600 — *See Vol. A*

Transformers, Printed Circuit Mounting-5600 — *See Vol. A*

Transformers, Programmable Ratio-5600 — *See Vol. A*

Transformers, Pulse-5600 — *See Vol. A*

Transformers, Ratio-5600 — *See Vol. A*

Transformers, RF-5600 — *See Vol. A*

Transformers, Reactor — See Reactors, Filter (Vol. A)

Transformers, Rectifier-5600 — *See Vol. A*

Transformers, Reference-5600 — *See Vol. A*

Transformers, Rotary-5600 — *See Vol. A*

Transformers, Scott T-5600 — *See Vol. A*

Transformers, Servo-5600 — *See Vol. A*

Transformers, Split Bobbin-5600 — *See Vol. A*

Transformers, Step Down, Step Up — See Transformers, Power (Vol. A)

Transformers, Synchro Control-5600 — *See Vol. A*

Transformers, Telephone Coupling-5600 — *See Vol. A*

Transformers, Toroidal-5600 — *See Vol. A*

Transformers, Transistor-5600 — *See Vol. A*

Transformers, Trigger — See Transformers, Pulse (Vol. A)

Transformers, Variable-5600 — *See Vol. A*

Transformers, Voltage Dividing-5600 — *See Vol. A*

Transformers, Voltage Regulating-Also See Regulators & Stabilizers, Voltage-5600 — *See Vol. A*

Transformers, Wall Plug-in — See Power Supplies, Plug-in (Vol. D)

Transformers, Wideband-5600 — *See Vol. A*

Transformers (MIL), Audio, Power, RF-2440

† Abbott Transistor Labs., Transformer Div., 639 So. Glenwood Pl., Burbank, CA 91506, 818-841-3630 ..... A•2104,2106,2107
Endicott Coil, 22 E. Charlotte St., Binghamton, NY 13905, 607-797-1263 ..... A•2135
EWC, Inc., 725 Federal Ave., Kenilworth, NJ 07033, 201-245-3200;800-526-4048 ..... A•2141
Freed Transformer, 1718 Weirfield St., Ridgewood, NY 11385, 212-386-1300 ..... A•2150
† Hisonic, Inc., 249 N. Troost, P.O. Box 1130, Olathe, KS 66061-1130, 913-782-0012 ..... A•2157
Magnetico Inc., 182 Morris Ave., Holtsville, NY 11742, 516-654-1166 ..... A•2167
§† Microtran Co. Inc., 145 E. Mineola Ave., Valley Stream, NY 11580, 516-561-6050 ..... A•2090
MTE Corp., 7901 W. Clinton Ave., P.O. Box 23957, Milwaukee, WI 53223, 414-358-5300;800-558-4332 ..... A•2199
† North Hills Elctrns., 1 Alexander Pl., Glen Cove, NY 11542, 516-671-5700 ..... A•2208
† OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865, 201-454-2600 ..... A•2212
† Pan-Magnetics Intl., Inc., 455-A Carson Plaza Dr., Carson, CA 90746, 213-532-1790 ..... A•2213
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... A•2234-2249,2252,2253,2254,2255
† Polyphase Instr., 175 Commerce Dr., Ft. Washington, PA 19034, 215-643-6950 ..... A•1622,2262,2263,2264
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, NY 11211, 718-782-4200 ..... A•2302
† Technitrol, 1952 E. Allegheny, Philadelphia, PA 19134, 215-426-9105 ..... A•2307, B•1010
§ Thordarson Meissner, Components Corp. of Amer., Electronic Center, Mt. Carmel, IL 62863, 618-262-5121 ..... A•2311
† Torotel Prods. Inc., 13402 S. 71 Hwy., Grandview, MO 64030, 816-761-6314 ..... A•2320-2322,2324,2325
† Torwico Elctrns. Inc., 410 Oberlin Ave. South, Lakewood, NJ 08701, 201-364-1800 ..... A•2328
Wayne Transformer Co., Inc., 99 Hazel St., Paterson, NJ 07503, 201-278-7674 ..... A•2340
† Adams-Russell, Anzac Div., 80 Cambridge St., Burlington, MA 01803 671-273-3333
Berkshire Transformer Corp., Route 341, P.O. Box 129, Kent, CT 06757 203-927-3541
† B. G. Laboratories, Inc., 75 Travis Ave., Binghamton, NY 13904 607-722-2376
B. H. Elctrns., 331 Bremer Bldg., St. Paul, MN 55101 612-228-6463
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
† Diamond Magnetics, P.O. Box 4736, San Luis Obispo, CA 93403 805-544-4019
† Elnetic Elctrns., 1730 21st St., Santa Monica, CA 90404 213-828-9541
† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
† Hammond Mfg. Co., 1690 Walden Ave., Buffalo, NY 14225 716-894-5710
† Magnetek, 7315 Red Deer Dr., Boulder, CO 80301-4696 303-442-6700
† Magnetic Circuit Elements, 1540 Moffett St., Salinas, CA 93905 408-757-8752
† Milwaukee Transformer Co., MTE Corporation, 7901 W. Clinton Avenue, Milwaukee, WI 53223 414-358-5300
Neshaminy Transformer, Neshaminy Electronics Corp., Edison-Furlong Road, Furlong, PA 18925 215-794-7411
Nortran, Power Elctrns. Corp., 96 Milton Rd., Rochester, NH 03867 603-332-3334
† Oram Electronics, 12 Cranston Rd., Pittsford, NY 14534 716-381-4673
† Pacific Electro Dynamics, Inc., 11465 Willows Rd. N.E., Redmond, WA 98052 206-881-1700
PC Transformer Corp., 64 D Nancy St., West Babylon, NY 11704 516-491-3300
Perkin-Elmer Corp., Elctrn. Prods. Dept., Main Ave., Norwalk, CT 06856 .. 203-762-4786
Power Elctrns., 96 Milton Rd., Rochester, NH 03867 603-332-3334
† Power Sys. Grp., Rantec Div., Emerson Elec., 9401 Oso Ave., Chatsworth, CA 91311 818-885-8223
Sigma Electronics Inc., 10830 Kinghurst Dr., Houston, TX 77099 713-933-4700
Technical Research & Mfg., Inc., R.F.D. #10, Manchester, NH 03103 ... 603-627-6000
Todd Systems, Inc., 50 Ash St., Yonkers, NY 10701 914-963-3400
† Trans American Transformer, 142 Peconic Ave., Medford, NY 11763 516-654-1880
Transformer & Coil Products, TRW Electronic Assemblies Division, 150 Varick St., New York, NY 10013 212-255-3500
† Vanguard Elctrns. Co., 1480 W. 178th St., Gardena, CA 90248 213-323-4100

Transformers (MIL), Pulse & Variable-2440

Freed Transformer, 1718 Weirfield St., Ridgewood, NY 11385, 212-386-1300 ..... A•2150
† Hisonic, Inc., 249 N. Troost, P.O. Box 1130, Olathe, KS 66061-1130, 913-782-0012 ..... A•2157
† North Hills Elctrns., 1 Alexander Pl., Glen Cove, NY 11542, 516-671-5700 ..... A•2208
† OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865, 201-454-2600 ..... A•2212
Pan-Magnetics Intl., Inc., 455-A Carson Plaza Dr., Carson, CA 90746, 213-532-1790 ..... A•2213
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... A•2250
† Polyphase Instr., 175 Commerce Dr., Ft. Washington, PA 19034, 215-643-6950 ..... A•1622,2261,2262,2263,2264
† Technitrol, 1952 E. Allegheny, Philadelphia, PA 19134, 215-426-9105 ..... A•2307, B•1010
† AIE Magnetics, Div. of Vernitron, 701 Murfreesboro Rd., Nashville, TN 37210 615-244-9024
Berkshire Transformer Corp., Route 341, P.O. Box 129, Kent, CT 06757 203-927-3541
† B. G. Laboratories, Inc., 75 Travis Ave., Binghamton, NY 13904 607-722-2376
B. H. Elctrns., 331 Bremer Bldg., St. Paul, MN 55101 612-228-6463
† Bicron Elctrns., Box 807, Barlow St., Canaan, CT 06018 203-824-5125
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
† Coiltronics Inc., 984 SW 13th Court, Pompana Beach, FL 33069 305-781-8900
† Diamond Magnetics, P.O. Box 4736, San Luis Obispo, CA 93403 805-544-4019
† ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., NJ 07650 201-947-0400
† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
† Hammond Mfg. Co., 1690 Walden Ave., Buffalo, NY 14225 716-894-5710
† Magnetek, 7315 Red Deer Dr., Boulder, CO 80301-4696 303-442-6700
† Microtran Co. Inc., 145 E. Mineola Ave., Valley Stream, NY 11580 516-561-6050
Neshaminy Transformer, Neshaminy Electronics Corp., Edison-Furlong Road, Furlong, PA 18925 215-794-7411
† Power Sys. Grp., Rantec Div., Emerson Elec., 9401 Oso Ave., Chatsworth, CA 91311 818-885-8223
† Trans American Transformer, 142 Peconic Ave., Medford, NY 11763 516-654-1880
Transformer & Coil Products, TRW Electronic Assemblies Division, 150 Varick St., New York, NY 10013 212-255-3500
† Vanguard Elctrns. Co., 1480 W. 178th St., Gardena, CA 90248 213-323-4100

Transistor Arrays-4800 — *See Vol. A*

Transistor, Diode, Thyristor Heat Dissipators — See Heat Sinks, Transistor (Vol. C)

Transistors, Bipolar-Also See Transistors, Silicon-4800 — *See Vol. A*

Transistors, Chip, Unpackaged-4800 — *See Vol. A*

Transistors, Darlington-4800 — *See Vol. A*

Transistors, Dual-4800 — *See Vol. A*

Transistors, Field Effect-4800 — *See Vol. A*

Transistors, Germanium-4800 — *See Vol. A*

Transistors, Low Noise, GaAs, FETs - Also See Transistors, Microwave-4800 — *See Vol. A*

Transistors, Microwave-4800 — *See Vol. A*

Transistors, Photo (Incl. Arrays)-3700

Centronic Inc., 1101 Bristol Rd., Mountainside, NJ 07092, 201-233-7200 ..... B•1204
§ Clairex Electronics, 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602 ..... B•1207
§ EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ... B•1210
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 .. 201-722-9800
§ Collmer Semiconductor, Inc., 14368 Proton Rd., Dallas, TX 75234-3335 214-233-1589
EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
Ferranti Elec., 87 Modula Ave., Commack, NY 11725 516-543-0200
Gilway Technical Lamp, 165 New Boston Street, Woburn, MA 01801 ... 617-935-4442
HEI, Inc., 1495 Steiger Lake La., Victoria, MN 55386 612-443-2500
§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248
Micropac Inds., 905 E. Walnut St., Garland, TX 75040 214-272-3571
Micropac Inds., Inc., General Sensors Div., 905 E. Walnut St., Garland, TX 75040 214-272-3571
§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900
§ NEC Elctrns. USA Inc., NEC Electron Div., 252 Humboldt Ct., Sunnyvale, CA 94086 408-745-6520
§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 201-748-5089
§† Optek Technology, Inc., 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 408-725-1220
Opto Technology, Inc., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
Philips ECG, Inc., 100 First Ave., Waltham, MA 02254 617-890-6107

§ RCA Distr. & Special Prods. Div., RCA Corp., 2000 Clements Bridge Rd., Deptford, NJ 08096 609-541-3636
Rohm Corp., 8 Whatney, Irvine, CA 92718 714-855-2131
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
§ Shokai Far East, Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
† Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901 518-561-3160
Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254 617-890-6107
§† Teledyne-Crystalonics, 147 Sherman St., Cambridge, MA 02140 617-491-1670

Transistors, Power-4800 — *See Vol. A*

Transistors, Power, Bipolar-4800 — *See Vol. A*

Transistors, Power, FET-4800 — *See Vol. A*

Transistors, Pressure Sensitive-4800 — *See Vol. A*

Transistors, RF-4800 — *See Vol. A*

Transistors, Silicon-4800 — *See Vol. A*

Transistors, Switching-4800 — *See Vol. A*

Transistors, Unijunction-4800 — *See Vol. A*

Transistors (MIL)-2440

Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 ..... A•2080,2082
Germanium Power Devices, Box 3065, Shawsheen Village Sta., Andover, MA 01810 617-475-5982
§† RCA Distr. & Special Prods. Div., RCA Corp., 2000 Clements Bridge Rd., Deptford, NJ 08096 609-541-3636
§† RCA Solid State Div., Transistors, Rte. 202, Somerville, NJ 08876 201-685-6000
§† Siliconix, Inc., 2201 Laurelwood Rd., Santa Clara, CA 95054 408-988-8000
Texas Instrs., Data Sys. Group, P. O. Box 809063, Dallas, TX 75380-9063 1-800-527-3500
† TRW Optoelectronics Div., 1207 Tappan Circle, Carrollton, TX 75006 ... 214-323-2200
§† TRW, RF Devices Div., 14520 Aviation Blvd., Lawndale, CA 90260 213-536-0888

Translators, Data-2325 — *See Vol. D*

Translators, Frequency Band-2700 — *See Vol. A*

Translators, Time Code-2000 — *See Vol. D*

Transmission Line, Wire & Cable — See Cable, Transmission Line (Vol. C)

Transmission Systems, Data-2000 — *See Vol. D*

Transmitters, Fiber Optic-3700

† Math Assocs., 2200 Shames Dr., Westbury, NY 11590, 516-334-6800 .... B•1124
† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1121
American Photonics Inc., 71 Commerce Dr., Brookfield Center, CT 06805 203-775-8950
Artel Communications Corp., 93 Grand St., Worcester, MA 01602 617-752-5690
§ Augat Fiberoptics, 710 Narragansett Park Dr., Pawtucket, RI 02861 401-724-4400
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Dymec, 8 Lowell Ave., Winchester, MA 01890 617-729-7870
† Farinon Div., Harris Corp., 1691 Bayport, San Carlos, CA 94070 415-594-3000
† Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
† Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON, CANADA K2E 7J6 613-226-4000
General Fiber Optics, Inc., 98 Commerce Rd., Cedar Grove, NJ 07009 .. 201-239-3400
† General Optronics, 3005 Hadley Rd., So. Plainfield, NJ 07080 201-549-9000
GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116 801-537-5237
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .. Call Local Sls. Off.
Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
LeCroy Resch. Sys. Corp., 700 S. Main St., Spring Vly., NY 10977 914-425-2000
§† M/A-COM Laser Diode, Inc., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
Manage, Inc., Fibre Optics Elctrns. Sys. Grp., P.O. Box 175, 40 Nichols Rd., Chicopee, MA 01014 ..... 413-598-8204;592-3834
Mikron Instr., Box 211, Ridgewood, NJ 07451 201-891-7330
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 818-281-3636
Photodyne, 1175 Tourmaline Dr., Newbury Park, CA 91320 818-889-8770
Poly-Scientific, Litton Inds., 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
† Ross Engrg. Corp., 540 Westchester Dr., Campbell, CA 95008 408-377-4621
SpecTran Corp., 50 Hall Road, Sturbridge, MA 01566 617-347-2261
Texas Instruments Optoelectronics, P.O. Box 225012 MS12, Dallas, TX 75265 214-995-3821

Transmitters, Fixed Frequency-1900 — *See Vol. D*

Transmitters, Laser-3700

† Analog Modules, Inc., 126 Baywood Avenue, Longwood, FL 32750, 305-339-4356/4355 ..... D•1004
MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1121
§ American Laser Sys., Inc., 106 Fowler Rd., Goleta, CA 93117 805-967-0423
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
M/A-COM Laser Diode, Inc., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 818-281-3636
Times Fiber Communications, Inc., 358 Hall Ave., P.O. Box 384, Wallingford, CT 06492-0384 203-265-6500

Transmitters, Position-1900 — *See Vol. D*

Transmitters, Process Control (Temperature, Pressure, Flow, etc.)-5500

Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Pk., CA 91304, 818-884-6860 ..... B•1789
§ NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110, 312-426-5900 ..... D•1069,1127,1159
Setra Systems, Inc., 45 Nagog Park, Acton, MA 01720, 617-263-1400 .... B•1826
† Acromag, 30765 Wixom Rd., Wixom, MI 48096 313-624-1541
§ Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726
§† Bailey Controls Co., 29801 Euclid Ave., Wickliffe, OH 44092 216-585-5800
Beckman Instrs., 2500 Harbor Blvd., Fullerton, CA 92634 714-871-4848
Brooks Instr. Div., Emerson Elec. Co., 407 W. Vine St., Hatfield, PA 19440 215-362-3500
Computer Instrs., 100 Madison Ave., Hempstead, NY 11550 516-483-8200
† Dresser Inds., 1505 Elm St., Dallas, TX 75201 214-746-6000
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006 201-227-1002
§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
§ International Microtronics Corp., 4016 E. Tennessee St., Tucson, AZ 85714 602-748-7900
† Kulite Semiconductor Prods., Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
Mikron Instr., Box 211, Ridgewood, NJ 07451 201-891-7330
§† MKS Instrs., Inc., 22 Third Ave., Burlington, MA 01803 617-272-9255
† Paine Instrs., 2401 S. Bayview St., Seattle, WA 98144 800-426-0366
§† Robinson-Halpern, One Apollo Rd., P.O. Box 248, Plymouth Meeting, PA 19462-0248 215-825-9200
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
§ Seaboard Elctrns., 70 Church St., New Rochelle, NY 10805 914-235-8073
Sensotec, Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
† G.T.E. Gov't Sys. Corp., Comm. Sys. Div., 77 A St., Needham Hgts., MA 02194 617-449-2000
Validyne Engrg. Corp., 8626 Wilbur Ave., Northridge, CA 91324 818-886-2057
§ Yellow Springs Instr., Box 279, Yellow Springs, OH 45387 513-767-7241

Transmitters, Radar — See Radar System Components (Vol. A)

Transmitters, Telemetry-1900 — *See Vol. D*

Transmitters, Tone-1900 — *See Vol. D*

Transmitters (MIL), ECM-3475 — *See Vol. D*

Transmitters (MIL), Shipboard Jamming-3475 — *See Vol. D*

Transmitters (MIL), TWTs-3475 — *See Vol. D*

Transponders-1900 — *See Vol. D*

Transports, Tape (all kinds)-2000 — *See Vol. D*

TRIACs-4800 — *See Vol. A*

Triggers, SCR — See Controls, SCR (Vol. D)

Tube Heat Dissipators-5700 — *See Vol. A*

Tubes, Backward Wave-5700 — *See Vol. A*

Tubes, Ballast — See Resistors, Ballast (Vol. A)

Tubes, Cathode Ray, General Purpose-5700 — *See Vol. A*

Tubes, Cathode Ray, Special Purpose-5700 — *See Vol. A*

Tubes, Counting-5700 — *See Vol. A*

Tubes, Electron Multiplier-5700 — *See Vol. A*

Tubes, Flash-5700 — *See Vol. A*

Tubes, Gas-5700 — *See Vol. A*

Tubes, Ignitron-5700 — *See Vol. A*

Tubes, Image Converter-5700 — *See Vol. A*

Tubes, Indicator — See Tubes, Readout (Vol. A)

Tubes, Magnetron — See Tubes, Microwave (Vol. A)

Tubes, Microwave-5700 — *See Vol. A*

Tubes, Noise Source-5700 — *See Vol. A*

Tubes, Photomultiplier-5700 — *See Vol. A*

Tubes, Readout (CRT, Cold-Cathode, Vacuum Fluorescent, Incandescent, etc.)-5700 — *See Vol. A*

Tubes, Receiving-5700 — *See Vol. A*

Tubes, Rectifying-5700 — *See Vol. A*

Tubes, Strobe — See Lamps, Stroboscopic Source (Vol. B)

Tubes, Switching-5700 — *See Vol. A*

Tubes, TV Camera Pickup-5700 — *See Vol. A*

Tubes, Transmitting-5700 — *See Vol. A*

Tubes, Voltage Reference or Regulating-5700 — *See Vol. A*

Tubes, X-ray-5700 — *See Vol. A*

Tubes (MIL), Indicator & Pickup-2440

† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
THORN EMI Gencom Inc., 23 Madison Rd., Fairfield, NJ 07006 201-575-5586

Tubes (MIL), Microwave-2440

§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
Hughes Aircraft Co., Electron Dynamics Div., 3100 W. Lomita Blvd., P.O. Box 2999, Torrance, CA 90509-2999 213-517-6000
† Litton Systems, Inc., Electron Dvcs. Div., 960 Industrial Rd., San Carlos, CA 94070 415-591-8411
Philips ECG, Inc., 100 First Ave., Waltham, MA 02254 617-890-6107
Varian Associates, Inc., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000
† VTM Microwaves, Inc., 4975 W. 80 Ave., Westminster, CO 80030 303-426-6866

Tubes (MIL), Power & Gas, Planar-2440

§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
Varian Associates, Inc., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000
† Westinghouse Electric Corp., Indl. Govt. Tube Div., Westinghouse Circle, Horseheads, NY 14845 607-796-3211

Tubes (MIL), Receiving, & Tube Shields-2440

Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018 312-696-1000
† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
Philips ECG, Inc., 100 First Ave., Waltham, MA 02254 617-890-6107

Tubing, Ceramic-2500 — *See Vol. C*

Tubing, Fiberglass-2800 — *See Vol. C*

Tubing, Glass-2500 — *See Vol. C*

Tubing, Heat Shrinkable-Also See Caps, Forms & Tapes, Heat Shrinkable-2800 — *See Vol. C*

Tubing, Metal-2500 — *See Vol. C*

Tubing, Paper-2800 — *See Vol. C*

Tubing, Plastic-Also See Tubing, Spaghetti-2800 — *See Vol. C*

Tubing, Spaghetti-2800 — *See Vol. C*

Tubing, Spiral Wrap-2800 — *See Vol. C*

Tubing, Waveguide-3450 — *See Vol. A*

Tubing, Zipper-6000 — *See Vol. C*

Tuners, AM/FM-1300 — *See Vol. D*

Tuners, Microwave-3450 — *See Vol. A*

Tuning Forks-2300 — *See Vol. A*

Tweezers, Manual & Vacuum-5400 — *See Vol. C*

Ultraviolet Inspection Lighting-Also See Microscopes, Ultraviolet-4100 — *See Vol. D*

Urea Formaldehyde — See Plastic Raw Materials (Vol. C)

Valve Position Indicators/Transmitters-5500

§ Jamesbury Corp., Div. of Combustion Engineering, Inc., 640 Lincoln St., Worcester, MA 01605 617-852-0200
NES, Inc. (Nationwide Electronic Systems), 3003 Wakefield, Carpentersville, IL 60110 312-426-5900

Valves, Solenoid-4550

§ Airmatic-Allied, 185 Park Dr., Wilmington, OH 45177 513-382-1691
§ Alltech Assocs. Inc., Applied Science Labs., 2051 Waukegan Rd., Deerfield, IL 60015 312-948-8600
† Automatic Switch Co., 50-60 Hanover Road, Florham Park, NJ 07932 1-201-966-2000
Barksdale Controls Div., Transamerica DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
† Bendix Corp., Electrodynamics Div., 11600 Sherman Way, N. Hollywood, CA 91605 818-765-1010
Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215 414-671-6800
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† Electro Kinetics Co., Sub. HTL Inds., Inc., 402 E. Gutierrez St., Santa Barbara, CA 93102 805-963-2055
Everett/Charles Test Equip. Inc., 2887 N. Towne Ave., Pomona, CA 91767 714-621-9511
† Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext 596
† IMC Magnetics Corp., Arizona Div., 1900 East Fifth St., Tempe, AZ 85281 602-968-4441
§ Industrial Computer Designs, Inc., 31264 La Baya Drive, Westlake Village, CA 91362 818-889-3179
§ ITT General Controls Div., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201 213-842-6131
§ Jamesbury Corp., Div. of Combustion Engineering, Inc., 640 Lincoln St., Worcester, MA 01605 617-852-0200
§ H. Kuhnke, Inc., 26 W. Highland Ave., Atlantic Highlands, NJ 07716 ..... 201-291-3334; 800-221-0714
† Lisk, G. W., Co., 2 South St., Clifton Springs, NY 14432 315-462-2611
§ Magnatrol Valve Corp., 67 Fifth Ave., Hawthorne, NJ 07507 201-427-4341
C. A. Norgren Co., 5400 South Delaware, Littleton, CO 80120-1663 303-794-2611
Parker Hannifin Corp., 17325 Euclid Ave., Cleveland, OH 44112 216-531-3000
† SR Engineering, Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Vactronic Lab. Equip., 65 Brightside Ave., E. Northport, NY 11731 ..... 516-AN1-2660
Varian Assocs., Indl. Equip. Grp., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000
Veeco Instruments Inc., Terminal Dr., Plainview, NY 11803 516-349-8300

Valves, Vacuum-4100 — *See Vol. D*

Varactors — See Diodes, Varactor (Vol. A)

Varistors — See Resistors, Voltage Sensitive (Vol. D)

VCXO — See Oscillators, Voltage Controlled Crystal

VHF Equipment — See Generators (Vol. D), Receivers (Vol. D), etc.

Vibration Surveys — See Services, Vibration Surveys (Vol. D)

Vibration Test Systems — See Testers, Vibration (Vol. D)

Vibrators-4050 — *See Vol. D*

Video Components & Equipment — See Specific Component: Amplifiers (Vol. D), Cameras (Vol. D), Networks (Vol. D), etc.

Viewers (MIL), Infrared-3475 — *See Vol. D*

Viewing Hoods, Cathode Ray Tube-2975 — *See Vol. D*

Vinyl Compounds — See Plastic Raw Materials (Vol. C)

Vises-5400 — *See Vol. C*

VLF Equipment — See Receivers (Vol. D), Transmitters (Vol. D), etc.

VME Bus Cards-2025 — *See Vol. D*

Voice Recognition Equipment — See Recognition Equipment, Speech (Vol. D)

Voltage Selector — See Adaptors, US to European Power

Voltage Sources-4000 — *See Vol. D*

Voltmeter, Electrostatic-2900 — *See Vol. D*

Wafer Fabrication, Semiconductor — See Semiconductor Wafer Fabrication (Vol. D)

Wall Plates — See Boxes, Junction, Outlet & Wall Plates (Vol. C)

Warning Systems, Lightning-4300

§† Audiosone, Inc., 617 Fan Hill Rd., Monroe, CT 06468 ..... 203-268-4372;203-268-6703
Avex Elctrns., 1683 Winchester Rd., P.O. Box 1026, Bensalem, PA 19020 215-638-1515

Warning Systems (MIL), Computerized-3475 — *See Vol. D*

Warning Systems (MIL), EW-3475 — *See Vol. D*

Warning Systems (MIL), IR-3475 — *See Vol. D*

Warning Systems (MIL), Laser-3475 — *See Vol. D*

Warning Systems (MIL), SAM Launch-3475 — *See Vol. D*

Washers, Lock-2825 — *See Vol. C*

Washers, Plain-2825 — *See Vol. C*

Wave Soldering Equipment — See Soldering Equip, Printed Circuit (Vol. C)

Waveguide-Coax Adapters-3450 — *See Vol. A*

Waveguides-3450 — *See Vol. A*

Waveguides (MIL)-2440

§† Dielectric Communications, General Signal, Tower Hill Rd., Raymond, ME 04071 ..... 207-655-4555;800-341-9678
† Microwave/Sys., 1 Adler Dr., E. Syracuse, NY 13057 315-437-9951

Wave Traps — See Filters, Antenna (Vol. A), Filters, Microwave (Vol. A), etc.

Welding Equipment & Accessories (Excl. Equipment for Semiconductor Devices)-5400 — *See Vol. C*

White Noise Generator Modules — See Generators, White Noise (Vol.), Diodes, Noise

Windows, Sapphire-2500 — *See Vol. C*

Windows, Shielded — See Shields, RF (Vol. C)

Wire & Cable Ties-2825 — *See Vol. C*

Wire, Airframe-2440

§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644, 201-796-2886 ..... C•1793
§† Judd Wire, High Voltage Engrg., 57 Turnpike Rd., Turners Falls, MA 01376, 413-863-4357 ..... C•1842
Judd Wire, High Voltage Engrg., 870 Los Vallecitos Blvd., San Marcos, CA 92069, 619-744-7720 ..... C•1842
MWS Wire Inds., 31200 Cedar Valley Dr., Westlake Village, CA 91362, 818-991-8553 ..... C•1864
† Arco Cable, 7361 Ethel Ave., North Hollywood, CA 91605 818-982-2832
§† Belden, Electronic Wire & Cable, P.O. Box 1980, Richmond, IN 47375 ... 317-983-5200
† Brand-Rex, Electronic & Indl. Cable Div., Box 498, Willimantic, CT 06226 203-456-8000
† Chester Cable, Oakland Ave., Chester, NY 10918 914-469-2141
§† Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
§† Consolidated Electronic Wire & Cable, 11044 King St., Franklin Park, IL 60131 312-455-8830
§ Custom Cable, 242 Butler, Westbury, NY 11590 516-334-3600
§† Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
§† Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018 312-696-1000
Delco Wire & Cable, Inc., 257 Rittenhouse Cir., Bristol, PA 19007 215-785-0511
† Electro Weave, 425 Shrewsbury St., Worcester, MA 01604 617-752-8932
† Galite, 2 Tower Dr., Wallingford, CT 06492 203-265-7126
† W. L. Gore & Assocs., 555 Paper Mill Rd., Newark, DE 19714 302-738-4880
† GSI Corp., 1917 Greenspring Dr., Timonium, MD 21093 301-252-1768
§† ITT Surprenant Division, 172 Sterling St., Clinton, MA 01510 617-368-1401
§† King Wire & Cable Corp., 179-45 110 Ave., Jamaica, NY 11433 .....212-657-4422; 800-221-0144
National Electric Cable, 16566 S.W. 72nd Ave., Portland, OR 97224 503-620-9400
§† Olympic Wire & Cable, 1 Madison Rd., Fairfield, NJ 07006 201-227-7996
§† Philadelphia Insulated Wire Co. Inc., 333 New Albany Rd., Moorestown, NJ 08057 609-235-6700
† Pirelli Cable Corp., Special Cable Div., P.O. Box 50, Wallingford, CT 06492 ..... 203-265-5533;800-243-3959
§† Pirelli Cimco, 800 Rahway Ave., Union, NJ 07083 201-687-8444
† Plastoid Corporation, 45 Gingerbread Castle Rd., Hamburg, NJ 07419 .. 201-827-7141
† Standard Wire & Cable Co., 2345 Alaska Ave., El Segundo, CA 90245 .. 213-536-0006
Storm Products Co., 116 Shore Drive, Hinsdale, IL 60521 312-323-9121
§† Tensolite, Old Post Rd., Rte. 9A, Buchanan, NY 10511 914-737-5600
† Thermax Wire Corp., 32-02 Linden Pl., Flushing, NY 11354-2897 718-939-8300
† United Wire & Cable, 425 Shrewsbury St., Worcester, MA 01604 617-757-3872
† Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, CA 90016 213-870-9933

Wire, Antenna (All Types)-6000 — *See Vol. C*

Wire, Bare, Copper-6000 — *See Vol. C*

Wire, Bare, Nickel-6000 — *See Vol. C*

Wire, Bare, Nickel-Chrome-6000 — *See Vol. C*

Wire, Bonding-4600 — *See Vol. C*

Wire, Braid (Excluding Shielding)-6000 — *See Vol. C*

Wire, Braid (Shielding) — See Braid, Cable (Vol. C)

Wire, Ceramic Insulated-6000 — *See Vol. C*

Wire, Clad (All Types)-6000 — *See Vol. C*

Wire Cutting & Stripping — See Services, Wire Cutting & Stripping (Vol. D)

Wire, Enamel Insulated — See Wire, Hookup (All Types) (Vol. C)

Wire, Fiberglass Insulated — See Wire, Glass Insulated (Vol. C)

Wire, Flame Retardant-6000 — *See Vol. C*

Wire, Flat Strip — See Cable, Flat (Vol. C)

Wire, Glass Insulated-6000 — *See Vol. C*

Wire, Gold-2825 — *See Vol. C*

Wire, Guy-6000 — *See Vol. C*

Wire, Heater — See Cable, Heater (Vol. C)

Wire, High Temperature (Over 125°C)-6000 — *See Vol. C*

Wire, High Voltage (1000 Volts & Over)-6000 — *See Vol. C*

Wire, Hookup (All Types)-6000 — *See Vol. C*

Wire, Irradiated-6000 — *See Vol. C*

Wire, Lead-in & Ground-6000 — *See Vol. C*

Wire, Litz-6000 — *See Vol. C*

Wire, Magnet-6000 — *See Vol. C*

Wire Markers (All Types)-Also See Strips Marker & Fanning-6000 — *See Vol. C*

Wire, Multiconductor — See Cable, Multiconductor (Vol. C)

Wire Nuts-2800 — *See Vol. C*

Wire, Plastic Insulated — See Wire, Hookup (All Types) (Vol. C)

Wire, Plated (All Types)-6000 — *See Vol. C*

Wire, Radiation Resistant-6000 — *See Vol. C*

Wire, Resistance-6000 — *See Vol. C*

Wire, Ribbon-6000 — *See Vol. C*

Wire, Semiconductor Lead-6000 — *See Vol. C*

Wire, Shielded-6000 — *See Vol. C*

Wire Shielding-Also See Braid, Cable-4525 — *See Vol. C*

Wire, Stainless Steel-6000 — *See Vol. C*

Wire, Strain Gauge-6000 — *See Vol. C*

Wire Strippers, Automatic-4100 — *See Vol. D*

Wire Strippers, Chemical — See Chemicals, Wire Stripping (Vol. C)

Wire Strippers, Manual-5400 — *See Vol. C*

Wire Strippers, Thermal-5400 — *See Vol. C*

Wire, Test Lead-6000 — *See Vol. C*

Wire, TFE Insulated-6000 — *See Vol. C*

Wire, Thermocouple-6000 — *See Vol. C*

Wire, Transmission — See Cable, Transmission Line (Vol. C)

Wire, Twisted Pair — See Cable, Twisted Pair (Vol. C)

Wire (MIL)-2440

§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644, 201-796-2886 ..... C•1793
§† Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648, 201-768-5400 ..... C•1832
Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018, 312-696-1000 ..... C•1839

§† Judd Wire, High Voltage Engrg., 57 Turnpike Rd., Turners Falls, MA 01376, 413-863-4357 ..... C•1042

Wire Twisters, Automatic-5400 — *See Vol. C*

Wire Twisters, Manual-5400 — *See Vol. C*

Wire Ways-6000 — *See Vol. C*

Wirewrapping Services — See Services, Wirewrapping (Vol. D)

Wiring Panels & Boards, Computer — See Boards, Programming (Vol. C)

Word Processors, Shared Logic Systems-2025 — *See Vol. D*

Word Processors, Standalone Systems-2025 — *See Vol. D*

Work Positioners, Circuit Board & Chassis — See Holders, Circuit Board (Vol. D), Jigs (Vol. D)

Work Stations/Desks, Data Entry-1400 — *See Vol. C*

Work Room, Shielded-1400 — *See Vol. C*

Wrenches-5400 — *See Vol. C*

X-ray Detector Arrays (For Industrial Inspections)-4100 — *See Vol. D*

X-ray Inspection Equipment-4100 — *See Vol. D*

X-Y Axis Tables — See Simulators, Motion (Vol. D)

Yokes, Deflection, Oscilloscope-1800 — *See Vol. A*

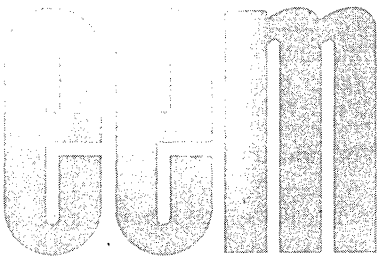
Yokes, Deflection, Radar PPI-1800 — *See Vol. A*

Yokes, Deflection, CRT-1800 — *See Vol. A*

Yokes, Deflection, TV Camera-1800 — *See Vol. A*

Zener Diodes — See Diodes, Zener

Zone Boxes, Thermocouple — See Thermocouples, Elements & Accessories (Vol. B)



COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M

MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O

OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P

PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

WPS word processing software

Y

YIG yttrium iron garnet

Z

ZIF zero insertion force

MINI-GLOSSARY

BASIC ASCII CODE

Bit positions 4, 3, 2, 1 — Second Hexadecimal Digit

First Hexadecimal Digit — Bit Positions 6, 5 — Bit Positions 8, 7

		00				01				10				11			
		00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0	NUL	DLE			SP	0					@	P			`	P
0001	1	SOH	DC1			!	1					A	Q			a	q
0010	2	STX	DC2			"	2					B	R			b	r
0011	3	ETX	DC3			#	3					C	S			c	s
0100	4	EOT	DC4			$	4					D	T			d	t
0101	5	ENQ	NAK			%	5					E	U			e	u
0110	6	ACK	SYN			&	6					F	V			f	v
0111	7	BEL	ETB			'	7					G	W			g	w
1000	8	BS	CAN			(	8					H	X			h	x
1001	9	HT	EM			)	9					I	Y			i	y
1010	A	LF	SUB			*	:					J	Z			j	z
1011	B	VT	ESC			+	;					K	[			k	{
1100	C	FF	FS			,	<					L	\			l	|
1101	D	CR	GS			-	=					M	]			m	}
1110	E	SO	RS			.	>					N	^			n	~
1111	F	SI	US			/	?					O	_			o	DEL

Control Character Representations

NUL	Null
SOH	Start of Heading (CC)
STX	Start of Text (CC)
ETX	End of Text (CC)
EOT	End of Transmission (CC)
ENQ	Enquiry (CC)
ACK	Acknowledge (CC)
BEL	Bell
BS	Backspace (FE)
HT	Horizontal Tabulation (FE)
LF	Line Feed (FE)
VT	Vertical Tabulation (FE)
FF	Form Feed (FE)
CR	Carriage Return (FE)
SO	Shift Out
SI	Shift In
DLE	Data Link Escape (CC)
DC1	Device Control 1
DC2	Device Control 2
DC3	Device Control 3
DC4	Device Control 4
NAK	Negative Acknowledge (CC)
SYN	Synchronous Idle (CC)
ETB	End of Transmission Block (CC)
CAN	Cancel
EM	End of Medium
SUB	Substitute
ESC	Escape
FS	File Separator (IS)
GS	Group Separator (IS)
RS	Record Separator (IS)
US	Unit Separator (IS)
DEL	Delete

(CC) Communication Control
(FE) Format Effector
(IS) Information Separator

Special Graphic Characters

SP	Space
!	Exclamation Point
|	Logical OR
"	Quotation Marks
#	Number Sign
$	Dollar Sign
%	Percent
&	Ampersand
'	Apostrophe
(	Opening Parenthesis
)	Closing Parenthesis
*	Asterisk
+	Plus
,	Comma
-	Hyphen (Minus)
.	Period (Decimal Point)
/	Slant
:	Colon
;	Semicolon
<	Less Than
=	Equals
>	Greater Than
?	Question Mark
@	Commercial At
[	Opening Bracket
\	Reverse Slant
]	Closing Bracket
^	Circumflex
¬	Logical NOT
_	Underline
`	Grave Accent
{	Opening Brace
¦	Vertical Line (This graphic is stylized to distinguish it from Logical OR)
}	Closing Brace
~	Tilde

CHARACTERISTICS OF BATTERIES AND FUEL CELLS

System	Anode	Cathode	Theoretical battery		Practical battery		
			Voltage, V	Capacity, Ah/kg	Typical voltage, V	Capacity[a]	
						Wh/kg	Wh/dm³
Primary:							
Leclanche	Zn	MnO_2	1.6	230	1.2	65	175
Magnesium	Mg	MnO_2	2.0	270	1.5	100	195
Organic cathode	Mg	*m*-DNB	1.8	1,400	1.15	130	180
Alkaline MnO_2	Zn	MnO_2	1.5	230	1.15	65	200
Mercury	Zn	HgO	1.34	185	1.2	80	370
Mercad	Cd	HgO	0.9	165	0.85	45	175
Silver oxide	Zn	AgO	1.85	285	1.5	130	310
Zinc-air	Zn	Air (O_2)	1.6	815	1.1	200	190
Li-organic electrolyte	Li	[b]	2.1-5.4	130-660	1.8-3.2	250	400
Secondary:							
Lead-acid	Pb	PbO_2	2.1	55	2.0	37	70
Edison	Fe	Ni oxides	1.5	195	1.2	29	65
Nickel-cadmium	Cd	Ni oxides	1.35	165	1.2	33	60
Silver-zinc	Zn	AgO	1.85	285	1.5	100	170
Silver-cadmium	Cd	AgO	1.4	230	1.05	55	120
Zinc-nickel oxide	Zn	Ni oxides	1.75	185	1.6	55	110
Zinc-air[c]	Zn	Air (O_2)	1.6	815	1.1	150	155
Cadmium-air[c]	Cd	Air (O_2)	1.2	475	0.8	90	90
Zinc-O_2	Zn	O_2	1.6	610	1.1	130	120
H_2-O_2	H_2	O_2	1.23	3,000	0.8	45	65
Reserve:							
Cuprous chloride	Mg	CuCl	1.5	240	1.4	45	65[d]
Silver-chloride	Mg	AgCl	1.6	170	1.5	60	95[d]
Zinc-silver oxide	Zn	AgO	1.85	285	1.5	30	75[e]
Thermal	Ca	[b]	2.8	240	2.6	10	20[f]
Ammonia-activated	Mg	*m*-DNB	2.2	1,400	1.7	22	60[g]
High-temperature	NA	S	2.1	685	1.8	200	[h]
	Li	S	2.2	1,150	1.8	200	[i]
Solid electrolyte	Ag	Polyiodide	0.66	. . .	0.6	180	75[j]
Fuel cell:							
Hydrogen[c]	H_2	Air	1.23	26,000	0.7		[k]
Hydrazine[c]	N_2H_4	Air	1.5	2,100	0.7	800[b]	[l]
Methanol[c]	CH_2OH	Air	1.3	1,400	0.9	175[b]	185[m]

a Delivered capacity when discharged at normal temperatures (20°C) at normal discharge rates.
b Based on fuel consumption only.
c Weight of air not considered in computation of watt hours.
d Water-activated
e Automatically activated; high rate discharge; 2- to 10-min rate.
f Fused salt; heat-activated; high rate discharge; 2- to 10-min rate.
g Four-minute discharge rate.
h β-alumina electrolyte, 300°C operation.
i Fused salt; 350°C operation.
j Solid $RbAg_4I_5$ electrolyte.
k Several different cathode materials used.
l Fuel consumption is based on source of H_2.
m Based on methanol battery-fuel supply in situ.

MINI GLOSSARY CAPACITORS

Anode: One of two plates or conductors. In polarized capacitors, the anode should be connected to the positive conductor in the circuit.

Capacitive Reactance: The measure of the opposition of a capacitor to accepting a charge and expressed in ohms. When direct current is applied under stated conditions capacitive reactance becomes a constant but, when alternating current is applied the capacitive reactance varies until an equilibrium is achieved and the capacitor appears to have only direct current present. This condition is commonly used in filter applications or in coupling circuits.

Cathode: One of two plates or conductors. In electrostatic capacitors the cathode is metallic. In electrolytic capacitors the cathode is a liquid, gel or other conductive material which is in intimate contact with a metallic cathodic connection.

Dielectric Constant: The measure of quality of the insulating materials in a capacitor. Dry air has a dielectric constant of one (1). Aluminum oxide used in aluminum electrolytic capacitors has a nominal dielectric constant of ten (10).

Electrolytic: A capacitor with one metallic conductor (generally the anode) and with a liquid or semiconductor cathode. Nonpolarized electrolytic capacitors generally have two equal anodes as well as the liquid cathode. These anodes operate alternately as anode and cathodic connection as alternating current is applied.

Electrostatic: One of two general classes of capacitors in which two or more discrete metallic conductors are present and separated by an insulating dielectric material. Examples include: mica, ceramic, film, and paper types.

Farad: The basic unit of measure in capacitors. A capacitor charged to one volt with a charge of one coulomb (one ampere flowing for one second) has a capacitance of one farad. Capacitors are generally rated at portions of a farad (microfarads or picofarads).

1 farad (F) = 1,000,000 microfarads (μF) 1 microfarad (μF) = 1,000,000 picofarads (pF)

Impedance: All capacitors exhibit impedance. It is a function of capacitor type and internal construction. This can be particularly important in certain applications such as filters for switching power supplies. Capacitors used in these applications often have special multiple tab construction to shorten current paths and to reduce internal resistance.

Leakage Current: Expressed as dcl for electrolytic capacitors, a measure of the intrinsic losses in a charged capacitor. Generally speaking, the lower the dcl, the higher quality the capacitor.

Power Factor: A measure of the overall efficiency of a capacitor. Power factor ratings take all internal losses into consideration in a complex formula. This parameter of certain capacitors is often very important in AC applications such as motor-start and/or motor-run capacitors.

Rated Voltage: The rated working voltage of a capacitor. Generally expressed in DC Volts (Vdcw). This is the voltage at which a capacitor may be safely operated at 25°C continuously within its overall parameters.

Ripple Current: The total amount of alternating and direct current that may be applied to an electrolytic capacitor under stated conditions. In general, the higher the ripple current applied, the shorter the operating life of the capacitor will be. Application of significantly higher than rated ripple currents can shorten the capacitor life dramatically and may even cause catastrophic failure (explosion).

Surge Voltage: The momentary surge voltage which may be applied for a stated length of time without doing permanent damage to the unit.

Temperature: Capacitors are generally rated at 25°C at sea level under specific humidity conditions. Operating temperature ranges are also given, along with derating (reliability) curves for operation at temperatures other than 25°C.

Temperature Coefficient: Expressed as TC in ppm (parts per million) or in percent (%) from the norm of 25°C. This is seldom a straight line and may vary widely for certain types. Most capacitors have positive TC in that the capacitance increases as temperature increases. Some types, however, have negative TC in that the capacitance decreases as temperature increases.

Ceramic Capacitor Codes
(Capacitance Given In pF)

Color	Digit	Multiplier	Tolerance			Temperature Coefficient ppm°C	Significant Figure	Multiplier
			Class 1		Class 2			
			10pF or less	Over 10pF				
Black	0	1	±2.0pF	±20%	±20%	0	0.0	—1
Brown	1	10	±0.1pF	±1%		—33		—10
Red	2	100		±2%		—75	1.0	—100
Orange	3	1000		±3%		—150	1.5	—1000
Yellow	4	10000			+100% —0%	—220	2.0	—10000
Green	5		±0.5pF	±5%	±5%	—330	3.3	+1
Blue	6					—470	4.7	+10
Violet	7					—750	7.5	+100
Gray	8	0.01	±0.25pF		+80% —20%	+150 to —1500		+1000
White	9	0.1	±1.0pF	±10%	±10%	+100 to —750		+10000
Silver								
Gold								

MINIGLOSSARY
BASIC CAPACITOR FORMULAS

I. Capacitance (farads)

English: $C = \frac{.224\,K\,A}{t_D}$

Metric: $C = \frac{.0884\,K\,A}{t_D}$

II. Energy stored in capacitors (Joules, watt-sec)

$E = \frac{1}{2}\,CV^2$

III. Linear charge of a capacitor (Amperes)

$I = C\frac{dV}{dt}$

IV. Total Impedance of a capacitor (ohms)

$Z = \sqrt{R_s^2 + (X_C - X_L)^2}$

Where Rs = ESR

V. Capacitive Reactance (ohms)

$X_C = \frac{1}{2\pi fC}$

VI. Inductive Reactance (ohms)

$X_L = 2\pi fL$

VII. Phase Angles:

Ideal Capacitors: Current leads voltage 90°
Ideal Inductors: Current lags voltage 90°
Ideal Resistors: Current in phase with voltage

VIII. Dissipation Factor

$DF = \tan\delta \text{ (loss angle)} = \frac{ESR}{X_c} = (2\pi fC)\,(ESR)$

IX. Power Factor

PF = Sine δ (loss angle) = Cos φ (phase angle)
PF = DF (when less than 10%)

X. Quality Factor (dimensionless)

$Q = \text{Cotan } \delta \text{ (loss angle)} = \frac{1}{DF}$

XI. Equivalent Series Resistance (ohms)

$ESR = (DF)\,(Xc) = (DF)\,(\frac{1}{2}\pi fC)$

XII. Power Loss (watts)

Power loss $= (2\pi fCV^2)\,(DF)$

XIII. KVA (Kilowatts)

$KVA = 2\pi fCV^2 \times 10^{-3}$

XIV. Temperature Characteristic (ppm/°C)

$TC = \frac{Ct - C_{25}}{C_{25}\,(T_t - 25)} \times 10^6$

XV. Cap Drift (%)

$C.D. = \frac{C_1 - C_2}{C_1} \times 100$

XVI. Reliability of Ceramic Capacitors

$\frac{L_o}{L_t} = \left(\frac{V_t}{V_o}\right)^x \left(\frac{T_t}{T_o}\right)^\tau$

XVII. Capacitors in Series (current the same)

Any number: $\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} \cdots + \frac{1}{C_N}$

Two: $C_T = \frac{C_1\,C_2}{C_1 + C_2}$

XVIII. Capacitors in Parallel (voltage the same)

$C_T = C_1 + C_2 \cdots + C_N$

XIX. Aging Rate

A.R. = % Δ C/decade of time

XX. Decibels

$db = 20 \log \frac{V_1}{V_2}$

Metric prefixes:

Pico	X 10^{-12}
Nano	X 10^{-9}
Micro	X 10^{-6}
Milli	X 10^{-3}
Deci	X 10^{-1}
Deca	X 10
Kilo	X 10^3
Mega	X 10^6
Giga	X 10^9
Tera	X 10^{12}

Symbols:

K = Dielectric Constant
A = Area
t_D = Dielectric thickness
V = Voltage
t = time
R_s = Series Resistance
f = frequency
L = Inductance
δ = Loss angle
φ = Phase angle
x + y = Exponent effect of voltage and temp
L_o = Operating life
L_t = Test life
V_t = Test voltage
V_o = Operating voltage
T_t = Test temperature
T_o = Operating temperature

MINIGLOSSARY CONNECTORS

Connector terminology is often quite confusing. This confusion starts with the very names of connectors. The name of a connector may derive from its shape, application, type of conductor or even method of termination.

Shape—Circular, cylindrical, and rectangular.

Electrical application—High voltage, RF, microwave, input/output, etc.

Mechanical application—Printed circuit, rack & panel, cable, etc.

Conductor type—Coaxial, flat cable, ribbon cable, flex circuit, etc.

Termination method—Wirewrap, soldercup, solderless, etc.

Hardware such as clamps, hoods, and adapters are frequently used to convert cable connectors to rack and panel types. This adds to the name confusion. A very common telephone connector, for example (the "C" type) got its name from the model number of the original maker.

Contact: The part(s) of the connector that actually provides circuit continuity between its two sections—the parts which are normally mated. The back end of the connector should properly be called the *termination*. This is the point where the wires or PC board is attached to the connector.

Contact alignments: Often called *contact float*. Describes the amount of allowable contact movement within the connector body. Permits self-alignment.

Male vs. female: In the U.S. this describes the contact construction. In Europe this term is more often used to describe the outer shell mating action which may be the reverse of the contacts.

Closed entry: A female contact which prevents entry of a male contact larger than a specific size.

Open entry: A female contact designed for a specific size of male contact but which will allow entry of larger male contacts by spring action.

Hermaphrodite: Contacts or connector bodies which are the same configuration. Male/female designations do not apply. Bodies usually have some mechanical means for maintaining polarity.

Hermetic seal: Glass-to-metal seals at terminations. Often used improperly to describe vacuum-tight seals.

Waterproof seal: May or may not be truly *waterproof*. May prevent easy entrance of casual water by means of a rubber or other boot.

Printed circuit connector: Connectors which are used in conjunction with printed circuit boards. There are two distinctly different styles.

Edgeboard. May be called *edge* or *card*. The printed circuit (PC) board edge enters the connector.

Two-piece: One part of the connecting pair is physically attached to the PC board itself. The other part is attached to something else such as a cable or a motherboard.

Readout: Describes the arrangement at the terminating edge of a PC board. May be single or double. A double readout PC board has termination strips on each side not usually interconnected.

Ribbon connectors: A type of connector which allows flat "ribbon" cable to be attached to a round or rectangular connector but also used interchangeably for flat connectors to flat cable.

Ribbon contact connector: Describes the contacts in a rectangular connector which have a self-wiping mating action. Not the same as ribbon connector.

Solderless terminal: Any style of termination which does not require solder for a permanent connection. See *crimp* and *insulation displacement*.

Crimp termination: A stripped wire is inserted into a barrel or trough which is then crimped to the conductor with a suitable tool.

Insulation displacement: Unstripped insulated wire is fitted into a channel containing metal teeth which are forced through the insulation to make contact with the conductor.

Service rating: The maximum rated voltage and/or current which may be applied continuously. May be called *working voltage*. Can be confused with the term used to describe how many times a connector may be mated and separated.

Withstanding voltage: Also called *test voltage*. The voltage a connector must withstand for one minute without breakdown. Applied between connectors and between connectors and shell and any grounding devices of the connector.

MAXIMUM CURRENT CAPACITY—CONDUCTORS

Size, AWG	MIL-W-5088				National Electrical Code	Underwriters Laboratory		American Insurance Association	500 c mils/A
	Copper		Aluminum			60°C	80°C		
	Single-wire	Wire-bundled	Single-wire	Wire-bundled					
30	...	...	...	...	...	0.2	0.4	...	0.20
28	...	...	...	...	...	0.4	0.6	...	0.32
26	...	...	...	...	...	0.6	1.0	...	0.51
24	...	...	...	...	...	1.0	1.6	...	0.81
22	9	5	...	...	...	1.6	2.5	...	1.28
20	11	7.5	...	...	...	2.5	4.0	3	2.04
18	16	10	...	...	6	4.0	6.0	5	3.24
16	22	13	...	...	10	6.0	10.0	7	5.16
14	32	17	...	...	20	10.0	16.0	15	8.22
12	41	23	...	...	30	16.0	26.0	20	13.05
10	55	33	...	...	35	...	...	25	20.8
8	73	46	58	36	50	...	...	35	33.0
6	101	60	86	51	70	...	...	50	52.6
4	135	80	108	64	90	...	...	70	83.4
2	181	100	149	82	125	...	...	90	132.8
1	211	125	177	105	150	...	...	100	167.5
0	245	150	204	125	200	...	...	125	212.0
00	283	175	237	146	225	...	...	150	266.0
000	328	200	...	...	275	...	...	175	336.0
0000	380	225	...	...	325	...	...	225	424.0

MINIGLOSSARY
BASIC
EBCDIC CODE

Bit Positions 4, 5, 6, 7	Second Hexadecimal Digit	Digit Punches	00				01				10				11				
			00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	Bit Positions 0, 1
			00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	Bit Positions 2, 3
			0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	First Hexadecimal Digit
			12				12	12		12	12	12		12	12				Zone Punches
				11				11	11	11		11	11	11		11			
					0		0		0	0	0		0	0			0		
			9	9	9	9	9	9	9	9									Digit Punches
			①	②	③	④	⑤	⑥	⑦	⑧					⑨	⑩	⑪	⑫	
0000	0	8-1	NUL	DLE	DS		SP	&	-									0	8-1
0001	1	1	SOH	DC1	SOS				⑬		a	j			A	J	⑭	1	1
0010	2	2	STX	DC2	FS	SYN					b	k	s		B	K	S	2	2
0011	3	3	ETX	TM							c	l	t		C	L	T	3	3
0100	4	4	PF	RES	BYP	PN					d	m	u		D	M	U	4	4
0101	5	5	HT	NL	LF	RS					e	n	v		E	N	V	5	5
0110	6	6	LC	BS	ETB	UC					f	o	w		F	O	W	6	6
0111	7	7	DEL	IL	ESC	EOT					g	p	x		G	P	X	7	7
1000	8	8		CAN							h	q	y		H	Q	Y	8	8
1001	9	8-1		EM							;	r	z		I	R	Z	9	9
1010	A	8-2	SMM	CC	SM		¢	!	⑮	:									8-2
1011	B	8-3	VT	CU1	CU2	CU3	.	$	,	#									8-3
1100	C	8-4	FF	IFS		DC4	<	*	%	@									8-4
1101	D	8-5	CR	IGS	ENQ	NAK	(	)	_	'									8-5
1110	E	8-6	SO	IRS	ACK		+	;	>	=									8-6
1111	F	8-7	SI	IUS	BEL	SUB	!	¬	?	"									8-7
			12				12				12	12		12	12	12		12	Zone Punches
				11				11				11	11	11		11	11	11	
					0				0		0		0	0	0		0	0	
			9	9	9	9									9	9	9	9	

Card Hole Patterns

①	12-0-9-8-1	⑤	No-Punches	⑨	12-0	⑬	0-1
②	12-11-9-8-1	⑥	12	⑩	11-0	⑭	11-0-9-1
③	11-0-9-8-1	⑦	11	⑪	0-8-2	⑮	12-11
④	12-11-0-9-8-1	⑧	12-11-0	⑫	0		

Control Character Representations

ACK	Acknowledge
BEL	Bell
BS	Backspace
BYP	Bypass
CAN	Cancel
CC	Cursar Control
CR	Carriage Return
CU1	Customer Use 1
CU2	Customer Use 2
CU3	Customer Use 3
DC1	Device Control 1
DC2	Device Control 2
DC4	Device Control 4
DEL	Delete
DLE	Data Link Escape
DS	Digit Select
EM	End of Medium
ENQ	Enquiry
EOT	End of Transmission
ESC	Escape
ETB	End of Transmission Block
ETX	End of Text
FF	Form Feed
FS	Field Separator
HT	Horizontal Tab
IFS	Interchange File Separator
IGS	Interchange Group Separator
IL	Idle
IRS	Interchange Record Separator
IUS	Interchange Unit Separator
LC	Lower Case
LF	Line Feed
NAK	Negative Acknowledge
NL	New Line
NUL	Null
PF	Punch Off
PN	Punch On
RES	Restore
RS	Reader Stop
SI	Shift In
SM	Set Mode
SMM	Start of Manual Message
SO	Shift Out
SOH	Start of Heading
SOS	Start of Significance
SP	Space
STX	Start of Text
SUB	Substitute
SYN	Synchronous Idle
TM	Tape Mark
UC	Upper Case
VT	Vertical Tab

Special Graphic Characters

¢	Cent Sign
.	Period, Decimal Point
<	Less-than Sign
(	Left Parenthesis
+	Plus Sign
|	Logical OR
&	Ampersand
!	Exclamation Point
$	Dollar Sign
*	Asterisk
)	Right Parenthesis
;	Semicolon
¬	Logical NOT
-	Minus Sign, Hyphen
/	Slash
,	Comma
%	Percent
_	Underscore
>	Greater-than Sign
?	Question Mark
:	Colon
#	Number Sign
@	At Sign
'	Prime, Apostrophe
=	Equal Sign
"	Quotation Mark

MINIGLOSSARY ENCAPSULATION

MATERIALS/HANDLING

Catalyst: A substance which changes the *rate* of chemical reaction. Very small quantities can cause fast change.

Conformal coating Sprayed or dipped. A thin conformal jacket which protects an assembly from moisture or other degrading environments.

Curing agent: See catalyst.

Hardener: See catalyst.

Hermetic: A permanent gas-tight seal.

RTV: Room Temperature Vulcanizing. Associated with silicone rubber sealants which vulcanize at room temperature.

Thermoplastic: Plastic materials which can be made to flow *repeatedly* with the application of heat.

Thermosetting: Plastics which once cured cannot be made to flow again.

Thixotropy: The property of a coating compound which has low viscosity when agitated, but which thickens when the agitation ceases.

Viscosity: Measured in units of *poise* or *centipoise.* The property of a liquid which resists internal flow. Low viscosity equates with thin and vice-versa.

PROCESSING

Casting: Parts or assemblies are placed in a mold. Encapsulating material is added and cured. Part is then removed from the mold.

Dip coating: Part or assembly is dipped into the encapsulating material. Final thickness is determined by number of dips, viscosity, rate of withdrawal, and temperature.

Embedding: Wherein an encapsulant substantially fills all voids in and about an assembly.

Impregnation: A process of encapsulation involving evacuating all air and then allowing the encapsulating material to flow in and fill all voids.

Molding: Similar to casting except this process usually implies multicavity molds and costly machines.

Potting: Wherein the part or assembly is immersed in an encapsulating material contained in a shell which becomes a permanent outer surface after curing.

DIELECTRIC

Arc resistance: An encapsulant's resistance to the formation of a conductive path or track. Measured in time.

Breakdown voltage: The voltage at which an encapsulant fails electrically.

Capacitance: The property of conductors and dielectrics which allows the storage of an electrical charge when the voltage is applied.

Corona: A luminous discharge of electricity due to air ionization when a certain voltage is reached. Can be internal or external. The formation of ozone can cause rapid deterioration of certain materials.

Dielectric: Insulator (Nonconductor.)

Dielectric constant: The property of a material that determines its ability to store electrostatic energy.

Dielectric strength: The ratio of dielectric breakdown to the thickness of insulating material.

Dissipation factor: The ratio of a dielectric material's energy losses.

Flashover: Point at which an electric discharge occurs around an edge or across a surface. Can result in a carbon track and permanent degradation.

Insulation resistance: (IR) An insulating material's total DC leakage.

Surface resistivity: The resistance of the surface of an insulating material to the flow of direct current.

Voltage endurance: Sometimes called corona resistance. The ability of a material to withstand the application of sustained high voltage.

Volume resistivity: The resistance of a material to direct current flow as a measure of volume. Expressed as ohm-centimeters.

MINIGLOSSARY OPTO SEMICONDUCTORS

Avalanche Photodiode: A photodiode that takes advantage of avalanche multiplication of photocurrent. It is particularly suited to low noise and/or high speed applications.

Contrast: A noticeable difference in color, brightness, or other characteristics in a side-by-side comparison.

Chrominance Contrast: The color contrast between two adjacent surfaces of identical area, shape, texture, and luminance. The human eye is more sensitive to differences in color than it is to differences in brightness.

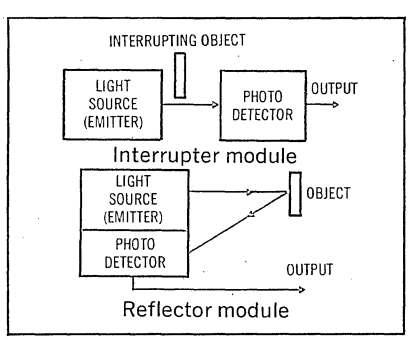
Current Transfer Ratio: The ratio of an optocoupler's output current to input current at a specified bias.

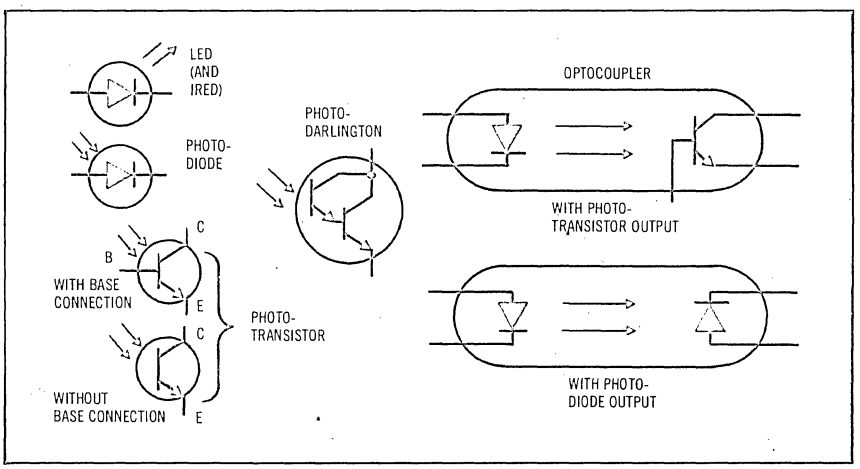
Dark Current: The leakage current of a photodetector with no incident light.

Dominant Wavelength: The wavelength that is a quantitative measure of apparent color of light as perceived by the human eye.

Infrared Radiation: The electromagnetic wavelength region between approximately 0.75 and 100 micrometers longer than the wavelength of visible light.

Interrupter (module): A device that produces an electrical output signal when an object breaks the light (visible or invisible) between a light source and a photodetector.





IRED: An infrared-emitting diode. See light-emitting diode.

Light Current: The current that flows through a photodetector when it is exposed to radiant energy.

Light-Emitting Diode (LED): A semiconductor diode that emits incoherent light at its PN junction when forward biased. The light can be in the visible or invisible (infrared) wavelength region.

Luminance Contrast: The observed brightness of a light-emitting element compared to the brightness of the "surround," an integral part of the device and inseparable from it.

Optocoupler: A device that transmits electrical signals, without electrical connection, between a light source (input) and the receiver (output). The input is generally an LED; the output might be a photodiode, phototransistor, a photo–Darlington, etc. Sometimes referred to as optoisolator.

Peak Wavelength: The wavelength at the peak of the radiated spectrum of an emitter.

Photo–Darlington: A light-sensitive Darlington-connected transistor pair. The photo–Darlington has a very high sensitivity to illumination or radiation.

Photodetector: A device that provides an electrical output signal when subjected to radiation in the visible, infrared, or ultraviolet regions of the electromagnetic spectrum. Photodiodes, phototransistors, and photo–Darlingtons are the most common type of photodetectors.

Photodiode: A junction diode that is responsive to radiant energy. Photodiodes have a high degree of linearity between the input radiation and the output current, and faster switching speeds than phototransistors.

Photothyristor: A thyristor whose switching action is controlled by light applied to the thyristor gate.

Phototransistor: A light-sensitive transister that delivers an electrical output proportional to the light intensity at its input. The low-level photocurrent that is generated is amplified by the current gain of the transistor. The base region (or gate in a FET) may or may not be brought out as an external terminal.

Point Source: A source with a maximum dimension less than one-tenth the distance between sources and detector.

Reflector (module): A device containing a light source and a photodetector that detects any object that reflects light produced by the source back to the detector.

MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

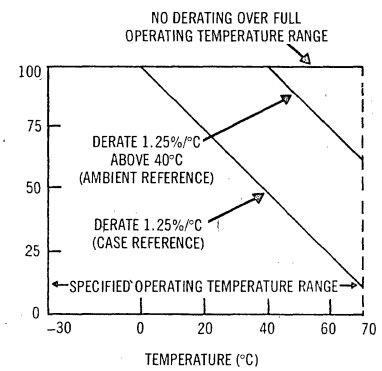


Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

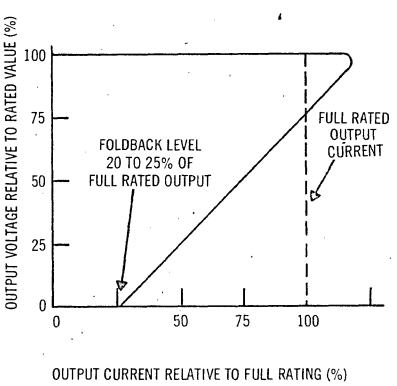


Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

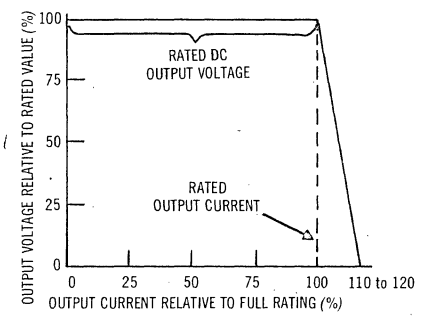


Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

MINIGLOSSARY
ELECTROMECHANICAL RELAYS

RELAYS

Hybrid: Isolated input and output either with a solid-state input and an electromechanical output or vice versa. Typically a reed switch is used to trigger a solid-state output or a solid-state amplifier is used to trigger an electromechanical relay.

Differential: Have multiple windings to function when voltage, current and/or power difference reaches a specific level or value.

Close-differential: The dropout value is specified close to the pickup value.

Frequency sensitive: Operates at a set frequency or within specific frequency bands. A resonant reed, for example.

Hermetically sealed: Totally sealed by glass-to-metal or metal-to-metal seals to ensure very low rates of gas leakage over long time periods.

Encapsulated: Imbedded in a suitable potting compound.

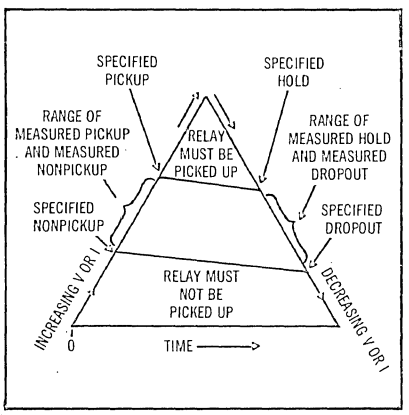
Sealed: Enclosed in a relatively airtight cover. (Not the same as hermetically sealed.)

Covered: Unsealed metal or plastic enclosure or housing.

CONTACTS

Dry circuit: contacts that carry current but do not open or close during energizing of the load circuit. Often wrongly used in reference to low level contacts.

Low Level: Contacts controlling relatively low voltages and low currents. Generally below 5 Vdc and 10mA.



OPERATING CHARACTERISTICS

Measured dropout: The value at which all contacts restore to their unoperated position as current or voltage decreases.

Specified dropout: The value at or *above* which all contacts *must* restore to their unoperated position as voltage or current is decreased.

Specified hold: The value that *must* be reached before any contact change occurs as voltage or current is decreased on an operated relay.

Specified nonpickup: The value that *must* be reached before any contact change occurs as voltage or current decreases on an unoperated relay.

Measured pickup: The value at which all contacts function as voltage or current increases on an unoperated relay.

Specified pickup. The value at or *below* which all contacts *must* function as voltage or current increases on an unoperated relay.

Sensitivity: Specified pickup expressed in watts.

Normal bridging: The make-before-break action between adjacent contacts on relays designed for this purpose.

Abnormal bridging: The undesired closing of contacts caused by a metal bridge or protrusion developed by arcing.

Magnetic freezing: Sticking of the armature to the core as a result of residual magnetism.

TIME

Actuation: The interval from coil energization or de-energization to the functioning of a specified contact.

Initial actuation: The interval from coil energization or de-energization to the *first* closing or opening of a previously open or closed contact.

Final actuation: Sum of initial actuation *and* bounce intervals following an actuation.

Contact bounce: The interval from close or opening of a contact to the end of the bounce of "chatter."

Chatter: See bounce.

Operate: Normally taken as the interval between energization and the opening or closing of the last contact to function not including bounce.

Release: Normally taken as the interval between de-energization and the opening or closing of the last contact to function excluding bounce.

Transfer: The interval between opening a closed contact and closing an open contact of a break-before-make relay.

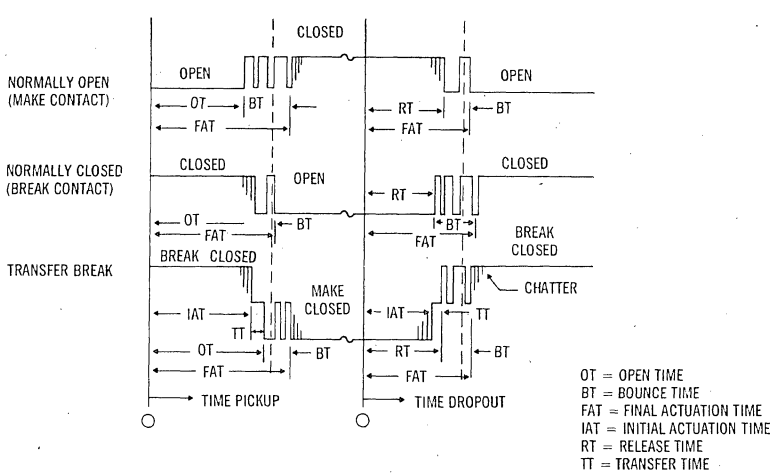
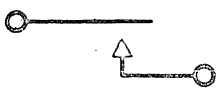


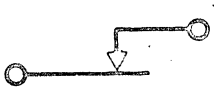
Fig. 2. Typical time vs. current (non-inductive load)

MINIGLOSSARY
RELAY CONTACT FORMS

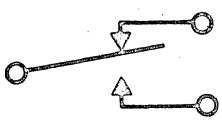
A
Make
SPST-NO



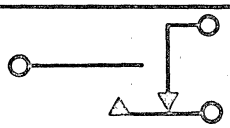
B
Break
SPST-NC



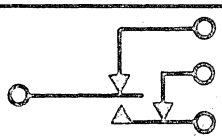
C
Break, Make
(Transfer)
SPDT



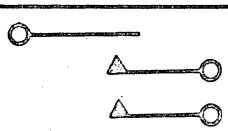
D
Make, Break
(Continuity
Transfer)



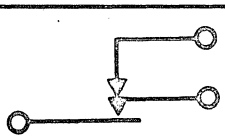
E
Break,
Make,
Break



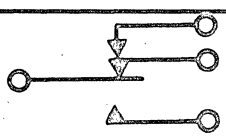
F
Make,
Make



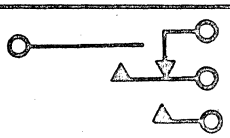
G
Break,
Make



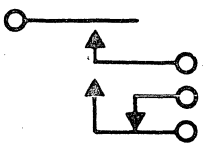
H
Break,
Break,
Make



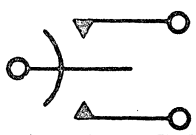
I
Make,
Break,
Make



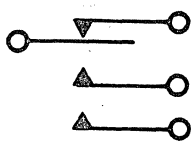
J
Make,
Make,
Break



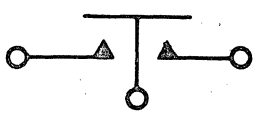
K
Center off
SPDT



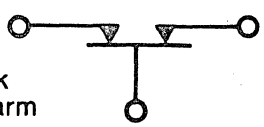
L
Break,
Make,
Make



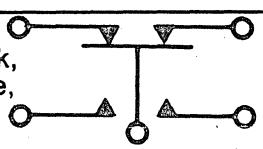
U
Double
make
Contact
on arm



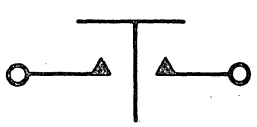
V
Double break
Contact on arm



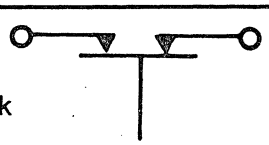
W
Double break,
Double make,
Contact
on arm



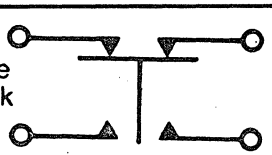
X
Double
make



Y
Double break

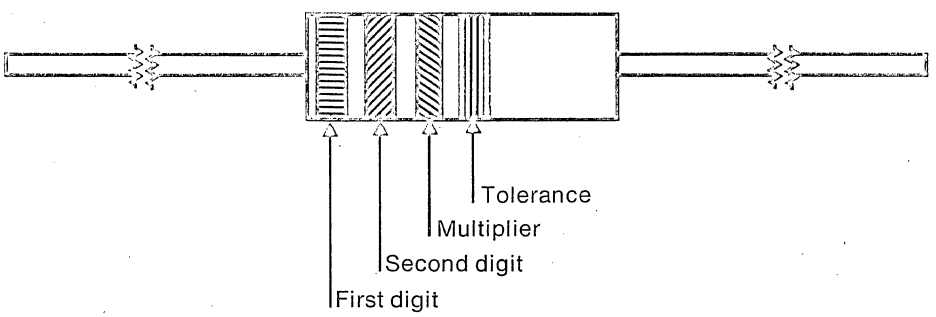


Z
Double make
Double break
SPDT-DB

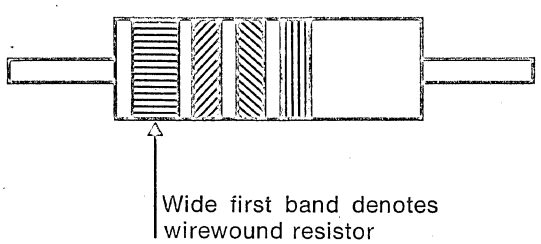


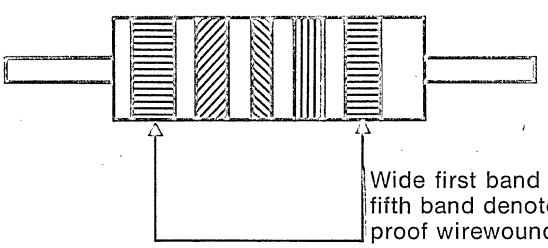
MINIGLOSSARY
RESISTOR COLOR CODES

EIA/MIL Resistor Color Codes



Color code for general-purpose industrial resistors

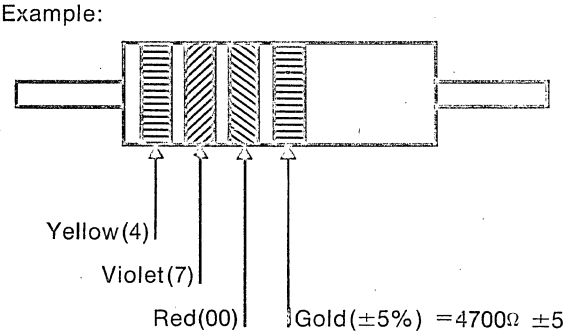




Color code for general-purpose wirewound resistors

Color	Significant digit	Multiplier	Tolerance
Black	0	1	—
Brown	1	10	± 1%
Red	2	100	± 2%
Orange	3	1000	± 3%
Yellow	4	10,000	± 4%
Green	5	100,000	—
Blue	6	1,000,000	—
Violet	7	10,000,000	—
Gray	8	—	—
White	9	—	—
Gold	—	0.1	± 5%
Silver	—	0.01	±10%
No color	—	—	±20%

Example:



MINIGLOSSARY SERVO COMPONENTS

SPECIFICATIONS

Excitation: The input voltage and frequency.

Transformation Ratio: The ratio of the output voltage, at maximum coupling, to the input voltage.

Phase Shift: The lead or lag of the output voltage with respect to the input voltage. For most synchros and resolvers, the phase shift can be approximated by the angle whose tangent is the ratio of the primary winding's DC resistance to its reactive component.

Impedance: Specified as R + jX, where R is the AC resistive component and X is the reactive component. Important impedances are: (a) Z_{po} (or Z_{ro} for rotor primary units), which is the impedance of the primary winding with the secondary open; (b) Z_{so}, which is the impedance of the secondary winding with the primary open; and (c) Z_{ss}, which is the impedance of the secondary with the primry shorted (essentially when driven by a low impedance).

Null Voltage: The voltage remaining when the unit is at electrical zero or in the minimum coupling position.

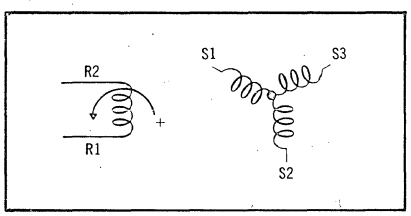
Accuracy: The error of the position of the rotor with respect to the electrical angle. It is defined as the output voltage driven by the "speed" (pole pairs) of the unit, referenced to the starting point of the calibration (usually the electrical zero position). Error is commonly expressed in minutes of arc (1/60 of a degree) or in seconds of arc.

Loads: For a transmitting unit, the impedance that the output voltage signal faces. This can be a receiver, a differential with its load, a control transformer, an A/D converter, etc.

Operation Temperature: The ambient temperature range over which the unit performs its primary function.

FUNCTIONS

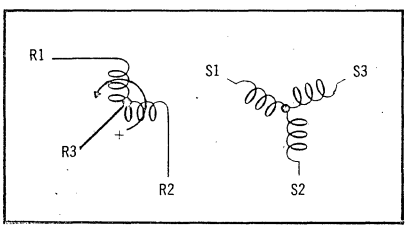
Transmitter: A unit with a Y-connected stator that outputs a signal proportional to the position of its single-phase excited rotor. High power units, called "torque transmitters," are used to drive one or more receivers. Low power transmitters are used to drive control transformers.



Receiver: A unit with a three-phase stator excited by the input, usually from a torque transmitter, and a single-phase rotor that follows the resulting stator field. Usually used to drive a position pointer.

Control Transformer: A unit with a three-phase stator excited by the input from a transmitter and a single-phase rotor mechanically driven to the null position by an external motor or other device.

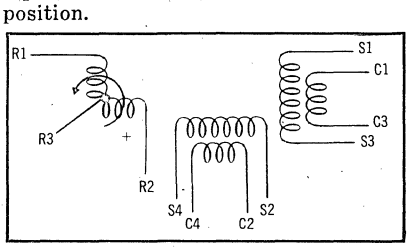
Differential: A unit with a three-phase stator and a three-phase rotor. It is usually connected between a transmitter, which excites its stator, and a receiver or control transformer. It can be used to "dial in" correction factors for the synchro chain.



Transolver: A unit with a three-phase stator and a two-phase rotor that can be used either as a control transmitter (with one rotor phase excited and the other shorted), or as a control transformer with the signal obtained from one phase of the rotor—making sure the other phase is equally loaded to prevent unbalances.

Differential Resolver: A unit with a two-phase stator and a three-phase rotor that is used as a transolver with the advantage that when connected as a control transformer, the signal does not travel through slip rings.

Resolver: A unit with a two-phase rotor and a two-phase stator that is used to create or receive SIN-COS signals such as vector resolutions for solving inertial platform coordinate transformations, unknowns of right triangles, etc. Resolvers can also be used as transmitting, differential, or receiving elements by proper choice of impedances. It is also possible to use resolvers as phase shifters where, in one mode, one rotor phase is excited and the two stator windings are feeding an appropriate RC network and indicating a phase shift, referred to the input, that corresponds to the rotor position.



Compensated Resolver: A unit with a "2×2" phase stator and a two-phase rotor used as a resolver with the added benefit of feedback windings in parallel with the stator windings that increase the useful accuracy over a wide range of environmental operating conditions.

Linear Transformer: A unit with a single-phase stator and single-phase rotor designed to provide a linear output voltage that is directly proportional to the rotor input angle. It operates over a range of less than ±90°, and is analogous to a potentiometer providing infinite resolution, but without contact between the elements. It can be used only with AC voltages.

Brushless Synchro: Available in two types—hairspring and bobbin. Hairspring synchros use spiral wound conductor springs to pick off the rotor signal, and are generally limited to a ±165° rotation. Most have mechanical stops to prevent damage due to overrotation. Bobbin synchros pick off the rotor signal with rotary transformers inside the unit, allowing the rotor unlimited motion.

Pancake Unit: A name derived from the physical dimensions of the unit, which has a diameter that exceeds axial length. Sizes range from under 1" to 20" or more. The unit is frequently used as a gimbal pickoff element and is designed to fit a particular application envelope. It can be supplied as a rotor and stator only.

THERMAL CONDUCTIVITY OF DIELECTRICS AT ROOM TEMPERATURE

Material	Thermal Conductivity, J/ (m.K)
Diamond	658
BeO	167
Graphite	117-200
Bonded SiC	42
MgO	42
Al_2O_3	33
TiC	33
BN	28
Mullite	6.3
Titania	3.3-4.2
Porcelain	1.7
Fused silica glass	1.5
Soda-lime glass	0.8
Cast epoxies	0.17-1.3
Wood	0.5-2.5
Melamines	0.3-0.7
Mica	0.3-0.7
Phenolics (molded)	0.17-0.67
Polyethylenes	0.33
Nylons	0.17-0.25
TFE fluorocarbons	0.25
Elastomers	0.08-0.17
Foams	0.003-0.04

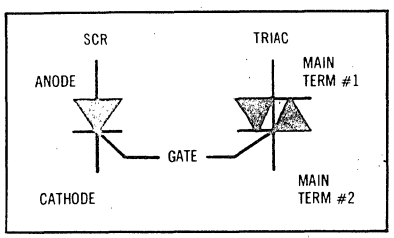
MINIGLOSSARY THYRISTORS/ HIGH POWER DIODES

THYRISTORS

A thyristor is a four-layer semiconductor (pnpn) that can be switched from an OFF to an ON state. This is usually done by a voltage or current pulse to the gate terminal. The device will then continue to conduct so long as the principal current of the device flows through the thyristor's two main terminals.

In many respects a thyristor is analogous to an electromechanical latching relay. In fact, thyristors have largely replaced these relays in newer equipment designs. But, misapplications and/or failure to fully understand the parameters of these and other solid state devices often leads to catastrophic field failures.

The terminology shown on this page has been condensed from common industry data books and is intended to be a guide for the engineer.



di/dt: *Critical rate of rise of ON state current* is the user's maximum design limit (Fig. 1).

di_R/dt: *Rate of decay of ON state current* (Fig. 1 & 2).

dv/dt (critical): *Rate of rise of OFF state voltage*. Lowest voltage rate of rise to cause a thyristor to turn ON.

dv/dt (reapplied) : *Rate of rise of reapplied OFF state voltage.*

I_{FSM}: *Nonrepetitive ON state surge current in diodes.* Maximum peak value of ½ cycles (60 Hz) a diode can withstand up to 100 times in its lifetime.

I_{TSM}: *Nonrepetitive ON state surge current in thyristors*. Maximum peak value of 60 Hz cycles a thyristor can withstand up to 100 times in its lifetime.

I_{DRM}/I_{RRM}: *Maximum peak forward/ reverse leakage current* at specified temperature and repetitive conditions.

I_{GDM}: *Continuous gate current not to trigger*. Highest dc gate current that will *not* cause thyristor to switch from OFF to ON at a specific temperature.

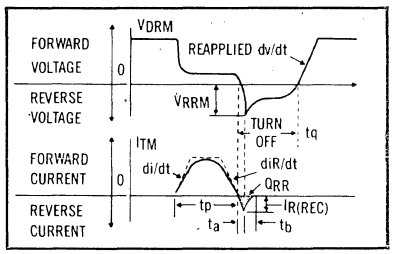


Fig. 1. Concurrent voltage and current waveforms

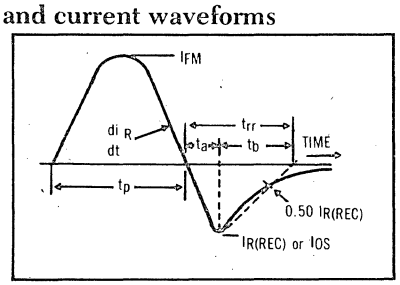


Fig. 2. Recovery current waveform

I_{GT}: *Continuous gate trigger current.* Absolute minimum gate current required to switch thyristor from OFF to ON.

I_H: *Holding Current*. Minimum current required to hold thyristor ON.

I_L: *Latching current*. Minimum current required to hold thyristor ON after removal of gate drive.

$I_{(REC)}$; *Recovery current*. Peak value of reverse current during recovery or turn OFF (Fig. 1 & 2).

I_{OS}: *Overshoot current*. See $I_{R(REC)}$.

I^2t: Maximum ON state, short time thermal capacity of the silicon element for operations less than ½ cycle of 180° conduction angle.

$I_{T(AV)}$: *Average ON state current* (max.)

Q_{RR}: *Reverse recovered charge* (Fig. 1).

$R_{\theta JC}$: *Junction-to-case thermal resistance* in degrees C per watt.

$T_{C(MAX)}$: *Max. allowable case temperature*.

$T_{J(MAX)}$: *Maximum allowable junction temp.*

t_d: *Delay time*. Interval between a specified point at beginning of gate pulse and the instant at which the principal voltage drops to a specified value. (OFF-ON) (Fig. 3)

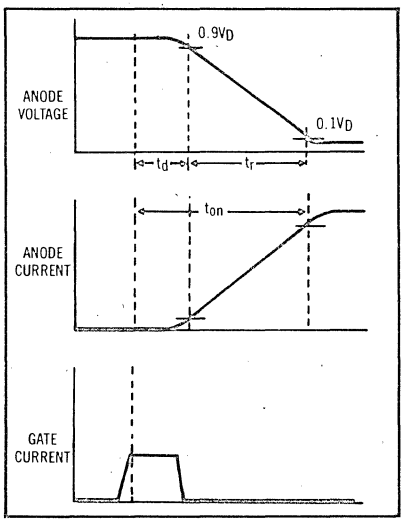


Fig. 3. Turn-on time waveforms

t_{on}: *Turn-on time*. The sum of delay time and rise time. (OFF-ON) (Fig. 3)

t_q: *Turn-off time*. Time between principal current reaching zero and the instant thyristor can block forward voltage without turning ON. (Fig. 1)

t_r: *Rise time*. Time between principal voltage dropping from one value to a second lower value when thyristor turns from OFF to ON. (Fig. 3)

t_{rr}: *Reverse recovery time*. (Fig. 2)

V_{DRM}/V_{RRM}: *Maximum repetitive peak OFF state/reverse voltage* excluding non-repetitive transients.

V_{DSM}/V_{RSM}: *Maximum nonrepetitive peak OFF state/reverse voltage*.

V_{FM}/V_{TM}: *Maximum forward voltage drop* at a specific forward current and case temp.

V_{GDM}: *Gate nontrigger voltage*. Highest dc voltage that will *not* cause thyristor to switch from OFF to ON.

V_{LATCH}: *Latching voltage*. Voltage required for thyristor to latch ON at a given gate current and junction temp.

$V_{TM(DYN)}$: *Dynamic ON state voltage*. Transient ON state voltage of thyristor when triggered into conduction for a given load and time.

WIRE GAUGES— DIAMETER, AREA AND COPPER WEIGHT

	Diameter at 20°C (68°F)		Area at 20°C (68°F)			Weight at 20°C (68°F), bare copper wire		
Size, AWG	mils	mm	mils	c mils	mm	lb/1,000 ft.	lb/mile	kg/km
4/0	460.0	11.68	166,200	211,600	107.2	640.5	3,382	953.2
3/0	409.6	10.40	131,800	167,800	85.01	507.8	2,681	755.7
2/0	364.8	9.266	104,500	133,100	67.43	402.8	2,127	599.5
1/0	324.9	8.252	82,891	105,600	53.49	319.5	1,687	477.6
1	289.3	7.348	85,730	83,690	42.41	253.3	1,338	337.0
2	257.6	6.543	52,120	66,360	33.62	200.9	1,061	298.9
3	229.4	5.827	41,330	52,620	26.67	159.3	841.1	237.1
4	204.3	5.189	32,780	41,740	21.15	126.3	667.1	188.0
5	181.9	4.620	25,990	33,090	16.77	100.2	528.8	149.0
6	162.0	4.115	20,610	26,240	13.30	79.44	419.4	118.2
7	144.3	3.665	16,350	20,820	10.55	63.03	332.8	93.80
8	128.5	3.264	12,970	16,510	8.367	49.98	263.9	74.38
9	114.4	2.906	10,280	13,090	6.631	39.61	209.2	58.95
10	101.9	2.588	8,155	10,380	5.261	31.43	166.0	46.77
11	90.7	2.304	6,460	8,230	4.17	24.90	131	37.1
12	80	2.05	5,130	6,530	3.310	19.8	104	29.4
13	72.0	1.83	4,070	5,180	2.63	15.7	82.9	23.4
14	64.1	1.63	3,230	4,110	2.08	12.4	65.7	18.5
15	57.1	1.45	2,560	3,260	1.650	9.87	52.1	14.7
16	50.8	1.29	2,030	2,580	1.31	7.81	41.2	11.6
17	45.3	1.150	1,610	2,050	1.040	6.21	32.8	9.24
18	40.3	1.02	1,280	1,620	0.823	4.92	26.0	7.32
19	35.9	0.912	1,010	1,290	0.653	3.90	20.6	5.81
20	32.0	0.813	804.0	1,020	0.519	3.10	16.4	4.61
21	28.5	0.724	638.0	812.0	0.412	2.46	13.0	3.66
22	25.3	0.643	503.0	640.0	0.324	1.94	10.2	2.88
23	22.6	0.574	401.0	511.0	0.259	1.55	8.16	2.30
24	20.1	0.511	317.0	404.0	0.205	1.22	6.46	1.82
25	17.9	0.455	252.0	320.0	0.162	0.970	5.12	1.44
26	15.9	0.404	199.0	253.0	0.128	0.765	4.04	1.14
27	14.2	0.361	158.0	202.0	0.102	0.610	3.22	0.908
28	12.6	0.320	125	159.0	0.0804	0.481	2.54	0.715
29	11.3	0.287	100.0	128.0	0.0647	0.387	2.04	0.575
30	10.0	0.254	78.50	100.0	0.0507	0.303	1.60	0.450
31	8.9	0.226	62.20	79.2	0.0401	0.240	1.27	0.357
32	8.0	0.203	50.30	64.0	0.0324	0.194	1.02	0.288
33	7.1	0.180	39.60	50.40	0.0255	0.153	0.806	0.227
34	6.3	0.160	31.20	39.7	0.0201	0.120	0.634	0.179
35	5.6	0.142	24.60	31.4	0.0159	0.0940	0.501	0.141
36	5.0	0.127	19.60	25.00	0.0127	0.0757	0.400	0.113
37	4.50	0.114	15.90	20.20	0.0103	0.0613	0.324	0.0912
38	4.0	0.102	12.60	16.0	0.00811	0.0484	0.256	0.0721
39	3.5	0.0889	9.62	12.2	0.00621	0.0371	0.196	0.0552
40	3.1	0.0787	7.55	9.61	0.00487	0.0291	0.154	0.0433
41	2.8	0.0711	6.16	7.84	0.00397	0.0237	0.125	0.0353
42	2.5	0.0635	4.91	6.25	0.00317	0.0189	0.0999	0.0282
43	2.2	0.0559	3.80	4.84	0.00245	0.0147	0.0774	0.0218
44	2.0	0.0508	3.14	4.00	0.00203	0.0121	0.0639	0.0180
45	1.8	0.0457	2.54	3.24	0.00164	0.00981	0.0519	0.0146
46	1.6	0.0406	2.01	2.56	0.00130	0.00775	0.0409	0.0115
47	1.4	0.0356	1.54	1.96	0.000993	0.00593	0.0313	0.00883
48	1.2	0.0305	1.13	1.44	0.000730	0.00436	0.0230	0.00649
49	1.1	0.0279	0.950	1.21	0 000613	0.00366	0.0193	0.00545
50	1.0	0.0254	0.785	1.00	0.000507	0.00303	0.0160	0.00450

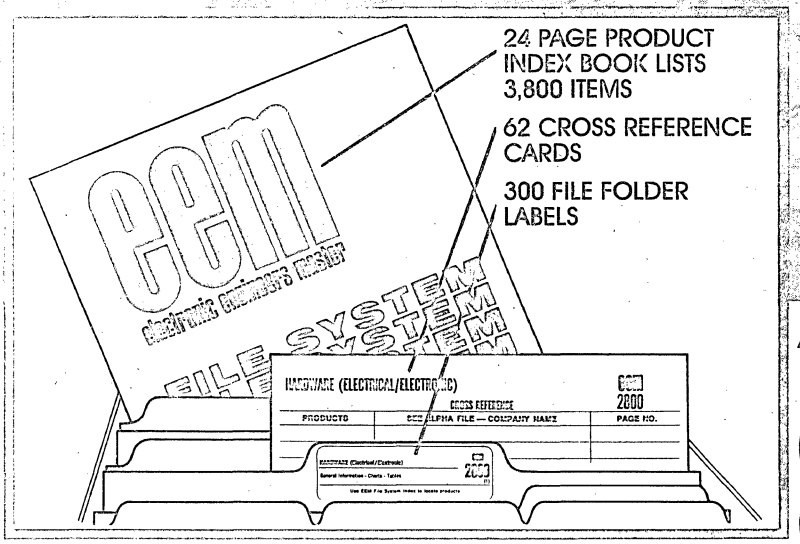
EEM PRODUCT SELECTION GUIDES

Use the EEM Product Selection Guides. There are 34 Guides in this edition of EEM. See page 2 (A-2, B-2, C-2, D-2) of each volume to locate the Product Selection Guides that pertain to your needs.

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... A•1166, B•1012, C•1028, D•1016
ASCII Code ..... D•1087
Batteries, Product Selection Guide ..... D•1413
Batteries & Fuel Cells, Characteristics ..... D•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... C•1003
Capacitors, Basic Formulas ..... A•1093
Capacitors, Miniglossary ..... A•1066
Capacitors, Product Selection Guide ..... A•1003
Circuit Boards (Printed) Product Selection Guide ..... C•1099
Coils, Chokes, Inductors, Product Selection Guide ..... A•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... C•1863
Connectors, Miniglossary ..... C•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... C•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... A•1309
Delay Lines, Product Selection Guide ..... A•1459
Discrete Semiconductors, Product Selection Guide ..... A•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... B•1015
EBCDIC Code ..... D•1092
Encapsulation, Miniglossary ..... C•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. C•1623
Filters, Product Selection Guide ..... A•1583
Instruments, Graphic Recording Product Selection Guide ..... D•1401
Instruments, Panel Meters, Product Selection Guide ..... D•1329
Instruments, Test & Measuring Product Selection Guide ..... D•1175
Interconnection Systems, Product Selection Guide ..... C•1699
Keyboards & Keypads, Product Selection Guide ..... B•1705
Logofinder & Trademark Directories ..... B•901
Microwave Components, Product Selection Guide ..... A•1701
Military Qualified Products Lists ..... B•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... B•1129
Opto Semiconductors, Miniglossary ..... B•1214
Oscilloscopes, Product Selection Guide ..... D•1385
Panel Hardware, Product Selection Guide ..... C•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... A•1991
Power Supplies, Miniglossary ..... D•1462
Power Supplies, AC, Product Selection Guide ..... D•1877
Power Supplies, DC, Product Selection Guide ..... D•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... B•1225
Relay Contact Forms ..... B•1317
Relays, Electromechanical, Miniglossary ..... B•1308
Relays, Product Selection Guide ..... B•1261
Resistor Color Codes ..... A•1828
Resistors, Product Selection Guide ..... A•1785
Servo Components, Miniglossary ..... D•1985
Solenoids, Product Selection Guide ..... B•1463
Switches, Product Selection Guide ..... B•1477
Thermal Components, Product Selection Guide ..... B•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... B•1744
Thyristors/High Power Diodes, Miniglossary ..... A•2076
Transducers & Encoders, Product Selection Guide ..... B•1777
Transformers, Product Selection Guide ..... A•2099
Wire & Cable, Product Selection Guide ..... C•1743
Wire Gauges—Diameter, Area, Copper Weight ..... C•1844



ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

85
86 Manufacturers and Sales Offices Directory

Each manufacturer is listed alphabetically with complete address and telephone number of main offices. The names of those with data pages in this edition of EEM are shown in boldface.

Many manufacturers also show TWX and Telex numbers, FSC (Federal Supply Code), other pertinent company data, their sales and/or local distributor offices and phones. The page numbers of their data pages in this edition are shown in all volumes.

AABA COMPONENTS CORP., P.O. Box 171, Baldwin Place, NY 10505, Tel: 914-628-6952; Empl.: 15; *Sls. Mgr.:* D. McVey; *Dist. Mgr.:* D. McVey

AAK CORP, 747 River St., Haverhill, MA 01830, Tel: 617-373-3769; FSC No.: 04 26 3109-1; Empl.: 10; *Sls. Mgr.:* S. Musumeci

A & B TECHNICAL SERVICES, 11300 Hartland St., N. Hollywood, CA 91605, Tel: 213-769-6772, Telex: 66-2497, TWX: 910-499-2675; Empl.: 40; *Sls. Mgr.:* V. A. Littlefield; *Dist. Mgr.:* C. Cloud

A & D ELEC. INSTRS., 73-07 88th St., Glendale, NY 11385, Tel: 718-275-6516; Empl.: 7

A&M INSTRUMENT, INC., 5 Nassau St., Rockville Centre, NY 11571, Tel: 516-678-6960

AAVID ENGRG., One Kool Path, Laconia, NH 03246, Tel: 603-524-4443, TWX: 510-298-1127; FSC No.: 30161; Empl.: 300; *Sls. Mgr.:* Philip Johnson; *Dist. Mgr.:* Philip Johnson

abacus controls inc.

ABACUS CONTROLS INC., 89 Readington Rd., Somerville, NJ 08876, Tel: 201-526-6010, Telex: 888186 ABACUS CONT UD; FSC No.: 54241; Empl.: 45; *Sls. Mgr.:* L. Albrecht ..... **D•1880-1882**

Local Sales Offices & Reps

AL Huntsville, Scientific Dvcs. 205-536-1969
CA Los Angeles, Power Partners 800-468-5400
CA San Diego, Power Partners 800-468-5400
CT New London, Elctrn. Sls. of New England 203-443-2646
FL Ft. Walton Beach, Scientific Dvcs. 904-651-4407
FL Orlando, Scientific Dvcs. 305-841-8180
GA Atlanta, Scientific Dvcs. 205-536-1969
GA Savannah, Scientific Dvcs. 904-651-4407
MA Wareham, Elctrn. Sls. of New England 617-295-7634
NC Raleigh, Scientific Dvcs. 919-846-7319
NC Winston-Salem, Scientific Dvcs. 919-765-5776
TX Dallas, True Techn. 214-691-7870

ABA ELECTROMECHANICAL SYS. INC., Box 500, Pinellas Pk., FL 34290-0500, Tel: 813-541-6681, TWX: 810-866-0433; FSC No.: 26795; Empl.: 485; *Sls. Mgr.:* Bruce W. Harting

ABALON PRECISION MFG., 1040 Home Street, Bronx, NY 10459, Tel: 212-589-5682; Empl.: 25; *Sls. Mgr.:* Norman C. Orent

abbott
WHEN RELIABILITY IS IMPERATIVE

ABBOTT TRANSISTOR LABS., Industrial Products Div., 8203 Vineland Ave., Sun Valley, CA 91352, Tel: 818-504-0644, Telex: 91-6101; Empl.: 30; *Sls. Mgr.:* Peter Batte ..... **D•1449, 1884-1885**

Local Sales Offices & Reps

CT Stamford, Dynamic Sls. 203-693-6567
MA Burlington, Dynamic Sls. of New England 617-272-5676
NJ Fort Lee, Abbott Transistor Labs. 201-461-4411
TX Richardson, Abbott Transistor Labs. .. 214-437-0697
VT S. Burlington, Dynamic Sls. 802-863-3928
Can North Vancouver, BC, Jerome & Francis Co. 604-986-1286

ABBOTT TRANSISTOR LABS., Power Supply Div., 5200 W. Jefferson Blvd., Los Angeles, CA 90016, Tel: 213-936-8185, Telex: 69-1398; FSC No.: 15755; Empl.: 500 ..... **D•1449-1461**

Local Sales Offices & Reps

FL Altamonte Springs, Gugel-Tuttle Assocs. Inc. 305-788-0845
NJ Ft. Lee, Abbott Transistor Labs. 201-461-4411
TX Richardson, Abbott Transistor Labs. .. 214-437-0697

ABBOTT TRANSISTOR LABS., Transformer Div., 639 So. Glenwood Pl., Burbank, CA 91506, Tel: 818-841-3630, Telex: 69-6282; FSC No.: 58910; Empl.: 50; *Sls. Mgr.:* P. Ferrari ..... **A•2102-2108**

Local Sales Offices & Reps

AL Huntsville, The Novus Grp. 205-881-2207
CT Stamford, Dynamic Sls. 203-693-6567
FL Altamonte Springs, Gugel-Tuttle Assocs. Inc. 305-788-0845
GA Norcross, The Novus Grp. 404-939-1135
IL Hinsdale, Palatine Engrg. & Sls. (CKC) 312-655-0668
IA Cedar Rapids, Palatine Engrg. & Sls., Inc. 319-365-8071
KS Mission, Palatine Engrg. & Sls., Inc. ... 913-831-0555
MA Burlington, Dynamic Sls. 617-272-5676
MN Spring Lake Park, Holmgren Assocs., Inc. 612-786-7641
MO Hazelwood, Palatine Engrg. & Sls., Inc. 314-839-0800
NJ Ft. Lee, Abbott Transistor Labs. 201-461-4411
TX Richardson, Abbott Transistor Labs. .. 214-437-0697
VT S. Burlington, Dynamic Sls. 802-863-3928
Can Rexdale, Ontario, Source Elctrns., Ltd. 416-675-6235

ABLE POWER AND ENGINEERING INC., 335 S. New Ave., # H, Monterey Park, CA 91754, Tel: 714-891-3568; *Sls. Mgr.:* Joe Chou; *Dist. Mgr.:* Bob Barrio

ABLESTIK LABORATORIES, 833 W. 182nd St., Gardena, CA 90248, Tel: 213-532-9341, TWX: 910-346-7606; FSC No.: 21109; Empl.: 100; *Sls. Mgr.:* D. W. Lefever

ABRAMS INSTR. CORP., P.O. Box 26007, Lansing, MI 48909, Tel: 517-332-6405, TWX: 810-251-0785; FSC No.: 00048; *Sls. Mgr.:* Merlyn Gates

ACCARDI LABORATORIES, 66-45 69th St., Middle Village, NY 11379, Tel: 212-326-0570; *Sls. Mgr.:* Leonard Carney

ACC ELECTRONICS, 1300 W. Oak, Independence, KS 67301, Tel: 316-331-1000, Telex: 436483; FSC No.: 316-331-0660; Empl.: 1000; *Sls. Mgr.:* Leon Allen ..... **A•1659**

Local Sales Offices & Reps

MI Troy, C. B. Jensen & Assoc. 313-643-0506

ACCESSORIES FOR ELCTRNS., INC., 800 Merrick Rd., Baldwin, NY 11510-3593, Tel: 516-546-1751; FSC No.: 54355; Empl.: 20; *Sls. Mgr.:* Angela Calabro

ACCUDYNE CORP., P.O. Box 1429, Janesville, WI 53547, Tel: 608-752-9081; FSC No.: 18356; Empl.: 276; *Sls. Mgr.:* R. E. Mowris; *Dist. Mgr.:* R. E. Mowris

ACCUGRAPH CORP., 50 Gervais Drive, Suite 204, Don Mills, ONT, Canada M3C 1Z3, Tel: 416-441-2211, TWX: 06 986 766 TOR; Empl.: 23; *Sls. Mgr.:* Mr. David V. McDonald

ACCUMET ENGRG., 518 Main St., Hudson, MA 01749, Tel: 617-568-8311; *Sls. Mgr.:* J. B. Snook

Local Sales Offices & Reps

CA Los Altos, Stout Inds. 415-949-0440
CA Malibu, R. L. Comps. 213-456-9021
MD Pasadena, Spectro-Lambda 301-437-7633
NJ East Windsor, Micro-Lambda 609-443-3113
NY Chappaqua, Micrel 914-238-4961

ACCUPROBE, INC., 1 Harrison Ave, Box 1044, Salem, MA 01970, Tel: 617-745-7878, Telex: 882194 Accuprobe UD; Empl.: 26; *Sls. Mgr.:* Dana B. Lee; *Dist. Mgr.:* T. H. Murphy

ACCURASSEMBLY, 9525 Cozycroft Ave., Chatsworth, CA 91311, Tel: 818-700-0708

ACCURATE ELCTRNS., 169 S. Abbe Rd., P.O. Box 1287, Elyria, OH 44036, Tel: 216-365-1211, Telex: 469705; FSC No.: 11375;13625; Empl.: 35

ACCURIDE, 12311 S. Shoemaker, Santa Fe Springs, CA 90670, Tel: 213-944-0921; *Sls. Mgr.:* Mike Hart; *Dist. Mgr.:* Bill Kniegge

ACCUSONIC SYSTEMS CORP., 12 Kulick Rd., Fairfield, NJ 07006, Tel: 201-575-1570; FSC No.: 5965;12606; Empl.: 45; *Sls. Mgr.:* Dennis Goodman

ACCUTEST, 25 Industrial Ave., Chelmsford, MA 01824, Tel: 617-256-8124, TWX: 710-347-0620; Empl.: 300; *Sls. Mgr.:* Tom Emery

ACCUTRONICS/CONNOR-WINFIELD, See Connor-Winfield

ACDC ELECTRONICS, 401 Jones Rd., Oceanside, CA 92054, Tel: 619-757-1880, TWX: 910-322-1470; Empl.: 750; *Sls. Mgr.:* Larry Slagal; *Dist. Mgr.:* Ray Brown

ACD-ELCOR PRODUCTS, P.O. Box 244, Bethel, CT 06801, Tel: 203-743-3510; Empl.: 3

ACHESON COLLOIDS, P.O. Box 288, Port Huron, MI 48060, Tel: 313-984-5581, TWX: 810-231-5265; Empl.: 150; *Sls. Mgr.:* Richard Doehring

ACI DATA PRODUCTS, 17921 Sampson Ln., Huntington Beach, CA 92647, Tel: 714-842-2945, Telex: 655328; Empl.: 10; *Sls. Mgr.:* J. Rogers

A.C. INTERFACE, 17911 Sampson, Huntington Beach, CA 92647, Tel: 714-841-6090, Telex: 655-328; Empl.: 23; *Sls. Mgr.:* R. D. Henwood; *Dist. Mgr.:* Wayne Neal

ACL INC., 1960 E. Devon Ave., Elk Grove, IL 60007, Tel: 312-981-9212; Empl.: 8

ACME CHEMICALS & INSULATION CO., Div. of Allied Products Corp., 166 Chapel St., New Haven, CT 06513, Tel: 203-562-2171, Telex: 295503 Acme UR; Empl.: 75; *Sls. Mgr.:* Marvin Leonard

ACME ELEC. HEATING CORP., 4685 E. 11th, Hialeah, FL 33013, Tel: 305-685-8326; Empl.: 12

ACME MODEL ENGRG. CO., 654 Bergen Blvd., Ridgefield, NJ 07657, Tel: 201-943-7650; Empl.: 29

ACOPIAN, Box 638, Easton, PA 18044, Tel: 215-258-5441, TWX: 510-651-4919; FSC No.: 14749; *Sls. Mgr.:* T. Skopal ..... **D•1463-1497**

Local Sales Offices & Reps

FL Melbourne, Acopian 305-727-1172
MD Ellicott City, Doss Elctrns. 301-465-1336

ACOUSTIC POWER SYS., 2151 Las Palmas Dr., Ste. G, Carlsbad, CA 92008, Tel: 619-438-4848, Telex: 67-8401; Empl.: 5

ACQUIS COMMUNICATIONS, 17192 Gillette Ave., Irvine, CA 92714, Tel: 714-250-4964; *Sls. Mgr.:* Patrice Garner

ACRODYNE CONTROLS, See Accudyne Corp.

ACROMAG, 30765 Wixom Rd., Wixom, MI 48096, Tel: 313-624-1541, Telex: 247354; Empl.: 110; *Sls. Mgr.:* Bill Carey

Local Sales Offices & Reps

AZ Tempe, Aldrich Indl. Controls, Ltd. 602-945-8598
CA Costa Mesa, FLW, Inc. 714-751-7512
CA Walnut Creek, Sharman, Inc. 415-947-5757
CO Lakewood, Technical Mktg. Mfg. 303-232-1516
FL Ruskin, Leroy E. Rogers 813-645-1453
GA Atlanta, R. Freeman Assocs. 404-938-1227
IL Hoffman Estates, Carvel Engrg. & Sls. Co. 312-885-8800
IN Indianapolis, Process Controls Corp. .. 317-259-1316
IA Cedar Rapids, Dy-Tronix 319-377-8275
KS Shawnee Mission, D. Allert Co. 913-831-4244
LA Baton Rouge, Devitt Pancoast Controls Co. 504-291-0074
MD Cockeysville, Koch/Assoc. 301-666-7400
MA Norwell, Bordewieck Engrg. & Sls. Co. 617-659-4915
MI Negaunee, The Shertron Co. 906-475-5234
MI Troy, George R. Peters & Assocs. 313-362-1200
MN Cedar, Bican Co. 612-434-7733
MO Bridgeton, Dy-Tronix 314-291-4777
NJ Blackwood, J. Koch/Assocs. 609-227-5000
NY Buffalo, Chippewa Instrs., Inc. 716-838-5050
NY E. Syracuse, Analog Instrs., Inc. 315-437-8413
NY New York, Flowmaster Controls Co. .. 212-741-9675
NC Matthews, W.K. Hile Co. 704-847-9125
OH Cincinnati, George Drysdale & Assocs. 513-528-2200
OH Cleveland, Jay Indl. Sls. Co. 216-831-9393
OK Tulsa, Dave Allert Co. 918-743-7705
OR Portland, McLaren, Inc. 503-297-2248
PA Bridgeville, Instr. Svcs. 412-221-3601
PA Erie, Instrument Svcs. 814-455-1969
TN Knoxville, Hile Controls of Tenn. 615-584-0208
TN Memphis, Mel Watson Co. 901-345-0890
TX Corpus Christi, Collier Equip. Co. 512-289-6181
TX Irving, DACO/Dave Allert Co. 214-986-1506
TX Sugar Land, Pan-Tech Engrg. Co. 713-240-1220
UT West Jordan, Specialty Sls. Co. 801-561-0222
VA Chester, Hile Controls of Virginia 804-796-3001
WA Bellevue, McLaren, Inc. 206-454-3400
WV Charleston, Instr. Svcs. 304-345-0348
WI New Berlin, Carvel Engrg. & Sls. Co. .. 414-784-7007

ACROMARK, 60 Locust/Dept. 397, Berkeley Hgts., NJ 07922, Tel: 201-464-6474; Empl.: 50

ACTION INSTRS., 8601 Aero Dr., San Diego, CA 92123, Tel: 619-279-5726, TWX: 910-335-2030; Empl.: 230; *Sls. Mgr.:* Frank Williams

ACTIVAIR, Duracell, Inc., 2777 Eagandale Blvd., Eagan, MN 55121, Tel: 612-681-4200, Telex: 297-486; Empl.: 100; *Sls. Mgr.:* H. T. Ross; *Dist. Mgr.:* H. T. Ross

ACTIVE CONTROL INSTRMN., P.O. Box 243-Wildwood Circle, Key Largo, FL 33037, Tel: 305-451-1000; FSC No.: 55116; Empl.: 6 ..... **D•1109**

AC TRANSFORMER, 89 Madison St., Newark, NJ 07105, Tel: 201-589-8574; Empl.: 13; *Sls. Mgr.:* George Giangrande

ACUREX-AUTODATA, 555 Clyde, Mountain View, CA 94039, Tel: 415-964-3200, Telex: 34-6391, TWX: 910-379-6593; Empl.: 1000; *Sls. Mgr.:* Don Willett

ACUSHNET CAPACITOR CO., INC., 720 Belleville, New Bedford, MA 02741, Tel: 617-999-3291, TWX: 710-344-6451; FSC No.: 61152; Empl.: 300

ACUSHNET ELCTRNS. CO., INC., 8700 E. Thomas Rd., Scottsdale, AZ 85252, Tel: 602-947-7474, TWX: 910-950-1320

ADAC CORP., 70 Tower Office Pk., Woburn, MA 01801, Tel: 617-935-6668, Telex: 951802; Empl.: 80; *Sls. Mgr.:* Les Silvern ..... **D•1135**

Local Sales Offices & Reps

AZ Phoenix, RML Assocs. 602-246-0321
CA Los Angeles, ADAC Corp. 213-476-6535
CA Redwood City, ADAC Corp. 415-366-4300
CO Denver, RML Assocs. 303-757-6654
FL Orlando, E. G. Holmes & Assocs. 305-894-8901
FL Palm Bay, E. G. Holmes & Assocs. 305-723-7339
GA Chamblee, E. G. Holmes & Assocs. 404-451-6161
IL Bloomingdale, ADAC Corp. 312-980-3191
IL Hoffman Estates, Carvel Engrg. & Sls. Co. 312-885-8800
KS Overland Park, Ramsey Assocs. 913-649-6996
MI Madison Hgts., WKM Assocs. 313-588-2300
MN Edina, Carvel Engrg. & Sls. Co. 612-835-7929
MO St. Louis, Ramsey Assocs. 314-878-5042
NJ Pennsauken, Sci-Reps 609-662-5222
NM Rio Ranch, RML Assocs. 505-892-2385
NY DeWitt, DB Assocs. 315-446-0220
NY White Plains, Cane Tech Sls. 914-694-9240
NC Carey, E. G. Holmes & Assocs. 919-469-8850
OH Dayton, WKM Assocs. 513-434-7500
OH Independence, WKM Assocs. 216-524-5930
OR Portland, Brett-Ross 503-256-9727
PA Pittsburgh, WKM Assocs. 412-892-2953
TX Houston, ADAC Corp. 713-771-9347
UT Salt Lake City, RML Assocs. 801-942-4468
VA Fairfax, Sci-Reps 703-385-0600
WA Redmond, Brett-Ross 206-882-4822
WI New Berlin, Carvel Engrg. & Sls. Co. .. 414-784-7007

ADALET-PLM DIV, Div. Scott & Fetzer Co., 4801 W. 150th St., Cleveland, OH 44135, Tel: 216-267-9000, Telex: 98-5349; FSC No.: 73389; Empl.: 177; *Sls. Mgr.:* J. L. Smelko

ADAMS-MAXWELL DIVISION, Coast Magnetics, 1207 North La Brea Ave., Inglewood, CA 90302, Tel: 213-673-3245, Telex: 686103; FSC No.: 22558; Empl.: 55; *Sls. Mgr.:* H. Adams

ADAMS RITE PRODS., INC., 540 W. Chevy Chase Dr., Glendale, CA 91204, Tel: 818-241-5121, TWX: 910-497-2276; Empl.: 130

ADAMS-RUSSELL, Antenna & Microwave Div., Haverhill Rd., Amesbury, MA 01913, Tel: 617-388-5210, TWX: 710-347-6360; FSC No.: 11556; Empl.: 350; *Sls. Mgr.:* David W. Ryan

ADAMS-RUSSELL, Anzac Div., 80 Cambridge St, Burlington, MA 01803, Tel: 671-273-3333, Telex: 200155, TWX: 710-332-0258; FSC No.: 21912; Empl.: 300; *Sls. Mgr.:* Julian D. Parker

ADAMS RUSSELL, Modpak Div., 80 Cambridge St, Burlington, MA 01803, Tel: 617-273-3333, TWX: 710-332-0258; FSC No.: 21912; Empl.: 1; *Sls. Mgr.:* Pat Corrigan

ADAMS-RUSSELL, Parisi Div., 280 Bear Hill Rd., Waltham, MA 02154, Tel: 617-890-0055, TWX: 710-324-6450; FSC No.: 27965; Empl.: 8; *Sls. Mgr.:* J. M. Caputo

ADAPTER/CHARGER PRDTS., Box 3218, Peoria, IL 61614, Tel: 309-691-0810; Empl.: 50

ADAPTIVE INTELLIGENCE, 1401 McCarthy Blvd., Milpitas, CA 95035, Tel: 408-262-7222; *Sls. Mgr.:* Jim Breen

ADAPTIVE SCIENCE, 4700 San Pablo Ave., Emeryville, CA 94608, Tel: 415-652-1805; FSC No.: 7379; Empl.: 26; *Sls. Mgr.:* Jesse Huffman

ADATEK, INC., P.O. Box 1339, Sandpoint, ID 83864, Tel: 208-263-1471, 800-323-3343; Empl.: 13; *Sls. Mgr.:* Kim Jones or Ray Pelland; *Dist. Mgr.:* Janis Chilton

ADC MAGNETIC CONTROLS CO., 4900 W. 78th St., Minneapolis, MN 55435, Tel: 612-835-6800, Telex: 290321; Empl.: 2000; *Sls. Mgr.:* Jack Brandmueller

ADCOTECH, 1980 Tarob Ct., Milpitas, CA 95035, Tel: 408-943-9430, TWX: 910-338-2333; Empl.: 125; *Sls. Mgr.:* Bill Sendell

ADC PRODS., 4900 W. 78th St., Minneapolis, MN 55435, Tel: 612-835-6800, TWX: 910-576-2832; Empl.: 1,435

ADDACON, INC., 3702-C Alliance Dr., Greensboro, NC 27407, Tel: 919-852-6200, TWX: 510-922-7361; *Sls. Mgr.:* Lynn Cummings

A.D. DATA SYS., Techtran Industries, 200 Commerce Dr., Rochester, NY 14623, Tel: 716-334-9649, TWX: 510-253-3246; Empl.: 35; *Sls. Mgr.:* Jack Petz

ADDELCO CORP., Advanced Dev. Elctrns. Div., 20 Freeman Pl., Needham, MA 02192, Tel: 617-444-4754, TWX: 710-325-0370; Empl.: 23; *Sls. Mgr.:* Alan LeMay; *Dist. Mgr.:* M. B. Polayes

ADDINGTON LABS. INC., SOLID STATE PRODS DIV., See Eaton Corp. Comm. Prods. Div.

ADDITIVE PRODUCTS DIV., Kollmorgen Corp., P.O. Box 700, West La., Aquebogue, NY 11931, Tel: 516-722-4100, TWX: 510-220-0022; Empl.: 450

ADDMASTER CORP., 416 Junipero Serra Dr., San Gabriel, CA 91776, Tel: 818-285-1121, Telex: 67-4770; Empl.: 200; *Sls. Mgr.:* Larry Wirtz

ADE, INC., 1560 E. 98th St., Chicago, IL 60628, Tel: 312-221-3400; FSC No.: 62049

ADELIE CORPORATION, 288 Walnut Street, Newtonville, MA 02160, Tel: 617-965-8480; Empl.: 35; *Sls. Mgr.:* Albert R. Vandam

ADI ELECTRONICS, INC., 160 Wilbur Place, Bohemia, NY 11716, Tel: 516-567-3555

ADHESIVE PRODS., 1660 Boone Ave., Bronx, NY 10460, Tel: 212-542-4600; *Sls. Mgr.:* M. S. Peters

ADIRONDACK WIRE & CABLE CO., INC., 1451 New Britain Ave., Farmington, CT 06032, Tel: 1-203-677-2657; Empl.: 150; *Sls. Mgr.:* Kenneth Stowell; *Dist. Mgr.:* Mary Anne Violette

ADRET/COMSTRON, See Comstron/Adret

ADTECH POWER INC., 1620 S. Sunkist St., Anaheim, CA 92806, Tel: 714-634-9211, Telex: 68-1498; FSC No.: 56410; Empl.: 70; *Sls. Mgr.:* C. C. O'Reilly; *Dist. Mgr.:* C. C. O'Reilly ..... **D•1499**

Local Sales Offices & Reps

CA Anaheim, Galaie Sls. Intl. 714-937-5622
CA Brea, Synertech 714-691-6123
CA Campbell, Sedillo Co. 408-374-5220
FL Melbourne, Reynolds & Assocs. 305-259-7000
MA Stoughton, Elctrn. Meas. Labs 617-341-0781
NY New York, Elctrn. Meas. Labs 212-706-4059
TX Garland, Carey, McMahill & Zerbe Co. 214-681-1414
TX Houston, Carey, McMahill & Zerbe Co. 713-771-1500
TX Round Rock, Carey McMahill & Zerbe Co. 512-255-1663
WA Bellevue, Al Smith Co. 206-746-6770
WA Vancouver, Al Smith Co. 206-892-9912

ADVANCE CONVERSION DEVICES CO., 274 S. Salem St., Randolph, NJ 07869, Tel: 201-989-0095; FSC No.: 52298; Empl.: 24; *Sls. Mgr.:* D. J. Fedderly ..... **D•1886-1887**

ADVANCED AUTOMATION CONCEPTS, INC., 3760 Lower Roswell Rd., Marietta, GA 30067, Tel: 404-973-0027, Telex: 703452; Empl.: 12; *Sls. Mgr.:* Bob Pap

ADVANCED CIRCUITRY, Litton Inds., 4811 W. Kearney, Springfield, MO 65803, Tel: 417-862-0751, TWX: 910-775-4705; Empl.: 1000; *Sls. Mgr.:* Steve Fadler

ADVANCED CIRCUIT TECHNLG., 118 N. Eastern Blvd., Nashua, NH 03062, Tel: 603-880-6000, TWX: 710-228-8961; FSC No.: 57034; Empl.: 125

Local Sales Offices & Reps

CA Mission Viejo, Advanced Circuit Technlg. 714-770-2637
FL Crystal River, Advanced Circuit Technlg. 904-795-3200

ADVANCED COATINGS & CHEM., Philip A. Hunt Chemical Corp., 4343 Temple City Blvd., Temple City, CA 91780, Tel: 818-579-6270, Telex: 675594; *Sls. Mgr.:* Tim Hughes

ADVANCED COLOR TECHNLG., 21 Alpha Rd., Chelmsford, MA 01824, Tel: 617-256-1222, Telex: 951-419; *Sls. Mgr.:* Jack Flynn

ADVANCED COMPONENTS INDS., INC., 114 Center St., El Segundo, CA 90245, Tel: 213-322-4249; *Sls. Mgr.:* Irma Spreitzer

ADVANCED CONTROL SYS., 24 Teed Dr., Randolph, MA 02368, Tel: 617-963-4543; Empl.: 6; *Sls. Mgr.:* Kenneth Egan

ADVANCED DETECTOR CORP., Applied Solar Energy Corp., 15251 E. Don Julian Rd., Industry, CA 91746, Tel: 818-369-6886, TWX: 910-584-4890; *Sls. Mgr.:* T. Scott Thorpe ..... **B•1203**

Local Sales Offices & Reps

AZ Tempe, Piper Sls. 602-949-0048
CA City of Industry, Advanced Detector Corp. 818-369-6886
CA Mountain View, Weseloh/Swanson Assocs. 415-961-0565
CO Longmont, Piper Sls. 303-651-2378
GA Norcross, Hollingsworth & Still, Inc. ... 404-447-1700
IL Buffalo Grove, Hill Sls. Corp. 312-541-0661
MA Sudbury, Poulin Assocs., Inc. 617-443-7333
MI Brooklyn, Engineered Comps., Inc. 517-592-3236
MN Minneapolis, Furber Sls. 612-881-3620
NJ Montclair, Controlyne, Inc. 201-746-8900
NC Fayetteville, Zim-Tek 919-488-4101
OR Portland, Component Technlg. 503-292-1518
PA Pittsburgh, Covert & Newman 412-531-2002
TX Richardson, Moore Assocs. 214-690-4929
UT Salt Lake City, Piper Sls. 801-466-9336
VA Fairfax, Beacon North, Inc. 703-591-1300

Local Distributors

AZ Tempe, Piper Sls. 602-949-0048
CA City of Industry, Advanced Detector Corp. 818-369-6886
CA Mountain View, Weseloh/Swanson Assocs. 415-961-0565
CO Longmont, Piper Sls. 303-651-2378
GA Norcross, Hollingsworth & Still, Inc. ... 404-447-1700
IL Buffalo Grove, Hill Sls. Corp. 312-541-0661
MA Sudbury, Poulin Assocs., Inc. 617-443-7333
MI Brooklyn, Engineered Comps., Inc. 517-592-3236
MN Minneapolis, Furber Sls. 612-881-3620
NJ Montclair, Controlyne, Inc. 201-746-8900
NC Fayetteville, Zim-Tek 919-488-4101
OR Portland, Component Technlg. 503-292-1518
PA Pittsburgh, Covert & Newman 412-531-2002
TX Richardson, Moore Assocs. 214-690-4929
UT Salt Lake City, Piper Sls. 801-466-9336
VA Fairfax, Beacon North, Inc. 703-591-1300

ADVANCED DEVICES, 1618 Camino Uva, Los Alamos, NM 87544, Tel: 505-662-7729

ADVANCED DIGITAL TECH, 13400 Northrup Wy Ste 27, Bellevue, WA 98005, Tel: 206-643-2382, TWX: 296 352 ADT UR; Empl.: 14; *Sls. Mgr.:* Brian T. Best; *Dist. Mgr.:* Matt Astengo

ADVANCED ELCTRNS. DESIGN, INC., 440 Potrero Ave., Sunnyvale, CA 94086, Tel: 408-733-3555, 800-538-1730 (outside CA), Telex: 357-498; *Sls. Mgr.:* Leon Drozdowski

ADVANCED ELECTRONIC PACKAGING, 2159 Bay St., Los Angeles, CA 90021, Tel: 213-622-9042; *Sls. Mgr.:* Douglas A. Hill

ADVANCED FILTER DEVICES, INC., 6241 Yarrow Dr., Ste. D, Carlsbad, CA 92008, Tel: 619-438-2074; FSC No.: 56620; Empl.: 45; *Sls. Mgr.:* Herbert Johnson

ADVANCED HIGH VOLTAGE CO., INC., P.O. Box 2136, Lancaster, CA 93539-2136, Tel: 213-997-7222; *Sls. Mgr.:* J. Richardson

ADVANCED INPUT DEVICES, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814, Tel: 208-765-8000, TWX: 510-776-0584; FSC No.: 95666; Empl.: 550; *Sls. Mgr.:* Larry May

ADVANCED INTERCONNECTIONS CORP., 5 Division St., Warwick, RI 02818, Tel: 401-885-0485, TWX: 710-382-0400; FSC No.: 05-0394638; *Sls. Mgr.:* Max E. Rice

ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, CA 92627, Tel: 714-646-7165, Telex: 18-2714; Empl.: 32; *Sls. Mgr.:* R. L. Gradishar

ADVANCED MATERIALS SYSTEMS, See Handy & Harman Electronic Materials Corp.

ADVANCED MICROCOMPUTERS, 3340 Scott Blvd., Santa Clara, CA 95051, Tel: 408-732-2400, Telex: 34-6306, TWX: 910-339-9280; *Sls. Mgr.:* Steve Zelencik; *Dist. Mgr.:* Rick Marz

ADVANCED MICRO DEVICES, P.O. Box 3453, 901 Thompson Pl., Sunnyvale, CA 94088, Tel: 408-732-2400, Telex: 34-6306, TWX: 910-339-9280; Empl.: 11000; *Sls. Mgr.:* Steve Zelencik; *Dist. Mgr.:* Michael Furman

ADVANCED SYS. CONCEPTS, 435 N. Lake Ave., Pasadena, CA 91101, Tel: 818-793-8971, Telex: 701 215 ASCI; *Sls. Mgr.:* Wesley Ferris; *Dist. Mgr.:* B. Lee ..... **D•1137**

Local Sales Offices & Reps

IA Des Moines, Beams Co. 515-255-1148
MN Edina, Integrated Peripheral Sys. 612-831-0349
OH Dayton, Ashby Assocs. 513-252-5627
VA Vienna, Advanced Technlg. Assocs. .. 703-556-0500

ADVANCED TECHN. RESEARCH LABS., 5645 K General Washington Dr., Alexandria, VA 22312, Tel: 703-750-2920; Empl.: 12; *Sls. Mgr.:* Bob Palma, Sr.; *Dist. Mgr.:* Bob Palma, Sr.

ADVANCED TOOL TECHNOLOGY, INC., Sub. of Alliance Resch. Corp., 18217 Parthenia St., Northridge, CA 91325, Tel: 213-993-1202, Telex: 181011; *Sls. Mgr.:* Lou Davis

ADVANCE ENGRG., 18225 So. Hoover St., Gardena, CA 90248, Tel: 213-321-3100

AD-VANCE MAGNETICS, INC., 625 Monroe St., Rochester, IN 46975, Tel: 219-223-3158, TWX: 810-290-0294; FSC No.: 50788; Empl.: 30; *Sls. Mgr.:* Kay Nixon ..... **C•1720**

Local Sales Offices & Reps

AL Huntsville, Remco 205-533-3763
CA El Cajon, A-Tronics 619-444-1501
CA Los Altos, Frauman Assoc. 415-941-0660
CA Woodland Hills, A-Tronics 213-703-7212
CT Meriden, A. Allison 203-481-0405
FL Orlando, Gillum Sales 305-857-2110
GA Atlanta, Remco 404-447-6937
IL Westchester, Brouillette 312-345-6500
MN Edina, J. H. Hanson 612-893-9960
NY Commack, RC Engrg. 516-543-3325
NC Raleigh, Remco 919-847-5079
OH Cincinnati, Makin Assocs. 513-871-2424
PA W. Conshohocken, Eastern Comps. ... 215-825-8610
TX Houston, Space Elctns. 713-266-9245
TX Irving, Space Elctns. 214-251-3636
VA Herndon, Eastern Comps. 703-368-3936

ADVANCE WIRE & CABLE, 1661 Industrial Way, Belmont, CA 94002, Tel: 415-592-4550, Telex: 334475; FSC No.: 57775; Empl.: 158; *Sls. Mgr.:* Ed Mittelbusher; *Dist. Mgr.:* Ed Mittelbusher

Local Sales Offices & Reps

AL Decatur, Tenn Tech, Inc. 205-350-0630
AZ Phoenix, Advance Elctrl. Sls. 602-243-4326
CA Belmont, Advance Elctrl. Sls. 415-592-4550
CO Denver, Advance Elctrl. Sls. 303-388-0923
FL Palm Bay, R-Rep Co. 305-725-6993
GA Atlanta, Tenn Tech, Inc. 404-622-5784
IL Arlington Heights, Brainard-Wilson Mktg. 312-437-2700
IN Carmel, Brainard-Wilson Mktg. 317-844-2800
KY Fort Mitchell, G. W. Thelen Co. 606-341-8181
MD Hunt Valley, Phoenix Elctrn. Sls. 301-628-2066
MA Sharon, Adcour, Inc. 617-784-8123
MI Pontiac, Matrix Elec. 313-338-7770
MN Minneapolis, Jos-Co/Melius, Inc. 612-861-3343
NJ Parlin, JMR Sls. 201-727-5335
NJ Sicklerville, Brown Assocs. 609-629-2240
NY Camillus, Ontec 315-672-8409
NY East Setauket, JMR Sls., Inc. 516-689-8871
NY Rochester, Ontec 716-464-8636
NY Wappingers Falls, Ontec 914-462-7374
NC Raleigh, Tenn-Tech, Inc. 919-266-3610
OH Medina, G. W. Thelen Co. 216-723-1293
TN Nashville, Tenn-Tech, Inc. 615-646-9811
TX Houston, Advance Elctrl. Sls. 713-956-5436
WA Seattle, Advance Elctrl. Sls. 206-575-4323
WI Waukesha, Brainard-Wilson Mktg. 414-797-7940

A E CORP., 65 Wellesley Ave., Needham, MA 02194, Tel: 617-449-3142; Empl.: 10; *Sls. Mgr.:* H. Harrison

A E G TELEFUNKEN, High Power Grp., Rte. 22, Orr Dr., Somerville, NJ 08876, Tel: 201-722-9800, Telex: 833409; *Sls. Mgr.:* John Szafranski

A E G TELEFUNKEN, Semiconductor Grp., Rte. 22, Somerville, NJ 08876, Tel: 201-722-9800, Telex: 833409; *Sls. Mgr.:* Carl Golasa; *Dist. Mgr.:* Thomas Carlisle

AEL, INC, See American Electronic Labs

AEMC, 99 Chauncy, Boston, MA 02111, Tel: 617-451-0227, 800-343-1391, Telex: 95-1073; *Sls. Mgr.:* Jon Henderson

AEROCOM, 405 Tasman Dr., Sunnyvale, CA 94086, Tel: 408-744-1320, TWX: 910-339-9308; Empl.: 50; *Sls. Mgr.:* H. Putnam

AEROCOM, 3090 S.W. 37th Ave., Miami, FL 33133, Tel: 305-448-6503, Telex: 51-9209; FSC No.: 81535; Empl.: 100; *Sls. Mgr.:* Thomas A. Coleman

AEROFLEX LABS., INTEGRATED MICROSYSTEMS DIV., See Aeroflex Labs., Microelectronics Div.

AEROFLEX LABS., MAGNETIC PRODS. DIV., 35 South Service Road, Plainview, NY 11803, Tel: 516-694-6700, TWX: 510-224-6417; Empl.: 490; *Sls. Mgr.:* Robert M. Slatkin ..... **B•1131, 1779**

Local Sales Offices & Reps

EXP New York, Henley Overseas Sls., Inc. 212-687-9390

AEROFLEX LABS., MICROELCTRNS. DIV., 35 S. Service Rd., Plainview, NY 11803, Tel: 516-694-6700, TWX: 510-224-6417; FSC No.: 88379; Empl.: 100; *Sls. Mgr.:* Melvin D. Schwartz ..... **A•1660**

Local Sales Offices & Reps

AZ	Phoenix, The Knight Co.	602-994-1311
CA	Los Altos Hills, HB Mktg.	415-941-4080
CA	Los Angeles, The Knight Co.	213-670-2833
CA	San Diego, The Knight Co.	714-451-0529
CO	Parker, Parker Webster Co.	303-841-4888
CT	Simsbury, Multitronics Sls. Co.	203-651-0140
FL	Altamonte Springs, R. W. Mitscher Co., Inc.	305-788-6844
FL	Boca Raton, R. W. Mitscher Co., Inc.	305-368-3841
IL	Northfield, Feller Assocs., Inc.	312-446-8065
IA	Cedar Rapids, Feller Assocs., Inc.	319-364-0566
MD	Baltimore, Micro Comp, Inc.	301-247-0400
MI	Detroit, Electro Sls.	313-474-7320
MI	Kalamazoo, Electro Sls.	616-323-2416
MN	Minneapolis, International Elctrns, Inc.	612-571-0000
NJ	Cherry Hill, Danco Elctrn. Sls. Corp.	609-424-5590
NJ	Teaneck, T.J. Squared	516-864-2263
NY	Albany, Nu-Tekneex Mktg.	518-355-1829
NY	Hartsdale, T.J. Squared	516-864-2263
OH	Dayton, Electro Sls.	513-426-5551
TX	Garland, Tesco Inc.	214-681-1376
UT	Salt Lake City, Parker Webster Co.	801-266-9939
EXP	New York City, New York, Henley & Co.	212-687-9390

AEROSPACE OPTICS, INC., 3201 Sandy La., Fort Worth, TX 76112, Tel: 817-451-1141, Telex: 75-8461; Empl.: 83; *Sls. Mgr.:* R. E. Borkowski

AEROTECH, INC., 101 Zeta Dr., Pittsburgh, PA 15238, Tel: 412-963-7470, TWX: 710-795-3125; Empl.: 150; *Sls. Mgr.:* Robert Mitchell

Local Sales Offices & Reps

CA	Hermosa Beach, Aerotech West	213-376-9698
CA	Sunnyvale, Aerotech Northwest	408-738-1220
CT	Farmington, Aerotech Northeast	203-673-3330
FL	Winter Park, McMahan Assocs.	305-645-0463
MD	Rockville, Spectro Assoc.	301-279-2010
NM	Albuquerque, G. Moore Assocs.	505-262-1416
NC	Raleigh, McMahan/Zellman Assoc.	919-848-1965
OH	Columbiana, Aerotech Midwest	216-482-9957
TX	Richardson, John Moore Assocs.	214-690-4929

AEROTRONIC ASSOCS., INC., Riverside Dr., Contoocook, NH 03229, Tel: 603-746-4631; FSC No.: 67272; Empl.: 225; *Sls. Mgr.:* Gary Moravchik

AERTECH INDS., See TRW Microwave

AES CORP., 285 Newbury St., P.O. Box 2093, Peabody, MA 01960, Tel: 617-535-7310, Telex: 387852 AES CORP INTL; *Sls. Mgr.:* James F. West

A.E.S INTERCONNECTS, Box 248, Plainfield, IN 46168, Tel: 317-272-2551; FSC No.: 00529; Empl.: 150; *Sls. Mgr.:* Jim Barnes

AETNA ENGRG., P.O. Box 7749, Van Nuys, CA 91409-7749, Tel: 818-341-9409; Empl.: 6; *Sls. Mgr.:* T. W. Collins

AETNA TELECOMMUNICATIONS LABS., P.O. Box 723, 131 Flanders Rd., Westborough, MA 01581, Tel: 617-366-0400, Telex: 951356; *Sls. Mgr.:* Marjorie Katz

AFI/DATATROL, Addressograph Farrington, Inc., Brent Dr., Hudson, MA 01749, Tel: 617-568-1411; Empl.: 350; *Sls. Mgr.:* Tom Galloway

AGFA-GEVAERT, INC., 275 North St., Teterboro, NJ 07608, Tel: 201-288-4100, TWX: 710-990-6137; Empl.: 750

AHAM TOR INC (ATI), 999, 27901 Front St., Rancho California, CA 92390, Tel: 714-676-4151

AIE MAGNETICS, Div. of Vernitron, 701 Murfreesboro Rd., Nashville, TN 37210, Tel: 615-244-9024, Telex: 554466; FSC No.: 06978; Empl.: 300; *Sls. Mgr.:* J. Holeman

AIKEN ADVANCED SYS., Amstar Technical Products Company, Inc., 5901 Edsall Rd., Alexandria, VA 22304-4197, Tel: 703-370-0900, TWX: 710-832-0612; FSC No.: 60590; Empl.: 250; *Sls. Mgr.:* C. G. Gilmer

Local Sales Offices & Reps

AZ	Tucson, Aiken Advanced Sys.	602-886-3219
CA	Saratoga, Interface Intl.	408-741-0265
CO	Colorado Springs, J. Smith & Assocs.	303-597-5343
FL	Melbourne, Barkman & Assocs. Mktg.	305-254-1863
EXP	MALexington, R.J. Sickles Assocs.	617-682-5100
NM	Albuquerque, J. Smith & Assocs.	505-265-3406
NY	Brooklyn, Pensky Assocs.	718-763-4936
TX	Austin, Data Mktg. Assocs.	512-451-5174
TX	Dallas, Data Mktg. Assocs.	214-661-0300
TX	Houston, Data Mktg. Assocs.	713-780-2511
TX	San Antonio, Data Mktg. Assocs.	512-342-3031
Can	Guelph, Ont., VALCOM	519-824-3220

AIL, DIV. CUTLER-HAMMER, See Eaton Corp. AIL Div.

AILTEC DIV. CUTLER-HAMMER, See Eaton Corp., Elctrn. Instrmn. Div.

AIMSCO INC., 4000-4024 22nd Ave. W., Seattle, WA 98199-0056, Tel: 206-284-5563, TWX: 910-444-1333; Empl.: 30; *Sls. Mgr.:* C. Ernst; *Dist. Mgr.:* E. Chadwick

AIPHONE, 1700 130th St. NE, Bellevue, WA 98005, Tel: 206-455-0510, Telex: 32-0288; Empl.: 42; *Sls. Mgr.:* Jim Morrison

AIRBORN, INC., 4321 AirBorn Dr., Addison, TX 75001; Tel: 214-931-3200, Telex: 79-4200, TWX: 910-860-5230; FSC No.: 10400;Multiple; Empl.: 350; *Sls. Mgr.:* J. L. Wolbrink ..... **C•1111-1118**

Local Sales Offices & Reps

AZ	Tempe, Piper Sls. Co.	602-949-0048
CA	Los Angeles, Air Born	213-670-7983
CA	Mountain View, Serra Assocs.	415-964-4300
CA	No. Hollywood, R. A. Strassner	213-761-1231
CA	San Diego, Ohm Spun Elctrns.	619-695-8102
FL	Melbourne, Reynolds & Assoc.	305-259-7000
IL	Des Plaines, ESCO Assoc.	312-298-5310
IA	Cedar Rapids, Dytronix	319-377-8275
KS	Wichita, Dytronix	316-838-0884
MN	Bloomington, PWC	612-831-5999
MO	Bridgeton, Dytronics, Inc.	314-291-4777
NH	Nashua, Solla - Tronics	603-882-7146
NJ	Manville, Dynorep	201-685-0135
NM	Albuquerque, Piper Sls. Co.	505-883-9090
NY	Kingston, R.P. Kennedy Co.	914-876-2700
NY	Rochester, R.P. Kennedy Co.	716-271-6322
OH	Dayton, Electro-Com	513-898-5140
OR	Beaverton, Don Smith Sls. Co.	503-643-8020
WA	Seattle, Don Smith Sls. Co.	206-633-3160
Can	Montreal, Que., Willagen Elctrns.	514-331-4283
Can	Rexdale, Ont., Willagen Elctrns.	416-675-1821

Local Distributors

TX	Addison, AirBorn Distribution Service	214-931-3200

CONTINENTAL WIRT, 130 Jamesway, South Hampton, PA 18966, Tel: 215-355-7080

AIR ELECTRO SUPPLY, INC., 7700 Gloria Ave., Van Nuys, CA 91406, Tel: 213-873-6400, 818-988-4400, Telex: 66-2459, TWX: 910-495-1794

AIR/FLEX INDS. INC., 2422 Merced Ave., S. El Monte, CA 91733, Tel: 818-579-7060; FSC No.: 22782; *Sls. Mgr.:* Karl Thorp

AIRFLYTE ELCTRNS. CO., 56 New Hook Rd., Bayonne, NJ 07002, Tel: 201-436-2230, TWX: 710-729-4489; Empl.: 70; *Sls. Mgr.:* John Piret ..... **B•1128, 1132-1137**

Local Sales Offices & Reps

CA	Culver City, Westaironics	213-641-4122
CA	Los Altos, Poltronics	415-941-3020
CT	No. Haven, Kitchen & Kutchin	203-239-0212
IL	Park Ridge, Probe Elctrns.	312-698-2044
MA	Lexington, Kitchen & Kutchin	617-862-8230
NJ	Kinnelon, Avionics Equip.	201-838-8105
NY	Rochester, R. P. Kennedy Co.	716-271-6322
PA	Philadelphia, R. P. Luce & Co.	215-884-8365
TX	Dallas, Jacobson Co.	214-363-7584

AIR LAND SYSTEMS CORPORATION, 2710 Prosperity Ave., Fairfax, VA 22031, Tel: 703-573-1100, Telex: 710-833-1174, TWX: Airland Frax; Empl.: 35; *Sls. Mgr.:* Frank Glaspell

AIRMATIC-ALLIED, 185 Park Dr., Wilmington, OH 45177, Tel: 513-382-1691; Empl.: 150

AIR MAZE CORP., 25000 Miles Rd., Cleveland, OH 44128, Tel: 216-292-6800, Telex: 98-5413; Empl.: 300; *Sls. Mgr.:* John Cummings; *Dist. Mgr.:* Bob Glasier

AIR-O-TRONICS PRODS., Box K, Morrisville, NY 13408, Tel: 315-684-3705; FSC No.: 16663; Empl.: 10; *Sls. Mgr.:* G. M. Trush

AIRPAX CORP., Woods Rd., Cambridge, MD 21613, Tel: 301-228-4600, Telex: 8-7715, TWX: 710-865-9655; FSC No.: 81541; Empl.: 550; *Sls. Mgr.:* D. Marshall ... **B•1226**

Local Sales Offices & Reps

AL	Huntsville, BCI	205-539-4411
AZ	Phoenix, Westrep	602-997-8899
CA	Pico Rivera, Westrep	213-949-2551
CA	San Diego, Westrep	714-276-0751
CO	Littleton, Lange Sls.	303-795-3600
CT	Wallingford, Selmark Assocs.	203-573-9088
FL	Ft. Lauderdale, ElectroComp	305-491-4141
GA	Chamblee, BCI	404-455-0405
IL	Palatine, Somers-Reagan, Inc.	312-991-1108
IN	Indianapolis, Leslie M. Devoe	317-842-3245
IA	Marion, Rep Assocs.	319-373-0152
MD	Baltimore, Pro-Rep, Inc.	301-653-3600
MA	Millis, Selmark	617-376-2914
MI	Troy, Pine Sls.	313-589-0350
MN	Hopkins, Peterson & Wolff	612-941-5400
MO	St. Louis, Delltron	314-869-4779
NY	Jericho, Airpax Corp.	516-822-2410
NY	Poughkeepsie, C. W. Floring	914-471-2973
NY	Rochester, Airpax Corp.	716-654-7470
NY	Syracuse, C.W. Floring & Assoc.	315-478-2144
NC	Winston-Salem, L.G. White	919-725-3612
OH	Cincinnatti, Baehr, Greenleaf	513-891-3826
OH	Cleveland, Baehr, Greenleaf	216-221-9030
OH	Columbus, Baehr, Greenleaf	614-486-4046
PA	Harleysville, T. Jackson	215-643-5560
PA	Pittsburgh, Russell F. Clark	412-242-9500
SC	Greenville, L.G. White	803-271-0630
TX	Dallas, Airpax Corp.	214-733-4377
UT	Salt Lake City, Lange Sls.	801-487-0843
VA	Richmond, L.G. White	804-740-7093
WA	Seattle, Don Smith	206-633-3160

AIRPAX CORP., Cheshire Div., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, Tel: 203-272-0301, Telex: 962421, TWX: 710-455-4048; Empl.: 800; *Sls. Mgr.:* John Ricardi ..... **B•1138; D•1110**

Local Sales Offices & Reps

AL	Huntsville, B.C.I.	205-539-4411
AZ	Phoenix, Westrep	602-997-8899
CA	Anaheim, Westrep	213-404-3881
CA	San Diego, Westrep	619-276-0751
CA	Santa Clara, Airpax Corp.	408-980-0410
CO	Littleton, Lange Sls.	303-795-3600
CT	Wallingford, Selmark Assocs.	203-573-9088
FL	Ft. Lauderdale, Electrocomp Assocs.	305-491-4141
GA	Chamblee, B.C.I.	404-455-0405
IL	Palatine, Somers-Reagan, Inc.	312-991-1108
IN	Indianapolis, Leslie M. Devoe	317-842-3245
IA	Marion, Rep Assocs.	319-373-0152
MD	Baltimore, Pro-Rep, Inc.	301-653-3600
MA	Millis, Selmark Assocs.	617-376-2914
MI	Madison Heights, Pine Sls, Inc.	313-589-0350
MN	Bloomington, PWC	612-831-5999
MO	St. Louis, Delltron	314-869-4779
NH	Hopkinton, Selmark Assocs.	603-746-3299
NY	Jericho, Airpax Corp.	516-822-2410
NY	Rochester, Airpax Corp.	716-654-7470
NY	Syracuse, C.W. Floring & Assocs.	315-478-2149
OH	Cleveland, Baehr, Greenleaf & Assocs.	216-221-9030
OH	Dayton, Baehr, Greenleaf & Assocs.	513-439-0724
PA	Harleysville, Thomas Jackson Assocs.	215-256-8877
PA	Pittsburgh, Russell F. Clark Co.	412-242-9500
SC	Greenville, L.G. White Southern, Inc.	803-271-0630
TX	Dallas, Airpax Corp.	214-733-4377
UT	Salt Lake City, Lange Sls.	801-487-0843
WA	Seattle, Don Smith Sls Co.	206-633-3160
WI	Wauwatosa, Larson Assocs.	414-258-0529

AIRPAX CORP., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313, Tel: 305-587-1100, Telex: 51-4448, TWX: 510-955-9866; Empl.: 200

AIRPAX CORP., FREDERICK DIV., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, Tel: 301-663-5141, TWX: 710-862-0901; Empl.: 600; *Sls. Mgr.:* Al Knezevich; *Dist. Mgr.:* B. L. Reeder ..... **B•1263, 1742**

Local Sales Offices & Reps

AL	Huntsville, B.C.I.	205-539-4411

AZ Phoenix, Westrep 602-997-8899
CA Anaheim, Westrep 213-404-3881
CA San Diego, Westrep 619-566-6580
CA Santa Clara, Airpax Corp. 408-980-0410
CO Littleton, Lange Sls. 303-795-3600
CT Clinton, Selmark Assocs. 203-573-9088
FL Deerfield Beach, Electrocomp Assocs. 305-429-0802
GA Chamblee, B.C.I. 404-455-0405
IL Palatine, Somers-Reagan 312-991-1108
IN Indianapolis, Leslie M. De Voe Co. 317-842-3245
IA Marion, Rep Assocs., Inc. 319-373-0152
MD Columbia, Pro-Rep, Inc. 301-992-7460
MA Millis, Selmark Assocs. 617-376-2914
MI Madison Heights, Pine Sls. 313-589-0350
MN Edina, PWC, Inc. 612-831-5999
MO St. Louis, Delltron Co. 314-869-4779
NH Hopkinton, Selmark Assocs. 603-746-3299
NY Jericho, Airpax Corp. 516-822-2410
NY Poughkeepsie, C.W. Floring Assocs. .. 914-471-2973
NY Rochester, Airpax Corp. 716-654-7470
NY Syracuse, C.W. Floring Assocs. 315-478-2149
NC Winston-Salem, L. G. White Southern 919-725-3612
OH Cleveland, Baehr, Greenleaf & Assocs. 216-221-9030
OH Columbus, Baehr, Greenleaf & Assocs. 614-486-4046
OH Dayton, Baehr, Greenleaf & Assocs. .. 513-439-0724
PA Harleysville, Thomas Jackson Assocs. 215-256-8877
PA Pittsburgh, Russell F. Clark Co. 412-242-9500
TX Dallas, Airpax Corp. 214-867-7741
UT Salt Lake City, Lange Sls. 801-487-0843
WA Seattle, Don Smith Sls. 206-633-3160
WI Wauwatosa, Larson Assocs. 414-258-0529

Local Distributors

CA Santa Ana, Norstan Elctrns. 714-540-4165
OK Tulsa, Altair 918-665-0524
TX Houston, Altair 713-462-3029
TX Richardson, Altair 214-231-5166

AIRPOT, 27 Lois St., Norwalk, CT 06851, Tel: 203-846-2021, Telex: 643-688; *Sls. Mgr.:* Mark A. Gaberman

AIRTRON, Litton Industries, Inc., 200 E. Hanover Ave., Morris Plains, NJ 07950, Tel: 201-539-5500, TWX: 710-986-7473; FSC No.: 80006; Empl.: 350

AIR-VAC ENGRG., 100 Gulf St., Milford, CT 06460, Tel: 203-874-2541; Empl.: 30

AJAX MAGNETHERMIC CORP., 1745 Overland Ave., N.E., Warren, OH 44482, Tel: 216-372-8511, Telex: 098-2482; Empl.: 500

AKG ACOUSTICS, INC., 77 Selleck St., Stamford, CT 06902, Tel: 203-348-2121; Empl.: 40; *Sls. Mgr.:* Peter Wellikoff

AKRO-MILS, 1293 S. Main St., Akron, OH 44301, Tel: 216-253-5593, Telex: 98-6321; Empl.: 200; *Sls. Mgr.:* W. J. Tonachio; *Dist. Mgr.:* D. Martin

ALADDIN ELCTRNS., See AIE Div. of Vernitron

ALAN GORDON ENTPRS., INC., P.O. Box 3914, 5362 Cahuenga Blvd., N. Hollywood, CA 91605, Tel: 818-985-5500, Telex: 662532 A-GB FOTO. LSA, TWX: 910-321-4526 GORDON NT LSA; *Sls. Mgr.:* D. Sahlenn

ALAN INDS., P.O. Box 1203, Columbus, IN 47201, Tel: 812-372-8869; FSC No.: 52750; Empl.: 36

Local Sales Offices & Reps

AL Huntsville, Saber Assocs. 800-327-0853
CA Los Angeles, RF Assocs. 213-478-1586
CA Palo Alto, RF Assocs. 415-494-3331
FL Bradenton, Saber Assocs. 800-327-0853
FL Longwood, Saber Assocs. 800-327-0853
FL Melbourne, Saber Assoc. 800-327-0853
GA Griffin, Saber Assocs. 800-327-0853
MD Randallstown, C. L. Malinow & Co. 301-922-2092
MA Needham, Addelco Corp. 617-444-4754
NY Liverpool, R. & D. Assocs. 315-457-0100
NY New Rochelle, Ascor Elctrns. 914-235-8838
NC Clayton, Saber Assocs. 800-327-0853
OH Dayton, Frederic L. Ohmer 513-434-1454
PA Lafayette Hill, M. Lader Co. 215-825-3177
SC Columbia, Saber Assoc. 800-327-0853
TX Dallas, Airep Elctrns. 214-349-4360
TX Houston, Airep Elctrns. 713-944-2055
EXP CT, Stamford, Dage Corp. 203-324-3123

ALARM CONTROLS, 19 Brandywine Dr., Deer Park, NY 11729, Tel: 516-586-4220; FSC No.: 55042; Empl.: 50; *Sls. Mgr.:* Howard Berger

ALASCO RUBBER & PLASTICS CORP., 617 Mountain View Ave. #7, Belmont, CA 94002, Tel: 415-595-4100; FSC No.: 13862; Empl.: 25; *Sls. Mgr.:* Philip K. Nordberg

ALBAR, INC., 19013 36th Ave. W., Lynnwood, WA 98036, Tel: 206-771-4006; Empl.: 20; *Sls. Mgr.:* Merv Eaton

ALBEROX, New Bedford Ind'l. Pk., New Bedford, MA 02745, Tel: 617-995-1725; Empl.: 140 ..... **C•1617**

Local Sales Offices & Reps

CA Los Gatos, Alberox Corp. 408-358-1714
IL Chicago, Karl D. Engle Co. 312-539-1820
IN Indianapolis, Butler Components 317-253-5143
MA Weston, J. Goode Assocs. 617-235-3900
MI Birmingham, Clifford Armstrong Co. ... 313-851-1404
MN Minneapolis, Magner & Assocs. 612-483-0656
NY Fayetteville, S. F. Foster Co. 315-637-5427
NY Valley Stream, Levison Sls. 516-561-9696
OH Cleveland, Greenleaf & Assocs. 216-333-5480
PA Philadelphia, Shelton Sls. Corp. 215-248-0131
TX Dallas, C. M. Farmer Co., Inc. 214-339-4970
WA Seattle, Demarest Assocs. 206-523-3210

ALCO ELCTRN. PRODS., INC., 1551 Osgood St., N. Andover, MA 01845, Tel: 617-685-4371, TWX: 710-342-0552; Empl.: 300 ..... **B•1481-1483**

Local Sales Offices & Reps

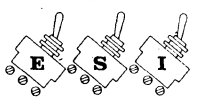
AL Huntsville, Glen White Assocs. Inc. 205-883-7938
AZ Phoenix, Knight Co. 602-582-8506
CA Los Angeles, Knight Co. 213-670-2833
CA Redwood City, J. Heaton Co. 415-367-9000
CA San Diego, Knight Co. 619-571-7903
CO Littleton, Simpson & Assocs. 303-794-8381
FL Safety Harbor, Augat/ALCO 813-725-1037
FL Tamarac, Augat/ALCO 305-721-6021
GA Norcross, Glen White Assocs. Inc. 404-441-1447
IN Indianapolis, Rockford Controls 317-248-2518
MA Norwood, Augat Sls. 617-762-3164
MI Livonia, Luebbe Sls. Co. 313-477-3131
MN St. Paul, Countryman Assocs. 612-645-9151
NM Albuquerque, C. T. Carlberg & Assoc. 505-888-3883
NY E. Rochester, Tri-Tech Elctrns. 716-385-6500
NY Endwell, Tri-Tech Elctrns. 607-754-1094
NY Fayetteville, Tri-Tech Elctrns. 315-446-2881
NY Fishkill, Tri-Tech Elctrns. 914-897-5611
NY Great Neck, Cooper-Simon & Co. Inc. 516-487-1142
NC Raleigh, Glen White Assocs. Inc. 919-787-7023
OH Cincinnati, Luebbe Sls. Co. 513-891-5770
OH Cleveland, Luebbe Sls. Co. 216-333-0425
OH Columbus, Luebbe Sls. Co. 614-431-0474
OH Dayton, Luebbe Sls. Co. 513-294-0426
OR Beaverton, D. Smith Sls. Co. 503-643-8020
PA Pittsburgh, Luebbe Sls. Co. 412-931-0414
PA Trevose, P.S.A., Inc. 215-245-0513
TN Gray, Glen White Assocs. Inc. 615-477-8850
TX Dallas, Augat/ALCO 214-788-4211
TX Georgetown, Augat/ALCO 512-479-9447
TX Houston, Augat/ALCO 713-495-3100
UT Midvale, Simpson Assocs. Inc. 801-566-3691
VA Lynchburg, P.S.A. Inc. 800-233-4242
VA McLean, P.S.A. Inc. 800-233-4242
WA Seattle, D. Smith Sls. Co. 206-633-3160

Local Distributors

AL Huntsville, Arrow Elctrns. 205-882-2730
AL Huntsville, Hall-Mark Elexs. 205-837-8700
AZ Phoenix, Hall-Mark Elexs. 602-437-1200
AZ Phoenix, Kachina Elctrns. 602-269-6201
AZ Tempe, Acacia Sls. 602-894-2874
AR Little Rock, Carlton-Bates 501-562-9100
CA Burbank, Switching Devices 213-849-3211
CA Chatsworth, Arrow Elexs. 213-701-7500
CA Gardena, CA Switch & Signal 213-770-2330
CA Hollywood, Yale Radio Electric 213-465-3186
CA Irvine, Acacia Sales 714-660-0834
CA Los Angeles, Electric Switch 213-664-1141
CA Mountain View, Abacus Elctrns. 415-961-1500
CA Newport Beach, Arrow Elexs. 714-851-8961
CA Palo Alto, Zack Elctrns. 415-326-5432
CA Pasadena, Dow Radio 213-793-1195
CA Riverside, Elctrn. Supp. 714-683-7300
CA San Diego, Acacia Sls. 619-565-4365
CA San Diego, Arrow Elexs. 619-565-4800
CA San Diego, El-Com Inc. 619-578-0900
CA San Diego, Hall-Mark Elexs. 619-268-1201
CA San Francisco, Steven Engrg. 415-588-9200
CA San Jose, Hall-Mark Elexs. 408-946-0900
CA San Jose, Ratel Inc. 408-946-4300
CA Santee, Mouser Elexs. 619-449-2300
CA Sunnyvale, Acacia Sls. 408-745-7200
CA Sunnyvale, Arrow Elexs. 408-745-6600
CA Van Nuys, Pacific Switch Controls 213-873-4802
CO Denver, Arrow Elexs. 303-758-2100
CO Denver, Ragon Elexs. 303-744-1992
CO Englewood, Hall-Mark Elexs. 303-694-1662
CO Lakewood, Acacia Sls. 303-232-2882
CT Greenwich, Wise Comps. 203-531-4880
CT Hartford, Wes-Garde 203-525-6907
CT Stratford, Utronics 203-378-4201
CT W. Hartford, Atlantic Switch Controls .. 203-527-7705
CT Wallingford, Arrow Elexs. 203-265-7741
FL Ft. Lauderdale, Arrow Elexs. 305-776-7790
FL Ft. Lauderdale, Hall-Mark Elexs. 305-971-9280
FL Lakeland, Switch Controls 813-644-7564
FL Miami, Elctrn. Equip. 305-871-3500
FL Orlando, Hall-Mark Elexs. 305-855-4020
FL Orlando, Hammond Elctrns. 305-849-6060
FL Palm Bay, Arrow Elexs. 305-725-1480
FL Pompano Beach, Components South 305-971-0350
GA Norcross, Arrow Elexs. 404-449-8252
GA Norcross, Hall-Mark Elexs. 404-447-8000
IL Arlington Heights, Lo Dan Elctrns. 312-398-5311
IL Bensenville, Diplomat/Illinois 312-595-1000
IL Chicago, Newark Elctrns. 312-638-4411
IL Glen Ellyn, Rockford Controls Co. 312-469-6016
IL Itasca, Voyager Elexs. Corp. 312-773-4900
IL Palatine, OHM Elexs. 312-359-5500
IL Rockford, Midwest Assocs. Inc. 815-962-8036
IL Rosemont, Advent Elctrns. 312-298-4210
IL Schaumberg, Arrow Elexs. 312-397-3440
IL Wheaton, Conectrix 312-653-1460
IN Indianapolis, Arrow Elexs. 317-243-9353
IN Indianapolis, Graham Elexs. 317-634-8202
IN Indianapolis, Neunier Elex. Supply 317-635-3511
IN South Bend, Genesis Elctrns. 219-287-2911
IA Cedar Rapids, Arrow Elexs. 319-395-7230
IA Cedar Rapids, Deeco Inc. 319-365-7551
KS Lenexa, Hall-Mark Elexs Corp. 913-888-4747
KS Witchita, Lee Products 316-264-2172
MD Baltimore, A. S. I. 301-265-5100
MD Baltimore, Arrow Elexs 301-247-5400
MD Gaithersburg, Pioneer Wash. 301-921-0660
MD Kensington, Marine Air Supp. 301-949-9560
MD Rockville, Arrow Elexs 301-251-0644
MA Burlington, Heilind Elexs 617-272-5610
MA Canton, H. Young Jr. Co. 617-828-4880
MA Canton, Impact Sls. 617-821-1500
MA Hingham, Sager Elec. Supp. 617-749-6700
MA Lynn, Land Elctrns. 617-592-2220

ALCO

ELECTRONIC PRODUCTS, INC.
FULL LINE
AUTHORIZED DISTRIBUTOR

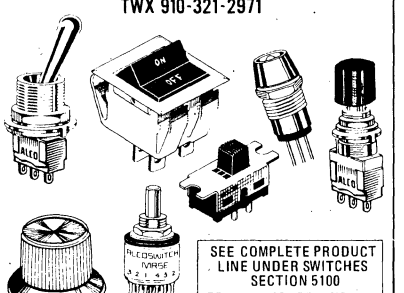


ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039

213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

MA Norwood, Gerber Elctrns. 617-769-6000
MA Woburn, Arrow Elexs 617-933-8130
MA Woburn, CNC 617-933-5017
MI Ann Arbor, Arrow Elexs 313-971-8220
MI Farmington Hills, Advent Elctrns. 313-477-1650
MI Grand Rapids, Arrow Elexs 616-243-0912
MI Zeeland, Tubergen & Assocs. Inc. 616-772-1548
MN Edina, Arrow Elexs 612-830-1800
MN Minneapolis, Newark Elexs 612-331-6350
MN St. Paul, Ragon 612-642-2828
MO Kansas City, Walter's Radio Supply ... 816-531-7015
MO Maryland Heights, Hall-Mark Elexs. ... 314-291-5350
MO St. Louis, Arrow Elexs. 314-426-4500
MO St. Louis, Olive Elctrn. Supp. 314-426-4500
MO St. Louis, Van Sickle Elexs. 314-621-5000
NH Manchester, Arrow Elexs. 603-668-6968
NJ Bellmawr, Mid Atlantic Elctrns. 609-931-5303
NJ Camden, General Radio 609-961-8560
NJ Clifton, J-Mar Elexs. Inc. 201-772-6400
NJ E. Marlton, Arrow Elexs. 609-596-8000
NJ Fairfield, Arrow Elctrns. 201-575-5300
NJ Springfield, Federated Purchaser 201-272-0505
NM Albuquerque, Arrow Elexs. 505-243-4566
NM Albuquerque, Walker Elex. Sup. 505-242-2288
NY Buffalo, Summit Distrs. 716-884-3450
NY Farmingdale, Arrow Elctrns. 516-293-4020
NY Hauppauge, Arrow Elexs. 516-231-1000
NY Hauppauge, Broadline Elexs. 516-231-4100
NY Hempstead, Elctrn. Equip. 516-538-5510
NY Liverpool, Arrow Elexs. 315-652-1000
NY Lynbrook, Peerless Radio 516-593-2121
NY Melville, Arrow Elexs. 516-694-6800
NY Rochester, Arrow Elexs. 716-275-0300
NY Rochester, Simcona Elctrns. 716-328-3230
NY Vestal, Pioneer/Harvey 607-748-8211
NC Raleigh, Arrow Elexs. 919-725-8711
NC Raleigh, Hall-Mark Elex. Inc. 919-722-9131
NC Winston-Salem, Arrow Elexs. 919-725-8711
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
OH Centerville, Arrow Elexs. 513-435-5563
OH Cincinnati, Hughes-Peters 513-351-2000
OH Cleveland, Pruitt Energy Sources Inc. 216-566-1545
OH Columbus, Arrow Elexs. 614-885-8362
OH Columbus, Hughes-Peter 614-294-5351
OH Columbus, Ohioswitch 614-885-0319
OH Dayton, Stotts-Friedman 513-298-5555
OH Solon, Arrow Elexs. 216-248-3990
OK Tulsa, Arrow Elexs. 918-665-7700
OK Tulsa, Hall-Mark Elexs. 918-665-3200
OR Beaverton, Acacia Sales 503-646-3377
OR Beaverton, Component Resources Inc. 503-641-8188
PA Allentown, A.A. Peters 215-434-5237
PA Braddock, Leff Elexs. 412-351-5000
PA McKean, Advacom 814-476-7774
PA Monroeville, Arrow Elexs. 412-856-7000
PA Norristown, Century Elctrns. 215-631-5400
PA Philadelphia, Almo Elctrns. 215-698-4000
PA Philadelphia, Philadelphia Elexs. 215-568-7400
TN Knoxville, Indl. Elctrns. 615-573-7135
TX Austin, Arrow Elexs. 512-835-4180
TX Austin, Hall-Mark Elex. Corp. 512-258-8848
TX Dallas, Arrow Elexs. 214-386-7500
TX Dallas, Hall-Mark Elex. Corp. 214-341-1147
TX Dallas, Texaswitch 214-357-1768
TX El Paso, Ideal Industrial Elexs. 915-779-6643
TX Garland, Newark Elexs. 214-494-5911
TX Houston, Hall-Mark Elexs. Corp. 713-781-6100
TX Midland, E.S.I. 915-694-9657
TX Stafford, Arrow Elexs. 713-491-4100
TX Stafford, Southwest Elctrns. 713-240-4000
UT Salt Lake City, Arrow Elexs. 801-539-1135
UT Salt Lake City, Standard Supply 801-486-3371
VA Arlington, Arlington Elctrns. 703-524-2412
VA Arlington, Arrow Elexs. 804-282-0413
WA Bellevue, Almac/Stroum Elctrns. 206-643-9992
WA Bellevue, Arrow Elexs. 206-643-4800
WA Seattle, Zepher Elctrns. 206-241-1980
WI Madison, Arrow Elexs. 608-273-4977
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI Oak Creek, Arrow Elexs. 414-764-6600

ALCOSWITCH, See Alco Elctrn. Prods., Inc.

ALDEN COMPUTER SYSTEMS, 27 Strathmore Rd., Natick, MA 01760, Tel: 617-655-6610; *Sls. Mgr.:* Bob Whitten

ALDEN ELECTRONICS, INC., 40 Washington Street, Westboro, MA 01581, Tel: 617-366-8851, Telex: 94-8404; Empl.: 125; *Sls. Mgr.:* L. A. Farrington

ALDEN

ALDEN PRODUCTS CO., P.O. Box 860, 117 N. Main St, Brockton, MA 02403, Tel: 617-583-0160, Telex: 28-7793 ALDN UR; FSC No.: 01009; Empl.: 150; *Sls. Mgr.:* Donald J. Paul ..... **C•1119-1124**

Local Sales Offices & Reps

CA Tarzana, High Voltage Sales 213-881-9194
NY Babylon, Astrorep, Inc. 516-422-2500
WA Mercer Island, Electronic Comp. Sls. .. 206-232-9301

ALDES SYS., Alden Products Co., 262 N. Main St., P.O. Box 860, Brockton, MA 02403, Tel: 617-583-0160, Telex: 287 793 ALDN UR DDD, TWX: 617-583-7618; Empl.: 150; *Sls. Mgr.:* G. Morrison

A. L. DESIGN, INC., 4232 Ridge Lea Rd., Amherst, NY 14226, Tel: 716-833-6272; Empl.: 9

ALESSI INDS., INC., 3195-C Airport Loop Dr., Costa Mesa, CA 92626, Tel: 714-979-8912, TWX: 910-595-1528; *Sls. Mgr.:* Tim McFadden

ALFORD MFG. CO., P.O. Box 2116, 32 Sixth Rd., Woburn, MA 01888, Tel: 617-935-8610, TWX: 710-348-1063; FSC No.: 07177; Empl.: 30; *Sls. Mgr.:* Fred Abel

ALGO, INC., 9198-C Red Branch Rd., Columbia, MD 21045, Tel: 301-730-7442; Empl.: 12; *Sls. Mgr.:* C.W. "Chuck" Alexander

Local Sales Offices & Reps

CA Novato, Ed Driscoll Assoc. 415-883-0353
FL Sarasota, Ram-Z Assoc. 813-951-9900
IL Park Ridge, Adtech Inc. 312-692-7320
MA Framingham, J.M. Lancaster Assoc. ... 617-875-8893
MO Grandview, Digital Sys. Sls. 316-685-9725
NJ Teaneck, Sci. Dvs. East 201-871-3916
OH Chesterland, EQS, Sys. Inc. 216-729-2222
TX Houston, Knox Mktg. 713-780-2516
VA Alexandria, Dyna-Repco 703-354-1222
WA Bellevue, Gerry Mara Assoc. 206-614-3535

ALINABAL, 28 Woodmont Rd., Milford, CT 06460, Tel: 203-877-3241, TWX: 710-462-1178; Empl.: 255

ALLACO PRODS. DIV., Bacon Industries, Inc., 192 Pleasant St., Watertown, MA 02172-2399, Tel: 617-926-2550, TWX: 710-327-6518; FSC No.: 99098; Empl.: 23; *Sls. Mgr.:* R.S. Cass

ALLEN AVIONICS, INC.

ALLEN AVIONICS, 224 E. 2nd St., Mineola, NY 11501, Tel: 516-248-8080 .... **A•1460-1463, 1584-1589, 2109**

Local Sales Offices & Reps

AZ Phoenix, J. F. Hurlbut Co. 602-952-2079
CA Arcadia, Van Gott & Assocs. 818-445-9728
CA Palo Alto, Adtek Assocs. 415-323-5414
CA San Diego, Van Gott & Assocs. 619-286-3633
CO Golden, J. F. Hurlbut Co. 303-279-7796
IL Elmhurst, Utronix Sls., Inc. 312-834-1100
MA Wayland, High-Tech Sls. 617-653-3838
MN Anoka, Ken Haugen & Assocs. 612-421-3395
MO Independence, Engrg. Svcs. Co. 816-254-3600
MO St. Louis, Engrg. Svcs. Co. 314-997-1515
NY Plainview, Eastern Metro Assocs. 516-931-1414
NY Rochester, J. G. Welch Assocs. 716-244-1100
NY Utica, J. G. Welch Assocs. 315-736-7821
OR Portland, Blum & Assocs., Inc. 503-643-8430
PA Huntingdon Valley, Rabal Assocs. 215-947-4825
TX Dallas, Bradenco Corp. 214-243-7261
UT Salt Lake City, J. F. Hurlbut Co. 801-973-4443
VA Alexandria, Vanguard Engrg. Sls. 703-768-1660
WA Lynnwood, Blum & Assocs., Inc. 206-775-6656
EXP CT, Stamford, Dage Corp. 203-324-3123

ALLEN-BRADLEY

ALLEN-BRADLEY CO., ELECTRONICS GROUP, Rockwell Corporation, 1201 S. Second St, Milwaukee, WI 53204, Tel: 414-671-2000, Telex: 26699 or 4311016; Empl.: 6500; *Sls. Mgr.:* Jack Kacsur; *Dist. Mgr.:* Chestley Grimsley ..... **A•1298-1301, 1784, 1787-1799, 1993-1995, 2068-2069**

Local Sales Offices & Reps

AL Birmingham, A-B Co. 205-988-4280
AK Anchorage, J. A. Tudor & Assocs. 907-344-5852
AZ Phoenix, A-B Co. 602-944-3303
AR Little Rock, C. H. Stout, Inc. 501-372-2555
CA City of Commerce, A-B Co. 213-724-5713
CA Hayward, A-B Co. 415-887-7888
CA Sacramento, A-B Co. 916-446-4064
CA San Diego, A-B Co. 619-292-4016
CO Denver, A-B Co. 303-985-8787
CT Stratford, A-B Co. 203-378-7364
FL Ft. Lauderdale, A-B Co. 305-771-0400
FL Jacksonville, A-B Co. 904-396-6010
FL Orlando, A-B Co. 305-894-9715
FL Tampa, Van & Smith Co. 813-877-8393
GA Doraville, A-B Co. 404-455-7422
ID Cedar Rapids, A-B Co. 319-377-3802
IL Chicago, A-B Co. 312-325-6750
IL Peoria, A-B Co. 309-697-8191
IL Rockford, A-B Co. 815-229-0920
IN Fort Wayne, A-B Co. 219-432-9538
IN Indianapolis, A-B Co. 317-872-2620
IN Merrillville, A-B Co. 219-769-7770
IA Bettendorf, A-B Co. 319-355-5316
KS Wichita, A-B Co. 316-267-1146
KY Louisville, A-B Co. 502-893-2571
LA Baton Rouge, A-B Co. 504-292-9028
LA Metairie, A-B Co. 504-888-2281
LA Shreveport, C. H. Stout 318-636-7777
ME Portland, A-B Co. 207-781-5402
MD Baltimore, A-B Co. 301-265-5600
MA Framingham, A-B Co. 617-879-5900
MA Holyoke, A-B Co. 413-533-3962
MI Flint, A-B Co. 313-733-3560
MI Grand Rapids, A-B Co. 616-455-2250
MI Kalamazoo, A-B Co. 616-344-6163
MI Lansing, A-B Co. 517-349-6903
MI Madison Heights, A-B Co. 313-583-9400
MN Minneapolis, A-B Co. 612-781-3406
MS Jackson, A-B Co. 601-969-1811
KS Kansas City, A-B Co. 913-371-5668
MO Maryland Heights, A-B Co. 314-291-0083
NE Omaha, A-B Co. 402-592-2010
NJ Bloomfield, A-B Co. 201-338-4600
NM Albuquerque, A-B Co. 504-881-7270
NY Albany, A-B Co. 518-869-5373
NY Buffalo, A-B Co. 716-634-2711
NY Plainview, A-B Co. 516-349-1445
NY Rochester, A-B Co. 716-235-0080
NY Syracuse, A-B Co. 315-463-4501
NC Charlotte, A-B Co. 704-394-9341
NC Greensboro, A-B Co. 919-852-4961
ND Bismark, A-B Co. 701-222-3155
OH Akron, A-B Co. 216-253-2106
OH Cincinnati, A-B Co. 513-793-7580
OH Cleveland, A-B Co. 216-442-0000
OH Columbus, A-B Co. 614-882-7722
OH Dayton, A-B Co. 513-435-7220
OH Toledo, A-B Co. 419-841-7726
OK Tulsa, A-B Co. 918-663-5120
OR Eugene, J. A. Tudor & Assoc. 503-686-1252
OR Portland, J. A. Tudor & Assoc. 503-288-5154
PA Bethlehem, A-B Co. 215-868-3131
PA Erie, A-B Co. 814-864-3066
PA King of Prussia, A-B Co. 215-337-1990
PA Pittsburgh, A-B Co. 412-923-1844
PA York, A-B Co. 717-848-2239
SC Charleston, A-B Co. 803-722-4073
SC Greenville, A-B Co. 803-268-9200
TN Knoxville, A-B Co. 615-588-0591
TN Memphis, C. H. Stout Co. 901-362-1616
TN Nashville, A-B Co. 615-366-7340
TX Austin, A-B Co. 512-467-0569
TX Dallas, A-B Co. 214-258-7767
TX Houston, A-B Co. 713-590-8282
TX San Antonio, A-B Co. 512-732-4362
UT Salt Lake City, Stevens Sls. Co. 801-487-8971
VA Richmond, A-B Co. 804-794-6900
WA Seattle, J. A. Tudor & Assoc. 206-682-7444
WA Spokane, J. A. Tudor & Assoc. 509-327-3328
WV Nitro, A-B Co. 304-755-8193
WI Appleton, A-B Co. 414-731-3202
WI Milwaukee, A-B Co. 414-671-2000
WY Casper, A-B Co. 307-266-4336

Local Distributors

AZ Phoenix, Schweber Elctrns. 602-997-4874
AZ Phoenix, Wyle Labs. 602-249-2232
CA Canoga Park, Marshall Inds. Elctrns. Grp. 818-999-5001
CA El Monte, Marshall Inds. Elctrns. Grp.... 818-442-7204

CA El Segundo, Wyle Labs. 213-322-8100
CA Irvine, Marshall Inds. Elctrns. Grp. 714-556-6400
CA Irvine, Schweber Elctrns. 714-863-0200
CA Irvine, Wyle Labs. 714-863-9953
CA Rancho Cordova, Wyle Labs. 916-638-5282
CA San Diego, Wyle Labs. 619-565-9171
CA Santa Clara, Schweber Elctrns. 408-748-4700
CA Santa Clara, Wyle Labs. 408-727-2500
CA Sunnyvale, Marshall Inds. Elctrns. Grp. 408-732-1100
CO Thornton, Wyle Distbn. Grp. 303-457-9953
CT Danbury, Schweber Elctrns. 203-748-7080
FL Hollywood, Schweber Elctrns. 305-927-0511
FL Orlando, Hammond Elctrns., Inc. 305-849-6060
GA Atlanta, Schweber Elctrns. 404-449-9170
IL Chicago, Newark Elctrns. 312-638-4411
IL Palatine, Ohm Elctrns., Inc. 312-359-5500
IN Ft. Wayne, Graham Elctrns. Supp., Inc. 219-423-3422
IN Indianapolis, Graham Elctrns. Supp., Inc. 317-634-8202
MD Gaithersburg, Schweber Elctrns. 301-840-5900
MA Bedford, Schweber Elctrns. 617-275-5100
MA Burlington, Marshall Elctrns. Grp. 617-272-8200
MI Livonia, Schweber Elctrns. 313-525-8100
MN St. Paul, Ragon Elctrns. 612-642-2828
MO Independence, Ragon Elctrns. 816-254-3410
MO St. Louis, Olive Elctrns., Inc. 314-426-4500
NJ Fairfield, Marshall Inds. Elctrns. Grp. 201-882-0320
NJ Fairfield, Schweber Elctrns. 201-227-7880
NY Hauppauge, Fairmont Elctrns. Sls. Corp. 516-231-3313
NY Rochester, Schweber Elctrns. 716-424-2222
NY Westbury, Schweber Elctrns. 516-334-7474
NC Greensboro, Hammond Elctrns., Inc. 919-275-6391
OH Cleveland, Schweber Elctrns. 216-464-2970
OH Columbus, Electronics Mktg. Corp. 614-229-4161
OR Hillsboro, Wyle Labs. 503-640-6000
PA Philadelphia, Almo Elctrns. Corp. 215-698-4000
TX Fort Worth, TTI, Inc. 817-831-0441
TX Houston, Harrison Equip. Co., Inc. 713-879-2600
TX Richardson, Wyle Labs. 214-235-9953
UT Salt Lake City, Wyle Labs. 801-974-9953
WA Bellevue, Wyle Labs. 206-453-8300
WI Milwaukee, Marsh Elctrns., Inc. 414-475-6000
Can Montreal, Quebec, Cesco Elctrns. Ltd. 514-735-5511
Can Quebec, Cesco Elctrns. Ltd. 418-524-4641
Can Toronto, Ont., Cesco Elctrns. Ltd. 416-661-0220

ALLEN-BRADLEY CO., Industrial Control Div., 1201 S. Second St., Milwaukee, WI 53201, Tel: 414-671-2000, Telex: 26699, TWX: 4311016; Empl.: 1600; *Dist. Mgr.:* Bob Anderson

ALLEN-BRADLEY CO., ELECTRONICS GROUP, Div. of Rockwell Corp., Magnetic Products Div., 5900 N. Harrison St., Shawnee, OK 74801, Tel: 405-275-2100, Telex: 796-208; *Sls. Mgr.:* Carl Tufts ..... **A•1298-1301**

ALLEN-BRADLEY CO., ELECTRONICS GROUP, Div.of Rockwell Corp., Microelectronic Products Div., Highway 29 N. Bryan Pk. Exit, Greensboro, NC 27410, Tel: 919-621-9010; *Sls. Mgr.:* Jack Polakowski ..... **A•2068-2069**

ALLEN-BRADLEY CO., ELECTRONICS GROUP, Div. of Rockwell Corp., Resistive Products Div., 1414 Allen-Bradley Dr., El Paso, TX 79935, Tel: 915-592-4888, Telex: 749-400; *Sls. Mgr.:* Jim Hadfield ..... **A•1993-1995**

ALLEN CO., INC., ROBERT G., 7267 Coldwater Canyon, N. Hollywood, CA 91605, Tel: 818-765-8300, 800-423-3186, Telex: 18-2699; *Sls. Mgr.:* Carl M. Witas

ALLEN DATAGRAPH, INC., 24 Keewaydin Dr., Salem, NH 03079, Tel: 603-893-1983, TWX: 710-366-0504; *Sls. Mgr.:* David Colinan

ALLEN MFG., 22 E. Dudley Town Rd., Bloomfield, CT 06002, Tel: 203-242-8511, Telex: 710-425-0099; Empl.: 420; *Sls. Mgr.:* M. Kubick; *Dist. Mgr.:* M. Kubick

ALLIED CORP. AEROSPACE SECTOR, Bendix Communications Div., East Joppa Rd., Towson, MD 21204, Tel: 301-583-4000, TWX: 710-232-1823; Empl.: 1350; *Sls. Mgr.:* Palmer H. Arnold

ALLIED PRECISION ELCTRNS., 1816 C. Ponderosa, College Station, TX 77840, Tel: 409-693-5397; Empl.: 10; *Sls. Mgr.:* Charles Johnson/Dewey Liccioni

ALLIED SYSTEMS CORP., Box 18077, Greensboro, NC 27419, Tel: 919-299-2294; Empl.: 25; *Sls. Mgr.:* E. V. Saude

ALLMETAL SCREW PRODUCTS CO., INC., 821 Stewart Ave., Garden City, NY 11530, Tel: 516-222-1200, TWX: 510-222-8132; Empl.: 200; *Sls. Mgr.:* Fred C. Sidebotham

ALL-STATES, INC., 1801 W. Foster Ave., Chicago, IL 60640, Tel: 312-728-0525; FSC No.: 26863; *Sls. Mgr.:* E. J. Marinelli; *Dist. Mgr.:* E. J. Marinelli

ALLTECH ASSOCS. INC., Applied Science Labs., 2051 Waukegan Rd., Deerfield, IL 60015, Tel: 312-948-8600, Telex: 687-1132; FSC No.: 36-2696920; *Sls. Mgr.:* Pat Krebs

ALMOND INSTRUMENTS, See EG & G Almond Instruments

ALMOR CO., INC., PO Box 1790, 155 Crescent St., Brockton, MA 02403, Tel: 617-586-5406; *Sls. Mgr.:* Bill Wolfreys

ALPHA COMPS., 115 Eucalyptus Dr., El Segundo, CA 90245, Tel: 213-322-7780; Empl.: 12

ALPHA COMPS., 1106 E. Simpson Rd., Mechanicsburg, PA 17055, Tel: 717-697-8595, TWX: 510-650-4930; FSC No.: 52748

ALPHA DATA, 20750 Marilla St., Chatsworth, CA 91311, Tel: 818-882-6500, TWX: 910-494-4914; FSC No.: 7025; Empl.: 30; *Sls. Mgr.:* James S. Howard

Distributor

ALPHA DISTR. CORP., 550 E. Royalton Rd., Cleveland, OH 44147, Tel: 216-526-3716 ..... pgs. **643, 713, 815**

ALPHA INDS., INC.-MICROELECTRONIC DIV., 2800 Crystal Drive, Hatfield, PA 19440, Tel: 215-822-1311, TWX: 510-661-7370; FSC No.: 17540; *Sls. Mgr.:* Joe Diesso

ALPHA INDS., INC., Microwave Comp. Div., 90 Glenn St., Lawrence, MA 01843, Tel: 617-681-8520, Telex: 949436, TWX: 710-342-8033; FSC No.: 17540; *Sls. Mgr.:* Frank Tarr

ALPHA INDS., INC.-MSD DIV., 20 Sylvan Rd., Woburn, MA 01801, Tel: 617-935-5150, Telex: 949436, TWX: 710-393-1236; FSC No.: 17540; *Sls. Mgr.:* Peter K. Butler; *Dist. Mgr.:* Nicholas Bishop

ALPHA INDS., INC., 20 Sylvan Rd., Woburn, MA 01801, Tel: 617-935-5150, Telex: 949436, TWX: 710-393-1236; FSC No.: 17540; Empl.: 1200

ALPHA INDS., INC. - TRG MILLIMETER COMP., 20 Sylvan Rd., Woburn, MA 01801, Tel: 617-935-5150, Telex: 949436, TWX: 710-393-1236; FSC No.: 17540; *Sls. Mgr.:* Peter K. Butler; *Dist. Mgr.:* Nicholas Bishop

ALPHA-M CORP., 3009 Wildflower Dr., Dallas, TX 75229, Tel: 214-620-0021; Empl.: 8; *Sls. Mgr.:* W. L. Cowley

Local Sales Offices & Reps
CA Panarama City, Viking Sls. 213-997-3933
FL Clearwater, Brennan Assocs. 313-446-5006
IN Indianapolis, Sukop & Cox 317-253-5501
MN Minneapolis, Heilites 612-861-6051
TX Dallas, Merit Co. 214-620-0021
WA Bellevue, Topp Engr. Sls. 206-747-5400

ALPHA MERICS CORP., 20931 Nordhoff St., Chatsworth, CA 91311, Tel: 818-709-1155, Telex: 182314, TWX: ALPHA-MER-CHCA 910-494-1931; *Sls. Mgr.:* Mark McGrew; *Dist. Mgr.:* Mark McGrew

ALPHA METALS, 600 Rte 440, Jersey City, NJ 07304, Tel: 201-434-6778, Telex: 12-5798; Empl.: 400; *Sls. Mgr.:* T. Marks

ALPHA PRODUCTS, INC., 5740 Corsa Ave. #104, Westlake Village, CA 91362, Tel: 818-889-9304

ALPHA-TEK, 7286 Murdy Circle, Huntington Beach, CA 92647, Tel: 714-847-7515

ALPHA WIRE CORP., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207, Tel: 201-925-8000, Telex: 6853017, TWX: 710-996-5895; Empl.: 575; *Sls. Mgr.:* Paul Dietlin

ALPS ELECTRIC (USA), INC., 3553 N. First St., San Jose, CA 95134, Tel: 408-946-6000, Telex: 157061; Empl.: 62 ..... **D•1057**

Local Sales Offices & Reps
AL Huntsville, Jack Harvey & Assocs. 205-536-4414
AZ Phoenix, Eltron 602-266-2164
CA Garden Grove, West Electronic Sls. Co. 714-829-0120
CA San Diego, Harvey King, Inc. 619-566-5252
CA Santa Clara, Nova-Tronix 408-727-9530
CO Englewood, Nelligan Co. 303-761-2121
CT Yalesville, Technology Sls. 203-269-8853
FL Clearwater, Jack Harvey & Assocs. 813-725-1841
FL Ft. Lauderdale, Jack Harvey & Assocs. 305-763-1945
GA Norcross, Jack Harvey & Assocs. 404-449-4643
IL Arlington Hgts., Micro Sls. 312-956-1000
IN Indianapolis, Alps Elec. (USA) 317-248-2577
IN Indianapolis, Jack Harvey & Assocs. 317-872-1031
IN Kokomo, Jack Harvey & Assocs. 317-453-4260
KS Kansas City, BC Electronic Sls. 913-342-1211
KS Wichita, BC Elctrn. Sls. 316-942-9840
KY Prospect, Jack Harvey & Assocs. 502-228-4100
MD Baltimore, Burgin-Kreh Assocs., Inc. 301-265-8500
MA Waltham, Technology Sls. 617-647-5700
MI Oak Park, A. Blumenberg Assocs. 313-968-3230
MN Minneapolis, PSI 612-944-8545
MO St. Louis, BC Elec. Sls. 314-291-1101
NJ Boonton, PAF Assocs. 201-335-0680
NY Albany, Reagan/Compar Albany 518-489-4777
NY Endwell, Reagan/Compar 607-723-8743
NY Fairport, Reagan/Compar 716-271-2230
NY New Hartford, Reagan/Compar 315-732-3775
NY Rockville Centre, Alps Elec. (USA) 516-766-3636
NY Smithtown, PAF Assocs. 516-360-0940
NC Greensboro, Wallace Elctrn. Sls. 919-996-2742
OH Rocky River, Norm Case Assocs. 216-333-0400
OK Tulsa, Norcom 918-832-7747
OR Aloha, Venture Elctrns. 503-642-9090
PA Willow Grove, Harry Nash Assocs. 215-657-2213
TN Johnson City, Jack Harvey & Assocs. 615-928-7588
TX Austin, Norcom 512-451-2757
TX Dallas, Norcom 214-386-4888
TX Houston, Norcom 713-778-0392
UT Salt Lake City, Nelligan Co. 802-261-1121
VA Lynchburg, Burgin-Kreh Assocs., Inc. 804-239-2626
WA Bellevue, Venture Elctrns. 206-454-4594
WI Milwaukee, Micro Sls., Inc. 414-782-1171

ALTEC LANSING, Altec Corp., 1250 N. Red Gum St., Anaheim, CA 92806, Tel: 714-632-7117, Telex: 665415; Empl.: 200; *Sls. Mgr.:* Gayle Campbell

ALTEK CO., P.O. Box 1128, Torrington, CT 06790, Tel: 203-482-7626; FSC No.: 53939; Empl.: 34; *Sls. Mgr.:* Stephen Altschuler

ALTEK CORP., 2150E Indl. Pkwy., Silver Spring, MD 20904, Tel: 301-622-3906, TWX: 710-825-0422; Empl.: 55; *Sls. Mgr.:* Lowell Nerenberg; *Dist. Mgr.:* Lowell Nerenberg

ALTUS CORP., 1610 Crane, San Jose, CA 95112; *Sls. Mgr.:* Don Keil

ALUMA TOWER CO., 1639 Old Dixie Hwy., Box 2806, Vero Beach, FL 32960, Tel: 305-567-3423, Telex: 803405

ALUMINUM FILTER, P.O. Box 1311, Santa Barbara, CA 93102, Tel: 805-684-7651, Telex: 658325, TWX: 910-336-1113; FSC No.: 17504; Empl.: 120; *Sls. Mgr.:* B. L. Baker

Local Sales Offices & Reps
CA Fremont, Vontek 415-651-7966
CA Reseda, Jerry Budenz & Assocs. 818-342-4276
CO Louisville, X-O Sales Inc. 303-666-7690
MA Brookline, Harman & Assocs. 617-232-6687
MN Edina, Peterson & Wolff 612-941-5400
OK Tulsa, NTR/Data Comp., Inc. 918-664-2180

Local Distributors
AZ Tucson, Air Filtration Prds. 800-528-1585

ALZBEAR CORP., 15411 Red Hill Ave., Unit F, Tustin, CA 92680, Tel: 714-557-0910; Empl.: 45; *Sls. Mgr.:* Al Robinson; *Dist. Mgr.:* Al Robinson

AMATOM ELCTRN. HARDWARE, 446 Blake St., New Haven, CT 06515, Tel: 203-397-3311, Telex: 963-419; FSC No.: 06540; Empl.: 55; *Sls. Mgr.:* Vince Maida

AMBER ELECTRO DESIGN INC., 4810 Jean Talon Blvd. W Ste 321, Montreal, Quebec, Canada H4P2N5, Tel: 514-735-4105, Telex: 05-827598; Empl.: 12; *Sls. Mgr.:* Wayne Jones

AMBI-TECH INDS., 319 Knickerbocker Ave., Hillsdale, NJ 07642, Tel: 201-666-0504; Empl.: 20; *Sls. Mgr.:* Al Nagler; *Dist. Mgr.:* Al Nagler

AMBROID CO., P.O. Box 1089, Taunton, MA 02780, Tel: 617-823-1726; Empl.: 10; *Sls. Mgr.:* J. F. Strauss

AMCO ENGRG., 3801 N. Rose St., Schiller Pk., IL 60176, Tel: 312-671-6670, TWX: 910-227-3152; Empl.: 350; *Sls. Mgr.:* F. A. Johnson ..... **C•1006-1007, 1625**

Local Sales Offices & Reps

AL	Huntsville, Kemp Instrs.	205-837-4304
AZ	Phoenix, The Knight Co.	602-994-1311
CA	Burlingame, The Knight Co.	415-697-2525
CA	Escondido, The Knight Co.	619-743-5136
CA	Los Angeles, Knight Co.	213-670-2833
CA	Orange County, Knight Co.	714-833-8250
CA	San Diego, Knight Co.	619-743-5136
CO	Englewood, FG Mktg. Co.	303-795-9176
CT	Stratford, Instr. Dynamics	203-378-6019
FL	Clearwater, WMM Assocs.	813-461-7074
GA	Atlanta, Kemp Instrs.	404-452-8050
IL	Schiller Park, R. L. Lang & Assocs.	312-671-3228
IN	Ft. Wayne, Aktron Corp.	219-747-3650
IA	Davenport, Rush & West	319-326-3091
KS	Olathe, Rush & West	913-764-2700
LA	Lafayette, Kemp Engrg.	318-269-9452
MD	Silver Spring, L. G. White & Co.	301-434-1555
MA	Wakefield, Instr. Dynamics	617-245-5100
MI	Livonia, Electro Sls. Assocs.	313-474-7320
MN	St. Paul, Bonament Heyda Co.	612-484-8531
MO	Ballwin, Rush & West	314-394-7271
NJ	Woodcliff Lake, J. Freid & Assocs.	201-391-6792
NM	Albuquerque, C. T. Carlberg Assocs.	505-888-3883
NY	Fairport, Naco Elctrns.	716-223-4490
NY	Great Neck, F & F Metro, Inc.	516-482-4080
NY	Syracuse, NACO Elctrns.	315-699-2651
NY	Utica, Naco Elctrns.	315-732-1801
NC	Winston Salem, L. G. White & Co.	919-725-3612
OH	Cleveland, Electro Sls. Assocs.	216-261-5440
OH	Dayton, Electro Sls. Assocs.	513-426-5551
OK	Tulsa, Don Shuhart Co.	918-747-4136
OR	Beaverton, Eclipse Mktg. Grp.	503-642-1661
PA	Allison Park, Electro Sls. Assocs.	412-487-3801
PA	Edgemont, White/Whiddett Co.	215-353-6343
SC	Greenville, L. G. White & Co.	803-271-0630
TX	Dallas, Don Shuhart Co.	214-349-6000
TX	Houston, Kemp Engrg.	713-466-1465
VA	Richmond, L. G. White & Co.	804-740-7093
WA	Redmond, Eclipse Mktg. Grp.	206-885-6991
EXP	NJ, Mahwah, Intl. Sls. Div.	201-825-0473

AMDAHL COMMUNICATIONS SYS. DIV., Amdahl Corp., 2500 Walnut Ave., Marina del Rey, CA 90291, Tel: 213-822-3202; Empl.: 350

AMECON, INC., 1900 S. Chris La., Anaheim, CA 92805, Tel: 714-634-2220, 800-392-2292, TWX: 510-1000-364; *Sls. Mgr.:* Frank Carleone ..... **A•2110-2117**

AME CORP., 101 E. Main St., Little Falls, NJ 07424, Tel: 201-256-3939; Empl.: 12; *Sls. Mgr.:* Edward Dimitry ..... **B•1485**

Local Sales Offices & Reps

FL	Orlando, EAB,Inc.	305-898-7444
NJ	Wyckoff, Chanco, Inc.	201-891-7866
TX	Dallas, Control Comps. Corp.	214-458-8877
Can	Scarborough, Ont., Leecraft Inds.	416-439-6320

Local Distributors

Can	Scarborough, Ont., Leecraft Inds.	416-439-6320

AMERACE CORPORATION, Newburgh Rd., Hackettstown, NJ 07840, Tel: 201-852-1122, Telex: 6853377 AMERACE or 136435 HACK; FSC No.: 3L154;2270; Empl.: 275; *Sls. Mgr.:* J. Cooper

AMERACE CORP., Elastimold Div., Newburg Rd., P.O. Box 503, Hackettstown, NJ 07840, Tel: 201-852-1122 ..... **D•1111**

AMEREX, P.O. Box 2815, Riverside, CA 92516, Tel: 714-686-1400; *Sls. Mgr.:* Roger D. Orton

AMERICAN AEROSPACE CONTROLS, 570 Smith St., Farmingdale, NY 11735, Tel: 516-694-5100; Empl.: 48; *Sls. Mgr.:* Gregory D'Abramo ..... **B•1780-1781**

Local Sales Offices & Reps

CA	Los Angeles, Dyna Sls. Co.	213-268-1175

AMERICAN ALUMINUM, 230 Sheffield St., Dept. EEM, Mountainside, NJ 07092, Tel: 201-233-3500; Empl.: 125

AMERICAN AUTOMATION, 14731 Franklin Avenue, Tustin, CA 92680, Tel: 714-731-1661, TWX: 910-595-2670 AMAUTO TSTN; *Sls. Mgr.:* Paul Niquette ..... **D•1179**

Local Sales Offices & Reps

CA	Garden Grove, Advanced Digital Grp.	714-897-0319
MA	Boston, Resolve Technlg.	617-527-8834

AMERICAN CAPACITOR, 2080 Central Ave, Duarte, CA 91010, Tel: 818-357-8806, Telex: 910 333 9810; FSC No.: 59366; Empl.: 65; *Sls. Mgr.:* John Williams; *Dist. Mgr.:* John Williams

AMERICAN CHEMICAL ETCHING, See American Etching & Mfg.

AMERICAN COMPUTER HARDWARE CORP., 2205 S. Wright St., Santa Ana, CA 92705, Tel: 714-549-2688, Telex: 330038; Empl.: 30; *Dist. Mgr.:* Thomas Allen

AMERICAN CONTROL PRODUCTS, Div. of Precision Timer Co., Inc., 13 Westbrook Ind'l. Pk, Westbrook, CT 06498, Tel: 203-399-6253; Empl.: 35; *Sls. Mgr.:* F. F. Coulom

AMERICAN CYANAMID CO., Metal Coated Fibers Dept., One Cyanamid Plaza, Wayne, NJ 07470, Tel: 201-831-3148, Telex: 219-136, TWX: 710-988-3045; *Sls. Mgr.:* James Tonges

AMERICAN ELECTRIC CABLE CO., 181 Appleton St., Holyoke, MA 01040, Tel: 413-539-9893; Empl.: 125; *Sls. Mgr.:* Michael A. Bousquet

AMERICAN ELECTRONIC LABS., Box 552, Lansdale, PA 19446, Tel: 215-822-2929, TWX: 510-661-4976; Empl.: 1300

AMERICAN ELCTRN. LABS., INC., Antenna Div., P.O. Box 552, Lansdale, PA 19446

AMERICAN ELCTRN. LABS., INC., Govt. Grp. Div., P.O. Box 552, Lansdale, PA 19446

AMERICAN ELCTRN. LABS., INC., Hybrid/MIC Div., P.O. Box 552, Lansdale, PA 19446

AMERICAN ELCTRN. LABS., INC., Special Prods. Div., P.O. Box 552, Lansdale, PA 19446

AMERICAN ELCTRNS., 1600 E. Valencia Dr., Fullerton, CA 92631, Tel: 714-871-3020, TWX: 910-592-1256; FSC No.: 89321; Empl.: 200; *Sls. Mgr.:* B. G. Guy

AMERICAN ETCHING & MFG., 13730 Desmond St., Pacoima, CA 91331, Tel: 213-896-1187; Empl.: 90

AMERICAN HV TEST SYSTEMS INC., Central Garrett Ind'l. Pk., Accident, MD 21520, Tel: 301-826-8651, Telex: 86223; Empl.: 45; *Sls. Mgr.:* Rolf B. Persson

AMERICAN INSULATED WIRE CORP., Leviton Mfg. Co., 36 Freeman St., Pawtucket, RI 02862, Tel: 401-726-0700, TWX: 710-384-0150; Empl.: 1300; *Sls. Mgr.:* Al Beauvais; *Dist. Mgr.:* Michael Koshgarian ..... **C•1747**

Local Sales Offices & Reps

CA	Los Angeles, Leviton/American	213-949-6575
FL	Coral Springs, EPM Corp.	305-755-5387
GA	Atlanta, Leviton/American	404-691-9303
IL	Chicago, Leviton/American	312-766-4100
LA	New Orleans, Leviton/American	504-834-9415
MA	Andover, Richard Purinton, Inc.	617-475-7055
MA	Boston, Associated Agencies	617-423-9880
MI	Detroit, Jim Groff Sls. Co.	313-933-3100
NY	New York, Leviton Corp. Headquarters	212-229-4040
NY	West Hempstead, Schmitt Indl. Mktg. Corp.	516-486-3510
NC	Charlotte, Over & Over, Inc.	919-872-2262
OH	Cleveland, Leviton/American	216-831-0615
TX	Houston, Leviton/American	713-956-2816
UT	Salt Lake City, Chuck Fields & Assocs.	801-531-6177
WA	Seattle, Leviton/American	206-576-0242

AMERICAN LASER SYS., INC., 106 Fowler Rd., Goleta, CA 93117, Tel: 805-967-0423, Telex: 4941760ALS; Empl.: 14; *Sls. Mgr.:* L. Shallenberger

AMERICAN MAGNETICS, 740 Watson Center Rd., Carson, CA 90745, Tel: 213-775-8651, TWX: 910-345-6258; Empl.: 175; *Sls. Mgr.:* Robert Mos

AMERICAN MAGNETICS, P.O. Box 8, Carterville, IL 62918, Tel: 618-985-4838; Empl.: 120

AMERICAN MAGNETICS, P.O. Box 2509, Oak Ridge, TN 37831-2509, Tel: 615-482-1056, Telex: 557-592; Empl.: 16; *Sls. Mgr.:* E. T. Henson

AMERICAN MICROSEMICONDUCTOR, INC., 133 Kings Rd., Madison, NJ 07940, Tel: 201-377-9566, TWX: 710-986-8500; Empl.: 15; *Sls. Mgr.:* W. M. Foley; *Dist. Mgr.:* D. B. Wilson ..... **A•1661, 2070-2071**

AMERICAN MICROSIGNAL, 8431 Monroe Ave., Stanton, CA 90680, Tel: 714-761-1222, TWX: 910-591-1202; Empl.: 80; *Sls. Mgr.:* Pat Nelson

AMERICAN MICROSYSTEMS, INC., See GOULD AMI

AMERICAN MONARCH, 2801-37th Ave., N.E., Minneapolis, MN 55421, Tel: 612-788-9161; Empl.: 300; *Sls. Mgr.:* B. Sutherland

AMERICAN PHOTONICS INC., 71 Commerce Dr., Brookfield Center, CT 06805, Tel: 203-775-8950; *Sls. Mgr.:* James A. Walyus

AMERICAN PLASTICRAFT CO., 814 N. Sacramento Blvd., Chicago, IL 60622, Tel: 312-722-7727, Telex: 910-221-6068; Empl.: 250; *Sls. Mgr.:* Larry J. Ferguson

AMERICAN POWER DEVICES, 7 Andover St., Andover, MA 01810, Tel: 617-475-4074, Telex: 951206; Empl.: 140; *Sls. Mgr.:* Robert Dimodana

AMERICAN RADIO RELAY LEAGUE, 225 Main St., Newington, CT 06111, Tel: 203-666-1541; Empl.: 120; *Sls. Mgr.:* Bobbie Chamalian

AMERICAN RESEARCH & ENGINEERING, 1500 Executive Dr., Elgin, IL 60120, Tel: 312-888-7245, TWX: 910-251-3008 ..... **B•1486-1487**

AMERICAN SWITCH CORP., 134 Water St., Wakefield, MA 01880, Tel: 617-246-1007, TWX: 710-348-6756; FSC No.: 54659; Empl.: 40; *Sls. Mgr.:* Mike Palmerino; *Dist. Mgr.:* Mike Palmerino ..... **B•1488-1491**

Local Sales Offices & Reps

MI	Grand Blanc, Intercomm	313-695-0665
AZ	Scottsdale, Bill Earl Assoc.	602-994-3813
CA	Arcadia, HMC, Inc.	818-447-0958
CA	Mountain View, Serra Assocs.	415-964-4300
CO	Lakewood, Andale	303-693-4331
FL	Orlando, OEM Mktg.	305-299-1000
GA	Lawrenceville, Tek-Rep Mktg.	404-963-1600
IL	Wheaton, Chadra-Schilke & Assoc.	312-653-8126
IN	Carmel, Nationwide Comps.	317-872-7207
IA	Marion, M-S-B Assocs.	319-377-6261
KS	Shawnee Mission, M-S-B Assocs.	913-432-2131
MA	Woburn, Boston Elctrn. Assocs.	617-938-3727
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
MO	St. Charles, M-S-B Assocs.	314-946-5577
NJ	Manville, Dyno Rep.	201-685-0135
OH	Willoughby, Nationwide Comps.	216-946-3226
PA	Elkins Park, Arnold Assocs.	215-742-0600
TX	Arlington, Comptech	817-265-6007
UT	Salt Lake City, Sage Sls.	801-467-5451
WA	Bellevue, Comtec	206-453-1188
EXP	CT, Litchfield, Intrade	203-567-5901
Can	Nepean, Ont., Reptronics	613-828-9274

Local Distributors

IN	Terre Haute, Midwest Supp.	812-232-0187
AL	Birmington, Forbes Distr.	205-251-4104
AL	Huntsville, Contact Elec.	205-881-9321
AZ	Phoenix, Arizona Comps.	602-269-5655
AZ	Phoenix, Electro Comps.	602-258-2665

CA Buena Park, RPS Elctrns. 213-744-0355
CA Los Angeles, Elec. Switches 213-660-1310
CA San Diego, Deco Elec. 619-693-1595
CA San Jose, Rose Elctrns. 408-263-9700
CA Santa Monica, Master Distrs. 213-452-1229
CA Sunnyvale, Sierra West 408-747-1188
CA Tustin, Western Switch & Controls 714-731-4333
CA Van Nuys, Patane Avionics 818-988-4455
CO Denver, Integrated Elctrns. 303-292-6121
CO Englewood, Indl. Elctrns. 303-694-9444
CT Greenwich, Wise Comps. 203-531-4880
CT Norwalk, Park Distr. 203-853-2011
CT Wallingford, Mid-State Elctrns. 203-265-9900
FL Clearwater, Electronics Precepts 813-596-2742
FL Longwood, Intertec Comps. 305-834-7777
FL Oakland Pk., Zelcon 305-565-2555
GA Atlanta, Specialty Distr. 404-873-2521
IL Chicago, NEP Elctrns. 312-625-8400
IL Wheeling, Hawk Elec. 312-459-4030
IN Lafayette, CWY Elec. 317-448-1611
IA Cedar Rapids, Iowa Radio Supply 319-393-4510
IA W. Des Moines, Ramco Co. 515-225-6933
KS Wichita, Radio Inc. 316-264-2798
MD Beltsville, Petricko Sls. 301-937-4960
MD Beltsville, Treeko Sls. 301-937-8260
MD Kensington, Marine Air Supp. 301-949-9560
MI Grand Rapids, Calder Elec. 616-698-7400
MI St. Clair Shores, Spemco 313-771-2700
MN Eden Prairie, Cassidy Elctrns. 612-944-0100
MN Fridley, Voyager Elec. 612-571-7766
MN Minneapolis, Tortec Corp. 612-866-3662
NH Astrum Elctrns. 603-329-5656
NJ E. Brunswick, Brothers Elctrns. 201-238-2200
NJ Fair Lawn, Relay Specialties 201-797-3313
NM Albuquerque, Intl. Elctrns. 505-345-8127
NY Bohemia, Key Comps. 516-567-7500
NY E. Syracuse, Add Elctrns. 315-437-0300
NY Hempstead, Davis Elctrns. 516-483-9200
NY Mt. Vernon, QAR 914-699-2224
NC Winston-Salem, Kirkman Elect. 919-722-9131
OH Columbus, Whitehead Elctrns. 614-224-1186
OH Dayton, Stotts-Friedman 513-298-5555
OK Tulsa, Radio Inc. 918-587-9123
PA Erie, Duncombe Elctrn. 814-454-5278
PA Norristown, Kimberly James Co. 215-666-7286
PA Philadelphia, Shap Elctrns. 215-969-3300
RI Pawtucket, MAJOR/Edwards 401-725-7400
TN Chattanooga, Specialty Distr. 615-267-9531
TN Knoxville, Curle Elctrn. 615-266-4727
TX Arlington, Bell Comp. Sls. 817-461-5303
TX Austin, Galtronics 512-837-7470
TX Dallas, Force/Solid State 214-438-5700
TX El Paso, Intl. Elctrns. 915-598-3406
TX Ft. Worth, Industrial Elctrns. 817-731-7321
UT Salt Lake City, Standard Supp. Co. 801-486-3371
WA Kent, Pyramid Elctrn. 206-872-5800
WV Huntington, Electronic Supp. 304-523-6443
WI Mequon, Lakeview Elctrns. 414-377-8250
WI New Berlin, Nep Elctrn. 414-785-9100
Can Montreal, Prelco Elctrn. 514-389-8051

AMERICAN TECHNICAL CERAMICS CORPORATION, 1 Norden La., Huntington Sta., NY 11746, Tel: 516-271-9600, Telex: 221201, TWX: 510-226-6993; FSC No.: 29990;11272-868-73; Empl.: 497; *Sls. Mgr.:* R. Blumkin ..... **A•1007-1009**

Local Sales Offices & Reps
AZ Scottsdale, Faser Tech. Sls. 602-948-4404
CA El Segundo, Fetty/Schoenduve 213-322-4991
CA Mtn. View, Fetty/Schoenduve 415-962-8330
CA San Diego, Fetty/Schoenduve 619-292-5136
CO Englewood, FG Mktg. 303-795-9176
DC Washington, M. Lader Co. 202-296-2497
FL Lighthouse Point, R. C. Simon & Co. .. 305-941-2757
GA Norcross, Mountain Electro Prods. 404-448-5594
IL Chicago, Tech. Sls. 312-237-7210
MA Topsfield, R.F. Assocs. 617-887-9762
MN New Brighton, TWC Sls. 612-636-1770
MO Grandview, Harris-Hanson Co. 816-763-6200
MO St. Louis, Harris-Hanson Co. 314-432-3611
NY Rochester, Sweetco Assocs. 716-225-2383
NY Utica, Sweetco Assocs. 315-797-6721
PA Lafayette Hill, M. Lader Co. 215-825-3177
TX Richardson, Vector Sls. Co. 214-234-4291
WA Bellevue, SD-R2 206-747-9424

AMERICAN TIME PRODS. DIV., See Frequency Control Prods., Inc.

AMERICAN ULTRAVIOLET, 320 Commerce St., Chatham, NJ 07928, Tel: 201-635-8355, Telex: 13-9266; Empl.: 14; *Sls. Mgr.:* M. C. Stines; *Dist. Mgr.:* M. C. Stines

AMERICAN VOLPI CORP., 26 Aurelius Ave., Auburn, NY 13021, Tel: 315-253-9707; Empl.: 18; *Sls. Mgr.:* Bill Meeks

AMERICAN ZETTLER, 16881 Hale Ave., Irvine, CA 92714, Tel: 714-660-1670, Telex: 67-8472; Empl.: 200; *Sls. Mgr.:* D. O. Barkhurst ..... **B•1264-1274**

Local Sales Offices & Reps
AL Huntsville, Electro-Wise, Inc. 205-830-4764
AL Huntsville, MacKay, Smith & Assocs. .. 205-539-8000
AZ Scottsdale, Thorson Desert States, Inc. 602-998-2444
CA Fountain Valley, Components Ctr. 714-979-0433
CA Fullerton, Groh Assocs. 714-738-7105
CA Mountain View, G.C. Woempner 415-964-5454
CO Englewood, Delta Sls. Assocs. 303-799-0646
FL Boca Raton, Perrott Assocs. 305-792-2211
FL Clearwater, Perrott Assocs. 813-443-5214
FL Orlando, Perrott Assocs. 305-298-7748
GA Norcross, McKay, Smith & Assocs. 404-449-7444
IL Rolling Meadows, KMA Sls. 312-398-5300
IN Carmel, Berndt Assocs. 317-844-0114
KS Wichita, Baka Corp. 316-682-8411
MA Brockton, Forsberg Sls. 617-522-6300
MN Minneapolis, R.W. Marshall Co. 612-929-0457
MN New Brighton, Chris Elctrns. Distr. 612-631-2647
MO Ferguson, Baka Corp. 314-878-4224
NJ Cherry Hill, Danco Elctrn. Sls. 609-424-5590
NM Albuquerque, Thorson Desert States, Inc. 505-293-8555
NY Alexander, B.H. Tollefson Assocs. 716-591-1219
NY Auburn, B.H. Tollefson Assocs. 315-253-4109
NY Rochester, B.H. Tollefson Assocs. 716-271-4141
NC Raleigh, J & B Sls. 919-878-8600
NC Raleigh, Resco/Raleigh 919-781-5700
OH Cincinnati, Makin Assocs. 513-871-2424
OR Beaverton, Thorson Co. N.W. 503-644-5900
PA Montgomeryville, Pyttronics Inds. 215-643-2850
TX Dallas, Cypress Elctrns. 214-869-1435
TX Houston, AID Elctrns. 713-955-6204
TX Irving, AID Elctrns. 214-790-4761
UT Salt Lake City, Delta Sls. Assocs. 801-487-7571
WA Bellevue, Thorson Co. N.W. 206-455-9180
WI Milwaukee, KMA Sls. Co. 414-259-1771

Local Distributors
CA Irvine, Acacia Sls. 714-660-0834
CA Los Angeles, Master Distrs. 213-452-1229
CA San Diego, Acacia Sls. 619-565-4365
CA San Jose, Cypress Elctrns. 408-945-8400
CA Santa Clara, Components Ctr. 408-988-3751
CA Torrance, Cypress Elctrns. 213-533-6005
CO Lakewood, Acacia Sls. 303-232-2882
CT New Haven, The Green-Shaw Co. 203-397-0710
IL Northbrook, Classic Comps. 312-272-9650
IN Carmel, Altex Elctrns. 317-848-1323
MD Savage, Pyttronic Inds. 301-953-9650
MA Canton, Impact Sls. Co. 617-821-1500
MA Woburn, Time Elctrns./New Eng. 617-935-8080
MI Ypsilanti, Tamco, Inc. 313-572-1950
NJ Fairlawn, Relay Spec. 201-797-3313
NJ Rahway, R. E. Breuer Co., Inc. 201-388-5045
NY Farmingdale, Pride Elctrns. 516-293-4020
NY South Farmingdale, R. E. Breuer Co., Inc. 516-694-6597
OR Beaverton, Acacia Sls. 503-646-3377
TX Austin, AID Elctrns., Inc. 512-450-1938
TX Dallas, Wallace Elctrns. 214-340-0400
Can Richmond, B.C., Macom Agy. 604-271-2661
Can Vancouver, B.C., Intek 604-324-6831
Can Winnipeg, Man., L. A. Varah, Ltd. 204-633-6190

AMETEK, 2 Station Square, Paoli, PA 19301, Tel: 215-355-6900; Empl.: 100

AMETEK, DYNAMICS DIVISION, AMETEK, Inc., 5649 Peck Rd., Arcadia, CA 91006, Tel: 818-442-5981, TWX: 910-587-3534; FSC No.: 18098; Empl.: 105

AMETEK, INC, Hunter Spring Division, 1 Spring Ave., Hatfield, PA 19440, Tel: 215-822-2971, TWX: 510-661-4888; FSC No.: ;43560; Empl.: 270; *Sls. Mgr.:* F. J. York

AMETEK/RODAN DIV., 2905 Blue Star St., Anaheim, CA 92806, Tel: 714-630-0081, TWX: 910-591-1684; FSC No.: 15454;DESC-EQP-75-1387; Empl.: 100; *Sls. Mgr.:* Steve Iovin

Local Sales Offices & Reps
AL Huntsville, Alpha Mktg. 205-533-0766
CA Mountain View, Gene Woempner Co. 415-964-5454
CO Westminster, Straube Assocs. 303-426-0890
FL Coral Springs, H.A., Inc. 305-752-7520
IL Downers Grove, Richmar Elctrns. 312-968-0118
IN Ft. Wayne, Menze Sls. Co. 219-747-5616
IA Cedar Rapids, Snider Sls. 319-362-4410
KS Overland Park, S. W. Wollard Co. 913-898-6552
MI Lathrup Village, R. C. Nordstrom Co. .. 313-559-7373
MI Southfield, R. A. Casalou 313-559-0350
MN Mendota Hgts., G-II Sls. 612-454-3086
MO St. Louis, Abrams & Assocs. 314-569-0447
NJ Cherry Hill, Danco Elctrn. Sls. 609-424-5590
NM Albuquerque, Straube Assocs. 505-265-7759
NY Melville, Comtronic Assocs. 516-249-0505
NY Syracuse, Canavah-Scanlon Assocs. 315-437-1271
TX Dallas, Cunningham Comps. Corp. 214-233-4303
TX Houston, Cunningham Comps. Corp. .. 713-461-4197
UT Salt Lake City, Straube Assocs. 801-486-5473
VA Gladys, Ralley Entprs. 804-283-5656
WA Vancouver, R. Over Sls. 206-695-6179
EXP NY, Westbury, CPS Intl. 516-334-8500

AMF INC., AMF Cuno/General Filter Products Division, 400 Research Pkwy., Meriden, CT 06450, Tel: 203-237-5541, Telex: 962457; Empl.: 700; *Sls. Mgr.:* Gregg Samal

AMF/ELECTRO COMPS. DIV., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060, Tel: 305-973-8620, TWX: 510-956-9400; Empl.: 900; *Sls. Mgr.:* C. Smith; *Dist. Mgr.:* C. Smith

AMF POTTER & BRUMFIELD, See Potter & Brumfield

AMGLO, 5265 Michigan Ave., Rosemont, IL 60018, Tel: 312-671-4321; Empl.: 21

AMICON CORP., 25 Hartwell Ave., Lexington, MA 02173, Tel: 617-861-9600; Empl.: 300; *Sls. Mgr.:* James Gilliland

AMILON CORP., 49-12 30th Ave., Woodside, NY 11377, Tel: 718-274-1794; Empl.: 50; *Sls. Mgr.:* L. Rosenblatt

AMKEY, INC., Sub. American Pwr. Dvs., Inc., 220 Ballardvale St., Wilmington, MA 01887, Tel: 617-658-7800; *Sls. Mgr.:* P. D. Prevett

AMLAN, INC., 97 Thornwood Rd., Stamford, CT 06903, Tel: 203-322-1913, Telex: 643647; *Sls. Mgr.:* Mark Landeweer; *Dist. Mgr.:* Mark Landeweer ..... **C•1125-1128**

Local Sales Offices & Reps
AL Huntsville, Interep Assocs., Inc. 205-533-1730
CA Brea, Astralonics 213-691-6123
CA Santa Cruz, Krippner & Assocs. 408-429-9798
CA Westlake Village, Astralonics 818-706-0488
FL Oakland Park, Zelcon, Inc. 305-565-2555
FL Orlando, J-R Controls, Inc. 305-282-6920
FL Tampa, J-R Controls 813-961-9478
GA Norcross, Interep Assocs., Inc. 404-449-8680
IL Chicago, Electro-Tech Mktg. Assocs. .. 312-676-3151
MA Quincy, Marketing Svcs., Inc. 617-545-3031
MN St. Paul, Complete Sls. 612-644-0484
MO Grandview, R. R. Burton & Assocs. 816-763-5385
MO Maryland Heights, R. R. Burton & Assocs. 314-434-1628
MO St. Louis, R. R. Burton & Assocs. 314-647-6353
NJ Parlin, JMR Sls., Inc. 201-254-8484
NY E. Setauket, JMR Sales, Inc. 516-689-8871
NY N. Syracuse, JMR Sales, Inc. 315-458-6576
PA Phildelphia, Check Assocs. 205-487-3007
TN Greeneville, Interep Assocs., Inc. 615-639-3491
VA Reston, Tytronics Tech. Sls. 703-471-0440
WA Mukilteo, Krippner & Assocs. 206-743-3579
WI Brookfield, Electro-Tech Mktg. Assocs. 414-785-9554

Local Distributors
CA Sacramento, The Supp. Sta. 916-920-2919
CA San Jose, Sundown Sls. 408-995-6327
CA Westlake Village, Bond Electro Sls. ... 818-706-0322
CT New Haven, Greene-Shaw Co., Inc. ... 203-397-0710
CT Torrington, Northeast Connectors 203-482-2817
FL Oakland Park, Zelcon, Inc. 305-565-2555
FL Orlando, Southeast Comp. Svc., Inc. .. 305-298-0321
GA Atlanta, Trans-Southern Elctrns. 404-451-4425
MA Chelmsford, Dynamic Engrg. 617-250-0200
MA Melrose, Hollex, Inc. 617-665-2413
MA Norwood, Emtel Elctrns. 617-769-9500
MA Waltham, Vantage Elctrns. Corp. 617-894-8690

MA Westford, ESI 617-486-8495
MA Woburn, EPC 617-935-0400
MA Woburn, The Supp. Stat. 617-935-0400
MN New Brighton, Chris Elctrns. 612-631-2647
NY Mt. Sinai, KC Elctrns. 516-473-3347
OR Aloha, Pacific Elctrns. 503-642-3591
OR Pendleton, Round-Up Elctrns. 503-276-3152
PA Wayne, Peak Elctrns. 215-293-9000
RI Warwick, Cal-Greg Comps., Inc. 401-738-6170
VT South Burlington, Hooker Elctrns., Inc. 802-864-0885
WA Auburn, West-Air Intl. 206-631-1000
WA Kirkland, Priebe Elctrns., Inc. 206-821-4695
WA Seattle, Pacific Elctrns. 206-575-1050
WA Seattle, Signal Comm., Inc. 206-324-8400
Can Montreal West, Que., Hooker Elctrns. Can., Ltd. 514-487-5151

AMP

AMP INCORPORATED, Box 3608, Harrisburg, PA 17105, Tel: 717-564-0100, TWX: 510-657-4110; Empl.: 19,650; *Dist. Mgr.:* Niel Spatz ..... **A•1590; B•1118-1120, 1492-1493, 1706; C•1131-1152, 1748**

Local Sales Offices & Reps

CA Compton, AMP, Inc. 213-537-4490
CA Cupertino, AMP, Inc. 408-255-3830
CO Englewood, AMP, Inc. 303-773-0422
CT Windsor, AMP, Inc. 203-683-2715
FL Altamonte Springs, AMP, Inc. 305-869-6766
FL Boca Raton, AMP, Inc. 305-997-7005
GA Atlanta, AMP, Inc. 404-934-6363
IL Schaumburg, AMP, Inc. 312-351-5020
IN Carmel, AMP, Inc. 317-848-1250
MA Boston, AMP, Inc. 617-891-7500
MA Framingham, AMP, Inc. 617-879-3255
MI Southfield, AMP, Inc. 313-645-5590
MN Minneapolis, AMP, Inc. 612-831-8242
NJ Parsippany, AMP, Inc. 201-334-6664
NY Holbrook, AMP, Inc. 516-588-4430
NY Pittsford, AMP, Inc. 716-385-2860
NC Winston- Salem, AMP, Inc. 919-725-8968
OH Dublin, AMP, Inc. 614-764-8866
PA Berwyn, AMP, Inc. 215-647-6060
PA Malvern, AMP, Inc. 215-296-5303
TN Knoxville, AMP, Inc. 615-691-5711
TX Irving, AMP, Inc. 214-258-1114
VA Alexandria, AMP, Inc. 703-683-5955
WA Renton, AMP, Inc. 206-255-0064

Local Distributors

AL Huntsville, Powell Elctrns. 205-539-2731
AZ Phoenix, Dalis Elctrn. Supp. 602-275-2626
AZ Phoenix, Sterling Elctrns. Corp. 602-258-4531
CA Buena Park, RPS Elctrns. 213-744-0355
CA Canoga Park, Marshall Elctrns. Grp. 213-999-5001
CA El Monte, Marshall Ind. 213-422-6204
CA Fullerton, Pyramid Elctrns. 714-773-0781
CA Hawthorne, Electro-Sonic Comps. 213-679-9781
CA Irvine, Marshall Elctrns. Grp. 714-556-6400
CA San Diego, Marshall Elctrns. Grp. 619-578-9600
CA San Diego, RPS Elctrns. 619-292-5611
CA San Jose, Powell Elctrns. 408-943-9020
CA Santa Clara, Pyramid Elctrns. 408-727-9810
CO Denver, CSID, Inc. 303-292-9594
CT Wallingford, Cronin Elctrns. 203-265-3134
FL Orlando, Hammond Elctrns. 305-849-6060
GA Norcross, Schweber Elctrns. Corp. 404-449-9170
IL Elk Grove, Schweber Elctrns. Corp. 312-364-3750
IL Elmhurst, Semiconductor Spec. 312-279-1000
IN Indianapolis, Graham Elctrns. 317-634-8202
KS Edwardsville, C. Tennant, Sons & Co. 913-441-1801
MD Columbia, Powell Elctrns. 301-631-4070
MD Gaithersburg, MS Elctrns. 301-921-0200
MA Needham, Cronin Elctrns. 617-449-5000
MA Winchester, Rush Industries, Inc. 617-729-5800
MI Grand Rapids, RS Elctrns. 616-241-3483
MI Livonia, RS Elctrns. 313-525-1155
MO St. Charles, Lectronix 314-946-6424
NH Hudson, C & H Elctrns. 603-882-1133
NJ Buffalo, Summit Distrs. 716-884-3450
NJ Fairfield, Marshall Elctrns. 201-882-0320
NJ Kenilworth, Federated Purchaser 201-272-0505
NY Farmingdale, Harrison Radio Corp. 516-293-7990
NY Lynbrook, Peerless Elctrns. 516-593-2121
NY Westbury, Schweber Elctrns. Corp. 516-334-7474
NC Raleigh, Southeastern Elctrns. 919-828-2311
OH Akron, Akron Elctrn. Supp. Co. 216-762-8818
OH Columbus, Hughes-Peters Inc. 614-294-5351
PA Philadelphia, Almo Elctrns. Corp. 215-698-4000
PA Philadelphia, Powell Elctrns. 215-365-1900
TN Nashville, Graham Elctrns. 615-242-2682
TX Austin, Kent Elctrns. Corp. 512-834-1900
TX Houston, Kent Elctrns. 713-780-7770
TX Irving, Hamilton-Avent Elctrns. 214-659-4157
TX Richardson, Kent Elctrns. Corp. 214-669-2600
UT Salt Lake City, Kimball Elctrns. 801-328-2075
WA Kent, Pyramid Elctrns. Supp., Inc. 206-872-5800

AMP DISTRIBUTOR MARKETING DIV, A Division of AMP Products Corporation, Harrisburg, PA 17105, Tel: 717-780-7025; Empl.: 24,500; *Sls. Mgr.:* Larry Backus ..... **B•1495; C•1130, 1683, 1749**

Local Sales Offices & Reps

Northern Wire & Cable, Inc.
CA Los Angeles 213-639-1691
CA Sacramento, Zack Elctrns. 916-446-3131
CA San Francisco 415-574-6006
IL Chicago 312-439-7800
PA Valley Forge 215-647-1000
TX Dallas (Irving) 214-258-1911

Local Distributors

EMSCO
AL Birmingham, Ack Radio Supp. Co. 205-322-0588
AL Birmingham, Forbes Distrbg. 205-251-3941
AL Decatur, Forbes Distrbg. 205-353-4546
AL Huntsville, Forbes Distrbg. 205-533-4150
AL Huntsville, Powell Elctrns., Inc. 205-539-2731
AL Mobile, Forbes Distrbg. 205-479-4535
AL Mobile, Specialty Distrs. 205-344-0450
AZ Phoenix, Dalis Elctrn. Supp. 602-275-2626
AZ Phoenix, Electronic Parts Co., Inc. 602-277-7281
AZ Phoenix, Sterling Elctrns. 602-268-2121
AZ Tempe, Hamilton/Avnet Elctrns. 602-231-5100
AR Little Rock, Carlton-Bates Co. 501-562-9100
AR Little Rock, Electro Entprs., Inc. 501-664-9207
AR Little Rock, Inter-Conn Elctrns., Inc. 501-753-7264
AR Pine Bluff, Carlton Bates Co. 501-535-1354
CA Bakersfield, Jack C. Arbuckle Co. 805-325-5816
CA Buena Park, RPS Elctrns., Inc. 213-744-0355, 714-521-5230
CA Canoga Park, Marshall Inds. 819-999-5001
CA Cerritos, El-Com, Inc. 213-404-2961
CA Costa Mesa, Mar Vac Elctrns., Inc. 714-540-3280
CA El Monte, Marshall Inds. 818-442-7204
CA Fountain Valley, Components Ctr., Inc. 714-979-0433
CA Fresno, Jack C. Arbuckle Co. 209-264-6554
CA Fullerton, Pyramid Elctrns., Inc. 714-773-0781
CA Gardena, California Switch & Signal 213-770-2300
CA Hawthorne, Electro-Sonic Comps., Inc. 213-679-9781
CA Irvine, Marshall Inds. 714-556-6400
CA Manhattan Bch., Prime Electro Prods. Co. 213-379-3642
CA Monrovia, Erik-A-Elctrn. Distr. 213-574-1020
CA North Hollywood, Alatec Prods. 213-875-1790
CA Northridge, Acort Inds., Inc. 213-993-6444
CA Oakland, Brill Elctrns. 415-834-5888
CA Palo Alto, Zack Elctrns. 415-326-5432
CA Sacramento, Hamilton/Avnet Elctrns. 916-925-2216
CA Sacramento, Sacramento Elctrns. 916-441-4821
CA San Bernardino, Hurley Elctrns. 714-885-0721
CA San Diego, El-Com, Inc. 619-578-0900
CA San Diego, Marshall Inds. 619-578-9600
CA San Diego, Ryno Elctrns. 619-543-8430
CA San Diego, RPS Elctrns., Inc. 619-292-5611
CA San Diego, Western Radio, Inc. 619-268-4400
CA San Francisco, Zack Elctrns. 415-626-1444
CA San Jose, Powell Elctrns., Inc. 408-943-9020
CA San Jose, Quement Elctrns. 408-998-5900
CA Santa Ana, C R Elctrns. 714-556-2040
CA Santa Clara, Components Ctr., Inc. 408-988-3751
CA Santa Clara, Cypress Elctrns., Inc. 408-945-8400
CA Santa Clara, Pyramid Elctrns. Supp., Inc. 408-727-9810
CA Sunnyvale, Hamilton/Avnet Elctrns. 408-743-3355
CO Arvada, Denver Wintronics 303-431-7161
CO Denver, CSID, Inc. 303-292-9594
CO Denver, Marshall Inds. 303-427-1818
CT Danbury, Pilgrim Elctrns. 203-792-7274
CT E. Hartford, R & S Elctrn. Distrs. 203-528-9901
CT Norwalk, Park Distrs. 203-853-2010
CT Stratford, Electro/Comp, Inc. 203-375-5811
CT Wallingford, Cronin Elctrns. 203-265-3134
CT Wallingford, Marshall Inds. 203-265-3822
FL Altamonte Springs, Schweber Elctrns. 305-331-7555
FL Casselberry, AFCOM 305-831-6630
FL Dania, Summit Elctrns. of Florida, Inc. 305-920-6263
FL Ft. Lauderdale, EMSCO 305-973-7103
FL Hollywood, Schweber Elctrns. 305-927-0511
FL Jacksonville, EMSCO 904-356-4851
FL Miami, Electro Std. Labs., Inc. 305-633-6973
FL Miami, Electronic Equip., Inc. 305-871-3500
FL Orlando, EMSCO 305-849-6362
FL Orlando, Hammond Elctrns., Inc. 305-849-6060
FL Pensacola, Pensacola Elctrns. 904-478-3771
FL Tampa, EMSCO Div. Hammond Elctrns. 813-253-0104
FL Tampa, Leader Elctrns. 813-870-3315
GA Atlanta, Ack Radio Supp. Co. 404-351-6340
GA Atlanta, Specialty Distrbg. Co. 404-873-2521
GA Norcross, Schweber Elctrns. 404-449-9170
HI Honolulu, Electrical Equip. 808-533-3884
HI Honolulu, Technical Mktg. Corp. 808-841-4175
ID Spirit Lake, A-I Elctrn. Supp. 208-623-3111
IL Addison, LCOMP, Inc. 312-628-1400
IL Chicago, Electronic Connector Corp. 312-767-2200
IL Chicago, NEP Elctrns., Inc. 312-625-8400
IL Elk Grove Village, Schweber Elctrns. 312-364-3750
IL Elmhurst, Semiconductor Specialists, Inc. 312-279-1005
IL Melrose Park, Belford Elctrns., Inc. 312-865-2400
IL Mt. Prospect, Tri-State Elctrn. Corp. 312-255-0600
IL Niles, Joseph Elctrns. 312-297-4200
IL Northbrook, Classic Comps. Supp. 312-272-9650
IL Palatine, Ohm Elctrns. 312-259-5500
IL Peoria, Warren Radio Co. 309-674-5998
IL Rosemont, Advent Elctrns., Inc. 312-297-6200
IL Villa Park, Melvin Elctrns., Inc. 312-279-5015
IL Wheeling, Hawk Elctrns. 312-459-4030
IN Evansville, Hutch & Son, Inc. 812-425-7201
IN Fort Wayne, Graham Elctrns. 219-423-3422
IN Indianapolis, Advent Elctrns., Inc. 317-872-4910
IN Indianapolis, Meunier Elctrns. 317-635-3511
IA Cedar Rapids, Deeco, Inc. 319-365-7551
KS Edwardsville, C. Tennant, Sons & Co. 913-441-1801
KY Louisville, Peerless Elctrn. Equip. Co., Inc. 502-637-7674
LA Baton Rouge, Industrial Elctrn. Supp. 504-357-4249
LA Baton Rouge, Ralph's Elctrns. Supp. 318-344-3761
LA Harvey, AFG Elctrn. Supp. 504-368-9696
LA Lafayette, Ralph's Elctrns. Supp. 318-233-0105
LA New Orleans, Southern Radio Supp. Co., Inc. 504-524-2343
LA New Orleans, Wm. B. Allen Supp. Co., Inc. 504-525-8222
LA Shreveport, Industrial Elctrn. Supp. 318-222-9459
MD Aberdeen, Harco Elctrns., Inc. 301-838-7990
MD Baltimore, Whitney Distrs., Inc. 301-944-8080
MD Columbia, Hamilton/Avnet Elctrns. 301-995-3500
MD Columbia, Powell Elctrns., Inc. 301-621-4070
MD Hagerstown, Allegheny Elctrn. 301-739-6460
MD Rockville, Capitol Radio Whlsrs., Inc. 301-881-2270
MD Rockville, MS Elctrns., Inc. 301-340-6400
MA Burlington, Heilind Elctrns. 617-272-5610
MA Burlington, QPL Elctrn. 617-891-0460
MA Canton, Impact Sls. Co., Inc. 617-821-1500
MA Holliston, Add Elctrns. 617-478-4200
MA Middleboro, Glynn Elctrns. 617-947-4262
MA N. Chelmsford, Pilgrim Elctrns. 617-251-8746
MA Needham, Cronin Elctrns. 617-449-0500
MA Needham, You Do It Elctrns. 617-449-1005
MA Newton, In-Stock Prods. Co. 617-964-6200
MA Waltham, Vantage Elctrns. Corp. 617-894-8690
MA Westborough, Future Elctrns. Corp. 617-366-2400
MA Westborough, Powell Elctrns./NE 617-366-6100
MA Wilmington, Aved Elctrns., Inc. 617-657-8310
MA Wilmington, J. V. Elctrns. 617-273-4300
MA Winchester, Rush Inds. 617-629-5800
MA Woburn, ACI Elctrns. 617-935-7230
MA Woburn, Hamilton/Avnet Elctrns. 617-273-7500
MI Flint, Shand Elctrns., Inc. 313-743-8940
MI Grand Rapids, RM Elctrns. 616-531-9300
MI Grand Rapids, RS Elctrns. 616-241-3483
MI Grand Rapids, S-F Elctrn. Supp., Inc. 616-459-0126
MI Livonia, RS Elctrns. 313-525-1155
MI Troy, Northern Wire & Cable 313-589-0510
MN Edina, Schweber Elctrns. 612-941-5280
MN Minneapolis, Electronic Ctr., Inc. 612-371-5200
MN Minneapolis, Stark Elctrn. Supp., Inc. 612-332-1325
MN St. Paul, Gopher Elctrns. Co. 612-483-3322
MO Kansas City, Electronic Supp. Co., Inc. 816-931-0250
MO St. Charles, Lectronix, Inc. 314-946-6424
MO St. Louis, Franklin Elctrns. 314-993-5333
MO St. Louis, Olive Elctrns., Inc. 314-426-4500
MO St. Louis, Van Sickle Radio Elctrns., Inc. 314-621-5000
NE Lincoln, Scott Elctrns. Supp. Corp. 402-466-8221
NV Las Vegas, CRW, Inc. 702-384-1500
NH Hudson, C & H Elctrns. 603-882-1133
NH Manchester, Yankee Elctrn. Supp., Inc. 603-625-9746
NJ Cherry Hill, Hamilton/Avnet Elctrns. 201-424-0110
NJ East Hanover, State Elctrns. 201-887-2550
NJ Edison, William Elctrns. 201-985-3700
NJ Fairfield, Marshall Inds. 201-882-0320

NJ Kenilworth, Federated Purchaser 201-272-0505
NJ Pine Brook, Alatec Prods. 201-227-8140
NJ Prospect Park, Kapp Inds., Inc. 201-790-1999
NJ Springfield, Route Elctrns. 22, Inc. 201-379-7710
NM Albuquerque, Connecting Comps. 505-345-8921
NM Albuquerque, Electronic Parts Co. 505-293-6161
NY Buffalo, Genesee Radio & Parts Co., Inc. 716-873-9661
NY Buffalo, Summit Distrs., Inc. 716-884-3450
NY Elmsford, Ancar Elctrns. Supp. 914-592-7100
NY Farmingdale, Harrison Radio Corp. 516-293-7990
NY Hempstead, Davis Elctrns. Corp. 516-483-9200
NY Johnson City, Help Elctrns., Inc. 607-729-3528
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY Pleasantville, Wise Comps., Inc. 914-939-8600
NY Poughkeepsie, Chief Elctrns. 914-471-1300
NY Rochester, Masline Elctrns. 716-546-5373
NY Rochester, Rochester Radio Supp. Co. 716-454-7800
NY Rome, Rome Elctrns., Inc. 315-337-5400
NY Schenectady, Grimmer's Elctrn. Supp. 518-374-8480
NY West Babylon, Delmar Elctrns., Inc. 516-410-1234
NY West Hempstead, March Elctrns. 516-486-6511
NY Westbury, Schweber Elctrns. 516-334-7474
NC Cary, Powell Elctrns. 919-467-1212
NC Charlotte, Dixie Elctrns. 704-337-5413
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Morrisville, Anixter-Raleigh 919-469-8303
NC Raleigh, Schweber Elctrns. 919-876-0000
NC Raleigh, Southeastern Elctrns. 919-828-2311
OH Akron, Akron Elctrn. Supp. Co. 216-762-8818
OH Cincinnati, Hughes-Peters, Inc. 513-351-2000
OH Cincinnati, U.R.I. Elctrns. 513-761-4030
OH Columbus, Hughes-Peters, Inc. 614-294-5351
OH Columbus, Thompson Elctrns. 614-228-6191
OH Columbus, Whitehead Elctrns. 614-224-1186
OH Dayton, Stotts-Friedman Co., Inc. 513-298-5555
OH Lima, LPR Elctrns., Inc. 419-228-1220
OH Marion, Servex Elctrns. Distr., Inc. 614-383-3117
OH Solon, Repco Elctrns. 216-248-8900
OH Solon, Targetronix Corp. 216-248-7930
OH Twinsburg, Schuster Elec. Co., Inc. 216-425-8134
OH Warren, REM Elctrns. Supp. Co., Inc. 216-373-1300
OK Oklahoma City, Electro-Enterprise 405-427-6591
OK Oklahoma City, Radio Supp., Inc. 405-232-6127
OK Tulsa, Carlton Bates 918-250-1626
OK Tulsa, Radio, Inc. 918-587-9123
OR Portland, Radar Elec. Co., Inc. 503-233-3691
PA Allentown, P.A. Peters, Inc. 215-434-5237
PA Altoona, Alleghény Elctrns. 814-946-0871
PA Braddock, Leff Radio Parts Co. 412-351-5000
PA Drexel Hill, Kass Elctrns. Distrs. 215-449-2300
PA Erie, REM Elctrn. Supp. 814-453-5626
PA Essington, Tri-Com, Inc. 215-521-3080
PA Horsham, Schweber Elctrns. 215-441-0600
PA Philadelphia, Almo Elctrns. Corp. 215-698-4000
PA Philadelphia, Arch Elctrns. Co. 215-563-4660
PA Philadelphia, Powell Elctrns., Inc. 215-365-1900
PA Reading, Barbey Elctrns. 215-376-6116
PA Wayne, Peak Elctrns. Corp. 215-293-9000
RI Pawtucket, Jabbour Elctrns. 401-728-4600
RI Pawtucket, Major Edward's Elctrn. Supp., Inc. 401-725-7400
SC Charleston, Wholesale Indl. Elctrns. 803-722-2634
SC Columbia, Dixie Elctrns., Inc. 803-779-5332
SC Greenville, Hammond Elctrns. 803-233-4121
TN Chattanooga, Curle Elctrns. 615-266-4727
TN Knoxville, Dixie Elctrns. 615-938-4131
TN Memphis, Carlton-Bates Co. 901-365-3539
TN Nashville, Electra Distrib. Co. 615-329-3971
TN Nashville, Graham Elctrns. 615-242-2682
TX Addison, Connec/Tek, Inc. 214-733-4411
TX Austin, Hamilton/Avnet Elctrns. 512-837-8911
TX Austin, Kent Elctrns. 512-834-1900
TX Beaumont, Ralph's Elctrns. 409-833-9443
TX Corpus Christi, Douglas Elctrns. 512-883-5103
TX Dallas, LBI Electro-Optics 214-358-4251
TX Dallas, Wallace Elctrns. Co., Inc. 214-340-0400
TX El Paso, Ideal Indl. Elctrn. Supp., Inc. 915-779-6647
TX Fort Worth, Industrial Elctrns., Inc. 817-731-7321
TX Fort Worth, Swieco, Inc. 817-335-6521
TX Fort Worth, Texas Connector Corp. 817-246-0109
TX Houston, Electronic Pkg. Comps., Inc. 713-447-5800
TX Houston, Electrotex 713-526-3456
TX Houston, Geophysical Supp. Co., Inc. 713-666-4100
TX Houston, Hamilton/Avnet Elctrns. 713-780-1971
TX Houston, Kent Elctrns. 713-780-7770
TX Irving, Hamilton/Avnet Elctrns. 214-659-4100
TX Midland, ESI Supp. 915-694-9657
TX Richardson, Kent Elctrns. 214-669-2600
TX San Antonio, Sherman Elctrns. Supp., Inc. 512-224-1001
TX San Antonio, Texas Intl. Cable 512-366-3648
UT Salt Lake City, Kimball Elctrns., Inc. 801-328-2075
VT Rutland, S.A.I. Semispecialists of Amer. 802-775-7126
VA Norfolk, Priest Elctrns., Inc. 804-855-0105
VA Richmond, Avec Elctrns. Corp. 804-359-6071
VA Richmond, Sterling Elctrns. 804-226-2190
VA Roanoke, Mexitronics 703-342-4444
WA Bellevue, Marshall Inds. 206-747-9100
WA Kent, Pyramid Elctrns. Supp. Co., Inc. 206-872-5800
WA Seattle, Connector World Supp. 206-767-6773
WA Seattle, Pacific Elctrns. 206-575-1050
WA Seattle, Radar Elctrn. Co., Inc. 206-282-2511
WA Seattle, Radar Elec. Co., Inc. 206-282-2511
WV Huntingdon, State Elec. Supp. Co. 304-523-7491
WV Kenova, Burco Distrs. 304-453-6387
WV Morgantown, State Elctrns. Co. 304-292-1641
WI Fond du Lac, Fedco, Elctrns., Inc. 414-922-6490
WI Madison, Superior Elctrn. Parts Co. 608-257-1477
WI Milwaukee, Industrial Elctrns. Corp. of WI 414-276-1212
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI Oshkosh, Electronics Inds. 414-235-8930

AMPEREX ELECTRONIC CORP., Ferroxcube Div., 5083 Kings Hwy., Saugerties, NY 12477, Tel: 914-246-2811, TWX: 510-247-5410; Empl.: 600; *Sls. Mgr.:* R. Denison; *Dist. Mgr.:* Ed Hellenschmidt

Refer to Amperex, Slatersville Div. for sales office information.

AMPEREX ELECTRONIC CORP., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802, Tel: 516-931-6200, TWX: 510-221-1839; Empl.: 270; *Sls. Mgr.:* Robert Carlin; *Dist. Mgr.:* Robert Carlin

AMPEREX ELCTRN. CORP., Slatersville Div., Providence Pike, Slatersville, RI 02876, Tel: 401-762-3800, Telex: 927584, TWX: 710-382-6332; FSC No.: 73445; Empl.: 565; *Sls. Mgr.:* Robert Carlin

AMPEREX ELECTRONIC INDS., Smithfield Div., George Washington Hwy., Smithfield, RI 02917, Tel: 401-232-0500, Telex: 92 76 43

Refer to Amperex, Slatersville . Div. for sales office information.

AMPERITE CO., INC., 600 Palisade Ave., Union City, NJ 07087, Tel: 201-864-9503, TWX: 710-992-8834; FSC No.: 70563; Empl.: 76; *Sls. Mgr.:* T. Whalen; *Dist. Mgr.:* T. Whalen

AMPEX CORP., 401 Broadway, Redwood City, CA 94063, Tel: 415-367-2011, TWX: 910-364-9034; Empl.: 9,800

AMPHENOL, 2801 South 25th Ave., Broadview, IL 60153, Tel: 312-345-9000

AMPHENOL, An Allied Co., 43 Commerce Ct., Lisle, IL 60532, Tel: 312-983-3500, TWX: 910-651-0191

AMPHENOL R F OPERATIONS, 33 E. Franklin St., Danbury, CT 06810, Tel: 203-743-9272

AMPLIFIER RESEARCH, 160 School House Rd., Souderton, PA 18964-9990, Tel: 215-723-8181, TWX: 510-661-6094; FSC No.: 30639; Empl.: 42; *Sls. Mgr.:* D.W. Roth **D•1002-1003**

Local Sales Offices & Reps
AL Huntsville, Beacon Elctrns. 205-881-5031
AZ Tempe, Mar Tech Assocs. 602-968-4944
CA N. Hollywood, O'Halloran Assoc. 213-877-0173
CA Palo Alto, O'Halloran Assoc. 415-969-1600
CA Santa Ana, Shoshin, U.S.A. 714-641-0417
CO Boulder, H. Bass. Assoc. 303-530-7509
CT Hamden, J.B.L. Assoc. 203-281-3161
FL Boca Raton, Beacon Elctrns. 305-392-3500
FL Clearwater, Beacon Elctrns. 813-796-2378
FL Maitland, Beacon Elctrns. 305-647-3498
FL Melbourne, Beacon Elctrns. 305-724-8010
GA Atlanta, Beacon Elctrns. 404-256-9640
IL Park Ridge, Elctrn. Instr. Assocs. 312-298-2290
IN Indianapolis, Elctrn. Instr. Assocs. 317-257-7231
MD Severna Park, Delmarva Eng. Assoc. Ltd. 301-647-8007
MA Lexington, R.J. Sickles 617-862-5100
MN Minneapolis, Elctrn. Instr. Assocs. 612-374-5628
NJ Denville, Metro-Mics 201-625-5959
NJ Westfield, Metro Mics 201-233-6116
NM Albuquerque, Hewitt & Assocs. 505-299-7746
NY Melville, Metro Mics 516-271-6677
NC Raleigh, Beacon Elctrns. 919-787-0330
OH Centerville, Micro Sls. 513-433-8171
OH North Olmsted, Micro Sls. 216-734-3080
PA Philadelphia, R. Meyers Assoc. 215-224-1663
TX Austin, Airep Elctrns. 512-327-0778
TX Dallas, Airep Elctrns. 214-349-4360
TX Houston, Airep Elctrns. 713-944-2055
UT Bountiful, Herb Bass Assoc. 801-295-0469
UT Salt Lake City, Herb Bass Assoc. 801-268-0262
WA Seattle, J. J. Assocs., Inc. 206-246-6619

AMPLIFONIX INC., 220 Rte. 13, Bristol, PA 19007, Tel: 215-788-2350, TWX: 510-667-0501; *Sls. Mgr.:* Jason A. Day; *Dist. Mgr.:* Jason A. Day

AMPROBE INSTR., 630 Merrick Rd., Lynbrook, NY 11563, Tel: 516-LY3-5600, TWX: 510-225-8403; Empl.: 230; *Sls. Mgr.:* W. Eagle

AMPTEK, INC., 6 De Angelo Dr., Bedford, MA 01730, Tel: 617-275-2242; Empl.: 11; *Sls. Mgr.:* George Kobaly, Jr.

Local Sales Offices & Reps
EXP MA, Plainville, Teknis 617-695-3591

AMPTEX, INC., 11103 Dennis Rd., P.O. Box 59841, Dallas, TX 75229, Tel: 214-241-2511, Telex: 730338; *Sls. Mgr.:* Richard Sparks

AMPTRONIX, INC., P.O. Box 8146, Rowland Heights, CA 91748, Tel: 714-595-5814; *Dist. Mgr.:* Ching Lin

Local Sales Offices & Reps
CA Los Angeles, Electric Switches, Inc. 213-660-1310

AMRAD & TRANSCON MFG. CO., Div. of D.J. Assocs., Inc., 8411 South Zero St., Fort Smith, AR 72903-7097, Tel: 501-452-3987; FSC No.: 55943; Empl.: 17

AMTEK DIGITAL SYSTEMS, INC., 12740 28th N.E., Seattle, WA 98125, Tel: 206-363-0217, Telex: 329473 (Burgess Sea); Empl.: 18; *Sls. Mgr.:* Fred Graham

AMUNEAL MFG., 4737 Darrah St., Philadelphia, PA 19124, Tel: 215-535-3000; FSC No.: 23740; Empl.: 120; *Sls. Mgr.:* S. M. Kamens; *Dist. Mgr.:* S. M. Kamens ..... **C•1721**

Local Sales Offices & Reps
AZ Phoenix, Shefler-Kahn Co. 602-257-9015
CA Fremont, William Parks Assoc., Inc. 415-796-0875
CA San Diego, C.E.M., Inc. 619-692-3551
CA Santa Ana, C.E.M., Inc. 714-835-2702
CO Wheatridge, Waugaman Assocs., Inc. 303-423-1020
CT New Britain, MPS Elctrns., Inc. 203-223-1006
GA Stone Mountain, Mountain Electro Prods., Inc. 404-448-5594
IL Chicago, Brock & Cushman, Inc. 312-622-4110
KS De Soto, Midtec Assocs., Inc. 913-441-6565
MD Baltimore, Muncy Sls. 301-484-6376
MA Norwood, MPS Elctrns. 617-769-8700
MI Ann Arbor, Metal-Tronics 313-437-7530
MI Wyoming, Howard Assocs., Inc. 616-532-2161
MN Hamel, Hedtke Mktg., Inc. 612-478-2120
MO Florissant, Midtec Assocs., Inc. 314-837-5200
NE Omaha, Hedtke Assocs., Inc. 402-895-6756
NM Albuquerque, Shefler Kahn Co. 505-296-0749
NY Bethpage, L. A. Buscaglia Co., Inc. 718-468-3666
NY Mendon, Tech-Mark, Inc. 716-624-3840
OH Akron, Imtech, Inc. 216-666-1185
OH Dayton, Imtech, Inc. 513-278-6507
OR Beaverton, Rep-West, Inc. 503-626-4279
TX Houston, Barry Sls. 713-784-5860
TX Richardson, Barry Sls. 214-234-0255
UT Salt Lake City, Waugaman Assoc. Utah, Inc. 801-261-0802
UT Salt Lake City, Waugaman Assocs. Utah, Inc. 801-261-0802
WA Seattle, Rep-West 206-283-8351
WI Waterford, Brock & Cushman, Inc. 414-662-3154
EXP NJ, Oradell, Sylvan Ginsbury 201-261-3200
Can Montreal, Que., Solid State Engrg. 514-481-3313

ANADEX, 1001 Flynn Rd., Camarillo, CA 93010, Tel: 805-987-9660, TWX: 910-494-2761; Empl.: 350

ANADYNE POWER SUPPLY DIVISION, 721 W. Whittier Blvd., La Habra, CA 90631, Tel: 213-697-3116, TWX: 910-583-4807; Empl.: 100

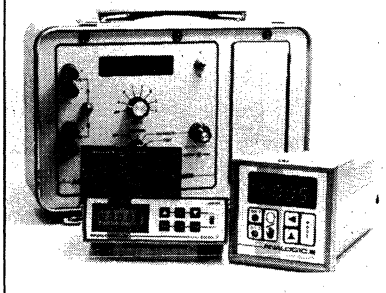
ANAHEIM AUTOMATION, 910 E. Orangefair La., Anaheim, CA 92801, Tel: 714-992-6990

ANALOGIC

AUTHORIZED DISTRIBUTOR

SSI SUNSHINE

THE SOURCE FOR METERS & TEST EQUIPMENT



Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT

(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area

(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

ANALOGIC

DIGITAL PANEL METERS & CONTROLLERS

AUTHORIZED DISTRIBUTORS

METERMASTER

FOR

Panel Meters • Test Equipment • Components
Sales, Modifications, Repair and Calibration

METERMASTER LOCATIONS:

ARIZONA
Phoenix ..... 602) 437-1425
Tucson ..... (602) 792-3411
CALIFORNIA
Los Angeles ..... (213) 685-4340
Palo Alto ..... (415) 960-8500
San Diego ..... (619) 560-4841
GEORGIA
Atlanta ..... (404) 446-0166
ILLINOIS
Chicago ..... (312) 250-0606
MASSACHUSETTS
Boston ..... (617) 523-2580
MINNESOTA
Minneapolis ..... (612) 332-6117
MISSOURI
St. Louis ..... (314) 454-0241
NEW MEXICO
Albuquerque ..... (505) 292-3330
OHIO
Cleveland ..... (216) 651-4100
OKLAHOMA
Tulsa ..... (918) 582-1444
PENNSYLVANIA
Pittsburgh ..... (412) 261-4548
TEXAS
Austin ..... (512) 473-8876
Dallas ..... (214) 271-5671
Houston ..... (713) 733-9814
WISCONSIN
Milwaukee ..... (414) 643-0554
ALL OTHER STATES ..... (800) 962-8128

ANALOG & DIGITAL PERIPHERALS, INC. (ADPI), 815 Diana Dr., Troy, OH 45373, Tel: 513-339-2241, TWX: 810-450-2685; FSC No.: 31-0949-745; Empl.: 19; *Sls. Mgr.:* Alan Kuebier

ANALOG DEVICES, P.O. Box 280, Norwood, MA 02062, Tel: 617-329-4700, TWX: 710-394-6577; FSC No.: 24355; Empl.: 4,000

ANALOGIC

ANALOGIC CORP., 8 Centennial Dr., Peabody, MA 01961, Tel: 617-532-5660, 617-777-4500, 617-246-0300, 800-451-1, Telex: 94-9307, TWX: 681-7180; Empl.: 2000; *Sls. Mgr.:* M. E. Culverhouse; *Dist. Mgr.:* D. Vermilyea ..... **D•1138-1139**

Local Sales Offices & Reps

Array Processors
AZ Phoenix, Cherry Assocs. 602-242-1922
CA Woodland Hills, Gordon Osborne & Assocs. 213-888-9916
CT Avon, Power Mark, Inc. 203-678-0123
FL Cape Canaveral, Analogic Corp 305-799-2300
GA Lilburn, Micro-Spec 404-921-3840
IL Elgin, Analogic 312-888-4242
IL Rolling Meadows, Commodore I 312-394-5441
IN Indianapolis, Sukup & Cox 317-253-5501
KS Overland Pk., Ramsey Assocs. 913-649-6996
MD Lanham, Data Sys. Mktg. 301-577-3700
MA Hopkinton, Power Mark, Inc. 617-435-9200
MI Livonia, Lowell-Wendt Mktg. Co. 313-464-2722
MN Golden Valley, J. R. Assocs. 612-546-4110
MO Maryland Heights, Ramsey Assocs. 314-878-5042
NJ Boonton, PAF Assocs. 201-335-0680
NM Albuquerque, Cleveland Entprs. 505-265-7893
NY New Hartford, PDQ Assocs. 315-768-8167
NY Smithtown, PAF Assocs. 516-360-0940
OH Chagrin Falls, Midwest Mktg. Assocs. 216-247-6655
OH Dayton, Midwest Mktg. Assocs. 513-433-2511
PA Churchville, Dynamic Elec. 215-322-2611
PA Pittsburgh, Staples 412-881-5990
TX Houston, A.C.U. Data 713-580-2451
TX Houston, Analogic Corp. 713-280-9048
Can Mississauga, Ont., Tracan Elctrns. 416-625-7752
CA Pasadena, RDX Corp. 213-681-3451
CA San Diego, RDX Corp. 619-278-6863
CA Sunnyvale, RDX Corp. 408-734-4500
CT Portland, B.B.I. 203-342-0648
IL Downers Grove, Physics Equip. 312-960-4054
MA Holbrook, McLellan Assocs. 617-767-4771
MO St. Louis, Engrg. Svcs. Co. 314-997-1515
NY Frankfort, Kapitol Instr. Sls. 315-894-4245
NY New York, Flowmaster 212-741-9675
NY Rochester, C. V. Sls. 716-328-0680
NY Williamsville, C. V. Sls. 716-759-2923
OK Tulsa, Data Mktg. Assocs. 918-438-4911
PA Pittsburg, R.D.P. Corp. 412-487-2217
TX Austin, Data Mktg. Assocs. 512-451-5174
TX Dallas, Data Mktg. Assocs. 214-661-0300
UT Salt Lake City, Westek Data Prods. 801-261-0999
VA Richmond, Commonwealth Controls 804-271-7700
WA Seattle, Brett Assocs. 206-431-8090

Digital Panel Instrs., Load Cell Digitizing Sys. & Temperature Instr.
AL Birmingham, Regal Controls 205-967-5770
CA Pasadena, RDX Corp. 213-681-3451
CA San Diego, RDX Corp. 619-278-6863
CA Sunnyvale, RDX Corp. 408-734-4500
IL Buffalo Grove, Laganowski & Assocs. 312-520-0130
IL Downers Grove, Physics Equip. 312-960-4054
IL Naperville, Synergy Sys. 312-369-2021
ME Boothbay, Linekin 207-633-5363
MA Belmont, Hi Tech Controls 617-489-0851
MA Danvers, Analogic 617-777-4500
MN Eden Prairie, Elctrn. Instr. Conslts. 612-937-9701
MO St. Louis, Engineering Svcs. Co. 314-997-1515
NM Albuquerque, Qualtech 505-243-5605
NY Frankfort, Kapital Instrs. 315-894-4245
NY NewYork, Flowmaster 212-741-9675
NC Charlotte, Zelco 704-523-2961
OH Dayton, P. J. Navin Co. 513-434-8940
OH Dayton, RDP Corp 513-253-6175
OK Tulsa, Data Mktg. Assocs. 918-741-4911
PA Pittsburg, RDP Corp. 412-487-2217
TN Knoxville, Paris Co. 615-966-2141
TX Austin, Data Mktg. Assocs. 512-451-5174
TX Dallas, Data Mktg. Assocs. 214-661-0300
TX Richmond, Commonwealth Controls 804-271-7700

ANALOGIC CORP., Data Conversion Prods. Grp., Audubon Rd., Wakefield, MA 01880, Tel: 617-246-0300, Telex: 94-9307, TWX: 710-348-0425; Empl.: 2000; *Sls. Mgr.:* Leonard D. Sacon ..... **D•1138-1139**

Local Sales Offices & Reps

AL Huntsville, Beacon Elctrns, Assocs., Inc. 205-881-5031
AZ Scottsdale, Arcom Sls., Inc. 602-947-5745
CA Carson, AMASCO 213-516-8561
CA San Jose, Analogic Corp. 408-247-6401
CA Sunnyvale, AMASCO 408-733-8690
CO Wheat Ridge, Westek Data Prods., Inc. 303-431-9876
CT Portland, BBI 203-342-0648
FL Boca Raton, Beacon Elctrns. Assocs., Inc. 305-393-3500
FL Clearwater, Beacon Elctrns. Assocs., Inc. 813-796-2378
FL Maitland, Beacon Elctrns. Assocs., Inc. 305-647-3498
FL Melbourne, Beacon Elctrns. Assocs., Inc. 305-724-8010
GA Atlanta, Beacon Elctrns. Assocs. 404-256-9640
IL Rosemont, Synmark Sls. Co. 312-825-3455
MA Holbrook, McLellan Assocs. 617-767-4771
MI Livonia, Lowell-Wendt Mktg. Co. 313-464-2722
MO St. Louis, Engrg. Svcs. Co. 314-997-1515
NJ Boonton, PAF Assocs. 201-335-0680
NY Smithtown, PAF Assocs. 516-360-0940
NY Syracuse, Labtronics 315-455-7314
NC Raleigh, Beacon Elctrns. Assocs., Inc. 919-787-0330
OH Chagrin Falls, Midwest Mktg. Assocs. 216-247-6655
OH Cincinnati, Analogic Corp. 606-371-0064
OH Dayton, Midwest Mktg. Assocs. 513-433-2511
OK Tulsa, Norcom, Inc. 918-832-7747
PA Norristown, Denco Data Equip. Corp. 215-630-8990
TX Austin, Norcom, Inc. 512-451-2757
TX Dallas, Norcom 214-386-4888
TX Houston, Norcom, Inc. 713-778-0392
TX San Antonio, Norcom, Inc. 512-680-4513
UT Salt Lake City, Westek Data Prods., Inc. 801-261-0999
Can Montreal, Tracan Elctrns. Corp. 514-636-8380
Can Ottawa, Tracan Elctrns. Corp. 613-722-7667
Can Toronto, Tracan Elctrns. Corp. 416-625-7752

ANALOG MODULES, INC., 126 Baywood Avenue, Longwood, FL 32750, Tel: 305-339-4356/4355, Telex: ANALOG MOD C1 467617; FSC No.: 61651; Empl.: 22; *Sls. Mgr.:* Ian D. Crawford ..... **D•1004**

ANALOG SYSTEMS, P.O. Box 35879, Tucson, AZ 85740-5879, Tel: 602-293-4923, TWX: 910-952-1185; FSC No.: 58976; Empl.: 13; *Sls. Mgr.:* Sharon Raban; *Dist. Mgr.:* Sharon Raban

ANALOG TECHNOLOGY CORP., 15859 E. Edna Pl., Irwindale, CA 91706, Tel: 213-960-4004, TWX: 910-584-1855; *Sls. Mgr.:* James L. Lawrence, Jr.

ANALYTICAL MEAS., 31 Willow St., Chatham, NJ 07928, Tel: 201-273-7500; Empl.: 35

ANALYTICS COMMUNICATIONS SYS., 1820 Michael Faraday Dr., Reston, VA 22090, Tel: 703-471-0892, Telex: 710-833-0326; Empl.: 35; *Sls. Mgr.:* Paul G. Jones

ANAREN MICROWAVE, P.O. Box 178, 6635 Kirkville Rd., E. Syracuse, NY 13057, Tel: 315-432-8909, Telex: 937351, TWX: 710-541-1507; FSC No.: 31597; Empl.: 310

ANCHOR SPECIALTY MFG. INC., 300 Hollister Rd., Teterboro, NJ 07608, Tel: 201-288-1939; Empl.: 10

AN/COM INDUSTRIES, P.O. Box 530, 5521 Cleon Ave., N. Hollywood, CA 91603, Tel: 818-769-5518, TWX: 910-498-5713; *Sls. Mgr.:* E. J. Wubben; *Dist. Mgr.:* E. J. Wubben

AND, 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-347-9916, TWX: 910-374-2353; Empl.: 30; *Sls. Mgr.:* Dean Ransom

ANDEEN-HAGERLING, INC., 31899 Miles Road, Chagrin Falls, OH 44022, Tel: 216-349-0370; Empl.: 14; *Sls. Mgr.:* Gwen Glazer

Local Sales Offices & Reps

OH Cleveland, TIBY Co. 216-371-5335

ANDERS, INC., 77 Wolcott Rd., Simsbury, CT 06070, Tel: 203-658-7666; FSC No.: 52045; Empl.: 18; *Sls. Mgr.:* R. A. Grover

ANDERSEN LABS., 1280 Blue Hills Ave., Bloomfield, CT 06002, Tel: 203-242-0761, TWX: 710-425-2390; FSC No.: 03947; Empl.: 125 ..... **A•1591**

Local Sales Offices & Reps

CA	Mountain View, Peninsula Tech. Sls.	415-965-3636
CA	San Marcos, Midwin & Olifson	619-571-0177
CA	Santa Ana, SSK USA, Inc.	714-250-4073
CA	Tarzana, Midwin & Olifson	213-996-9093
CA	Tustin, SC Cubed	714-731-9206
IL	Northfield, Feller Assocs.	312-446-8065
IA	Cedar Rapids, Feller Assocs.	319-364-0566
MD	Owings Mill, Neal Deoul Assocs., Inc.	301-795-5775
MA	Wayland, High-Tech Sls.	617-653-3838
NY	Melville, Carnes Assocs.	516-694-1600
PA	Huntingdon Valley, Rabal Assoc.	215-947-4825
TX	Dallas, McDonald Assocs.	214-238-1858
Intl	Japan, Tokyo, Japan Telescomm Corp.	403-5301
Can	Bolton, Ont., MacKay Assocs.	416-857-4302
Can	Quebec, R. F. Microwave, Ltd.	514-335-2335

ANDERSON-BELL CO., P.O. Box 191, Canon City, CO 81212, Tel: 303-275-1661, Telex: 499-4230; *Sls. Mgr.:* Carol Fontecchio; *Dist. Mgr.:* Carol Fontecchio

ANDERSON ELCTRNS., 310 Penn St., P.O. Box 89, Hollidaysburg, PA 16648, Tel: 814-695-4428, TWX: 510-691-2516; Empl.: 85; *Sls. Mgr.:* W. H. Anderson ..... **A•1313**

Local Sales Offices & Reps

CA	Fullerton, GRU Assocs.	714-738-0903
CA	Santa Clara, Logan Sls	408-496-0660
CT	Branford, LJM Assocs.	203-488-7995
FL	New Port Richey, Lobo Mktg. Assocs., Inc.	813-848-8578
GA	Lawrenceville, B. T. Funderburk, Inc.	404-963-9495
IL	South Elgin, R.K. Elctrn.	312-695-8552
MA	Plymouth, Newby, Inc.	617-746-3869
MI	Lathrup Village, R. C. Nordstrom & Co.	313-559-7373
NY	Smithtown, LI., PAF Assocs.	516-360-0940
NY	Syracuse, Murcan Sls. Corp.	315-437-0734
NC	Raleigh, B. T. Funderburk, Inc.	919-782-3493
OH	Dayton, Dynel Co.	513-434-6467
PA	Rydal, Espy Sls.	215-576-0780
TX	Plano, GW Prods.	214-422-1746
WA	Seattle, Harry Levinson Co.	206-382-1300
Can	Mississauga, Ontario, Gidden-Morton Assocs.	416-671-8111

ANDERSON POWER PRODS., Div. of High Voltage Engrg., 145 Newton St., Boston, MA 02135, Tel: 617-787-5880, Telex: 940453

ANDREW CORP., 10500 W. 153rd St., Orland Pk., IL 60462, Tel: 312-349-3300, Telex: 25-3897, TWX: 910-651-3340; *Sls. Mgr.:* Carl Van Hecke

ANDREWS BEARING CORP., MPB Corp., New Cut Road, Spartanburg, SC 29304, Tel: 803-583-4541, TWX: 810-282-2578; *Sls. Mgr.:* Michael S. Diblasi; *Dist. Mgr.:* Jack E. Barker

ANDRICH SYS., INC., 1699 Roosevelt Ave., Bohemia, NY 11716, Tel: 516-589-5656; *Sls. Mgr.:* Robert G. Andrews

ANDROMEDA SYS., 9000 Eton Ave., Canoga Park, CA 91304, Tel: 818-709-7600, TWX: 910-444-1248; Empl.: 23; *Sls. Mgr.:* Mike Morgan; *Dist. Mgr.:* Mike Morgan

ANDROTEK/DMI, Box 29098, Columbus, OH 43229, Tel: 614-882-7821; *Sls. Mgr.:* James M. Shively

ANGENIEUX INC., 120 Derry Rd., Hudson, NH 02051, Tel: 603-889-2116, Telex: 94-3469; *Sls. Mgr.:* Edward A. Wollensak

ANGO ELECTRONICS CORP., Post Office Box 112, Harrison, NJ 07029, Tel: 212-685-6336, 201-484-1115, Telex: 421531; *Sls. Mgr.:* Brian K. Yuen ..... **C•1008**

ANN ARBOR TERMINALS, 6175 Jackson Rd., Ann Arbor, MI 48103, Tel: 313-663-8000, Telex: 706905; Empl.: 50; *Sls. Mgr.:* Gary DeLuca

ANORAD CORP., 110 Oser Ave., Hauppauge, NY 11788, Tel: 516-231-1990, TWX: 510-227-9894; Empl.: 235

ANRO ELCTRN. INDS., 300 Wildcat Rd., Downsview, ON, Canada, Tel: 416-661-2600; Empl.: 85; *Sls. Mgr.:* E.H. Jones

ANSCO, 1243 West 134th St., Gardena, CA 90247, Tel: 1-800-421-1270, 1-800-821-3308, 213-532-7780; Empl.: 25+; *Sls. Mgr.:* Melvin Preston

ANSLEY ELECTRONICS, DIVISION OF THOMAS & BETTS, See T & B/Ansley Corp.

ANSONICS, INC., P.O. Box 910, Halfway, OR 97834, Tel: 503-742-7475; Empl.: 6

ANTENNACRAFT, Box 1005, Burlington, IA 52601, Tel: 319-754-7575

ANTENNA RESCH. ASSOCS., 11317 Frederick Ave., Beltsville, MD 20705, Tel: 301-937-8888, Telex: 908754; FSC No.: 04190; Empl.: 25; *Sls. Mgr.:* H.W. Rapalus

ANTENNA SPECIALISTS, 12435 Euclid Ave., Cleveland, OH 44106, Tel: 216-791-7878, Telex: 980-732; Empl.: 1000; *Sls. Mgr.:* Larry Kline

ANTEX DIV., 7 Hawkes St., Marblehead, MA 01945, Tel: 617-631-7100; *Sls. Mgr.:* C. Loutrel; *Dist. Mgr.:* C. Loutrel

ANTEX ELECTRONICS CORP., 16100 S. Figueroa St., Gardena, CA 90248, Tel: 213-532-3092, TWX: 910-344-7381; Empl.: 53; *Sls. Mgr.:* J. Antrim; *Dist. Mgr.:* K. Ross

ANTONA CORP., 2100 S. Sawtelle Blvd., Suite 205, Los Angeles, CA 90025, Tel: 213-473-8995; Empl.: 4

ANTRONIC CORP., 7755 E. Redfield Rd., Ste. 300, Scottsdale, AZ 85260, Tel: 312-287-5110

APAHOUSER-ELCOM, INC., 101 Walnut St., Watertown, MA 02172, Tel: 617-924-1500; FSC No.: 53721; Empl.: 90; *Sls. Mgr.:* Fred Gately

APA DIVISION, 399 Executive Blvd., Elmsford, NY 10523, Tel: 914-592-7322, Telex: 646186; *Sls. Mgr.:* Carl Gruenberg

A. P. CIRCUIT CORP., 513 East 86th St., P.O. Box 1350, New York, NY 10028, Tel: 212-737-1348, Telex: 428759 ..... **A•1592**

Local Sales Offices & Reps

MI	Detroit, Comtel Instrs.	313-255-1970
OH	Cleveland, Comtel Instrs.	216-442-8080
OH	Dayton, Comtel Instrs.	513-298-7573

APEX MICROTECHNOLOGY CORP., 2895 W. Rudasil Road, Tucson, AZ 85741, Tel: 602-746-0849, TWX: 910-952-1176; Empl.: 65; *Sls. Mgr.:* Rita Olschewski; *Dist. Mgr.:* Rita Olschewski ..... **D•1005**

Local Sales Offices & Reps

AZ	Tempe, Mar Tech. Assocs., Inc.	602-747-8098
CA	Los Altos, Kolm Mktg.	415-948-2635
CA	San Diego, California Elctrn. Mktg.	619-692-3551
CA	Santa Ana, California Elctrn. Mktg.	714-835-2702
CO	Denver, W. H. Howard Assocs.	303-426-3499
IL	Chicago, L.G.S. Sls.	312-456-0616
MD	Ellicott City, Nelson Elctrns.	301-747-7887
MA	Malden, J.K. Assocs.	617-321-2922
MN	Bloomington, Merril Franklin Co.	612-854-9446
NY	Smithtown, T & K Sls.	516-724-3456
OH	Fort Wayne, TX Sales	219-489-4447
TX	Dallas, Repmasters	214-247-6236
TX	Houston, Repmaster	713-692-8204

Local Distributors

Intl	Austria, Wien, Nano-80	0222-65-15-22
Intl	Finland, Helsinki, Turion Oy	90-372144
Intl	France, Orsay, Microel	907-08-24
Intl	Germany, Nauheim, Emtron Vertriebs GmbH	(06152) 6003
Intl	India, Bombay, Elmatronic Dvs.	362421
Intl	Ireland, Co. Louth, Success Elect.	042-72374
Intl	Israel, Giuataim, EIM	03-77-40-41
Intl	Italy, Milanino, Servotecnia S.A.S.	...39/02-619-53-27
Intl	Japan, Tokyo, Kyokuto Boeki Kaisha	244-3511
Intl	Netherlands, Oosterhout, Klaasing Elctrns.	01620-51400
Intl	Norway, Oslo, Eltron	02-462-870
Intl	South Africa, Johannesburg, Advanced Semiconductor	27/11802-4107
Intl	Sweden, Stockholm, Scancopter AB	046-828-9425
Intl	Switzerland, Zug, Anatech AG	042-315-477
Intl	Taiwan, Taipei, Hitek Co. Ltd.	536-1157
Intl	UK, Sunbury-on-Thames, Pascall Elctrns.	09327-87418

API INSTRS., 1601 Trapelo Rd., Waltham, MA 02254, Tel: 617-890-2000, Telex: 92-3445, TWX: 710-324-0681; FSC No.: 20905; Empl.: 350; *Sls. Mgr.:* R. Yates; *Dist. Mgr.:* G. Wood

APM-HEXSEAL, 44 Honeck St., Englewood, NJ 07631, Tel: 201-569-5700, Telex: 13-3403; Empl.: 65; *Sls. Mgr.:* Kenneth Schwinn; *Dist. Mgr.:* Kenneth Schwinn

APOLLO LASERS, INC., 9201 Independence Ave., Chatsworth, CA 91311, Tel: 213-709-1111, Telex: 66-2278; Empl.: 82; *Sls. Mgr.:* John Q. Adams

APOLLO MAGNETICS CORP., 2720 W. Beverly Blvd., Los Angeles, CA 90057, Tel: 213-381-2500, TWX: 910-321-4348; Empl.: 420 ..... **D•1058**

Local Sales Offices & Reps

CT	Stratford, Gerald Rosen	203-375-5456
MA	Framingham, Gerald Rosen	617-879-5505
NH	Hollis, Gerald Rosen	603-465-7902
NY	Rochester, J. W. Welch	716-244-1100
NY	Utica, J. W. Welch	716-244-1100
OK	Oklahoma City, MGR Elctrns.	918-366-0125
TX	Dallas, MGR Elctrns.	214-349-9940

APPLETON PAPERS INC., P.O. Box 359, Appleton, WI 54912, Tel: 414-734-9841; Empl.: 3,500; *Sls. Mgr.:* Doug Adams ..... **D•1059**

APPLIED CIRCUITS, INC., 36-06 43rd. Ave., Long Island City, NY 11101, Tel: 212-786-7200; Empl.: 20

APPLIED CIRCUIT TECHNLG. (ACT), 2931 La Jolla St., Anaheim, CA 92806, Tel: 714-632-9230; *Sls. Mgr.:* Hank Pselos

APPLIED COMMUNICATIONS, Amstar Tech. Prods. Co., 5490 Spectrum Drive, Frederick, MD 21701, Tel: 301-694-5300, TWX: 710-828-9706; Empl.: 150; *Sls. Mgr.:* Joseph Rock

APPLIED COMMUNICATIONS, 9125 Gaither Rd., Gaithersburg, MD 20877, Tel: 301-948-5210, TWX: 701-828-9706; Empl.: 200; *Sls. Mgr.:* Joseph Rock

APPLIED CONTROL, 1275 Bloomfield Ave., Fairfield, NJ 07006-2828, Tel: 201-227-5454; FSC No.: 4A725; Empl.: 26; *Sls. Mgr.:* Monica E. Merel

APPLIED DATA COMMUNICATIONS, 14272 Chambers Rd., Tustin, CA 92680, Tel: 714-731-9000; Empl.: 75

APPLIED DIGITAL DATA SYSTEMS INC., 100 Marcus Blvd., Hauppauge, NY 11787, Tel: 516-231-5400, TWX: 510-227-9886; Empl.: 760; *Sls. Mgr.:* Dennis O'Donnell

APPLIED ELECTRO TECHNOLOGY, INT.
AN STI COMPANY

APPLIED ELECTRO TECHNLG., INT., STI Company, 2220 So. Anne St., Santa Ana, CA 92704, Tel: 714-556-6570, TWX: 910-595-1797; FSC No.: 52797; Empl.: 25; *Sls. Mgr.:* Deborah Core ..... **B•1275**

Local Sales Offices & Reps

AL	Odenville, Hubert Satterfield	205-629-5939
CA	Mountain View, Scientific Technlg.	415-965-0910
CA	San Jose, Rick Schloss	408-274-3304
OR	Eugene, Dennis Ellingsen	503-484-5564
PA	King of Prussia, Joseph McCready	215-527-5921
TX	Richardson, Dwain Lawhon	214-231-2289

APPLIED ENGRG. PRODS., P.O. Box A-D, Amity Sta., New Haven, CT 06525, Tel: 203-387-5282, TWX: 710-465-1173; FSC No.: 19505; Empl.: 65; *Sls. Mgr.:* C. Goff; *Dist. Mgr.:* C. Goff

APPLIED INSTRS., INC., 25 Will Place, Brooklyn, NY 11207, Tel: 212-257-0885; *Sls. Mgr.:* I. L. Litty

APPLIED MAGNETICS, 75 Robin Hill Rd., Goleta, CA 93117, Tel: 805-683-5353, TWX: 910-334-1195; FSC No.: 11935; Empl.: 4500; *Sls. Mgr.:* O. M. Fundingsland

A.P. PRODUCTS

APTRONICS

IN STOCK • IN STOCK

Franchised Distributor

LOGICOMP
ELECTRONICS, INC.

1009 W. BOSTON POST ROAD
MAMARONECK, NEW YORK 10543
PHONE: (914) 698-9332

TOLL FREE
(Outside N.Y.)
800/431-2625

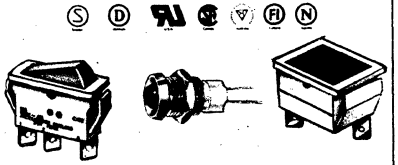
ARCOLECTRIC

FULL LINE
AUTHORIZED DISTRIBUTOR

E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971
WITH ELECTRICAL APPROVALS OF:



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

APPLIED MICROSYSTEMS CORP., 5020-148th Ave. NE C-1002, Redmond, WA 98073-1002, Tel: 206-882-2000, 800-426-3925, Telex: 152471; Empl.: 140; *Sls. Mgr.:* Joe Gomula

APPLIED MICRO TECHNLG., A Burr Brown Co., 3669 E. 44th Street, Tucson, AZ 85713, Tel: 602-622-8605, TWX: 910-952-1164; Empl.: 15; *Sls. Mgr.:* Lee Davis

APPLIED MICROWAVE DIV. EPSCO, See Epsco Microwave

APPLIED POWER CONVERSION
DIVISION OF TECHNOLOGY DYNAMICS, INC.

APPLIED POWER CONVERSION, Technology Dynamics, Inc., 100 School St, Bergenfield, NJ 07621, Tel: 201-664-7636 ..... **D•1500-1507**

Local Sales Offices & Reps

CA	Sunnyvale, Sourcetronics, Inc.	408-988-8801
CA	West Lake Village, Powerdyne Assocs.	818-991-0632
CO	Aurora, Butler Tech. Sls.	303-343-3787
FL	Orlando, Gramar, Inc.	305-894-3351
MD	Hagerstown, Stinson Assocs., Inc.	301-790-1193
VA	Reston, Stinson Assocs., Inc.	703-620-0088

APPLIED RESEARCH, INC., 160 Dupont St, Plainview, NY 11803, Tel: 516-349-9200; Empl.: 50; *Sls. Mgr.:* S. Klipper ..... **A•1702-1703**

Local Sales Offices & Reps

CA	Los Angeles, EBA Microwave	213-822-7510
CA	Orange, E. Bell Assocs.	714-857-6079
MA	Lowell, Russell Engrg.	617-458-7146
NY	Great Neck, Industron Assocs.	516-487-2620

APPLIED RESEARCH LABS, 9545 Wentworth, P.O. Box 129, Sunland, CA 91040, Tel: 818-352-6011, Telex: 673299; Empl.: 300 (USA); *Sls. Mgr.:* Brian Myerscough

APPLIED SOLAR ENERGY CORP., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749, Tel: 818-968-6581, TWX: 910-584-4890; Empl.: 160; *Sls. Mgr.:* T. Scott Thorpe

APPLIED SYS., 26401 Harper Ave., St. Clair Shores, MI 48081, Tel: 313-779-8700; Empl.: 15; *Sls. Mgr.:* Marty Wyrod

A P PRODUCTS INCORPORATED, 9450 Pineneedle Dr., Box 540, Mentor, OH 44060, Tel: 216-354-2101, TWX: 810-425-2250; Empl.: 84; *Sls. Mgr.:* Kathy M. Dusa

APSCO, INC., Sub. of The National Copper & Smelting Co., 5976 Heisley Road, Mentor, OH 44060, Tel: 216-942-3871; Empl.: 270; *Sls. Mgr.:* A. Stuart Hamilton III

APTEK MICROSYSTEMS, 700 N. W. 12th Ave., Deerfield Beach, FL 33441, Tel: 305-421-8450, Telex: 441020; Empl.: 250; *Sls. Mgr.:* Joseph F. Centeno

APTRONICS CORPORATION, 9450 Pineneedle Dr., P.O. Box 270, Mentor, OH 44060, Tel: 216-354-9239, TWX: 810-425-2250; FSC No.: 30146; *Sls. Mgr.:* Phillip F. Fram; *Dist. Mgr.:* Debra L. Kardum

A.P.W. CO., INC., 72 W. Main, Rockaway, NJ 07866, Tel: 201-627-0643; Empl.: 18

AQ SYS., 1736 Front St., Yorktown Hgts., NY 10598, Tel: 800-431-2104; Empl.: 15; *Sls. Mgr.:* Charles E. Fitzsimmons; *Dist. Mgr.:* Charles E. Fitzsimmons

AQUALARM INC., 544 W. 182nd, Gardena, CA 90248, Tel: 213-321-5873

ARCO CABLE, 7361 Ethel Ave., North Hollywood, CA 91605, Tel: 818-982-2832; Empl.: 10; *Sls. Mgr.:* J. R. Parke

ARCO ELCTRNS., 400 Moreland Rd., Commack, NY 11725, Tel: 516-864-7000, TWX: 510-226-0241; FSC No.: 84171; Empl.: 40; *Sls. Mgr.:* Abe Kosakowsky

ARCOLECTRIC CORP., 9001 Canoga Ave., Canoga Park, CA 91304, Tel: 818-700-1933, Telex: 19-4645; Empl.: 20; *Sls. Mgr.:* L. Lewis; *Dist. Mgr.:* Carrie Donze ..... **B•1018-1020, 1496-1501; C•1153**

Local Distributors

CA	Berkeley, Al Lashers Elctrns.	415-843-5915
CA	Fullerton, Orvac Elctrns.	714-871-1020
CA	Los Angeles, Electric Switches	213-664-1141
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Riverside, Material Techniques	714-686-6186
CA	San Jose, Quement Elctrns.	408-998-5900
IL	Rockford, GC Elctrns.	815-968-9661
MA	Needham, YDI Elctrns.	617-449-1005
NJ	Denville, Lashen Elctrns.	201-627-3783
NJ	Springfield, Route Elctrns.	201-379-7710
NY	Bronx, CAM Elctrns.	212-893-8300
NY	New Hyde Park, Electronic City	516-352-7145
OH	Ashtabula, Sesco Sims Elctrns.	216-997-8391
OR	Eugene, Larsco	503-484-7491
PA	Willow Grove, Resco Elctrns.	215-659-4575
TX	Houston, City Elctrns.	713-621-1060

ARC SYSTEMS, INC., 400 Oser Ave., Hauppauge, NY 11788, Tel: 516-231-9261, Telex: 230199 SWIFT UR ARC; *Sls. Mgr.:* Robert Miller

AREMCO PRODS., Box 429, Ossining, NY 10562, Tel: 914-762-0685, Telex: 13-7442; Empl.: 30; *Sls. Mgr.:* Mark Wandzilak

A.R.F. PRODS., 2559 75th St., Boulder, CO 80301, Tel: 303-443-4844, TWX: 910-940-3446; Empl.: 65; *Sls. Mgr.:* R. C. Lloyd, Jr.

ARGA CONTROLS, 35 E. Glenarm St., Pasadena, CA 91105, Tel: 213-682-3314; FSC No.: 50290; Empl.: 20; *Sls. Mgr.:* Linda Galman

Local Sales Offices & Reps

AZ	Phoenix, P. T. L. Electrns., Inc.	602-892-9329
CA	Santa Ana, Brooks-Moore & Assocs.	714-544-8900
MN	Minneapolis, Marsh Sls.	612-729-9345
MO	St. Louis, Engineering Svcs. Co.	314-997-1515

ARGENT ELCTRNS., 3245 S. County Rd., 25A, Troy, OH 45373, Tel: 513-335-0031; FSC No.: 55901; Empl.: 20; *Sls. Mgr.:* W. Zickafoose

ARGOS PRODS., 600 S. Sycamore St., Genoa, IL 60135, Tel: 815-784-5118; Empl.: 50; *Sls. Mgr.:* Ron Evers

Local Sales Offices & Reps

CA	Burlingame, Meyer, Ross & Fleming	415-348-6800
CA	Culver City, W. Alderson	213-837-1398
FL	Ocala, Bencsik Assoc.	904-732-9775
GA	Atlanta, Murphy & Cota	404-875-2525
IL	Chicago, G. Mcl. Cole	312-774-3535
IN	Mulberry, Maish Sls.	317-296-2322
MA	North Scituate, W.A. Hendrickson	617-545-0652
MI	Pontiac, Ted Firaneck Sls.	313-373-9595
MN	Edina, Foster Tech. Sls.	612-941-9800
MO	Kansas City, Nevco	816-421-1751
NJ	Fort Lee, TMC Sls.	201-944-5665
NY	Syracuse, Lewis & Dunnigan	315-446-5522
OH	Dayton, Shamrock Elctrn	513-258-1227
PA	Wynnewood, Stinson Assocs.	215-896-7378
TX	Houston, Peregrine Southwest	713-772-6765
WA	Lynnwood, Pacnor Mktg.	206-284-8020
EXP	N.Y., New York, Roburn Agencies	212-989-5939

ARGO TRANSDATA CORP., Box 554, Clinton, CT 06413, Tel: 203-669-2233; Empl.: 15

ARIES® ELECTRONICS, INC.

ARIES ELCTRNS., Box 130, Frenchtown, NJ 08825, Tel: 201-996-6841, TWX: 510-235-3391; FSC No.: 51167; Empl.: 110; *Sls. Mgr.:* Frank Folmsbee ... **C•1155-1158**

Local Sales Offices & Reps

AL	Huntsville, CSR	205-533-2444
AZ	Glendale, Adtek, Inc.	602-931-9289
CA	Los Angeles, Universal Comp.	213-641-4255
CA	Santa Clara, Nova-Tronix	408-727-9530
CO	Aurora, Mountain View Mktg.	303-360-9641
CT	Canton, Bell Controls	203-693-8926
FL	Altamonte Springs, APM Assocs.	305-869-6831
FL	Ft Lauderdale, APM Assocs.	305-565-0056
FL	Tampa, APM Assocs.	813-886-2457
GA	Atlanta, CSR	404-396-3720
IL	Elk Grove Village, Carlson Sls. Assocs.	312-956-8240
IN	Indianapolis, J and W Sls.	317-842-3740
IA	Cedar Rapids, Carlson Sls. Assocs.	319-377-6341
KS	Gladstone, Delltron Co.	816-436-6445
MD	Lutherville, J. A. Dougherty Sls.	301-321-7890
MI	Jenison, OBE, Inc.	616-457-9300

MI St. Joseph, OBE, Inc. 616-429-7788
MI W. Bloomfield, OBE, Inc. 313-332-4900
MN Sweet Lake Park, Holmgren Assocs. .. 612-786-7641
MO Gladstone, Delltron Co. 816-436-6445
MO St. Louis, Delltron Co. 314-869-4779
NH Nashua, Bell Controls 603-882-6984
NJ Ho-Ho-Kus, DJ Fisher Co. 201-652-0090
NM Albuquerque, Varigon Assocs. 505-344-5503
NY Fairport, TAC Sls., Inc. 716-425-1070
NC Matthews, CSR 704-847-1927
NC Raleigh, CSR 919-878-9200
OH Akron, Augnat Assocs. 216-273-1211
OH Cincinnati, Augnat Assocs. 513-791-6720
OH Dayton, Augnat Assocs. 513-298-1507
OH Mansfield, Augnat Assocs. 419-526-1488
OK Tulsa, Rem-Air Comps. 918-742-2559
OR Forest Grove, Doran Sls. Assocs. 503-357-3333
PA Harleysville, Thomas Jackson Assocs. 215-643-5560
PA Harrison City, Augnat Assocs. 412-281-8283
SC Matthews, CSR 704-847-1927
TX Dallas, Rem-Air Comps. 214-234-1069
UT Murray, Mountain View Mktg. 801-261-4867
WA Greenacres, Doran Sls. Assocs. 509-922-2317
WA Redmond, Doran Sls. Assocs. 206-885-1885
WI Milwaukee, Carlson Sls. Assocs. 414-476-2790

Local Distributors

AL Huntsville, Comp. Dist. 205-883-7501
AL Huntsville, Resisticap 205-883-4270
AZ Phoenix, Arizona Comps. 602-269-5655
AZ Scottsdale, Com-Tech 602-948-3330
AZ Tempe, Circuit Specialists 602-966-2878
AZ Tucson, Southwest Sls. 602-628-1613
AR Little Rock, Component Distrs. 501-227-6278
CA Canoga Park, Tim-Co 818-992-5040
CA Fullerton, Pyramid Elctrns. 213-691-0561
CA Gardena, Cal. Switch & Signal 213-770-2330
CA Santa Clara, Peters De-Laet 408-727-9440
CA Santa Clara, Pyramid Elctrns. 408-727-9810
CA Sunnyvale, Sierra West 408-946-6044
CO Englewood, Industrial Elctrns. 303-694-9444
CT Danbury, Pilgrim Elec. 203-792-7274
CT Norwalk, Cobra Comps. 203-847-6442
CT Wallingford, Cronin 203-265-3134
FL Ft. Lauderdale, Comp. Distr. 305-971-4950
FL Ft. Lauderdale, KSM 305-971-5900
GA Atlanta, KSM Elec. 800-554-9227,404-458-2013
GA Norcross, CDI 404-441-3320
IL Elk Grove Village, Ragon 312-595-6633
IL Northbrook, Classic Comps. Supp. 312-272-9650
IN Indianapolis, Classic 317-872-4777
IN Indianapolis, Meunier Elctrn. Supp. 317-635-3511
LA Lafayette, Ralph's 318-234-4507
MD Baltimore, A S I Elctrns. 301-265-5100
MA Burlington, OPL Elctrns. 617-229-2424
MA Middleboro, Glynn Elctrns. 617-947-4262
MA Wilmington, Cronin Elctrns. 617-449-5000, 800-225-4501
MA Woburn, Electronic Pkg. Comps. 617-935-0400
MI Grand Rapids, Calder 616-698-7400
MI Grand Rapids, T & W Elctrns. 616-241-3645
MN Hopkins, The Joel Co. 612-935-6202
MO Valley Park, Beckwith Computer Elctrns. 314-825-2237
NH Salem, Cronin 603-898-4440
NH Salem, Glynn 603-893-8313
NM Albuquerque, Intl. Elctrns. 505-345-8120
NY Rochester, Simcona Elctrns. 716-328-3230
NC Cary, Powell Elctrns. 919-467-1212
NC Raleigh, Comp. Distrs. 919-834-9465
OH Columbus, Wedemeyer Elec. Supp. 614-436-9600
OH Dayton, Stotts-Friedman 513-298-5555
OH Middleburg Hts., Selectronics 216-243-9500
OH Warren, REM Elctrns. 216-373-1300
OK Tulsa, The Altair Co. 918-252-5781
OR Corvallis, Electronic Superstore 503-757-1800
OR Portland, Carlyle 503-244-1375
PA Erie, REM Elctrns. 814-453-5626
PA McKeesport, Barno Radio 412-751-5966
PA Philadelphia, Shap Elctrns. 215-969-3300
TX Addison, Connec-Tek 214-733-4411
TX Arlington, Bell Comp. Sls. 817-461-5303
TX Austin, Quality/Comps. 512-835-0220
TX El Paso, Intl. Elctrns. 915-598-3406
TX Fort Worth, Indl. Elctrns. 817-731-7321
TX Houston, Ralph's 713-748-4902
TX Richardson, Air Quip Sls. 214-234-3285
UT Salt Lake City, Wintronics 801-483-1882
VA Falls Church, Comp. Dist. 703-533-3500
WA Kent, Pyramid Elctrns. 206-872-5800
WA Seattle, Carlyle Wire & Cable 206-575-6750
WA Seattle, Pacific Elctrns 206-575-1050
WI Mequon, Taylor 414-241-4321
WI New Berlin, Classic 414-786-5300
Can Montreal, Tech-Rep 514-337-6046

ARISTO GRID LAMP PRODS., 65 Harbor Rd., Port Washington, NY 11050, Tel: 516-944-3030; Empl.: 21

ARK ELCTRNS. CORP., 1325 Industrial Hwy., Southampton, PA 18966, Tel: 215-322-6510; *Sls. Mgr.:* S. Kalos

Local Sales Offices & Reps

FL St. Petersburg, Tech-Rep Assocs., Inc. 813-577-2779
WA Monroe, Envirotest, Inc. 206-794-6640
Can Ottawa, Giga-Tron Assocs., LTD 613-225-4090

ARMIGER & ASSOCS., INC., Daniel Woodhead, Inc., 2525 Ridgmar Blvd., Fort Worth, TX 76116, Tel: 817-737-2900; *Sls. Mgr.:* Dave Forcey; *Dist. Mgr.:* Dave Forcey

ARK-LES, 51 Water St., Watertown, MA 02172, Tel: 617-924-2330, Telex: 92-2441; Empl.: 700; *Sls. Mgr.:* Stephen Glorioso

ARMEL ELCTRNS., 1601 75th St., N. Bergen, NJ 07047, Tel: 201-869-4201, TWX: 710-992-8842; FSC No.: 91663; Empl.: 55; *Sls. Mgr.:* V. A. Pasqualino

ARMSTRONG WORLD INDS., W. Liberty St., Lancaster, PA 17604, Tel: 717-397-0611, TWX: 717-560-4405; Empl.: 24,000

ARMTEC INDUSTRIES, INC., Daven Components Grp., Manchester Airport, Manchester, NH 03103, Tel: 603-669-0940, TWX: 710-220-1747; FSC No.: 58880; Empl.: 400; *Sls. Mgr.:* Andy Walton ..... **B•1502**

Local Sales Offices & Reps

AZ Tempe, Trembly Assocs. 602-967-2058
CA Fullerton, Groh Assocs. 714-738-7105
CA Santa Clara, Fischer Assocs. 408-733-7350
CO Lakewood, Trembly Assocs. 303-233-9544
FL Melbourne, Reynolds & Assocs. 305-259-7000
IL Northfield, Imex 312-446-8934
IN Ft. Wayne, J&B Engrg. Sls. 219-483-2813
KS Shawnee Mission, Technical Sls. 913-888-3330
MA Norwood, MPS Elctrns. 617-769-8700
MN Minneapolis, R-J, Inc. 612-866-3661
MO St. Louis, Technical Sls. 314-725-5361
NV Las Vegas, Trembly Assocs. 702-739-9770
NJ New Providence, Al Robinson Assocs. 201-464-4812
NM Albuquerque, Trembly Assocs. 505-266-8616
NY Clarence Center, Nu-Tekneex, Inc. 716-741-9138
NY Guilderland, Nu-Tekneex, Inc. 518-355-1829
NY Lynbrook, HLJ Comp-Tech 516-599-2999
NC Burlington, P. J. Nahser 919-226-8053
OH Englewood, Allen Nace Co. 513-836-0931
OH Richfield, Allen Nace Co. 216-659-7178
OR Portland, Comp. Technlg., Inc. 503-292-1518
PA King of Prussia, Freedman-Malta Assocs. 215-337-9211
TX Dallas, Oeler & Menelaides 214-361-8876
TX Houston, Oeler & Menelaides 713-772-0730
UT Salt Lake City, Trembly Assocs. 801-486-5292
WA Seattle, Comp. Technlg., Inc. 206-789-4555
EXP NY, New York, Lothar Sanford Corp. .. 212-757-3881

ARNOLD ENGINEERING COMPANY, Subsidiary Allegheny International, 300 West Street, Marengo, IL 60152, Tel: 815-568-2000, Telex: 25-7448, TWX: 910-642-2790; Empl.: 600; *Sls. Mgr.:* M. C. Johnson

ARNOLD MAGNETICS

ARNOLD MAGNETICS, 11520 W. Jefferson Blvd., Culver City, CA 90230, Tel: 213-390-3537/8837, TWX: 910-343-6468; FSC No.: 04879; Empl.: 130; *Sls. Mgr.:* Joel Zillman; *Dist. Mgr.:* Joel Zillman ..... **D•1508-1511**

Local Sales Offices & Reps

AZ Pheonix, Arnold Magnetics Corp. 800-421-8181
CA Los Altos, Kolm Mktg. Assocs. 415-948-2635
CO Denvor, Arnold Magnetics Corp. 800-421-8181
CT Danbury, Power Assocs. 203-354-6505
FL Melborne, Reynolds & Assocs. 305-259-7000
GA Atlanta, Arnold Magnetics Corp. 800-421-8181
MD Silver Springs, Youth Assocs. 301-321-6623
MA Chelmsford, Power Assocs. 617-251-8756
MN Minneapolis, Arnold Magnetics Corp. .. 800-421-8181
NY New Rochelle, Ascor Elctrns. 914-235-8838
OK Tulsa, Spectra Sls. Corp. 218-663-7188
OR Portland, Arnold Magnetics Corp. 800-421-8181
TX Houston, Spectra Sls. 713-747-2798
TX Richardson, Spectra Sls. 214-234-3600
WA Seattle, Arnold Magnetics Corp. 800-421-8181
Can Montreal, Que., Arnold Magnetics Corp. 800-421-8181

Aromat
Member of Matsushita Group

AROMAT CORP., 250 Sheffield St., Mountainside, NJ 07092, Tel: 201-232-4260, TWX: 710-997-9536; Empl.: 150 ..... **B•1276-1295, 1503**

Local Sales Offices & Reps

AL Huntsville, Beacon Elctrns. Assoc. 205-881-5031
AZ Tempe, Sys. Sls. of Arizona, Inc. 602-829-9338
AR Little Rock, Beacon Elctrns. Assoc. 501-224-5449
CA Cupertino, Aromat Corp. 408-446-5000
CA Garden Grove, Aromat Corp. 714-895-7707
CA Garden Grove, Elsco 213-533-1255
CA Santa Clara, Westrep 408-988-8833
CO Englewood, Omega Ltd. 303-762-1921
CT Madison, United Comps. 203-245-4810
FL Maitland, EIR, Inc. 305-660-9600
FL Orlando, Aromat Corp. 305-855-1075
GA Atlanta, Beacon Elctrns. Assoc. 404-256-9640
IL Elk Grove Village, Aromat Corp. 312-593-8535
IL Elk Grove Village, Carlson Elctrn. Sls. 312-956-8240
IN Indianapolis, J & W Sls. Co. 317-842-3740
IA Cedar Rapids, Carlson Elctrn. Sls. 319-377-6341
MD Pikesville, Imagitron Sls. 301-521-2020
MA Gilman, United Comps. 203-889-4050
MA Norwood, United Comps. 617-226-0556
MI Grand Rapids, R. P. Urban & Assocs. 616-245-0511
MI Redford, R. P. Urban & Assocs. 313-535-2355
MN Bloomington, Northport Engrg. 612-854-5556
NJ Hackensack, Meg Elctrn. Sls. 201-489-7700
NJ Mountainside, Aromat Corp. 201-232-4260
NM Albuquerque, SSA Inc. of New Mexico 505-881-8877
NY Binghamton, Rochester Comps. 607-772-9292
NY W. Henrietta, Rochester Comp. 716-546-4766
NC Raleigh, Beacon Elctrns. Assoc. 919-787-0330
OH Cleveland, J. R. Thornberry Co. 216-321-3328
OH Kettering, J. R. Thornberry Co. 513-258-1863
OK Tulsa, Advanced Tech. Sls. 918-664-0482
PA Pittsburgh, Covert & Newman Co. 412-531-2002
TX Austin, C. R. Colvin & Assocs. 512-474-8698
TX Dallas, Advanced Tech. Sls. 214-340-1300
TX Houston, C. R. Colvin & Assocs. 713-961-1262
TX Richardson, Aromat Corp. 214-235-0415
UT Salt Lake City, Omega, Ltd. 801-277-8061
WA Bellevue, Sls. & Engrg. 206-883-4999
WA Vancouver, Sls. & Engrg. 206-573-5161
WI Milwaukee, Carlson Elctrn. Sls. 414-476-2790
Can Mississauga, Ont., Aromat Canada, Inc. 416-624-7777
Can Mississauga, Ont., Tech-Rep Elctrns., Ltd. 416-890-2903
Can Richmond, B.C., Deskin Sls. Corp. 604-922-5036
Can St. Laurent, Que., Tech-Rep Elctrns., Ltd. 514-337-6046

Local Distributors

AL Huntsville, Contact Elctrns. 205-881-9321
AZ Phoenix, Acacia Sls., Inc. 602-882-9054
AZ Tempe, Bell Inds. 602-966-7800
AZ Tempe, J. C. Intl. 602-968-0893
CA Chatsworth, Mil-Com Dist. 213-998-3111
CA Mountain View, U.S.I. 415-969-5420
CA San Diego, Acacia Sls., Inc. 619-565-4365
CA Santa Clara, Patane Selectronics 408-496-6151
CA Santa Monica, Master Distrs. 213-452-1229
CA Sunnyvale, Acacia Sls., Inc. 408-745-7200
CA Sunnyvale, Bell Inds. 408-734-8570
CA Van Nuys, Patane Avionics 213-988-4455, 213-873-5541
CO Englewood, Industrial Elctrns. 303-694-9444
CT Naugatuck, SCR Elec. Co. 203-729-8274
CT Wallingford, Cronin Elctrns. 203-265-3134
FL Ft. Lauderdale, Dielco 304-973-8700
IL Elk Grove, R. M. Elctrns. 312-364-6622
IL Mt. Prospect, Magnuson Elctrns. 312-956-0700
IN Indianapolis, Magnuson Elctrns. 317-247-5108
IN Indianapolis, R. M. Elctrns. 317-291-7110
IA Cedar Rapids, Ragon Elctrns. 319-393-4093
KS Derby, Ragon Elctrns. 816-254-3410
MA Canton, Impact Sls. Co. 617-821-1500
MA Middleboro, Glynn Elctrns. 617-947-4262
MA Needham, Cronin Elctrns. 617-449-5000
MI Grand Rapids, R. M. Elctrns. 616-531-9300

MN Hopkins, Joel Co. 612-935-6202
MN St. Paul, Ragon Elctrns. 612-642-2828
MO Hazelwood, Ragon Elctrns. 314-524-4138
MO Independence, Ragon Elctrns. 816-254-3410
NJ Bellmawr, Mid-Atlantic Elctrns. Corp. 609-931-5303, 215-923-6868
NJ Fair Lawn, Relay Specialties 201-797-3313
NJ Plainfield, Mars Elctrns. 201-757-4332
NM Albuquerque, Bell Inds. 505-292-2700
NY Buffalo, Summit Distrs. 716-884-3450
NY Hauppauge, Jaco Elctrns. 516-273-5500
NY Lynbrook, Peerless Radio Corp. 516-593-2121, 212-523-3456
NY Millbrook, Villarreal Elctrns. 914-677-3447
NY Mt. Vernon, QAR Indl. Elctrn. Sls. 914-699-2224
NY Rochester, Masline Elctrns. 716-546-5373
NY Rome, Rome Elctrns. 315-337-5400
NC Charlotte, Dixie Elctrns. 704-377-5413
NC Charlotte, Elctrns. Mktg. Corp. 704-394-6195
NC Hickory, Dixie Elctrns. 704-328-2646
NC Winston-Salem, Dixie Elctrns. 919-724-5961
OH Columbus, Elctrns. Mktg. Corp. (EMC) 614-299-4161
OH Highland Heights, Elctrns. Mktg. Corp. (EMC) 216-442-3441
OH Kettering, Elctrns. Mktg. Corp. (EMC) .. 513-439-4711
OK Tulsa, Norvell Elctrns. 918-254-8606
OR Beaverton, Acacia Sls., Inc. 503-646-3377
OR Portland, P&R Inds. 503-641-9525
PA Harrisburg, Advacom 717-545-5674
PA Horsham, Pioneer/Del. Vall. 215-674-4000
PA McKean, Advacom 814-476-7774
PA Wayne, Peak Elctrns. 215-293-9000
RI Pawtucket, Major/Edwards 401-725-7400
SC Charleston, Dixie Elctrns. 803-554-7515
SC Columbia, Dixie Elctrns. 803-779-5332
SC Greenville, Dixie Elctrns. 803-297-1437
TN Gray, Dixie Elctrns. 615-477-3838
TN Knoxville, Dixie Elctrns. 615-938-4131
TX Austin, Norvell Elctrns. 512-458-8106
TX Austin, Southwest Elctrns. 512-837-8971
TX Dallas, Computer Comps. Corp. 214-239-0271
TX Dallas, Norvell Elctrns. 214-233-0020
TX Houston, Norvell Elctrns. 713-777-1666
TX Richardson, Southwest Elctrns. 214-234-3050
TX Stafford, Southwest Elctrns. 713-491-4900
UT Salt Lake City, Bell Inds. 801-972-6969
VA Roanoke, Mexitronics Corp. 703-342-4444

ARROW-HART
MILITARY SPECIFICATION
INDUSTRIAL AND COMMERCIAL

FULL LINE
AUTHORIZED DISTRIBUTOR

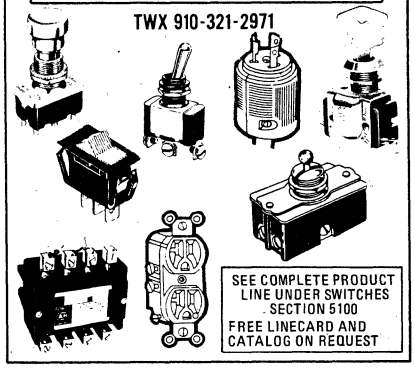
E S I

ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039

213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

WA Bellevue, Bell Inds. 206-747-1515
WA Seattle, Pacific Elctrns. 206-575-1050
WI Mequon, Taylor Elec. 414-241-4321
Can Richmond, B.C., Deskin Sls. Corp. 604-273-4963
Can St. Laurent, Que., Tech-Rep Elctrns., Ltd. 514-337-6046

ARRA INC., 15 Harold Ct, Bay Shore, NY 11706, Tel: 516-231-8400, TWX: 510-227-6231; FSC No.: 09992; Empl.: 50; *Sls. Mgr.:* M. V. Geraci ..... **A•1705**

Local Sales Offices & Reps
AL Huntsville, Redstone Military Svc. 205-837-6136
AZ Chandler, Blackhart Assoc. 602-831-2566
CA Los Angeles, McDougall/McLaughlin 213-477-8556
CA Mountain View, Mark V Assocs. 415-964-6275
FL Winter Park, Microwave Mktg. 305-678-2141
IL Mt. Prospect, Cain & Co. 312-253-3578
IA Cedar Rapids, Palatine Sls. 319-365-8071
KS Mission, Palatine Sls. 913-831-0555
KS Wichita, Palatine Sls. 316-776-0065
MD Ellicott City, Doss Elctrns. 301-465-1336
MA Chelmsford, BBC 617-256-6593
MO Hazelwood, Palatine Sls. 314-839-0800
NY Great Neck, EAC 516-466-9798
NY Utica, B D Hummel Co. 315-736-7821
NC Raleigh, Barker Assoc. 919-851-7841
OH Dayton, Haacke Co. 513-254-1951
OH Lancaster, Cain & Co. 614-654-4800
PA Newtown, SWR Assocs. Corp. 215-356-8550
TX Garland, TESCO 214-681-1376
WA Seattle, Datacom Assocs. 206-285-2525

ARRAY TECHNOLOGY, 992 S. Saratoga-Sunnyvale Rd., San Jose, CA 95129, Tel: 408-252-9900; *Sls. Mgr.:* Jim Schenck

ARROW FASTENER, 271 Mayhill St, Saddlebrook, NJ 07662, Tel: 201-843-6900; Empl.: 600

COOPER INDUSTRIES **ARROW HART**

ARROW HART DIV., Cooper Inds., 103 Hawthorn St, Hartford, CT 06101, Tel: 203-249-8471, Telex: 99328 ..... **B•1504-1509**

Local Sales Offices & Reps
AL Mobile, Hollingsworth & Still 800-241-5712
AZ Phoenix, Elec-Com 602-967-8643
CA Fountain Valley, Arrow Hart Div. 714-964-2758
CA Los Angeles, Arrow Hart Div. 213-588-5251
CA Palo Alto, Abbot Engrg. 415-968-2265
CO Englewood, Wescom Mktg. 303-773-0225
CT Hartford, Arrow Hart Div. 203-249-8471
FL Ft. Lauderdale, Hollingsworth & Still ... 305-753-3136
FL Tampa, Hollingsworth & Still 800-241-5712
GA Norcross, Hollingsworth & Still 800-241-5712
IL Wood Dale, Arrow Hart Div. 312-595-7750
IA Cedar Rapids, Lorenz Sls. 319-377-4666
KS Overland Park, Lorenz Sls. 913-649-5556
MN Burnsville, Arrow Hart 612-894-2099
NE Lincoln, Lorenz Sls. 402-475-4660
NJ Berlin, Arrow Hart 609-768-9520
NY Syracuse, Osterman & Assocs. 315-437-7750
NC Kernersville, Hollingsworth & Still 800-241-5712
OH Mason, Arrow Hart 513-398-0156
OK Tulsa, Genzel Sls. Assocs. 918-622-7744
PA Willow Grove, Arrow Hart Div. 215-659-3728
TX Richardson, Arrow Hart Div. 214-644-6210
UT Salt Lake City, Wescom Mktg. 801-466-9594

Local Distributors
AL Muscle Shoals, Jones Elctrns. 205-383-1241
AZ Phoenix, Be Switched 602-275-4805
AZ Tempe, Fisher/Brownell 602-967-1464
AR Little Rock, Carlton-Bates Co. 501-562-9100
CA Alhambra, Fisher/Brownell 213-289-0255
CA Commerce, Electro Comps. 213-727-0200
CA Covina, Selecta Switch 213-967-4123
CA Gardena, California Switch & Signal .. 213-770-2330
CA Hayward, Electro Comps.
CA Los Angeles, Electric Switches 213-660-1310
CA Sacramento, Integrated Elctrns. 916-424-5297
CA San Diego, Fisher/Brownell 714-560-8545
CA San Francisco, Zack Elctrns. 408-626-1444
CA San Jose, Consolidated Parts 408-263-9521
CA San Jose, Cypress Elctrns. 408-945-8400
CA San Leandro, Electro Comps. 415-352-5210
CA Santa Clara, Fisher/Brownell 408-988-6041
CA Santa Fe Springs, Eurton Elec. 213-946-4477
CA Santa Monica, Master Distr. 213-452-1229
CA Tustin, Western Switches & Control ... 714-731-4333
CO Arvada, Denver Wintronics 303-934-2406
CO Denver, Consolidated Parts 303-623-5313
CO Denver, CISD 303-534-6121
CO Denver, Fistells Elctrn. Supp. 303-244-4691
CO Denver, Star for Parts 303-623-4224
CT Shelton, Century Elec. Sys. 203-736-2684
CT West Hartford, Gal Elec. 203-232-9880
FL Ft. Lauderdale, Peerless Radio 305-973-4141
FL Jacksonville, Ace Elec. Supp. 904-398-9857
FL Miami, Electrn. Equip. 305-871-3500
FL Ovieda, Dixie Sls.
FL Sarasota, Workman Elctrn. 813-371-4242
FL Tampa, Dow Elctrns. 813-365-3393
GA Atlanta, A-C Equip. 404-451-2747
GA Atlanta, Ack Radio Supp. 404-351-6340
HI Honolulu, Honolulu Elctrns. 808-949-5564
IL Addison, LComp Chicago 312-628-1400
IL Chicago, Newark Elctrns. 312-638-4411
IL Chicago, Revere Elec. Supp. 312-738-3636
IL Palatine, OHM Elctrns. 312-359-5500
IL Rockford, G. C. Elctrns. 815-968-9661
IL Wood Dale, Electro Kinetics 312-595-6700
IN East Chicago, Acro Elctrns. 219-397-8681
IN Evansville, Hutch & Son 812-425-7201
IN Indianapolis, Graham Elctrns. 317-634-8202
LA Lafayette, Ralph's Elctrns. 318-233-0105
LA New Orleans, William B. Allen 504-525-8222
LA Shreveport, Ind. Elctrns. 318-222-9459
MD Bethesda, Empire Elec. Sys. 301-656-3300
MD Rockville, Capital Radio Whlsrs. 301-881-2270
MA Allston, Hilco Elec. Supp. 617-783-2600
MA Billerica, A. W. Mayer Co. 617-229-2255
MA Hingham, Sager Elctrl. 617-749-6700
MI Grand Rapids, S-F Elctrn. Sys. 616-459-0216
MI Livonia, Pioneer Michigan 313-525-1800
MI Livonia, RS Elctrns. 313-525-1155
MI St. Clair Shores, SPEMCO 313-771-2700
MN Minneapolis, Sterling Elec. 612-332-4571
MN St. Paul, Gopher Elctrns. Co. 612-483-4450
MS Jackson, Ellington Elctrns. 601-355-0561
MO Kansas City, LComp 816-221-2400
MO Maryland Heights, LComp 314-291-6200
NE Lincoln, Scott Elctrns. 402-466-8221
NH Nashua, Brevan Elctrns.
NJ Camden, General Radio Sys. Co. 609-964-8560
NJ East Hanover, State Elctrn. Parts 201-887-2550
NJ Edison, Brownell Electro
NJ Manasquan, Heiman H. Smith 201-223-9400
NJ Prospect Park, Kappe 201-790-1999
NM Albuquerque, Walker Radio 505-247-2288
NY Binghamton, Florance Elec. Sys. 607-724-2455
NY Buffalo, Genesee Radio & Parts 716-873-9661
NY Buffalo, Summit Distrs. 716-884-3450
NY Farmingdale, S.A.I. 516-293-2710
NY Hempstead, Electronic Equip. 516-538-5510
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY Rochester, Rochester Radio Sys. 716-454-7800
NY Woodside, Switches Unltd. 212-478-5000
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
OH Cincinnati, Hughes-Peters 513-351-2000
OH Cleveland, Midland Elec. 216-248-3800
OH Cleveland, Pioneer/Cleveland 216-587-3600
OH Columbus, Hughes-Peters 614-294-5351
OH Dayton, Esco 513-226-1133
OH Dayton, Pioneer/Dayton 513-236-9900
OR Portland, Johnstone Corp. 503-231-4833
PA Philadelphia, Philadelphia Elctrns. 215-568-7444
RI Providence, W. M. Dandreta 401-861-2800
TN Memphis, Bluff City Elctrns. 901-345-9500
TN Nashville, Carlton-Bates 615-244-3562
TN Nashville, Randolph & Rice 615-255-9602
TX Austin, Harrison Equip. 512-458-3555
TX Dallas, Associated Aircraft 214-331-4381
TX Dallas, Harrison Equip. 214-239-2750
TX Dallas, Wilkinson Bros. 214-941-9963
TX El Paso, Midland Specialty 915-533-9555
TX Ft. Worth, Allied Elctrns. 817-336-5401
TX Garland, Newark Elctrns. 214-494-5911
TX Houston, Harrison Equip. 713-879-2600
TX Lubbock, Texas Elctrn. Sys. Corp. 806-765-8456
TX Richardson, Fisher/Brownell 214-235-3177
TX San Antonio, Sherman Elctrns. 512-224-1004
UT Salt Lake City, Standard Supp. 801-486-3371
VA Charlottesville, Virginia Radio Sys. 804-296-4184
VA Richmond, Sterling Elctrns. 804-226-2190
WA Bellevue, Bell Ind. 206-747-1515
WA Bellevue, Integrated/Jaco 206-455-2727
WA Seattle, Radar Elec. 206-282-2511
WI Mequon, Taylor Elec. Co. 414-241-4321

ARSTAN PRODUCTS INTL. LTD., 99 Jericho Tpke., Jericho, NY 11753, Tel: 516-333-8100, Telex: 221519 ARSTN; Empl.: 10; *Sls. Mgr.:* Stan Shapiro ..... **A•2118-2121**

Local Sales Offices & Reps

CA Mountain View, Marguez & Assocs. ... 415-966-1012
CA Orange, S & A Tech. Sls. 714-567-3270
CA San Diego, S & A Tech. Sls. 619-560-1888
CO Broomfield, Ramark Assocs. 303-466-6168
GA Atlanta, Electro Sls. 404-394-1122
IL Arlington Heights, M. J. Peterson & Assocs., Ltd. 312-577-8200
IN Noblesville, KW Elctrn. Sls., Inc. 317-773-5536
KY Louisville, KW Electronic Sales, Inc. ... 502-451-1860
MA Advanced Design Grp. 617-279-0216
MI Novi, Lektronics Sales 313-349-3304
MN Minneapolis, Berndt Assoc. 612-546-2021
NY Bayside, John Kavanagh 212-229-2731
NC Greensboro, KZJ Component Sales .. 919-852-5990
OH Dayton, KW Elctrn. Sls., Inc. 513-890-2150
OH Shaker Heights, KW Elctrn. Sls., Inc. ... 216-491-9177
OH Worthington, KW Elctrn. Sls., Inc. 614-888-0483
PA Allison Park, KW Elctrns. Sls., Inc. 412-487-4300
PA Philadelphia, Check Assocs., Inc. 215-487-3007
TN Chattanooga, Electro Sls., Inc. 615-267-4260
TX Arlington, Comptech Sls. 817-265-6007
TX Austin, Comptech Sls. 512-331-8922
TX Houston, Comptech Sls. 713-491-6695

Local Distributors

NC Raleigh, Century Elctrns. 919-872-2203
PA Norristown, Century Elctrns. 215-631-5400

ARTECH CORP., 2901 Telestar Ct., Falls Church, VA 22042, Tel: 703-560-3292; Empl.: 40; *Sls. Mgr.:* S. Martin

ARTEL COMMUNICATIONS CORP., 93 Grand St., Worcester, MA 01602, Tel: 617-752-5690

ARTISAN ELCTRNS., 5 Eastmans Rd., Parsippany, NJ 07054, Tel: 201-887-7100, Telex: 881107; Empl.: 200; *Sls. Mgr.:* Gail Norton; *Dist. Mgr.:* Gail Norton

Local Distributors

CA Haywards, Allied Elctrns., Inc. 415-487-5250
IL Elgin, Allied Elctrns., Inc. 312-697-8200
NJ Fair Lawn, Relay Specialties 800-526-5376
NY Rochester, Simcona Elctrns. Corp. 716-328-3230
OH Euclid, Rockford Controls Ohio, Inc. ... 216-731-5250
PA Washington Crossing, Riverside Comp. Supp. Co. 215-493-5228
TX Fort Worth, Allied Elctrns. 817-336-5401

ARTRONIC INSTR. CO., INC., 9 Division St., Sidney, NY 13838, Tel: 607-563-8444; FSC No.: 09446; Empl.: 12

ARTRONICS CORPORATION, 3 Electronic Avenue, Danvers, MA 01923, Tel: 617-777-2880, Telex: 312097; Empl.: 20; *Sls. Mgr.:* Lewis Smolin

ART WIRE/DODUCO, 9 Wing Dr., Cedar Knolls, NJ 07927, Tel: 201-428-4880, Telex: 13-6455; Empl.: 100; *Sls. Mgr.:* Kenneth de Graaf

ASACA SHIBASKU CORP. OF AMER., 12509 Beatrice St., Los Angeles, CA 90066, Tel: 827-7144, Telex: 182089; *Sls. Mgr.:* Alan R. Davis; *Dist. Mgr.:* Susan Grossinger

ASCO WIRE & CABLE CO., 412 Housatonic Ave., Bridgeport, CT 06608, Tel: 203-366-5294; Empl.: 30; *Sls. Mgr.:* M. Madow

ASHLAND CHEMICAL, Ashland Oil, Inc., Box 2219, Columbus, OH 43216, Tel: 614-889-3333

ASHLAND ELEC. PRODS., 80 39th Street, Brooklyn, NY 11232, Tel: 718-965-0770; Empl.: 115; *Sls. Mgr.:* John J. Conlon

ASM, 525 Truck La., Smithfield, NC 27577, Tel: 919-934-3104; FSC No.: 31336; Empl.: 12; *Sls. Mgr.:* L. L. Armstrong

ASMANN COMPONENTS, Div. of ebm Industries, Inc., 525 New Britain Ave., Unionville, CT 06085, Tel: 203-674-1515, TWX: 710-423-8723; *Sls. Mgr.:* Robert S. Sobolewski; *Dist. Mgr.:* Judith A. Buerger ..... **C•1160-1161**

Local Sales Offices & Reps

AL Huntsville, Raycom, Inc. 205-859-2017
AZ Scottsdale, Harris and Croy 602-951-9121
AZ Tucson, Harris & Croy 602-293-5393
CA Chatsworth, WCV-Raltech, Inc. 818-700-0933
CA Los Angeles, Wiley Co. 213-666-1611
CA Palo Alto, Abbott Engrg. 415-968-2265
CA San Diego, Cerco 619-450-1754
CA San Diego, Wiley Co. 619-571-2881
CA Santa Clara, Ross Mktg. Assocs. 408-988-8111
CO Littleton, Simpson Assocs., Inc. 303-794-8381
CT Clinton, Selmark Assocs. 203-573-9088
FL Melbourne, Raycom, Inc. 305-259-7988
FL Orlando, Raycom, Inc. 305-859-5504
FL Plantation, Raycom, Inc. 305-741-6690
FL Wellborn, Raycom, Inc. 904-963-5023
GA Duluth, Raycom, Inc. 404-446-9015
IL Schaumburg, Micro-Tex 312-885-1131
IN Columbus, Technical Reps. 812-376-9226
IN Indianapolis, Technical Reps., Inc. 317-882-4407
KS Overland Park, Web Elec. 913-381-7986
MD Columbia, Delta III Assocs. 301-730-4700
MA Millis, Selmark Assocs. 617-376-2914
MI Grand Rapids, Burcaw Co. 313-573-4605
MI Warren, Burcaw Co. 313-573-4605
MN St. Paul, Arkco Sls. 612-777-7454
MO Florissant, WEB Elctrns. 314-921-5720
NH Hopkinton, Selmark Assocs. 603-746-3299
NJ Marlton, b.g.r. Assocs. 609-983-1020
NJ Palmyra, RD Indl. Sls. 609-829-4741
NY Buffalo, Rudell-Merrifield Assocs. 716-634-4300
NY Skaneateles, ADN/Rudell-Merrifield .. 315-685-8991
NC Raleigh, Raycom, Inc. 919-847-8276
OH Cleveland, KT/DEPCO 216-442-6200
OH West Chester, KT/Depco 513-874-0236
OK Tulsa, Bonser-Philhower Sls. 918-744-9964
OR Portland, Earl & Brown Co., Inc. 503-245-2283
PA Harrison City, Rudell-Merrifield Assocs. 412-327-0858
TX Austin, Bonser-Philhower Sls. 512-346-9186
TX Houston, Bonser-Philhower Sls. 713-531-4144
TX Richardson, Bonser-Philhower Sls. 214-234-8438
UT Midvale, Simpson Assocs., Inc. 801-566-3691
WA Seattle, Earland Brown Co., Inc. 206-284-1121
WI Waukesha, Micro-Tex 414-542-5352

Local Distributors

AL Huntsville, Powell Elctrns. 205-539-2731
AZ Scottsdale, Hall Elctrns. 602-946-9977
AZ Tempe, Powell Elctrns. 602-967-7538
CA Anaheim, DECO Elctrns. 714-630-8252
CA Chatsworth, Integrated Elctrns./JACO 213-998-2200
CA Costa Mesa, Powell Elctrns. 714-754-1717
CA Fullerton, Pyramid/Fullerton 714-773-0781
CA Fullerton, Young Sls. 714-871-5355
CA Hollywood, Yale Elctrns. 213-465-3186
CA San Diego, DECO Elctrns. 619-693-1595
CA San Jose, Integrated Elctrns. 408-263-1100
CA San Jose, Powell Elctrns. 408-943-9020
CA Santa Clara, Pyramid Elctrns. 408-727-9810
CA Sunnyvale, Target Elctrns., Inc. 408-734-5611
CA Tustin, Added Value Elec. Distr. 714-730-5848
CO Denver, Integrated Elctrns., Inc. 303-292-6121
CO Englewood, Industrial ELctrns., Inc. 303-694-9444
CT Danbury, Pilgrim Elctrns. 203-792-7274
CT New Canaan, Impact Sls. Co., Inc. 203-972-1458
CT Wallingford, Cronin Elctrns., Inc. 203-265-3134
FL Ft. Lauderdale, Powell Elctrns. 305-979-5606
FL Melbourne, Eurick Corp. 305-254-8718
FL Melbourne, Raycom, Inc. 305-259-7988
FL Pompano Beach, Peerless Radio Corp. 305-973-4141
FL Tampa, Reptron 813-855-4656
GA Atlanta, ACK Radio Supp. Co. 404-351-6340
GA Fayetteville, Frankland, Inc. 404-461-4026
IL Chicago, Nep Elctrns. 312-625-8400
IL Hoffman Estates, I.E.C. Intercomp 312-843-2040
IL Rosemont, Advent Elctrns. 312-297-6200
IN Indianapolis, Advent Elctrns. 317-872-4910
IA Cedar Rapids, Advent Elctrns. 319-363-0221
IA Cedar Rapids, Bergquist Elctrns. 319-366-8733
MD Beltsville, RESCO/D.C. 301-937-9100
MD Columbia, Powell Elctrns. 301-621-4070
MD White Marsh, RESCO/Baltimore 301-529-0500
MA Canton, Impact Sls. Co., Inc. 617-821-1500
MA Middleboro, Glynn Elctrns. 617-947-4262
MA Needham, Cronin Elctrns. 617-449-5000
MA Westborough, Powell Elctrns. 617-366-6100
MA Wilmington, J. V. Elctrns. 617-273-4300
MI Farmington Hills, Advent Elctrns., Inc. 313-477-1650
MI Grand Rapids, S. F. Elctrns. 616-459-0216
MI Grand Rapids, T & W Elctrns. 616-241-3645
MI Lansing, Fulton Radio Supp. Co. 517-394-5020
MI Livonia, Reptron Elctrns., Inc. 313-525-2700
MI Westland, Westcomp Elctrns. 313-728-0650
MI Zealand, Tubergen & Assocs. 616-772-1548
MN Bloomington, NWR Elctrns. 612-854-7329
MN Minneapolis, Bergquist 612-835-2322
MN Minneapolis, Control Design Supp., Inc. 612-721-1628
MO Kansas City, L Comp 816-221-2400
NH Salem, Glynn Elctrns. 603-893-8313
NJ Atlantic Highlands, Freedom Elctrns. .. 201-872-2300
NJ Englewood, Powell Elctrns. 201-894-0800
NJ Rockaway, Tonar Ind. 201-586-9000
NJ West Berlin, GCI Corp. 609-768-6767
NY Central Islip, Domino Comp. 516-582-3050
NY Farmingdale, Addem Sls., Inc. 516-882-0993
NY Hauppauge, Broadline Elctrns. Distr. .. 516-231-4100
NY Lynbrook, Peerless Radio 516-593-2121
NY Poughkeepsie, Kabelton, Inc. 914-473-1222
NY Rochester, Simcona 716-328-3230
NY Suffern, Nobel Elctrns. 914-357-4500
NC Cary, Powell Elctrns. 919-467-1212
NC Raleigh, Century Elctrns. 919-872-2203
OH Akron, Akron Elctrns. Supp. Co. 216-762-8818
OH Dayton, Related Comps., Inc. 513-253-6116
OH N. Royalton, Related Comps., Inc. 216-237-7271
OH Worthington, Reptron Elctrns., Inc. 614-436-6675
OR Beaverton, Norvac Elctrns. 503-644-1025
OR Tigard, Integrated Elctrns. 503-639-9661
PA Export, Advacom/Export 412-733-5400
PA Harrisburg, Advacom 717-545-5674
PA McKean, Advacom 814-476-7774
PA Norristown, Central Elctrns. Comps. Co. 215-631-5400
PA Philadelphia, Powell Elctrns. 215-365-1900
RI Warwick, Cal-Greg Comps., Inc. 401-738-6170
TN Hixson, Techni-Tronics, Inc. 615-842-0514
TX Irving, Powell Elctrns. 214-258-6841
WA Bellevue, Powell Elctrns. 206-641-4446
WA Bellevue, Integrated Elctrns./Jaco 206-455-2727
WI New Berlin, Nep Elctrns. 414-785-9100
EXP Caguas, Harvest Elctrns. 809-743-3552

ASPECT ELCTRNS., 725 San Aleso, Sunnyvale, CA 94086, Tel: 408-737-2290; *Sls. Mgr.:* Doug Coke

ASPEN RIBBONS INC., 555 Aspen Ridge Dr., Lafayette, CO 80026, Tel: 303-666-5750, 800-525-0646, 800-525-9966, Telex: 45-0055; FSC No.: 84-0724829; Empl.: 205; *Sls. Mgr.:* Peta C. Williams; *Dist. Mgr.:* Dianne Lippolet

A. S. R. SERVOTRON, INC., (Sub. Baldor Elec. Co.), 7945 Deering Ave., Canoga Park, CA 91304, Tel: 818-999-6193, Telex: 181213 ASR USA CNPK; Empl.: 2400; *Sls. Mgr.:* Robert W. Ferran

ASSEM-PRO INSTRS., Div. of Overnight Engineering Inc., 1859 Andrews Ave., San Jose, CA 95124, Tel: 408-267-1168; *Sls. Mgr.:* Lynn Riordan; *Dist. Mgr.:* Lynn Riordan

ASSEMBLY SPECIALISTS, 914 Main St., Box 965, Acton, MA 01720, Tel: 617-263-9100; *Sls. Mgr.:* George L Boyden ..... **C•1700**

Local Sales Offices & Reps

MA Acton, E.E. Specialists 617-259-9200

ASSOCIATED CIRCUITS INC., 621 Old County Rd., San Carlos, CA 94070, Tel: 415-592-7528; Empl.: 35; *Sls. Mgr.:* Betty Smeland

ASSOCIATED ENGRG. MFG., 546 Valley Rd., Upper Montclair, NJ 07043, Tel: 201-783-7800, Telex: 138866; Empl.: 69

ASSOCIATED ENVIRONMENTAL SYSTEMS, 10 Industrial Way, Amesbury, MA 01913-4848, Tel: 617-388-5662, TWX: 710-347-0590; Empl.: 300; *Sls. Mgr.:* A. P. Campagna

ASSOCIATED RESEARCH, INC., 8221 N. Kimball Ave., Skokie, IL 60076, Tel: 312-647-7850, Telex: 28-3511; FSC No.: 04237; Empl.: 58; *Sls. Mgr.:* Joe Guerriero ..... **D•1181-1182**

Local Sales Offices & Reps

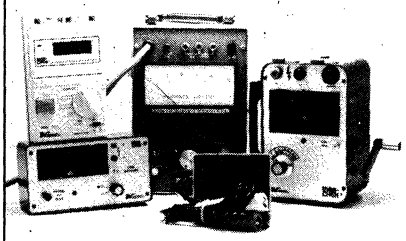
CA Palo Alto, Mollard Mktg. 415-961-0456
CA Santa Ana, Brooks-Moore Assocs. 714-544-8900
CO Lakewood, Technical Mktg. 303-232-1516

ASSOCIATED RESEARCH, INC.

AUTHORIZED DISTRIBUTOR

SSI SUNSHINE

THE SOURCE FOR METERS & TEST EQUIPMENT



Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT
(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area
(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

ASSOCIATED RESEARCH, INC.

Hypots & Megometers

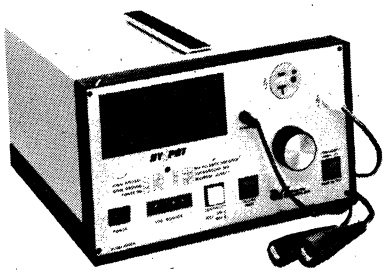
Authorized Distributors

RAG ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



Model 4040a

DE Wilmington, Electrical Equip. Co. 302-478-9455
FL Orlando, Datarep 305-843-5224
GA Marietta, Tanner & Assocs., Inc. 404-952-7773
IL Columbia, R. L. Weisheimer & Assocs. 618-281-4148
IL Streamwood, Fortier Testing & Sls. ... 312-837-5407
LA Mandeville, Griffith Co., Inc. 504-626-8516
MA West Newbury, Digital & Analog Sls. Co. 617-363-5420
MN Minneapolis, Minnkota Elec. Sls. 612-871-7838
NY Buffalo, U. J. Brown 716-839-4232
NC Charlotte, W. R. Daniel & Assocs. 704-376-8603
OH Milford, Alexander Equip. Co. 513-248-0901
PA Pittsburgh, Gateway Equip. Co. 412-795-1315
TN Knoxville, E-P & Assocs., Inc. 615-966-6131
TX Houston, E.V. Smith Sls. Co. 713-649-5756
VA Dumfries, Electra-Tech 703-670-6962
WA Seattle, Winberg Engr. Sls. 206-523-3370
WI Appleton, Carl Stracka & Assocs. 414-734-7847

ASSOCIATED SPECIALTIES, 1751 Main St., Orefield, PA 18069, Tel: 215-395-9172; *Sls. Mgr.:* V. Laudenslager; *Dist. Mgr.:* V. Laudenslager

ASSOCIATED SPRING, BARNES GRP., 18 Main St., Bristol, CT 06010, Tel: 203-583-1331, Telex: 962449, TWX: 710-454-0592; Empl.: 1850; *Sls. Mgr.:* R. Hufsmith

ASSOCIATED TESTING LABS., Div. of Kidde, Inc., 53 Second Ave., Burlington, MA 01803, Tel: 617-272-9050; Empl.: 80; *Sls. Mgr.:* Robert H. Croft

ASTEC
A BSR COMPANY

ASTEC USA, LTD., A BSR Intl. Co., 2880 San Tomas Expwy., # 200, Santa Clara, CA 95051, Tel: 408-748-1200, Telex: 4745018 ASTEC UI, TWX: 310-474-5018; *Sls. Mgr.:* Russ Sinagra ..... **D•1512-1514**

Local Sales Offices & Reps

AL Huntsville, 20th Century Mktg. 205-533-9281
AZ Phoenix, Compass Mktg. & Sls. 602-996-0635
AZ Tucson, Compass Mktg. & Sls. 602-293-1220
CA San Diego, SR Elctrns. 619-560-8330
CA Santa Clara, Astec (USA) Ltd. 408-748-1200
CA Santa Clara, I Squared 408-988-3400
CA Thousand Oaks, SC Cubed 805-496-7307
CA Tustin, SC Cubed 714-731-9206
CO Wittleton, Lange Sales Inc. 303-795-3600
PA Huntingdon Valley, Omega Elctrns. Sls. 215-947-4135
GA Norcross, 20th Century Mktg. 404-446-1999
IL Rolling Meadows, Sumer 312-991-8500
IN Indianapolis, Leslie Devoe 317-842-3245
MA Burlington, Mill-Bern Assocs. 617-273-1313
MA Glenburnie, Tri-Mart 301-761-6000
MN Bloomington, Elctrn. Sls. Agency 612-884-8291
MO Bridgeton, Centech, Inc. 314-219-4230
NM Albuquerque, Compass Mktg. & Sls. .. 505-888-0800
NY E. Rochester, Tri-Tech Elctrns. 716-385-6500
NY Elmont, Crane & Egert Corp. 516-872-0800
NY Jamaica, SJ Assocs. 212-291-3232
OH Beachwood, Elctrn. Salesmasters 216-831-9555
OK Tulsa, West Assocs. 918-665-4365
OR Tigard, Components West, Inc. 503-684-1617
TN Knottsville, 20th Century Mktg. 615-690-1618
TX Austin, West Assocs. 512-454-3681
TX Dallas, West Assocs. 214-248-7060
TX Houston, West Assocs. 713-777-4108
UT Salt Lake City, Lang Sls., Inc. 801-487-0843
WA Bellevue, SDR Squared 206-747-9424
WA Liberty, Comps. West, Inc. 509-255-6224
WA Redmond, Comps. West 206-885-5880
WI Brookfield, Sumer, Inc. 414-784-6641

Local Distributors

CA Calabasas, Wyle Labs. .. 213-322-8100,818-880-9000
CA Irvine, Wyle Labs. 714-863-9953
CA Rancho Cordova, Wyle Labs. 916-638-5282
CA San Diego, Wyle Labs. 619-565-9171
CA Santa Clara, Wyle Labs. 408-727-2500
CO Phoenix, Wyle Labs. 602-249-2232
CO Thornton, Wyle Labs. 303-457-9953
OK Tulsa, Quality Comps. 918-664-8812
OR Hillsboro, Wyle Labs. 503-640-6000
TX Addison, Quality Comps. 214-733-4306
TX Austin, Quality Comps. 512-835-0220
TX Sugarland, Quality Comps. 713-491-8812, 713-240-2255
UT Salt Lake City, Wyle Labs. 801-974-9953
WA Bellevue, Wyle Labs. 206-453-8300

ASTON ELECTRONICS, INC., Aston Electronic Designs, Ltd., 531 North Murlen Rd., Olathe, KS 66062, Tel: 913-782-4007; *Sls. Mgr.:* D. MacClymont

ASTRO CIRCUIT, 100 Hale St., Lowell, MA. 01851, Tel: 617-458-3240, TWX: 710-343-0754; Empl.: 220; *Sls. Mgr.:* Don Gingras

ASTROCOM ELECTRONICS, INC., Box 370, Oneonta, NY 13820, Tel: 607-432-1930

ASTRO DYNAMICS, INC., 2 Gill St., Woburn, MA 01801, Tel: 617-935-4944; Empl.: 50

ASTRO-GEO-MARINE, INC., 202 E. Cota St., Santa Barbara, CA 93101, Tel: 805-965-7005; FSC No.: 51473; Empl.: 15

ASTRO INSTRUMENT, CORP., 2501 NW 17th Ln., Pompano Beach, FL 33064, Tel: 305-973-8900, TWX: 510-956-9601; FSC No.: 51761; *Sls. Mgr.:* Peter J. Sinatra, Jr.

ASTROLAB INC., 4 Powder Horn Drive, Warren, NJ 07060, Tel: 1-201-560-3800, Telex: 710-991-9713; FSC No.: 16301; Empl.: 36; *Sls. Mgr.:* J. R. Toma

ASTRO-MED, INC., 600 East Greenwich Avenue, W. Warwick, RI 02893, Tel: 401-828-4000, TWX: 710-382-6409; Empl.: 120; *Sls. Mgr.:* Everett V. Pizzuti; *Dist. Mgr.:* Everett V. Pizzuti ..... **D•1402**

ASTRONAUTICS CORPORATION OF AMERICA, P.O. Box 523, Milwaukee, WI 53201-0523, Tel: 414-447-8200, TWX: 910-262-3153; FSC No.: 10138; Empl.: 1,500; *Dist. Mgr.:* L. J. Singleton

ASTRON CORPORATION

ASTRON CORP., 2852 Walnut # E, Tustin, CA 92680, Tel: 714-832-7770; *Sls. Mgr.:* William Pochirowski; *Dist. Mgr.:* William Pochirowski ..... **D•1515**

Local Distributors

CA Los Angeles, Henry Radio 213-820-1234
CA Northridge, Ora Elctrns. 213-701-5848
CA Sun Valley, Cartwright Comms. 213-768-7744
CO Aurora, Electro Tech Sls. 303-343-8937
GA Marrietta, NBC Mktg. 404-424-9097
IL Joliet, Communications Assoc. 815-744-6444
IL Joliet, Primus Elctrns. 815-436-8945
MD Cockleysville, Tessco. 301-252-0860
NJ Clifton, Meridian Comms. 201-473-1623
OH Cincinnati, Cartwright Comms. 513-489-1755
TX Dallas, M. Hutton Co. 214-484-0580

ASTRO PACKAGING, INC., 100 Thomas Road North, Hawthorne, NJ 07507, Tel: 201-423-3000, Telex: 130545; Empl.: 125; *Sls. Mgr.:* Phillip L. Steiner

ASTROSYN AMERICA, 14349 Victory Blvd., Ste. 304, Van Nuys, CA 91401, Tel: 213-785-2197, Telex: 651446; *Sls. Mgr.:* D. F. Dowis; *Dist. Mgr.:* D. F. Dowis

asi

ASTROSYSTEMS, 6 Nevada Dr., Lake Success, NY 11042, Tel: 516-328-1600, TWX: 510-223-0411; Empl.: 150; *Sls. Mgr.:* Howard Lazarus ... **D•1183, 1517, 1888**

Local Sales Offices & Reps

AL Huntsville, Kemp Engrg. 205-837-4304
AZ Mesa, Foxco Equip., Inc. 602-820-8685
AR El Dorado, Indust. Controls Assoc. 501-862-2051
AR Searcy, Industrial Controls Assocs. ... 800-643-1109
CA Cerritos, Foxco Equip. 213-921-3421
CA Long Beach, Saber Entprs., Inc. 213-595-5645
CO Englewood, Dynatech 303-773-2830
DE Garrison Lake, Broge-Matarese, Inc. .. 302-653-5005
FL Melbourne, Reynolds & Assocs. 305-259-7000
GA Atlanta, Kemp Instrs. 404-452-8050
IL Elgin, JHS Assocs. 312-741-9070
IN Mishawaka, Engineered Sls. 219-255-5111
IA Cedar Rapids, Di-Tronix, Inc. 319-377-8275

KS Wichita, Di-Tronix, Inc. 316-838-0884
LA Baton Rouge, Industrial Controls Assocs. 800-643-1109
MA Ashland, Polytek Assocs., Inc. 617-881-4741
MA Southborough, Motion Engrg. 617-485-2144
MO Bridgeton, Di-Tronix, Inc. 314-291-4777
MO Raytown, Di-Tronix, Inc. 816-365-6340
NY Cazenovia, D & O Engrg. 315-655-8602
NY Youngstown, D & O Engrg. 716-745-3915
NC Charlotte, Jake Rudisill Assoc. Inc. 704-377-6901
OH Cleveland, Instr. Sys. 216-845-8800
OH Dayton, Instr. Sys. 513-294-2838
OR Portland, Frys Controls, Inc. 503-226-2620
PA Pittsburgh, Instrumentation Sys. 412-823-7005
PA Warminster, Multi-Measurements 215-675-3082
TN Memphis, Industrial Controls Assocs. 800-643-1109
TX Dallas, Data Mktg. Assocs., Inc. 214-661-0330
TX Fort Worth, Indust. Controls Assoc. ... 800-643-1109
TX Houston, Indust. Controls Assoc. 501-862-2051
TX Humble, Industrial Controls Assocs. ... 800-643-1109
WA Bellevue, Fry Controls, Inc. 206-282-9270
WA Seattle, Datacom & Assocs., Inc. 206-285-2525
WI Appleton, Bu-Nell Eng. Co. 414-733-4242
WI Waukesha, Bu-Nell Eng. Co. 414-784-0994
Can Willowdale, Ont., Arthur Rosenblum Sls. 416-224-1177

ASTRO TOOL CO., INC., 21615 Southwest Tualatin Valley Hwy., Beaverton, OR 97006, Tel: 503-642-9853

AT&T

AT&T, 1 Oak Way, Berkeley Heights, NJ 07922, Tel: 1-800-372-2447; *Sls. Mgr.:* W. R. Sherman

Local Sales Offices & Reps

CA Los Angeles, AT&T Technlg. Sys. 213-726-5184
CA Sunnyvale 408-746-2332
CO Denver 303-538-2406
GA Atlanta 404-447-6495
IL Chicago, AT&T Technlg. Sys. 312-494-5190
MA Burlington 617-229-5672
MN Minneapolis 612-724-2019
NJ Berkeley Heights 201-771-2601
PA King of Prussia, AT&T Technlg. Sys. .. 215-768-2626

ATC POWER SYSTEMS, INC., 472 Amherst Street, Nashua, NH 03063, Tel: 603-882-1366, Telex: 756779; FSC No.: 61814; Empl.: 26; *Sls. Mgr.:* Wendall Finneault

ATEC, INC., Box 19426, 8219 Kempwood Dr., Houston, TX 77055, Tel: 713-468-7971, Telex: 77-4132 FLEKS HOU; FSC No.: 09552; Empl.: 82; *Sls. Mgr.:* F. Sawberger

A-SYSTEMS INC., 1500 Avon St. Extd., Charlottesville, VA 22901, Tel: 804-295-7200; *Sls. Mgr.:* F. M. Artrip

ATEC SYS., 107 N. Washington St., E. Rochester, NY 14445, Tel: 716-381-4740; Empl.: 6; *Sls. Mgr.:* Harry Turner

ATHENA CONTROLS, INC., 5145 Campus Dr., Whitemarsh Ind. Campus, Plymouth Meeting, PA 19462, Tel: 215-828-2490; Empl.: 85; *Sls. Mgr.:* David A. Tryon; *Dist. Mgr.:* Allen Breckenridge

ATKINS TECH., 3321 S.W. 40th Blvd., Gainesville, FL 32608, Tel: 904-378-5555, Telex: 51-4736-HALA; Empl.: 30; *Sls. Mgr.:* Walter Fitz-William; *Dist. Mgr.:* Walter Fitz-William

ATLANTIC MAGNETICS, INC., 1441 S.W. 30th Ave., Pompano Beach, FL 33061, Tel: 305-979-7920; *Sls. Mgr.:* Edward Cammarata; *Dist. Mgr.:* Scott Thompson

ATLANTIC OPTICAL MOULDING, Ellis St., P.O. Box 309, Dudley, MA 01570, Tel: 617-943-1746; Empl.: 6

ATLANTIC RESEARCH, 5390 Cherokee Ave., Alexandria, VA 22312, Tel: 703-642-4000, Telex: 248893; FSC No.: 95335; Empl.: 2400

ATLANTIC SCIENTIFIC CORP., 2711 S. Harbour City Blvd., Melbourne, FL 32901, Tel: 305-725-8000, Telex: 755959; *Sls. Mgr.:* Murray W. Boggs

ATLANTIC SWITCH CONTROLS, INC., 194 Elliott St., Hartford, CT 06114, Tel: 203-527-7705

ATLANTIC SWITCH CONTROLS, INC., 5 Coliseum Ave., Nashua, NH 03063, Tel: 603-880-1971

ATLAS ENERGY SYS., 9457 Rush St., S. El Monte, CA 91733, Tel: 213-575-0755, TWX: 910-587-3531; Empl.: 35; *Sls. Mgr.:* J. Thompson

ATLAS ENGRG. CORP., 10 Cheney St., Dorchester, MA 02121, Tel: 617-445-7100; FSC No.: 07001; Empl.: 61; *Sls. Mgr.:* Norman Scotch

ATLAS EYELETS, Pinkham St., Fairhaven, MA 02719, Tel: 617-997-9491; *Sls. Mgr.:* Arthur S. Tisch

ATLAS SOUND DIV., 10 Pomeroy Rd., Parsippany, NJ 07054, Tel: 201-887-7800, Telex: 13-6119; Empl.: 350; *Sls. Mgr.:* Paul Grote; *Dist. Mgr.:* David A. Chambers

ATLEE

ATLEE INC., One Gill St., Woburn, MA 01801, Tel: 617-933-3510, Telex: 949407; FSC No.: 99378; Empl.: 40 ..... **B•1229; C•1009, 1684, 1701, 1722**

Local Sales Offices & Reps

CA Agoura, Cal Rep 213-991-1940
CA Corte Madera, Paul Oneal Assoc. 415-924-1691
CO Arvada, Challange Sls. 303-427-3149
FL Melbourne, R-Rep 305-725-6993
MD Baltimore, Stitzer Assocs. 301-823-7688
MA Sharon, Cummings 617-784-5600
MN St. Paul, Countryman Assoc 612-645-9151
NY Huntington, C. R. Mayer Co. 516-921-7876
NY Latham, L-Tron 518-785-5032
NC Raleigh, B. T. Funderburk 919-782-3493
OH Cleveland, Techn. Sls. Assocs. 216-461-0826
PA Paoli, Stitzer Assocs. 215-644-5500
TX Dallas, Rem-Air Comp. Corp. 214-234-1069

Local Distributors

AZ Phoenix, EGR 602-840-0320
CA Northridge, Acort Inds. 213-993-6444
CA San Jose, Bisco Inds. 408-946-8980
IN Ft. Wayne, Graham Elec. Supp. 219-423-3422
IA Cedar Rapids, Deeco 319-365-7551
MA Winchester, Rush Inds. 617-729-5800
MN Minneapolis, Aerospace Computer 612-884-4725
NJ Nutley, Essex Electric 201-661-2600
NJ Paramus, N.Y. Fastener 201-265-8770
NY Bayshore, Merrit Fastener 516-242-1800
NY Bohemia, Car-Lac 516-567-4200
NY Buffalo, Summit Dist. 716-887-2800
NY Long Island City, Hardware Specialty 212-361-9393
NY Plainview, G & B Fasteners 516-694-0990
TX Dallas, National Precision 214-357-3921
TX Richardson, Altair Co. 214-231-5166
VA Charlottesville, Virginia Radio Supp. Co. 804-296-4184

ATMOSPHERE CONTROLS PRODS., 295 Polaris, Mountain View, CA 94043, Tel: 415-969-2640; Empl.: 14; *Sls. Mgr.:* Walter Quave Jr.; *Dist. Mgr.:* W. H. Ellis

ATOMERGIC CHEMETALS CORP., 100 Fairchild Ave., Plainview, NY 11803, Tel: 516-349-8800, Telex: 144612, TWX: 6852289; *Sls. Mgr.:* H. J. Gary

ATR ELCTRNS., INC., P.O. BOX 7008, St. Paul, MN 55107, Tel: 612-738-6520, 414-297-7374 ..... **D•1889**

ATV RESEARCH, INC., 1301 Broadway, Dakota City, NE 68731, Tel: 402-987-3771; *Sls. Mgr.:* Mel Shadbolt

AUBURN MFG., Pease Ave. & Stack St., Middletown, CT 06457, Tel: 203-346-6677; Empl.: 45; *Sls. Mgr.:* Richard Agria

AUDIO EQUIP., Div. W. Kidde & Co., Inc., 706 Forrest St., Charlottesville, VA 22901, Tel: 804-977-8050, TWX: 510-587-5461; Empl.: 50

AUDIOSEARS, South St., Stamford, NY 12167, Tel: 607-652-7305; FSC No.: 97101; Empl.: 140; *Sls. Mgr.:* D. Hartwell

AUDIOSONE, INC., 617 Fan Hill Rd., Monroe, CT 06468, Tel: 203-268-4372, 203-268-6703; *Sls. Mgr.:* Rudolph Duris

AUDIOTRONICS CORP., 7428 Bellaire Ave., N. Hollywood, CA 91605, Tel: 818-765-2645, Telex: 69-1241; Empl.: 300; *Sls. Mgr.:* Roy Schaub

AUDIOVOX CORP., 150 Marcus Blvd., Hauppage, NY 11787

AUGAT INTERCONNECTION SYSTEMS

AUGAT INC., 33 Perry Ave., Box 779, Attleboro, MA 02703, Tel: 617-222-2202, TWX: 710-391-0644; FSC No.: 91506; Empl.: 3,200; *Sls. Mgr.:* Jim Fuchs/Jeff Mahall; *Dist. Mgr.:* William Hall ..... **C•1702-1703**

Local Sales Offices & Reps

AL Huntsville, Glen White Assocs. 205-883-7938
AZ Scottsdale, Augat Sls. 602-224-0950
CA Los Angeles, Wiley Co. 213-666-1611
CA San Diego, Wiley Co. 619-571-2881
CA Santa Clara, Augat Sls. 408-980-0955
CO Littleton, Simpson Assocs. 303-794-8381
FL Safety Harbor, Augat Sls. 813-725-1037
FL Tamarac, Augat Sls. 305-721-6021
GA Norcross, Glen White Assocs. 404-441-1447
HI Honolulu, Hawaii Elctrns. Sls. & Svc. .. 808-845-8207
IL Rolling Meadows, Sumer 312-991-8500
IA Davenport, Ensco-Rep. Inc. 319-386-6600
KS Overland Park, Ensco-Rep, Inc. 913-381-7557
KS Wichita, Ensco-Rep. Inc. 316-683-1070
MD Silver Spring, NKA Inc. (Govt.) 301-585-6141
MA Norwood, Augat Sls. 617-762-3164
MI Detroit, Rathsburg Assocs. 313-882-1717
MN Edina, Augat Sls. 612-925-0255
MN Minnetonka, Gibb Elctrn. Sls. 612-935-4600
MO Maryland Hts., Ensco-Rep. Inc. 314-423-3935
NJ Cherry Hill, Trinkle Sls. 609-795-4200
NJ Maple Shade, NKA Inc. (Govt.) 609-234-4008
NM Albuquerque, C. T. Carlberg Assoc. ... 505-888-3883
NY N. Syracuse, L. D. Allen, Inc. 315-437-8387
NY Yonkers, D. Sonkin Assocs. 914-968-8282
NC Raleigh, Glen White Assocs. 919-848-1931
OH Dayton, NKA, Inc. 513-268-8771
OH Englewood, A. Nace Co. 513-836-0931
OH Richfield, A. Nace Co. 216-659-7178
OR Portland, Augat Sls. 503-256-4596
TN Gray, Glen White Assocs. 615-447-8850
TX Dallas, Augat Sls. 214-788-4211
TX Georgetown, Augat Sls. 512-479-9447
TX Houston, Augat Sls. 713-781-9343
UT Midvale, Simpson Assocs. 801-566-3691
VA Lynchburg, Glen White Assocs. 804-237-6291
WA Bellevue, Augat Sls. 206-451-9777
WI Brookfield, Sumer Inc. 414-784-6641

AUGAT/ALCOSWITCH, See Alco Elctrn. Prods., Inc.

AUGAT/ES•P. INC., /Augat, Inc., 12832 Chadron Ave., Hawthorne, CA 90250, Tel: 213-973-0262, Telex: 66-4467; Empl.: 125; *Sls. Mgr.:* Karl f. Zimmermann

AUGAT FIBEROPTICS, 710 Narragansett Park Dr., Pawtucket, RI 02861, Tel: 401-724-4400, Telex: 511450; *Sls. Mgr.:* Bob Goecheler; *Dist. Mgr.:* Bill Hall

AUGAT/PYLON CO., INC., P.O. Box 2510, Attleboro Falls, MA 02763, Tel: 617-699-7646, TWX: 948095; Empl.: 200; *Sls. Mgr.:* John Deichl

AULT, INCORPORATED, 1600 Freeway Blvd., Minneapolis, MN 55430, Tel: 612-560-9300, TWX: 910-756-3435; Empl.: 300; *Sls. Mgr.:* John Newhouse ..... **D•1518-1519**

Local Sales Offices & Reps

AL Huntsville, L & D, Inc. 205-837-1469
AZ Scottsdale, DAR-C, Inc. 602-948-2240
CA Los Angeles, West Elctrn. Sls. 714-898-0120
CA San Diego, West Elctrn. Sls. 619-576-9268
CA Santa Clara, Magna Sls. 408-727-8753
CO Denver, William J. Purdy 303-777-1411
CO Denver, William J. Purdy 303-753-6800
CT Manchester, G/M Assocs. 203-646-4443
CT Wallingford, Marathon Sls., LTD 617-875-3566
FL Boca Raton, QXI, Inc. 305-392-2626
FL St. Petersburg, QXI, Inc. 813-821-2281
GA Atlanta, L & D, Inc. 404-455-3483
IL Arlington Hgts., MSI 312-956-1000
OH Columbus, McFadden Sls. 614-459-1280
IA Des Moines, Beams Co. 515-255-1148
KS Shawnee Mission, Beams Co. 913-631-0300

MD Columbia, Delta III Assocs. 301-730-4700
MA Framingham, Marathon Sls., LTD 617-875-3566
MI Plymouth, Jay Mktg. Assocs. 313-459-1200
MO St. Louis, Beams Co. 314-434-8448
NV Carson City, Magna Sls. 702-883-1471
NJ Ocean, P. Saftler Assocs. 201-922-3014
NY Lynbrook, P. Saftler Assocs. 516-593-7880
NC Greensboro, L & D, Inc. 919-292-3201
OH Cleveland, Lyons Corp. 216-659-9224
OH Dayton, E. Lyons Co. 513-278-0714
OR Portland, Jas. J. Bacher Co. 503-297-8744
PA Philadelphia, Samuel K. MacDonald, Inc. 215-545-1205
TX Austin, R. F. Kimball Co. 512-443-5284
TX Houston, R. F. Kimball Co. 713-890-8810
TX Houston, R. F. Kimball Co. 713-840-0590
TX Richardson, R. F. Kimball Co. 214-231-3447
WA Seattle, Jas. J. Backer Co. 206-285-1300

Local Distributors

CA Cincinnati, Hughes Peters 513-351-2000
CA Mountain View, USI Elctrn. Comps. ... 415-969-5420
CA San Diego, Tauber Elctrns. 619-274-7242
CA Santa Monica, Distr. Specialists 213-393-9666
CA Van Nuys, Natl. Electro Sls. Corp. 213-781-0505
MA Sharon, Adcour 617-784-8123
MO St. Charles, Finnigan Elctrns. 314-946-6201
Can St. Laurent, Que., Tech-Rep Elctrns., Ltd. 514-337-6046

AURA MFG., 50 McDermott Rd., North Haven, CT 06473, Tel: 203-777-2541; Empl.: 200; *Sls. Mgr.:* Fred Bonito

AURIC CORP., 470 Frelinghuysen Ave., Newark, NJ 07114, Tel: 201-242-4100; Empl.: 35

AUSTIN ELECTRONICS, The Austin Co., 17-01 Pollitt Drive, Fair Lawn, NJ 07410, Tel: 201-794-0200, TWX: 710-988-2262; Empl.: 100; *Sls. Mgr.:* Frank J. Cerven

AUSTRON, INC.

AUSTRON, INC., P.O. Box 14766, Exit 248 N. IH 35, Austin, TX 78761, Tel: 512-251-2341, TWX: 910-874-1356; FSC No.: 24672; Empl.: 153; *Sls. Mgr.:* R. Ellis ..... **A•1314-1315**

Local Sales Offices & Reps

AL Huntsville, Sci. Devices - SE 205-536-1969
AZ Scottsdale, Territorial Mktg. 602-994-8665
CA Pleasant Hill, Austron 415-930-7268
CA San Carlos, Westronics Assocs. 415-592-1417
CA San Diego, Thorson Co. 619-292-8525
CA Signal Hill, Thorson Co. 213-595-0361
CT Southington, Scheinfein Assocs. 203-621-3492
FL Orlando, Sci. Devices - SE 305-841-8180
FL Shalimar, Sci. Devices - SE 904-651-4407
GA Atlanta, Sci. Devices-SE 404-452-8709
IL Elk Grove, Loren Green Assoc. 312-593-0282
IN Indianapolis, Loren Green Assoc. 317-293-9827
MA Reading, Scheinfein Assocs. 617-944-2304
MI Union Lake, Ashby Assocs. 313-363-1100
MN Minneapolis, Loren Green Assoc. 612-571-6666
NY Frankfort, Kapital Instr. Sls. 315-894-4245
NY Huntington, CDB Entprs. 516-692-5200
NC Winston Salem, Sci. Devices-SE 919-765-5766
OH Dayton, Ashby Assocs. 513-252-5627
OH Lyndhurst, Ashby Assocs. 216-461-0826
OR Portland, Cascade Data Mktg. 503-641-9266
PA Plymouth Meeting, Sci. Devices - Phila. 215-825-9515
TX Houston, Sci. Devices - Gulfcoast 713-864-1711
TX Richardson, Sci. Devices - SW 214-231-8106
VA McLean, Austron 703-734-1990
WA Woodinville, Cascade Data Mktg. 206-788-3421

AUTODESK, 2658 Bridgeway, Sausalito, CA 94965, Tel: 415-331-0356; *Sls. Mgr.:* John Macleod

AUTOMATED PRODUCTION CONCEPTS, 8 E. Garden Pl., Pompton Plains, NJ 07444, Tel: 201-831-8300, Telex: 130120; Empl.: 12

Advertisement

For the Finest Electronics Production Equipment and Service • In Line Jet Wave Chip Soldering • I.C. Lead Tinning Equipment • Loupot Lead Formers • Peter Jordan Assembly Tables. For thru hole-chip or mixed assembly • 1 Step Strip and Crimp • Component counters See Our Complete Line A.P.C. 201-831-8300 Pompton Plains, N.J.

AUTOMATED PROD. EQUIP. CORP., 142 Peconic Ave., Medford, NY 11763, Tel: 516-654-1197, TWX: 510-228-2120; FSC No.: 57216; *Sls. Mgr.:* Peter Clancy

AUTOMATIC COIL CORP., Sub. Designatronics, Inc., 455 E. 10th Ave., Hialeah, FL 33010, Tel: 305-883-5311, TWX: 810-848-8097; Empl.: 245 ..... **A•1207-1209, 1464-1467**

Local Sales Offices & Reps

AL Huntsville, CRS Elctrns., Inc. 205-533-2444
CA Huntington Beach, Mil-Com Sls. 714-840-2424
GA Atlanta, CRS Elctrns., Inc. 404-396-3720
MD Laurel, CSDS, Inc. 301-490-3800
MA Manchester, Alard, Galagan & Assocs. 617-526-7733
MN Spring Lake Park, Holmgren Assocs. .. 612-786-7641
NY Brooklyn, Irv Morse Sls. 212-444-4974
NY Carle Place, Olkon Corp. 516-747-2330
NC Raleigh, CSR Elctrns. 919-878-9200
OH Dayton, Rockford Controls Ohio, Inc. .. 513-898-5452
OH Euclid, Rockford Controls Ohio, Inc. ... 216-731-5250
OH Reynoldsburg, Rockford Controls Ohio, Inc. 216-731-5250
OK Bixby, MGR Elctrns. 918-369-5186
TX Dallas, MGR Elctrns. 214-942-6041
EXP Israel, Tel Aviv, Star-Tronies 703-385-0139

AUTOMATIC CONNECTOR, INC., 400 Moreland Rd., Commack, NY 11725, Tel: 516-543-5000, TWX: 510-226-3744; FSC No.: 94375; Empl.: 250; *Sls. Mgr.:* William Pitcher

AUTOMATIC SWITCH CO., 50-60 Hanover Road, Florham Park, NJ 07932, Tel: 1-201-966-2000, Telex: 136422; Empl.: 1,200; *Sls. Mgr.:* Wayne Bouchard

AUTOMATIC TEST SYSTEMS, 23 Poplar St., Malden, MA 02148, Tel: 617-322-1107

AUTOMATIC TIMING & CONTROLS CO., 201 So. Gulph Rd., King of Prussia, PA 19406, Tel: 215-337-5500, 800-441-8245, Telex: 84-6437; Empl.: 300; *Sls. Mgr.:* R. L. Swanson ..... **D•1112**

Local Sales Offices & Reps

AZ Phoenix, Portis & Assocs. 602-947-4379
CA Gardena, Instrument Lab. 213-327-3282
CA San Francisco, Automated Proc. Controls 415-467-6162
CO Englewood, E & M Sls. 303-761-6202
FL Lakeland, A.A. Elec. Div. 813-665-6941
GA Norcross, A.A.Electric Div. of AEC 404-449-8670
IL Glen Ellyn, Rockford Controls 312-469-6016
IN Indianapolis, Rockford Controls 317-248-2518
KY Louisville, Air-Hydro Power 502-451-1000
LA New Orleans, Mid South Sls. 504-641-7480
MD Baltimore, Jobe & Co. 301-327-0220
MA Hingham, Hingham Bay Corp. 617-749-8700
MI Brighton, H. H. Barnum Co. 313-229-2961
MN Minneapolis, Automated Controls 612-941-4092
MO Kansas City, Duncan Sls. & Engrg. 816-356-1888
MO St. Louis, E. Mooney Co. 314-878-9910
NE Omaha, Lakeland Engrg. Equipt. 402-734-2600
NJ Newark, Norman Bragar Co. 201-344-1100
NM Albuquerque, E & M Sls. 505-883-8955
NY Buffalo, Niagara Electric Sls. 716-886-4000
NY Rochester, Niagara Electric Sls. 716-271-1223
NY Syracuse, Niagara Elec. Sls. 315-437-1656
NC Charlotte, Brown & Morrison 704-554-8570
OH Cincinnati, Anderson-Bolds 513-528-5680
OH Cleveland, Anderson-Bolds 216-229-4700
OH Worthington, Anderson-Bolds 614-885-3933
OK Tulsa, Driscol Auto. Control 918-747-6625
OR Portland, Coons Western 503-295-0411
PA King of Prussia, Applied Controls 215-265-3832
PA Pittsburgh, Gilson Engrg. Sls. 412-931-6114
TX Houston, Gettys-Eads-Adair 713-781-3005
UT Salt Lake City, Control Equip. 801-487-7741
VA Richmond, Jobe & Co. 804-282-6508
WA Seattle, J. A. Tudor & Assocs. 206-682-7444
WA Spokane, J. A. Tudor & Assocs. 509-327-3328
WI Cedarburg, Automation Engrg. 414-377-7500

AUTOMATION ASSOCS., 1212 Westheimer #120, Austin, TX 78752, Tel: 512-458-4412

AUTOMATION DISPLAYS INC., 3833 N. White Ave., Eau Claire, WI 54703, Tel: 715-834-9595; Empl.: 38

AUTOMATION DYNAMICS, 77 Brookside Pl., Hillsdale, NJ 07642, Tel: 201-666-2458; FSC No.: 53089; Empl.: 40

AUTOMATION COMPONENTS, INC., One Short Ave., Peckville, PA 18452, Tel: 717-489-7508

AUTOMATION PRODS., INC., 3030 Max Roy, Houston, TX 77008, Tel: 713-869-0361, Telex: 775-959

AUTOMATION UNLTD., 10H Roessler Rd., Woburn, MA 01801, Tel: 617-933-7288, Telex: 949329; *Sls. Mgr.:* Stephen A. Gould

AUTOSPLICE, INC., 59-12, 37th Ave, Woodside, NY 11377, Tel: 718-429-0500, Telex: 420902, TWX: 968171; Empl.: 86; *Sls. Mgr.:* O. Nedelkovich

auto-swage
726 River Road, Shelton, CT 06484 Tel. (203) 929-1401

AUTO-SWAGE PRODS., 726 River Rd., Shelton, CT 06484, Tel: 203-929-1401, Telex: 963-542; Empl.: 170; *Sls. Mgr.:* R. Mikulsky ..... **C•1685**

Local Sales Offices & Reps

AL Montgomery, M.Y.A., Inc. 205-284-1948
CA Corte Medera, Paul O'Neal & Assocs. 415-924-1691
CA Glendale, Halderman & Frazier 818-957-4554
CO Denver, Regional Sls. Co. 303-433-7397
CT Roxbury, Yankee Engrg. 203-426-5679
FL Seminole, D-Rep Sls., Inc. 813-397-1395
IL Barrington, Perhats Assocs. 312-381-6360
IN Greensburg, H. K. Feaster Assocs. 812-663-5689
MN Minneapolis, W. R. Maleckar Co. 612-926-7601
MO Maryland Heights, Meiners Sls. 314-739-1114
NY Rochester, Antil-Thrasher Assoc. 716-586-0595
OH Chagrin Falls, Bray Assocs. 216-247-4474
OR Portland, Syscom Sls., Inc. 503-644-2505
PA Broomall, AM Tech. Sls. Co. 215-356-0574
SC Fort Mills, Eagle Sales, Inc. 803-548-2222
Can Candiac, Que., W. H. Elctrns. Registered 514-632-3685

AUTOTROL, P.O. Box 557, Crystal Lake, IL 60014, Tel: 815-459-3080, Telex: 72-2417; Empl.: 140; *Sls. Mgr.:* Thomas Heldt

AUTO-TROL TECH., 12500 N. Washington St., Denver, CO 80233, Tel: 303-452-4919, TWX: 910-320-0772; Empl.: 600; *Sls. Mgr.:* Jim Norrod

AUTRONICS, 314 E. Live Oak, Ste. A, Arcadia, CA 91006, Tel: 818-445-5470, TWX: 910-582-3216; FSC No.: 03972; Empl.: 65

AVA INSTRMN., INC., 8010 Highway 9, Ben Lomond, CA 95005, Tel: 408-336-2281, Telex: 357403 AVA; FSC No.: 61933; Empl.: 6; *Sls. Mgr.:* Allan Hughes

AVANTEK, INC., 3175 Bowers Ave., Santa Clara, CA 95054, Tel: 408-496-6710, Telex: 34-6337, TWX: 910-339-9274; Empl.: 2268

AVCO-ELCTRNS. DIV., 4807 Bradford Dr., Huntsville, AL 35805, Tel: 205-837-6500, TWX: 810-726-2240; Empl.: 700; *Sls. Mgr.:* Jim Pool and David Helms

AVDEL, Newman Inds., Inc., 50 Lackawanna Ave., Parsippany, NJ 07054, Tel: 201-263-8100, Telex: 4574107, TWX: 710-987-8349; Empl.: 160; *Sls. Mgr.:* R. G. Palmiteer; *Dist. Mgr.:* M. E. Mervis

AVEL-LINDBERG, INC., Peacock Alley 116, 1 Padanaram Rd., Danbury, CT 06811, Tel: 203-797-8698, TWX: 710-456-9984; Empl.: 4; *Sls. Mgr.:* Rowland Mattin

Local Sales Offices & Reps

CA Buena Park, Chuck Cooper Co., Inc. .. 714-739-8526
MA Canton, D. Taggart Assocs. 617-828-6064

Local Distributors

CT Wallingford, Sager Elctrl. Supp. Co. 203-265-4600
MA Hingham, Sager Electrical Supp. Co. .. 617-749-6700
NY New York, Martin Audio/Video Corp. 718-541-5900

AVEX ELCTRNS., 1683 Winchester Rd., P.O. Box 1026, Bensalem, PA 19020, Tel: 215-638-1515; FSC No.: 58414; *Sls. Mgr.:* Mike Battery Batley; *Dist. Mgr.:* Mike Batley ..... **D•1416**

AVIBANK MFG., 210 S. Victory Blvd., Burbank, CA 91503, Tel: 818-843-4330, TWX: 910-498-2215; FSC No.: 84256; Empl.: 330; *Sls. Mgr.:* D. Ladin

Avionic Instruments, Inc.

AVIONIC INSTRS., 943 E. Hazelwood Ave., Rahway, NJ 07065, Tel: 201-388-3500, Telex: 844413; Empl.: 55; *Sls. Mgr.:* Wallace J. Izzo; *Dist. Mgr.:* Wallace J. Izzo ..... **D•1890-1893**

Local Sales Offices & Reps

AL Huntsville, Rakes Engrg. and Mktg Corp. 205-533-3763
AZ Tempe, Southwest e/m Mktg. 602-941-2828
CA Simi Valley, 3-B Assocs. 805-581-1681
FL New Port Richey, Lobo Mktg. Assocs. 813-848-8578
GA Atlanta, Rakes Engrg. and Mktg. 404-447-6937
MA Needham Heights, Shain Assocs. 617-449-4380
MN Edina, JH Hansen 612-893-9960
MO St. Louis, Harris Hanson Co. 314-432-3611
NV Las Vegas, 3-B Assocs. 805-581-5681
NJ Rahway, Avionic Instrs. Inc. 201-388-3500
NC Raleigh, Rakes Engrg. and Mktg. 919-847-5079
OH Hudson, Integrated Aircraft Sys. 216-656-4251
TX Dallas, Seaton Corp. 214-380-0414
WA Seattle, Rep West 206-283-8351
EXP NJ, Rahway, REA Intl. Ltd. 201-382-7100
Can Toronto, Norgay Entprs. Ltd. 416-239-3025

AVIONICS, Box 200, Niagara-On-Lake, ON, Canada, Tel: 416-468-3632; Empl.: 25

AVTEL DIV., UNITRON INC., 10925 Miller Rd., Dallas, TX 75238, Tel: 214-340-8600, Telex: 882511; FSC No.: 6130; Empl.: 113; *Sls. Mgr.:* R. L. Beutel ... **D•1895-1897**

Local Sales Offices & Reps

CA Sunland, Unitron (Jim Crevier) 818-352-7348
GA Byron, Unitron (Joe Joiner) 912-956-2866

AVX CORPORATION, Box 867, Myrtle Bch., SC 29577, Tel: 803-448-9411, TWX: 810-661-2252; FSC No.: 9K916; *Sls. Mgr.:* John Winn; *Dist. Mgr.:* Allan Cole ..... **A•1010-1011**

Local Sales Offices & Reps

AL Huntsville, Beacon Elctrns. 205-881-5031
AZ Scottsdale, Interstate Mktg. 602-244-9050
AZ Scottsdale, Thorson Desert Sls. 602-998-2444
AR Little Rock, Beacon Elctrns. 501-224-5449
CA San Diego, Interstate Mktg. 619-292-8117
CA San Jose, Quadrep Inc. 408-946-4000
CA Woodland Hills, Interstate Mktg. Assocs. 818-883-7606
CO Denver, Elcom 303-337-2300
FL Clearwater, Dyne-a-Mark 813-441-4702
FL Fort Lauderdale, Dyne-a-Mark 305-771-6501
FL Maitland, Dyne-a-Mark 305-831-2097
FL Palm Bay, Dyne-a-Mark 305-727-0192
GA Atlanta, Beacon Elctrns. 404-256-9640
IL Highland Park, T.B. Hunter Assocs. ... 312-433-7000
IN Ft. Wayne, F.J. Campisano Co. 219-747-2633
IN Indianapolis, Frank J. Campisano 317-253-7651
IA Cedar Rapids, Comstrand 319-377-1575
MD Baltimore, Burgin-Kreh Assocs. 301-265-8500
MA Lexington, J.E. Boeing Co. 617-862-2500
MI Southfield, J.L. Montgomery 313-358-2616
MN Minneapolis, Comstrand Inc. 612-788-9234
MO Grandview, Beneke & McCaul 816-765-2998
NJ Bellmawr, Thomas Assocs., Inc. 609-933-2600
NM Albuquerque, Thorson Co. 505-293-8555
NY Ithaca, Bob Dean, Inc. 607-257-1111
NY Melville, Comtronic Assocs. 516-249-0505
NY Wappingers Falls, Bob Dean, Inc. 914-297-6406
NC Raleigh, Tingen Technical Sales 919-781-1100
OH Cincinnati, F.J. Campisano Co. 513-574-7111
OH Cleveland, Frank J. Campisano 216-749-5550
OH Columbus, Frank J. Campisano 614-876-5405
OH Dayton, Schmidt & Assoc. 513-293-6652
OK Oklahoma City, Ammon & Rizos 405-942-2552
OR Hillsboro, Western Tech. Sls. 503-640-4621
PA Coraopolis, F.J. Campisano Co. 412-264-5151
TX Austin, Ammon & Rizos Co. 512-454-5131
TX Dallas, Ammon & Rizos Co. 214-644-5591
TX Houston, Ammon & Rizos Co. 713-781-6240
UT Salt Lake City, Elcom, Inc. 801-485-7415
VA Lynchburg, Burgin-Kreh Assoc. 804-239-2626
WA Bellevue, Western Tech. Sls. 206-641-3900
WA Spokane, Western Techn. Sls. 509-922-7600
Can Kirkland, Que., Longman Sls. 514-694-3911
Can Mississauga, Ont., Longman Sls. 416-677-8100
Can Ottawa, Ont., Longman Sls. 613-564-0100

Local Distributors

AL Huntsville, R. M. Elctrns. 800-633-2046
AZ Phoenix, Kierulff Elctrns. 602-437-0750
AZ Phoenix, TTI 602-966-1616
AZ Phoenix, Wyle Elctrns. 602-249-2232
AZ Tempe, Arrow Elctrns. 602-968-4800
CA Chatsworth, Arrow Elctrns. 818-701-7500
CA Chatsworth, IEC 213-998-2200
CA Chatsworth, IEC Elctrns. 213-998-2200
CA El Monte, Marshall Elctrns 818-442-7204
CA El Segundo, Wyle Elctrns. 818-880-9001
CA Hayward, Arrow Elctrns. 415-487-4300
CA Irvine, IEC 714-660-1055
CA Irvine, Marshall Elctrns 714-660-9261
CA Irvine, Wyle Elctrns. 714-863-9953
CA Los Angeles, Kierulff Elctrns. 213-725-0325
CA N. Hollywood, T.T.I. 818-709-1010
CA Rancho Cordous, Wyle Elctrns. 916-638-5282
CA Sacramento, IEC 916-424-5297
CA San Diego, Arrow Elctrns. 619-565-4800
CA San Diego, Kierulff Elctrns. 619-278-2122
CA San Diego, Wyle Elctrns. 619-565-9171
CA San Jose, Cetec Elctrns. 408-980-0110
CA San Jose, Eric Elctrns. 408-262-1111
CA San Jose, IEC 408-263-1100
CA Santa Clara, Wyle Elctrns. 408-727-2500
CA Southgate, Cetec Elctrns. 213-773-6521
CA Sun Valley, Q.C. Comps. 818-700-2622
CA Sunnyvale, Arrow Elctrns. 408-745-6600
CA Tustin, Arrow Elctrns. 714-838-5422
CA Tustin, Kierulff Elctrns. 714-731-5711
CO Denver, Arrow Elctrns. 303-696-1111
CO Denver, IEC 303-292-6121
CO Denver, Kierulff Elctrns. 303-371-6500
CO Thornton, Wyle Dist. Gp. 303-457-9953
CT E. Haven, J. V. Elctrns. 203-469-2321
CT Wallingford, Arrow Elctrns. 203-265-7741
CT Wallingford, Kierulff Elctrns. 203-265-1115
CT Wallingford, Marshall Elctrns. 203-265-3822
FL Ft. Lauderdale, Arrow Elctrns. 305-429-8200
FL Ft. Lauderdale, NRC Elctrns. 305-772-4500
FL Orlando, Marshall Elctrns. 305-841-1878
FL Orlando, T.T.I. 305-859-1000
FL Palm Bay, Arrow Elctrns. 305-725-1480
FL St. Petersburg, Kierulff Elctrns. 813-576-1966
GA Norcross, Arrow Elctrns. 404-449-8252
GA Norcross, Kierulff Elctrns. 800-241-0560
GA Norcross, Marshall Elctrns. 404-923-5750
IL Elk Grove, Kierulff Elctrns. 312-640-0200
IL Lombard, RM Elctrns. 312-932-5150
IL Schaumburg, Arrow Elctrns. 312-397-3440
IL Schaumburg, Marshall Elctrns. 314-490-0155
IN Indianapolis, Arrow Elctrns. 317-243-9353
IN Indianapolis, RM Elctrns. 317-291-7110
MD Baltimore, Arrow Elctrns. 301-995-0003
MD Gaithersburg, Marshall Elctrns. 301-840-9450
MD Rockville, M.S. Elctrns. 301-340-6400
MA Wakefield, MCI 617-245-5967
MA Westboro, Future Elctrns. 617-366-2400
MA Wilmington, RC Components 617-273-1860
MA Woburn, Arrow Elctrns. 617-933-8130
MI Ann Arbor, Arrow Elctrns. 313-971-8220
MI Grand Rapids, Arrow Elctrns. 616-243-0912
MI Grand Rapids, RM Elctrns. 616-531-9300
MI Livonia, Marshall Elctrns. 313-525-5850
MN Edina, Arrow Elctrns. 612-830-1800
MN Edina, Kierulff Elctrns. 612-941-7500
MN Plymouth, Marshall Elctrns. 612-559-2211
MO Maryland Hgts., Kierulff Elctrns. 314-739-0855
MO St. Louis, Arrow Elctrns. 314-567-6888
NH Manchester, Arrow Elctrns. 603-668-6968
NJ Clifton, J-Mar Elctrns. 201-772-6400
NJ Fairfield, Arrow Elctrns. 201-575-5300
NJ Fairfield, Marshall Elctrns. 201-882-0320
NJ Marlton, Arrow Elctrns. 609-596-8000
NJ Mt. Laurel, Marshall Elctrns. 609-234-9100
NM Albuquerque, Arrow Elctrns. 505-243-4566
NY Bohemia, TTI 516-567-1500
NY E. Farmingdale, Tri-Start 516-293-0400
NY Endwell, Marshall Inds. 607-754-1570
NY Hauppague, Arrow Elctrns. 516-231-1000
NY Hauppauge, Jaco Elctrns. 516-273-5500
NY Liverpool, Arrow Elctrns 315-652-1000
NY Lynbrook, Patriot 516-599-8881
NY Melville, Arrow Elctrns. 516-391-1484
NY Rochester, Arrow Elctrns. 716-275-0300
NY Rochester, Marshall Inds. 716-235-7620
NC Greensboro, Kierulff Elctrns. 919-852-9440
NC Raleigh, Arrow Elctrns. 919-876-3132
NC Raleigh, Kierulff Elctrns. 919-872-8410
NC Winston Salem, Arrow Elctrns. 919-725-8711
OH Akron, Akron 216-762-8818
OH Centerville, Arrow Elctrns. 513-435-5563
OH Cleveland, Kierulff Elctrns. 216-587-6558
OH Dayton, Marshall Elctrns. 513-236-8088
OH Solon, Arrow Elctrns. 216-248-3990
OK Tulsa, Arrow Elctrns. 918-665-7700
OK Tulsa, Kierulff Elctrns. 918-252-7537
OR Tigard, Arrow Elctrns. 503-684-1690
PA Monroeville, Arrow Elctrns. 412-856-7000
PA Philadelphia, Almo Elctrns. 215-698-4000
TX Austin, Arrow Elctrns. 512-835-4180
TX Austin, Kierulff Elctrns. 512-835-2090
TX Dallas, Arrow Elctrns. 214-380-6464
TX Dallas, Kierulff Elctrns. 214-343-2400
TX Dallas, R.M. Elctrns. 214-235-3100
TX Ft. Worth, T.T.I. 817-429-1440
TX Richardson, Jaco 214-235-9575
TX Stafford, Arrow Elctrns. 713-530-4700
UT N. Salt Lake City, IEC 801-298-1868
UT Salt Lake City, Arrow Elctrns. 801-972-0404
UT Salt Lake City, Kierulff Elctrns. 801-973-6913
WA Bellevue, Arrow Elctrns. 206-643-4800
WA Bellevue, IEC 206-455-2727
WA Bellevue, Wyle Elctrns. 206-453-8300
WI New Berlin, R.M. Elctrns. 414-784-4420
WI Oak Creek, Arrow Elctrns. 414-764-6600
Can Downsview, Ont., Future Electrns 514-694-7710

AXEL ELCTRNS., General Signal Corp., 134-20 Jamaica Ave., Jamaica, NY 11418, Tel: 718-291-3900, TWX: 710-582-2618; FSC No.: 13058; Empl.: 210; *Sls. Mgr.:* J. Alaimo

AXIAL MAGNETICS, 15922 Strathern, Van Nuys, CA 91406, Tel: 818-994-3346 ..... **B•1139**

Local Sales Offices & Reps

OH Cleveland, S.B. Reese Sls. 216-932-8079
TX Houston, Southland Engrg. & Sls. 713-772-3170

AXIOM CORP., 1014 Griswold Ave., San Fernando, CA 91340, Tel: 213-365-9521

AXIS, INC., 7825 Engineer Rd., Ste. 208, San Diego, CA 92111, Tel: 619-560-7737; FSC No.: 9S849; Empl.: 12; *Sls. Mgr.:* Mark J. Prager

AYDIN CORP., 700 Dresher Rd., Horsham, PA 19044, Tel: 215-657-7510, Telex: 685 1211, TWX: 510-661-0518; Empl.: 2,000; *Sls. Mgr.:* B. Jack Miller

AYDIN CONTROLS, 414 Commerce Dr., Ft. Washington, PA 19034, Tel: 215-542-7800, Telex: 6851057, TWX: 510-661-0518; Empl.: 533; *Sls. Mgr.:* Joseph J. Taylor

AYDIN MICROWAVE, 75 East Trimble Rd., San Jose, CA 95131, Tel: 408-946-5600, Telex: 4990756, TWX: 910-338-0216; Empl.: 200; *Sls. Mgr.:* Bruce M. Jennings

AYDIN MONITOR SYS., 502 Office Center Dr., Ft. Washington, PA 19034, Tel: 215-646-8100, TWX: 510-661-1520; Empl.: 241

AYDIN VECTOR DIV., Box 328, Newtown, PA 18940, Tel: 215-968-4271, TWX: 510-667-2320; FSC No.: 13923; Empl.: 280

BABCOCK, INC., 1717 West Collins Ave., Orange, CA 92667, Tel: 714-633-3700, TWX: 910-595-1517; FSC No.: 56623; Empl.: 245; *Sls. Mgr.:* Albin Gudis; *Dist. Mgr.:* Albin Gudis

BACH-SIMPSON LTD., 1255 Brydges St., London, ON, Canada N5W-2C2, Tel: 519-452-3200

BACON INDS., 192 Pleasant St., Watertown, MA 02172-2399, Tel: 617-926-2550, TWX: 710-327-6518; FSC No.: 99098; Empl.: 23; *Sls. Mgr.:* R. S. Cass

BAILEY CONTROLS CO., 29801 Euclid Ave., Wickliffe, OH 44092, Tel: 216-585-5800, Telex: 980621, TWX: 216-944-4160; Empl.: 2300; *Sls. Mgr.:* R. A. Purmal; *Dist. Mgr.:* R. C. Wright

BALDOR ELECTRIC COMPANY, P.O. Box 2400, Fort Smith, AR 72901, Tel: 501-646-4711, Telex: 53-7425

BALLY ELECTRONICS, Bally Mfg., 10750 W. Grand Ave., Franklin Park, IL 60131, Tel: 312-451-7223; Empl.: 300; *Sls. Mgr.:* Lam McGannon

BAKER, J. T., CHEMICAL CO., 222 Red School La., Phillipsburg, NJ 08865, Tel: 201-859-2151, TWX: 510-235-2924; Empl.: 1,200; *Sls. Mgr.:* D. J. Calder

BAKER CO., INC., Drawer E - Sanford Airport, Sanford, ME 04073, Tel: 207-324-8773; Empl.: 150

BALLANTINE LABS., 90 Fanny Rd., Boonton, NJ 07005, Tel: 201-335-0900, TWX: 710-987-8380; FSC No.: 50423; Empl.: 90; *Sls. Mgr.:* Joe Deery; *Dist. Mgr.:* Joe Deery ..... **D•1185**

Local Sales Offices & Reps

AZ Phoenix, Fry-Gates 602-277-2808

B&K PRECISION

AUTHORIZED DISTRIBUTOR

SUNSHINE

THE SOURCE FOR METERS & TEST EQUIPMENT

Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT
(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area
(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

B&K PRECISION

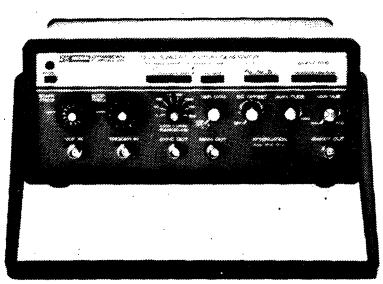
Authorized Distributors

RAG ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



Model 3030

AZ	Tempe, Fry-Gates Inc.	505-262-1525
CA	Laguna Hills, Elotek Sys. Inc.	714-830-4856
CA	Los Angeles, Elotek Sys., Inc.	213-416-9190
CA	San Diego, Elotek Sys., Inc.	619-438-4856
CA	San Jose, MCH Assocs.	408-246-7330
CO	Denver, Fry-Gates, Inc.	303-321-6818
CT	Southington, Scheinfein Assocs.	203-621-3492
FL	Orlando, Micro Spec, Inc.	305-299-6508
GA	Lilburn, Micro Spec, Inc.	404-921-3840
IL	Arlington Hgts., Dytec/Central	312-394-3380
IN	Indianapolis, Dytec/Central	317-247-1316
KS	Kansas City, Marsland Assocs.	913-888-2840
MA	Reading, Scheinfein Assocs.	617-944-2304
MI	Madison Hgts., WKM Assocs.	313-588-2300
MO	St. Louis, Marsland Assocs.	314-991-1399
NJ	Elmwood Park, L & M Assocs.	201-797-0441
NM	Albuquerque, Fry-Gates, Inc.	505-262-1525
NY	Canandaigua, Mamula Sls.	716-394-5560
NY	New York, L & M Assocs.	212-243-6155
OH	Cleveland, WKM Assoc.	216-267-0445
OH	Dayton, WKM Assoc.	513-434-7500
OH	Independence, WKM Assocs.	216-524-5930
OR	Portland, Westcon	503-283-0132
PA	Andalusia, L & M Assocs.	215-245-6658
PA	Pittsburgh, WKM Assoc.	412-292-2953
SC	Rock Hill, Micro Spec, Inc.	803-366-3015
TN	Nashville, Micro Spec. Inc.	615-383-4064
TX	Austin, Lear Assocs.	512-450-1059
TX	Richardson, Lear Assocs.	214-231-5388
UT	Salt Lake City, Zeus Elctrns.	801-534-0500
VA	Alexandria, Dyna Rep Co.	703-354-1222
WI	Elm Grove, Dytec/Central	414-784-9686

BALL ELCTRN. SYS. DIV., Ball Corp., P. O. Box 64376, St Paul, MN 55164, Tel: 612-786-8900, TWX: 910-563-3552; FSC No.: 612-786-4577; Empl.: 150; *Sls. Mgr.:* Richard C. Scarle

BALL ELECTRONIC, Systems Div., 9300 W. 108th Circle, Broomfield, CO 80020, Tel: 303-460-5256, Telex: 45776; Empl.: 500; *Sls. Mgr.:* R. Scarle

BALSTON, 703 Massachusetts Ave., Lexington, MA 02173, Tel: 617-861-7240, Telex: 92-3481; Empl.: 50; *Sls. Mgr.:* J. Alpert

BALZERS OPTICAL GRP., 170 Locke Dr., Marlboro, MA 01752, Tel: 617-481-9860, Telex: 951-562; Empl.: 136; *Sls. Mgr.:* C. A. Burke

B & B MOTOR & CONTROL CORP., Apple Hill Commons, Burlington, CT 06013, Tel: 203-673-7151, Telex: 14-1484; Empl.: 90; *Sls. Mgr.:* Sam Mandel

Local Sales Offices & Reps

CT	Berlin	203-828-8550
FL	Clearwater	800-845-1020
IL	Chicago, B & B Motor & Control Corp.	312-681-0089
IN	Indianapolis	317-248-0396
KY	Louisville	502-589-7753
MA	Boston, B & B Motor & Control Corp.	617-890-4944
NH	Nashua, B & B Motor & Control Corp.	603-883-1062
NJ	Piscataway	201-572-0500
NY	Baldwin, B & B Motor & Control Corp.	212-784-1313
NY	Elmira	607-732-6599
NY	Long Island City, B & B Motor & Control Corp.	212-784-1313
NY	Rochester	716-424-7040
NC	Charlotte	704-375-0577
OH	Cincinnati	513-381-1885
SC	Greenville	803-268-5702
TX	Dallas	214-641-0857
TX	Houston	713-820-7931

B & G PRECISION ELCTRNS., 538 Maple Ave., Doylestown, PA 18901, Tel: 215-348-4413; *Sls. Mgr.:* Eugene R. Bigay; *Dist. Mgr.:* Xavier Garcia

B & K PRECISION, INDUSTRIAL ELECTRONICS PRODUCT GROUP, Dynascan Corporation, 6460 W. Cortland, Chicago, IL 60635, Tel: 312-889-9087, Telex: 253475; FSC No.: 08098, 18110, 48560, 30678; Empl.: 250; *Sls. Mgr.:* Dennis Hoy **D•1186-1190, 1386-1388, 1521**

Local Sales Offices & Reps

AL	Alabaster, Maitland K. Smith, Inc.	205-664-3093
AR	Little Rock, Erickson Sls., Inc.	501-225-7379
CA	Irvine, Mike Roth Sls.	714-250-0722
CA	Pleasanton, Moulthrop Sls.	415-463-0450
CO	Denver, K-C Marketers, Inc.	303-733-5561
FL	Maitland, Hutto, Hawkins, Peregoy	305-831-2474
GA	Tucker, Maitland K. Smith	404-939-3322
HI	Honolulu, Omega Hawaii, Inc.	808-946-2983
IL	Arlington Hgts., Brainard-Wilson Mktg.	312-437-2700
KS	Shawnee Mission, Lowell-Kangas & Assocs.	913-631-3515
LA	Chalmette, Erickson Sls.	504-271-1976
MD	Perry Hall, Electra-Tech	301-256-2723
MA	Woburn, W & D Mktg.	617-935-5610
MI	Southfield, Robert Milsk Co., Inc.	313-354-3310
MN	Minneapolis, HMR, Inc.	612-888-2122
MO	St. Louis, Lowell-Kangas Assocs.	314-821-4050
NJ	Medford, Champion Elctrn. Sls. Co.	609-983-0932
NY	Bellmore, Selectra Sls.	516-221-7865
NY	East Greenbush, Warren Kaufman & Assocs.	518-477-9864
NY	Rochester, Warren Kaufman & Assocs.	716-266-2728
NC	Charlotte, Maitland K. Smith, Inc.	704-372-2681
OH	Cleveland, Marlow Assocs.	216-991-6500
OH	Columbus, Marlow Assocs.	614-885-7643
OK	Broken Arrow, Erickson Sls., Inc.	918-455-4276
OR	Portland, Dussault & Assocs.	503-641-8540
PA	Pittsburgh, Marlow Assocs.	412-367-8886
TX	Austin, Erickson Sls., Inc.	512-244-3068
TX	Dallas, Erickson Sls.	214-739-5833
TX	Houston, Erickson Sls., Inc.	713-266-1604
VA	Dumfries, Electra-Tech	703-670-6962
WA	Seattle, Dussault & Assocs.	206-527-5454
WI	Waukesha, Brainard-Wilson Mktg.	414-797-7940
EXP	NY, Plainview, Empire Exporters	516-293-5582

BANNER ENGRG. CORP., 9714 - 10th Ave. N., Minneapolis, MN 55441, Tel: 612-544-3164, Telex: 29-1011; *Sls. Mgr.:* Floyd Schneider

BARBER-COLMAN CO., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132, Tel: 815-877-0241, Telex: 257327; Empl.: 5000; *Sls. Mgr.:* John Parry

BARCEL WIRE & CABLE CORP., Electronics Div., 2851 Aton Ave., Irvine, CA 92714

BARKSDALE CONTROLS DIV., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058, Tel: 213-589-6181; Empl.: 325; *Sls. Mgr.:* R. C. Wolf

BARNES & REINECKE, INC., 2375 Estes Ave., Elk Grove Village, IL 60007, Tel: 312-640-7200; Empl.: 290

B E

BARNES ENGRG., 1645 So. Claudina Way, Anaheim, CA 92805, Tel: 714-533-7530; FSC No.: FSCM 53823 S.I.C. 3469; Empl.: 38; *Sls. Mgr.:* Gordon Mackenzie **C•1010-1024**

Local Sales Offices & Reps

OH	Cleveland, Components, Inc.	216-243-9200
OH	Miamisburg (Dayton), Components, Inc.	513-866-0661
PA	Pittsburgh, Components, Inc.	412-824-1600

BARNES ENGRG., 44 Commerce Rd., P.O. Box 53, Stamford, CT 06904, Tel: 203-348-5381, Telex: 965921, TWX: 710-474-3367; Empl.: 300; *Sls. Mgr.:* H. R. Hofmann, Jr.

BARON-BLAKESLEE, INC., Sub. Purex Inds., Inc., 2001 N. Janice Ave., Melrose Pk., IL 60160, Tel: 312-450-3900, Telex: 25-4701; *Sls. Mgr.:* B. Uffer

BARON WIRE & CABLE, 1811 W. Bryn Mawr Ave., Chicago, IL 60660, Tel: 312-728-7480, Telex: 72-4322; Empl.: 50; *Sls. Mgr.:* Al Desaluo

BARRY CONTROLS, Barry Wright Corp., 700 Pleasant St., Watertown, MA 02172, Tel: 617-923-1150, TWX: 710-327-1290; FSC No.: 81860; *Sls. Mgr.:* Philip R. Littlewood

BARSOM INC., See IR Scientific

BARTLETT INSTRUMENT CO., 14th & Ave. 'M', P.O. Box 445, Ft. Madison, IA 52627, Tel: 319-372-8366; Empl.: 25; *Sls. Mgr.:* P. R. Bartlett

BASCOM-TURNER INSTRS., 111 Downey St., Norwood, MA 02062, Tel: 617-769-9660, Telex: 92-2413; Empl.: 35; *Sls. Mgr.:* D. Weise; *Dist. Mgr.:* S. Holly

BASE TEN SYS., One Electronics Dr., Box 3151, Trenton, NJ 08619, Tel: 609-586-7010, Telex: 4754158, TWX: 510-685-5692; FSC No.: 30377; Empl.: 255; *Sls. Mgr.:* Oleh Pavlovsky

BASF SYS., Crosby Dr., Bedford, MA 01730, Tel: 617-271-4000, 800-343-4600, Telex: 92-3423; Empl.: 1,300; *Sls. Mgr.:* David F. Pippin

BASIC ELECTRONICS, INC., 11762 Western Ave. "Q", Stanton, CA 90680, Tel: 714-530-2400; Empl.: 30; *Sls. Mgr.:* Tom Jones; *Dist. Mgr.:* Tom Jones

BASIC MEASURING INSTS., 402 Lincoln Centre Dr., Foster City, CA 94404, Tel: 415-570-5355; *Sls. Mgr.:* Robert Moore

BASIC SYSTEMS, 1919 S. 129 5. Ave., Tulsa, OK 74108, Tel: 918-437-7066; Empl.: 20; *Sls. Mgr.:* Karen Duggan; *Dist. Mgr.:* Karen Duggan

BASLER ELEC., Rte. 143, Highland, IL 62249, Tel: 618-654-2341, TWX: 910-996-2522; Empl.: 1,233

BASLER ELEC. CIRCUITS, INC., 204 Highland Dr., P.O. Box 1165, Taylor, TX 76574, Tel: 512-352-7683; Empl.: 110; *Sls. Mgr.:* Warwick R. Tobias

BAUSCH & LOMB, 820 Linden Ave., Rochester, NY 14625, Tel: 716-338-6000, Telex: 97-2286; *Sls. Mgr.:* Martin Green

BAUSCH & LOMB, 820 Linden Ave., Rochester, NY 14625, Tel: 716-338-6314, Telex: 98-8286; Empl.: 500

BAUSCH & LOMB, O.S.D. Div., 1400 N. Goodman St., Rochester, NY 14692, Tel: 716-338-6000, Telex: 97-8231; Empl.: 5000; *Sls. Mgr.:* Martin L. Green

BAY COMPONENTS, INC., 1806 Dreams Landing Way, Annapolis, MD 21401, Tel: 301-266-6767, Telex: 710-867-8567; Empl.: 55; *Sls. Mgr.:* Lois Levit

BAYLEY INSTR. CO., Box 357, Kenwood, CA 95452, Tel: 707-833-6014

BAY PRODS., 8701 Torresdale Ave., Phila., PA 19136, Tel: 215-DE8-7300, Telex: 83-4434; Empl.: 150; *Sls. Mgr.:* Frank Stewart

BAYTRON, See M/A-Com Millimeter Products Inc.

BBC BROWN BOVERI GOERZ METRAWATT

BBC-METRAWATT/GOERZ, 2150 W. 6th Ave., Broomfield, CO 80020, Tel: 303-469-5231, 800-821-6327, Telex: 4970869; Empl.: 20; *Sls. Mgr.:* Andy Zeidler/Mac McChesney ..... **D•1192-1193**

Local Sales Offices & Reps

Multimeter

AL	Birmingham, Adams & Assocs.	205-788-0305
CA	Sun Valley, Teqni-Rep. Assocs.	818-768-4223
CO	Louisville, Stan Sliz Assocs.	303-666-4760
FL	Lake Park, Adams & Assocs.	305-694-1543
GA	Marietta, Adams & Assocs.	404-973-0853
HI	Honolulu, Hawaiian Indl. Inst. Sls. Corp.	808-533-5170
LA	Kenner, Assoc. Mktg. Grp.	504-443-5072
MA	Norwood, Mac Innis Corp.	617-762-8090
MI	Livonia, Harvey Sls.	313-591-1975
MN	Edina, Pec/Levi & Assocs.	612-944-8540
NJ	Medford, Jack McCoy Assocs.	609-953-0770
NM	Tijeras, Stan Sliz Assocs.	505-281-3856
NY	Kew Gardens, Jack Brown Elec.	212-805-0343
NY	Liverpool, Jack Brown Elec.	315-622-3211
NY	Whitestone, Jack Brown Elec.	212-767-1977
NC	Charlotte, Adams & Assocs.	704-552-7800
NC	Greensboro, Adams & Assocs.	919-272-6838
PA	Dawnington, Jack Brown Elec.	215-363-0350
TX	Dallas, Assoc. Mktg. Grp.	214-241-7190
TX	Houston, Assoc. Mktg. Grp.	713-466-8673
UT	So. Jordan, Stan Sliz Assocs.	801-254-4141
WA	Seattle, Northmar	206-524-5170

Recorder

AL	Huntsville, Newcomb Assocs.	205-837-3233
CA	Berkeley, Rotech	415-428-2044
CA	Woodland Hills, Friedman & Assocs.	818-702-0665
CO	Arvada, Air-Row Entprs.	303-421-4204
GA	Roswell, Newcomb Assocs.	404-641-7942
HI	Honolulu, Hawaiian Indl. Inst. Sls. Corp.	808-533-4232
IL	Rolling Meadows, Commodore-I	312-394-5441
MD	Rockville, Dela Technlg.	301-881-6292
MA	Sharon, Reptek	617-784-6700
MI	Trenton, I & C Sls.	313-671-1320
MN	Burnsville, Commodore-I	612-894-5488
MT	Billings, Geo Research	406-248-6771
NY	Albany, L-Tron	518-482-1987
NY	Rochester, L-Tron	716-436-4410
NY	Roslyn Heights, Penzias Assocs.	516-621-8522
NC	R.T.P., Newcomb Assocs.	919-549-0486
OH	Cincinnati, I & C Sls.	513-772-3101
OR	Portland, Westcon	503-283-0132
TX	Austin, Acudata	512-346-4033
TX	Houston, Acudata	713-580-2451
TX	Plano, Acudata	214-424-3567

BBK, INC., 75 Travis Ave., Binghamton, NY 13904, Tel: 607-772-8119; *Sls. Mgr.:* Jerome Kunze

B-D CRYSTAL ENTPRS., INC., 1727 W. Galbraith Rd., Cincinnati, OH 45239, Tel: 513-522-3300, Telex: 21-4545; *Sls. Mgr.:* Janet Wood, Charles Fithen

BDS COMPUTER CORP., 800 Maude Ave., Mountain View, CA 94043, Tel: 415-964-2115, TWX: 910-373-2005; *Sls. Mgr.:* Dave Lester

BEAD ELECTRONIC CONNECTORS, Bead Chain Manufacturing Co., 10878 Wiles Rd., Box 9897, Coral Springs, FL 33075, Tel: 305-753-3639; Empl.: 150; *Sls. Mgr.:* Bruce Thomas; *Dist. Mgr.:* Bruce Thomas ..... **C•1162-1167**

Local Sales Offices & Reps

CA	Anaheim, Galaxie Sls. Intl.	714-937-5622
CO	Denver, Gribble Sls. Engrg.	303-278-1495
CT	Kensington, Metal Tech., Inc.	203-828-1148
FL	Coral Springs, Janco Sls.	305-755-0631
IL	Chicago, Electro Mech. Sls. Co.	312-777-0554
IN	Indianapolis, Hoster & Sieloff Assocs.	317-842-3700
MI	Detroit, Fox Inds., Inc.	313-363-7183
MN	Minneapolis, Gribble Sls. Engrg.	612-788-7028
TX	Dallas, Gribble Sls. Engrg.	214-221-5109
VA	Williamsburg, Dyneers, Inc.	804-229-3612

Local Distributors

CA	Anaheim, Beta Inds.	714-978-7544

BEAD ELCTRNS., Div. Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, CT 06605, Tel: 203-334-4124; Empl.: 175; *Sls. Mgr.:* Mrs. B. M. Krafcik ..... **C•1686-1688**

Local Sales Offices & Reps

CA	Anaheim, Galaxie Sls. Intl.	714-937-5622
CO	Denver, Gribble Sls. Engrg.	303-279-4545
CT	Kensington, Metal Tech, Inc.	203-828-1148
FL	Coral Springs, Janco Resch. & Sls. Co.	305-755-0631
IL	Chicago, Electro-Mech Sls. Co.	312-777-0554
IN	Indianapolis, Hoster & Sieloff Assocs.	317-842-3700
MI	Union Lake, Fox Inds.	313-363-7183
MO	Independence, Gribble Sls. Engrg.	816-796-4333
TX	Lewisville, Gribble Sls. Engrg.	214-221-5109
VA	Williamsburg, Dyneers	804-229-3612
EXP	NJ Rochelle Park, Richmen Metals & Comps.	201-796-6271

BEA ELECTRO-OPTICS, INC., 690 First Ave., Des Plaines, IL 60016, Tel: 312-298-1420, Telex: 882903; *Sls. Mgr.:* George E. Magerl; *Dist. Mgr.:* Vic Halkyn

BEAL COMMUNICATIONS, Beneficial Properties, 11020 Audelia Rd. Ste. C 101, Dallas, TX 75243, Tel: 214-340-2044, 214-340-2045; Empl.: 7; *Sls. Mgr.:* Robert Farrier

BEAM TUBE CO., INC., 11 Beach St., Milford, MA 01757, Tel: 617-473-0660; FSC No.: 5960; Empl.: 25; *Sls. Mgr.:* Joseph A. Casciano

BEAN RUBBER MFG. CO., 1623 S. 10th St., San Jose, CA 95112, Tel: 408-293-2790; FSC No.: 18545; *Sls. Mgr.:* Kris Mosher

BEARING INSPECTION, 10041 Shoemaker Ave., Santa Fe Springs, CA 90670, Tel: 213-944-6251; Empl.: 31

BEAU PRODUCTS DIV., Vernitron Corp., Box 10, Laconia, NH 03247, Tel: 603-524-5101, TWX: 710-364-1843; FSC No.: 13150; Empl.: 230; *Sls. Mgr.:* John Jansen; *Dist. Mgr.:* Larry Murphy ..... **C•1168-1170**

Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean	205-830-1540
AZ	Phoenix, The Knight Co.	602-582-8506
CA	Los Angeles, The Knight Co.	213-670-2833
CA	Santa Clara, Nova-Tronix Elec. Sls.	408-727-9530
CO	Denver, W.J. Purdy Co.	303-753-6800
FL	Orlando, Cartwright & Bean	305-422-4531
GA	Atlanta, Cartwright & Bean	404-233-2939
IL	Lisle, W-G Controls	312-963-5954
LA	Kenner, Cartwright & Bean	504-466-0020
MA	Needham, R. Perron & Co.	617-449-6162
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
MO	Kansas City, Forristal-Young Sls. Co.	816-358-6771
NH	Dover, R. Perron & Co.	603-742-2321
NJ	West Caldwell, Grimm, Siegel Assoc.	201-575-9300
NM	Albuquerque, C.T. Carlberg & Assoc.	505-883-3883
NY	Buffalo, Rudell-Merrifield Assoc	716-634-4300
NC	Charlotte, Cartwright & Bean	704-377-5673
OH	Cleveland, Jim Finnegan & Co.	216-238-5905
OK	Oklahoma City, Erickson Sls.	405-682-2947
PA	Broomall, L.D. Lowery	215-356-5300
PA	Pittsburgh, Jim Finnegan	412-561-4687
TN	Memphis, Cartwright & Bean	901-276-4442
TX	Dallas, Erickson Sls.	214-739-5833
WA	Medina, Henry Paulman Sls. Co.	206-455-3311
WA	Seattle, Don Smith Sls. Co.	206-633-3160

BEAU TECH, P.O. Box 598, Portland, ME 04122, Tel: 207-775-6139; Empl.: 9

BEAVER LABS, P. O. Box 202, Kingston, MA 02364, Tel: 617-585-5666; Empl.: 5

BEC INC., 2709 N. Broad St., Philadelphia, PA 19132, Tel: 215-229-9800; *Sls. Mgr.:* Bob Kandel

BECKMAN INDUSTRIAL CORP., Cedar Grove Div., 89 Commerce Rd., Cedar Grove, NJ 07009, Tel: 201-239-6200, TWX: 710-994-5781

BECKMAN INDUSTRIAL CORP., Electronic Technologies Div., 2500 Harbor Blvd., Fullerton, CA 92634, Tel: 714-871-4848, Telex: 06-78413, TWX: 910-592-1260; FSC No.: 73138; Empl.: 2600; *Sls. Mgr.:* Roger Jones; *Dist. Mgr.:* Philip Graham

BMI
Line Monitors
Authorized Distributors
RAG ELECTRONICS, INC.
New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing
21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500
CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225

Model GS-3

Beckman Industrial™

AUTHORIZED DISTRIBUTOR

SUNSHINE

THE SOURCE FOR METERS & TEST EQUIPMENT

Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT

(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area

(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

Douglas Randall

SOLID STATE RELAYS
PROPORTIONAL
CONTROLS

AUTHORIZED & STOCKING DISTRIBUTOR

ALPHA DISTRIBUTOR CORP

550 E. ROYALTON ROAD
CLEVELAND, OHIO 44147
PHONE 216/526-3716

BECKMAN INDUSTRIAL CORP., Emerson Electric Co., 630 Puente Street, Brea, CA 92621, Tel: 714-773-8111, Telex: 06-78413; *Sls. Mgr.:* P. E. Spillane/John Tyree

BECKMAN INSTRS., 2500 Harbor Blvd., Fullerton, CA 92634, Tel: 714-871-4848, Telex: 06-7413; Empl.: 12000

BECKMAN INSTRS., HELIPOT DIV., See Beckman Instrs., Electro-Prods. Grp.

BEECHWOOD MFG., 310 S. Ohmer, Indianapolis, IN 46219, Tel: 317-356-2493; *Sls. Mgr.:* Robt. Cox

BEEDE ELECTRICAL INSTR. CO., S. Main St., Penacook, NH 03303, Tel: 603-753-6362, TWX: 710-364-6977; Empl.: 500; *Sls. Mgr.:* Mike Harbour

BEHLMAN DIV., CALIFORNIA INSTRS., Div. of Norlin Inds., 5150 Convoy St., San Diego, CA 92111, Tel: 619-279-8620, Telex: 695-047; FSC No.: 16067; Empl.: 90

BEHLMAN ENGINEERING, 1142 Mark Ave., Carpinteria, CA 93013, Tel: 805-684-8311; FSC No.: 53636; *Sls. Mgr.:* Edward C. Bertolet/Frank Chase; *Dist. Mgr.:* John White ..... **D•1898-1905**

Local Sales Offices & Reps

AL	Huntsville, Reynolds & Assocs.	305-259-7000
AZ	Phoenix, J. Smith & Assocs., Inc.	602-267-0981
AZ	Phoenix, R. L. Davis	602-955-2266
CA	Cupertino, T. Louis Snitzer	408-257-8333
CA	Del Mar, T. Louis Snitzer	714-226-0305
CA	Los Angeles, T. Louis Snitzer	213-836-6170
CO	Colorado Springs, J. Smith & Assocs., Inc.	303-597-5343
FL	Melbourne, Reynolds & Assocs.	305-259-7000
FL	Satellite, Reynolds & Assocs.	305-773-4700
GA	Atlanta, Reynolds & Assocs.	404-252-5360
IL	Wheeling, Ed Joyner & Co.	312-520-1200
IN	Noblesville, R & D Elctrns.	317-849-2026
MD	Rockville, Farrell Assocs.	301-424-9460
MA	Needham, Addelco Corp.	617-444-4754
MI	Farmington Hills, Carter, McCormic & Peirce, Inc.	313-477-7700
MN	St. Paul, Dytec No.	612-645-5816
MO	Independence, Engineering Svcs. Co.	816-254-3600
MO	St. Louis, Engineering Svcs. Co.	314-997-1515
NM	Albuquerque, J. Smith & Assocs., Inc.	505-265-3406
NY	Great Neck, Industron Assocs., Inc.	516-487-2620
NC	Raleigh, Reynolds & Assocs.	305-259-7000
OH	Cleveland, Carter, McCormic & Peirce, Inc.	216-779-5100
OH	Dayton, Carter, McCormic & Peirce, Inc.	513-836-0951
OK	Tulsa, Testech, Inc.	918-665-7788
PA	Pittsburgh, Carter, McCormic & Peirce, Inc.	412-372-4415
TX	Austin, Testech, Inc.	512-327-7033
TX	Houston, Testech, Inc.	713-956-0837
TX	Richardson, Testech, Inc.	214-644-5010
WA	Seattle, Datacom Assocs.	206-285-2525
Can	Burnaby, B.C., Atelco, Inc.	604-299-9331
Can	Calgary, Alberta, Atelco, Inc.	403-230-1697
Can	Montreal, Que., Atelco, Inc.	514-481-7733
Can	Ottawa, Ont., Atelco, Inc.	613-596-5894
Can	Scarborough, Ont., Atelco, Inc.	416-497-2208

BEI MOTION SYSTEMS CO., Corporate Off., 166 Geary St, Ste. 1400, San Francisco, CA 94108, Tel: 415-788-6840, Telex: 910-380-5402; Empl.: 5 ..... **B•1782-1783**

Local Sales Offices & Reps

CA	Santa Ana, BEI Motion Sys. Co.	714-973-8510
CA	Santa Clara, BEI Motion Sys. Co.	408-986-9006
CO	Westminster, BEI Motion Sys. Co.	303-426-1566
GA	Lawrenceville, BEI Motion Sys. Co.	404-963-0673
IL	Rockford, BEI Motion Sys. Co.	815-968-9528
MA	Wakefield, BEI Motion Sys. Co.	617-245-3851
MI	Plymouth, BEI Motion Sys. Co.	313-451-0359
OH	Cincinnati, BEI Motion Sys. Co.	513-232-4545
OR	Beaverton, Thorson Co. NW	503-644-5900
PA	Exton, BEI Motion Sys. Co.	215-363-5444
TX	Hurst, BEI Motion Sys. Co.	817-284-4313
WA	Bellevue, Thorson Co. Northwest	206-455-9180
Can	Montreal, Miller Engrg., Ltd.	514-748-6169
Can	Willowdale, Miller Engrg., Ltd.	416-499-4421

BEI MOTION SYS. CO., Computer Prod. Div., 1755 B La Costa Meadows Dr., San Marcos, CA 92069, Tel: 619-471-2600; *Sls. Mgr.:* Everett McElroy ..... **B•1783**

BEI MOTION SYS. CO., Digital Prods. Div., P.O. Box 3838, Little Rock, AR 72203, Tel: 501-851-4000, TWX: 910-722-7384; Empl.: 103; *Sls. Mgr.:* H. O. Tyler .... **B•1782**

Refer to BEI Motion Sys. Co., Corporate Off., San Francisco, CA for sales office information.

BEI MOTION SYS. CO., General Control Systems Div., 564 Alpha Dr., Pittsburgh, PA 15238, Tel: 412-963-0515; *Sls. Mgr.:* Chic Sweeney ..... **B•1783**

Refer to BEI Motion Sys. Co., Corporate Off., San Francisco, CA for sales office information.

BEI MOTION SYS. CO., Industrial Encoder Div., 7230 Hollister Ave., Goleta, CA 93117, Tel: 805-968-0782; *Sls. Mgr.:* Glenn Avolio ..... **B•1782**

Refer to BEI Motion Sys. Co., Corporate Off., San Francisco, CA for sales office information.

BEI MOTION SYSTEM COMPANY, Kimco Division, 150 Vallecitos de Oro, San Marcos, CA 92069, Tel: 619-744-5671, TWX: 910-322-1168; Empl.: 43; *Sls. Mgr.:* William Byrnes ..... **B•1783**

BEI MOTION SYS. CO., Position Controls Div., 819 Reddick Ave., Santa Barbara, CA 93103, Tel: 805-966-1538, TWX: 910-334-4903; *Sls. Mgr.:* K. Capps ..... **B•1782**

Refer to BEI Motion Sys. Co., Corporate Off., San Francisco, CA for sales office information.

BELDEN

BELDEN, Electronic Wire & Cable, P.O. Box 1980, Richmond, IN 47375, Tel: 317-983-5200, TWX: 810-345-1393; Empl.: 2180; *Sls. Mgr.:* Bill Donahoe ..... **C•1742, 1750-1789**

Local Sales Offices & Reps

Regional Sales Offices

CA	Cannon Country, John Duffin	805-252-2525
CA	Hayward, Harry Furst	415-278-1607
CA	Irvine	714-474-1200
CA	Lafayette, Mark Warren	415-284-5064
CA	Placentia, Rick Webber	714-524-7619
CA	San Diego, Judy Hummerich	619-484-5766
CA	Torrance, Dave Wilhide	213-373-1967
CO	Englewood, Terry Godwin	303-694-3292
FL	Orlando, Brad Hahn	305-291-7739
GA	Norcross, Tom Beane	404-925-0679
IL	Naperville, Kelley Smith	312-961-1249
IL	Palatine, Phil Dunn	312-358-9336
IL	St. Charles, Joe Prechodnik	312-377-9464
IN	Richmond	317-983-5200
KS	Shawnee, Dave Phelps	913-268-6528
LA	St. Rose, Kyle Ingram	504-464-0125
MA	Framingham, John Kennedy	617-872-4585
MA	Wayland, Cathie Hamel	617-651-1213
MN	Plymouth, Ken Pratt	612-593-0907
MN	Spring Park, Jim Hughes	612-471-9478
NY	Huntington Station, Dale Ambery	516-549-9731
NY	Oyster Bay, Mike Wakeland	516-922-3762
OK	Broken Arrow, Jeff Cooper	918-251-2027
PA	Bethel Park, J. D. Allen	412-831-9312
PA	Exton, Tom Deckard	215-363-2874
PA	Rosemont, Brian Easley	215-525-3268

TN Hendersonville, Dale Diedrichs 615-822-3861
TX Carrollton, Tim Fast 214-492-0937
TX Dallas 214-788-4300
TX Dallas, Mike Kipper 214-553-0521
TX Houston, Charles Amonett 713-350-2271
TX Plano, Mary McQuistion 214-423-2335
VA Richmond, Karen Jones 804-747-1090

Local Sales Reps.
AZ Scottsdale, W. Atkins 602-998-7355
CA Huntington Beach, E. Kerezsi 714-848-2157
CA Newark, R. Tribendis 415-490-0838
CA Northridge, J. Duffin 213-993-8919
CA San Jose, S. Landis 408-723-7117
CA Tustin, W. Caughlin 714-832-5278
CT South Bury, L. Kerchief 212-264-8012
FL Boca Raton, G. Pedigo 305-482-1279
GA Atlanta 404-934-6767
GA Marietta, J. Fienning 404-973-6212
IL Oakbrook 312-789-0800
IN Indianapolis, L. Brown 317-849-1945
IN Richmond, J. Daggy 317-962-6103
MD Columbia, E. Wunder 301-997-4480
MA Framingham 617-872-7846
MA Framingham, A. Harris 617-872-2066
MA Franklin, S. LaRocco 617-528-1896
MO Clayton, Fletcher Lane 314-725-1488
NY Rochester, T. Centofonti 716-461-0818
NY Sunnyside, E. Mammone 212-361-0993
NC Raleigh, A. Hatcher 919-848-3342
OH Medina, H. Flanders 216-725-4285
OR Lake Oswego, D. Clicquennoi 503-638-0271
SC Columbia, G. Owen 803-781-9739
TX Austin, M. Mullery 512-345-5204
TX Houston, C. Amonett 713-350-2271
TX Houston, M. Masucci 713-721-6023
WA Bellevue, S. Abernethy 206-885-5808
WI Milwaukee, M. Lucky 414-355-4986

BELDEN, Fiber Optics, 2000 S. Batavia Ave., Geneva, IL 60134, Tel: 312-232-8900, TWX: 910-237-1681

bel BEL FUSE INC.

BEL FUSE, 198 Van Vorst St., Jersey City, NJ 07302, Tel: 201-432-0463, TWX: 710-730-5301; Empl.: 225; *Sls. Mgr.:* A. Sutta; *Dist. Mgr.:* S. Rader ..... **A•1468-1486; B•1230-1232**

Local Sales Offices & Reps

Delay Lines
AL Huntsville, EMA, Inc. 205-830-4030
AZ Scottsdale, SMS & Assocs. 602-998-0831
CA Escondido, Cirolia Elctrn. 619-743-3015
CA Los Angeles, Corcoran Assocs. 213-823-4589
CA Santa Clara, Thresum Assocs. 408-996-9889
CO Boulder, Front Range Mktg. 303-443-4780
CT Branford, L.J.M. Assocs. 203-488-4244
FL Altamonte Springs, Semtronics Assocs. 305-831-8233
FL Clearwater, Semtronic Assocs. 813-461-4675
FL Fort Lauderdale, Semtronics Assocs. 305-731-2484
GA Atlanta, Beacon Elctrns. 404-256-9640
IL Chicago, MGA 312-775-1151
IN Indianapolis, Insul-Reps, Inc. 317-251-1994
MA Wellesley Hills, Sturdy Co. 617-235-2330
MI Bloomfield Hills, Enco Mktg. 313-642-0203
MN So. St. Paul, Northport Engr. 612-457-8000
NH Milford, D. A. Crowley Assocs. 603-673-7050
NJ East Brunswick, Winch Sls. Assocs. 201-828-4615
NM Albuquerque, SMS & Assocs. 505-883-9765
NY E. Rochester, Tri-Tech Elctrns. 716-385-6500
NY Fayetteville, Tri-Tech Elctrns. 315-446-2881
NY Roslyn Hgts., Winch Sls. Assocs. 516-621-6378
NC Raleigh, Beacon Elctrns. 919-787-0330
OH Cleveland, J. Finnegan & Co. 216-238-5905
PA Bala Cynwyd, Friedman & Assocs. 215-667-1838
TN Knoxville, Insul-Reps 615-691-7586
TX Austin, Oeler & Menelaides 512-453-0275
TX Dallas, Oeler & Menelaides 214-361-8876
TX Houston, Oeler & Menelaides 713-682-1083
UT Salt Lake City, Front Range Mktg. 801-364-6481
WA Kirkland, A/D Elctrns. 206-821-3205
PR Hato Rey, M. Anderson Co. 809-751-2026
Can Downsview, Ont., Cantronics 415-665-8020

Fuses
CA Huntington Beach, Corcoran Assocs. 714-841-4759
CA Playa Del Rey, Corcoran Assocs. 213-823-4589
CA Sunnyvale, W. W. Posey 408-746-0771
CO Boulder, Front Range Mktg. 303-443-4780
IL Chicago, MGA 312-775-1151
IN Indianapolis, Insul-Reps., Inc. 317-842-5203
MI Bloomfield Hills, Enco Mktg., Inc. 313-642-0203
MN S. St. Paul, Northport Engrg., Inc. 612-457-8000
NH Milford, David A. Crowley & Assocs. 603-673-7050
NJ So. Orange, Ira Brody 201-992-1727
NM Albuquerque, Syntech 505-266-7951
NY East Rochester, Tri-Tech Elctrns. 716-385-6500
NY Fayetteville, Tri-Tech Elctrns. 315-446-2881
NY Hempstead, L.I., Kahgan Sls. 516-538-2300
PA Philadelphia, Check Assocs. 215-487-3007
TN Knoxville, Insul-Reps., Inc. 615-691-7586
UT Salt Lake City, Front Range Mktg. 801-364-6481
WA Kirkland, A/D Elctrns., Inc. 206-821-3205
PR Hato Rey, Max Anderson Co., Inc. 809-751-2026
Can Downsview, Ont., Cantronics 416-665-8020

Local Distributors

Fuses
CA Santa Ana, Amco Tech. 714-957-3003
DE Danbury, Future Elctrns. 203-743-9594
FL Clearwater, Future Elctrns. 813-441-4771
IN Indianapolis, MAR Elctrns. 317-875-4510
IA Cedar Rapids, Deeco Elctrns. 319-365-7551
MD Columbia, D-K Elctrns. 301-995-1950
MA Boston, Future Elctrns. 617-366-2400
MN New Brighton, Chris Elctrns. 612-631-2647
MO St. Charles, Finnigan Elctrns. 314-946-6201
NJ Mt. Laurel, Future Elctrns. 609-778-7600
NY Liverpool, Future Elctrns. 315-451-2371
OR Beaverton, Component Resources 503-641-8488
PA Harrisburg, Cumberland Elctrns. 717-232-9715
PA Lyndora, Seneca Fuse 412-285-8544
UT Salt Lake City, Future Elctrns. 801-972-8489
UT Salt Lake City, Standard Supp. Co. 801-486-3371
Can Pointe Claire, Quebec, Future Elctrns. 514-694-7710
CA El Segundo, Force Elctrns. 213-772-1324
NH Hudson, C & H Elctrns. 603-882-1133
CA Anaheim, Deco Elctrns. 714-630-8252
CA City of Industry, Ital Elctrns. 213-968-8515
CA Hayward, KEA Elctrns. 415-887-2900
CA San Diego, Sigma Elctrns. 619-763-0545
CA San Jose, Force Elctrns. 408-943-1324
CT Norwalk, Cobra Comps. 203-847-6442
FL Boca Raton, D & R Assocs. 305-395-2341
MA Canton, Electronic Packaging Comps. 617-821-2111
NH Hudson, C & H Elctrns. 603-882-1133
NY Bohemia, Key Comps. 516-567-7500
TX Dallas, Fuses, Inc. 214-341-6407

BELL, FLOYD, ASSOCS., INC., 897 Higgs Ave., Columbus, OH 43212, Tel: 614-488-3193, TWX: 810-482-1763; FSC No.: 56493; *Sls. Mgr.:* Tom Shain ..... **D•1023**

Local Sales Offices & Reps

CA Pasadena, Paul Nurches Co. 213-681-8957
CA Redwood City, Hickey Indl. Sls. Corp. 415-368-3849
CO Denver, Moss Mktg. 303-455-7205
FL Casselberry, Barrett & Assocs. 305-699-0311
FL Melbourne, Barrett Assocs. 305-727-2491
FL Miami, Barrett Assocs. 305-681-4957
FL Palm Harbor, Barrett Assocs. 813-785-1954
IL Mt. Prospect, Robert Adams Sls. Co. 312-297-8733
KY Edgewood, ELECCO 606-341-0330
MD Columbia, Tyler Griffin Co. 301-995-1215
MA Scituate, New England Area Reps. 617-545-6327
MI Jenison, R.C. Nordstrom 616-457-5762
MI Lathrup Village, R.C. Nordstrom 313-559-7373
MN Minneapolis, A.J. Warner Co. 612-729-7371
NJ Ocean, P. Saftler Assocs. 516-593-7880
NY Fulton, P. Saftler Assocs. 315-592-7184
NY Lynbrook, P. Saftler Assocs. 516-593-7880
OR Aloha, Elctrn. Comp. Sls. 503-245-2342
PA Paoli, Tyler Griffin Co. 215-647-1550
TX Dallas, Jim D. Gray & Assocs. 214-341-7190
WA Mercer Island, Elctrn. Comp. Sls. 206-232-9301

BELL, F. W., INC., 6120 Hanging Moss Rd., Orlando, FL 32807, Tel: 305-678-6900, TWX: 810-853-3115; FSC No.: 18479; *Dist. Mgr.:* Edward S. Wilush ..... **B•1784-1785; D•1113, 1194-1195, 1977**

Local Sales Offices & Reps

CA Milpitas, Maxim Elctrn. Sls. 408-946-6001
CA Pasadena, Jim Robins Assoc. 818-795-9118
CO Denver, Moss Mktg. 303-455-7205
FL Indian Rock Beach, Par Assoc. 813-596-8841
GA Atlanta, Par Assoc. 404-391-9117
IL Downers Grove, Splon Assoc. 312-963-7011
MA Needham Hgts., Shain Assoc. 617-449-4380
MI Royal Oak, Dave Ray & Assocs. 616-792-9831
NM Albuquerque, Moss Mktg. 505-292-7505
NY White Plains, Cane Tech. Sls. 914-694-9240
OH Chagrin Falls, RPM Indl. Sls. 216-247-3295
PA Paoli, T. Griffin Co. 215-644-7710
TX Carrollton, Seaton Corp. 214-380-0414

Local Distributors

AZ Phoenix, Jensen Tools & Alloys 602-968-6231
CA Milpitas, Maxim Elctrn. Sls. 408-946-6001
CA Pasadena, Jim Robins Assoc. 818-795-9118
CA Pasadena, Pasadena Elctrns. 818-796-5844
CO Denver, Moss Mktg. 303-455-7205
GA Atlanta, Process Meas. Co. 404-696-7481
IL Rolling Meadows, Commodore-1 312-394-5441
MA Needham Hgts., Shain Assocs. 617-449-4380
NY White Plains, Cane Tech. Sls. 914-694-9240
OH Chagrin Falls, RPM Indl. Sls. 216-247-3295
OH Dayton, National Instr. Distrs. 513-435-4503
PA Paoli, Tyler Griffin Co. 215-644-7710
TN Chattanooga, Edwin Bohr Elctrns. 615-877-8207
TX Houston, Quality Instr. Lab. 713-524-0528

BELL & HOWELL/CEC DIV., 360 Sierra Madre Villa, Pasadena, CA 91109, Tel: 213-796-9381, Telex: 67-5415, TWX: 910-582-3205; Empl.: 500

BELL AUDIO SERVICE CO., Magnetic Programming, Inc., 6740-G Huntley Road, Worthington, OH 43085, Tel: 614-846-2766; Empl.: 20; *Sls. Mgr.:* Thomas A. Curran

BELL CO., INC., 106 Morrow Ave., Box 92E, Trussville, AL 35173, Tel: 205-655-2135; Empl.: 19; *Sls. Mgr.:* R. Bell; *Dist. Mgr.:* Neil H. Bell

J. W. Miller Division
BELL INDUSTRIES

BELL INDS., J. W. Miller Div., 19070 Reyes Ave., P.O. Box 5825, Rancho Dominguez, CA 90224, Tel: 213-537-5200, TWX: 910-346-6740; FSC No.: 76493; Empl.: 55 ..... **A•1210-1217**

Local Sales Offices & Reps

AZ Phoenix, Moore Sls. 602-274-4558
AR El Dorado, D. Bellew Sls. 501-863-8325
CA Santa Clara, Logan Sls. Co. 408-496-0660
CO Denver, Wm. J. Purdy Co. 303-777-1411
FL Ft. Lauderdale, Hutto-Hawkins-Peregoy 305-971-5750
FL Maitland, Hutto-Hawkins-Peregoy 305-831-2474
GA Atlanta, Millar Elctrns. 404-261-6160
HI Gardena, CA, Bidwell Sls. Assoc. 213-770-0300
IL Chicago, Ken Levy & Assocs. 312-763-5000
IN Indianapolis, Elctrn. Reps. 317-894-1414
IN South Bend, Elctrn. Reps. 219-277-4565
LA Metairie, D. Bellow Sls. 504-887-1195
MD Columbia, Par-Nell Sls. Co. 301-992-5454
MA N. Scituate, W. A. Hendrickson Co. 617-545-0652
MI Grand Rapids, Burcaw Co. & Assoc. Inc. 313-573-4605
MI Warren, Burcaw Co. & Assoc. Inc. 313-573-4605
MN Eden Prairie, Electro Mark, Inc. 612-944-5850
MO Raytown, Marty Taraski Sls. Co. 816-358-1442
NJ Englewood, Baum & Epstein Assoc. 201-569-7600
NM Albuquerque, Wm. J. Purdy Co. 505-266-7959
NY Syracuse, PITronics, Inc. 315-455-7346
NC Raleigh, Millar Elctrns. 919-787-9585
OH St. Marys, T. Shelby & Co. 419-394-3377
OR Portland, Earl & Brown Co. 503-245-2283
PA Langhorne, Par-Nell Sls. Co. 215-750-0380
TN Memphis, D. Bellew Sls. 901-452-1468
TX Ft. Worth, Chet Wells & Co. 817-284-0261
UT Salt Lake City, Wm. J. Purdy Co. 801-486-8557
WA Seattle, Earl & Brown Co. 206-284-1121
EXP NY, New York, Roburn Agencies 212-989-5939

Local Distributors

AZ Tempe, Bell Industries/EDD 602-966-7800
AZ Tempe, Circuit Specialists 602-966-0764
CA Buena Park, RPS Elctrns. 714-521-5230
CA Garden Grove, Bell Industries/EDD 714-220-0681
CA Gardena, Bell Industries/EDD 213-515-1800
CA Mountain View, Abacus Elctrns. 415-961-1500
CA Palo Alto, Zack Elctrns. 415-326-5432
CA Riverside, Elctrn. Supp. 714-683-7300
CA Sacramento, Integrated Elctrns. 916-424-5297
CA San Diego, Bell Industries/EDD 619-268-1277
CA San Jose, Cypress Elctrns. 408-945-8400
CA San Jose, Quement Elctrns. 408-998-5900
CA Sunnyvale, Bell Industries/EDD 408-734-8570
CA Thousand Oaks, Bell Inds./Ventura/EDD 805-499-6821
CO Denver, Bell Industries/EDD 303-424-1985
CO Denver, Integrated Elctrns. 303-292-6121
CO Denver, Ragon Elctrn. Parts 303-744-3601

CT Danbury, Pilgrim Elctrns. 203-792-7274
CT New Haven, Greene-Shaw Co. 203-397-0710
CT Wallingford, Sager Elctrcl. Supp. 203-265-4600
FL West Palm Beach, Nurmi Elctrns. 305-686-8553
IL Chicago, Bell Industries/EDD 312-640-1910
IL Chicago, Newark Elctrns. 312-784-5100
IL Palatine, Ohm/Elctrns, Inc. 312-359-5500
IN Fort Wayne, Graham Elect./Div. Bell Ind. 219-423-3422
IN Indianapolis, Graham Elect./Div. Bell Ind. 317-634-8202
IN Indianapolis, Meunier Elctrn. Supp. 317-635-3511
IA Cedar Rapids, Bell Industries/EDD ... 319-395-0730
LA New Orleans, Wm. B. Allen Supp. 504-525-8222
MD Gaithersburg, MS Elctrns. 301-921-0200
MA Hingham, Sager Elctrcl. Supp. 617-749-6700
MA Newton, Greene-Shaw Co. 617-969-8900
MN Minneapolis, Ind. Comps., Inc. 612-831-2666
MN Thief River Falls, Dici-Key Corp. 218-681-6674
MO Saint Louis, Olive Elctrns. 314-426-4500
NJ Camden, General Radio 609-964-8560
NJ East Hanover, State Elctrn. Parts 201-887-2550
NM Albuquerque, Bell Industries/EDD 505-292-2700
NY Bohemia, Key Comps. 516-567-7500
NY Buffalo, Summit Elctrns. 716-887-2800
NY Hempstead, Davis Elctrns. 516-483-9200
NY Rochester, Summit Elctrns. 716-334-8110
NY Rome, Rome Elctrns. 315-337-5400
NC Raleigh, Southeastern Elctrns. 919-828-2311
OH Columbus, Hughes-Peters, Inc. 614-294-5351
OH Dayton, Bell Industries/Micro-Mil Div. 513-434-8231
OH Dayton, Stotts-Friedman Corp. 513-298-5555
OK Tulsa, Radio, Inc. 918-587-9123
OR Portland, Bell Industries/EDD 503-241-4115
PA Allentown, P. A. Peters, Inc. 215-434-5237
PA Braddock, Leff Elctrns. 412-351-5000
PA Philadelphia, PEI Genesis 215-568-7400
PA Reading, Barbey Elctrns. 215-376-7451
PA Willow Grove, Resco Elctrns. 215-659-4575
TN Hixson, Techni-Tronics, Inc. 615-842-0514
TX Dallas, Wholesale Elctrns./Ind. Div. ... 214-824-3001
TX Fort Worth, TTI, Inc. 817-831-0441
TX Houston, Lenert Co. 713-225-1465
UT Salt Lake City, Bell Industries/EDD ... 801-972-6969
VA Charlottesville, Virginia Radio 804-296-4184
WA Bellevue, Bell Industries/EDD 206-747-1515
WI Milwaukee, Bell Industries/EDD 414-547-8879
WI Milwaukee, Marsh Elctrns. 414-475-6000

BELLOFRAM CORP., A Rexnord Co., 30 Blanchard Rd., Burlington, MA 01803, Tel: 617-272-2100, 800-225-1031, Telex: 94-9457; Empl.: 400; *Sls. Mgr.:* Steve Jackson; *Dist. Mgr.:* Steve Jackson

BELL PA PRODS., See Bell Audio Sys.

BELTING INDS. CO. INC., 20 Boright Ave., Kenilworth, NJ 07033, Tel: 201-272-8591, Telex: 138045; Empl.: 125; *Sls. Mgr.:* Harry K. Denaker

BEMCO, 9908 San Fernando Rd., Pacoima, CA 91331, Tel: 818-899-5296, TWX: 910-496-1520; Empl.: 45; *Sls. Mgr.:* John Riddle; *Dist. Mgr.:* Brian Duggan

BENDIX CORP., Electrical Comps. Div., Sidney, NY 13838, Tel: 607-563-5324, Telex: 932 456, TWX: 510-261-7550; FSC No.: 77820; Empl.: 3000; *Dist. Mgr.:* G. Anderson

BENDIX CORP., Electric Power Div., Hwy. 35, Eatontown, NJ 07724, Tel: 201-542-2000, Telex: 132-444 TWX: 710-722-6686; FSC No.: 83298;Multiple; Empl.: 950; *Sls. Mgr.:* R. Freeman; *Dist. Mgr.:* Cal Schrum

BENDIX CORP., Electrodynamics Div., 11600 Sherman Way, N. Hollywood, CA 91605, Tel: 818-765-1010, TWX: 910-499-2151; Empl.: 1200

BENDIX CORP., MOTOR COMPS. DIV., See Facet Entprs.

BENDIX CORP., Test Systems Div., Teterboro, NJ 07608, Tel: 201-288-2000, TWX: 710-990-6136; Empl.: 1,077

BENJAMIN ELECTROPRODUCTS, INC., Robins Div., 80 Smith St., Farmingdale, NY 11735, Tel: 516-293-7744, Telex: 12-7908; Empl.: 50

BENSON, INC., 2690 Orchard Parkway, P.O. Box 32059, San Jose, CA 95152-2059, Tel: 408-945-1000, Telex: 4941178 BENUW, TWX: 8104941178 BENUW; Empl.: 400; *Sls. Mgr.:* Alexander Salottolo

BENTHOS, INC., Edgerton Dr., N. Falmouth, MA 02556, Tel: 617-563-5917, 617-540-5500, Telex: 820673; Empl.: 80; *Sls. Mgr.:* R. K. Church

BENTLY NEVADA CORP., P.O. Box 157, Minden, NV 89423, Tel: 702-782-3611, Telex: 354437

BERG, W. M., INC., 499 Ocean Ave., East Rockaway, NY 11518, Tel: 516-599-5010; Empl.: 150; *Sls. Mgr.:* C. Keenan

BERGER-LAHR CORP., Fitzgerald Dr., Jaffrey, NH 03452, Tel: 603-532-7701, Telex: 92-8445; Empl.: 50; *Sls. Mgr.:* Wolfgang Hartert

BERGQUIST, 5300 Edina Ind'l., Minneapolis, MN 55435, Tel: 612-835-2322, TWX: 910-576-2423; FSC No.: 55285; Empl.: 105; *Sls. Mgr.:* Bob Savage; *Dist. Mgr.:* Larry Kocon

BERGQUIST SWITCH, INC., Bergquist Co., 5300 Edina Indl. Blvd., Edina, MN 55435, Tel: 612-835-2322, TWX: 910-576-2423; *Sls. Mgr.:* Lamar Popp

BNC

BERKELEY NUCLEONICS CORP., 1198 Tenth St., Berkeley, CA 94710, Tel: 415-527-1121, Telex: 677-1167; Empl.: 30; *Sls. Mgr.:* E. J. Buchs ..... **D•1196**

All sales engineering services in the U.S. and Canada are provided by our factory-direct sales and applications staff. For immediate assistance please contact: Tele-sales Department (415) 527-1121

BERKELEY PROCESS CONTROL, INC., 5327-K Jacuzzi St., Richmond, CA 94804, Tel: 415-526-3333; Empl.: 8; *Sls. Mgr.:* Paul Sagues; *Dist. Mgr.:* Paul Sagues

BERKSHIRE TRANSFORMER CORP., Route 341, P.O. Box 129, Kent, CT 06757, Tel: 203-927-3541; FSC No.: 89870; Empl.: 105; *Sls. Mgr.:* David Barbierl

BERK TEK, INC., Box 60, RD 1, Reading, PA 19607, Tel: 215-376-8071, TWX: 510-651-0511; Empl.: 350; *Sls. Mgr.:* Chester Klinke; *Dist. Mgr.:* Chester Klinke

Local Sales Offices & Reps
AZ Scottsdale, Bill Earl Assocs. 602-994-3813
CA Los Angeles, The Knight Co. 213-670-2833
CA Milpitas, Maxim Elctrn. Sls. 408-946-6001
FL Tampa, APM 813-886-2457
IL Des Plaines, Electron Mktg. 414-547-1505
MD Wheaton, Electronic Data Assocs. 301-699-1843
MA Shrewsbury, B&N Assoc. 617-845-1613
MI Orchard Lake, TPM & Assoc. 313-851-2784
MN St. Paul, Arkco Sls. 612-777-7454
NY Poughkeepsie, C.W. Floring & Assoc. 914-471-2973
NY Syracuse, C.W. Floring & Assoc. 315-478-2149
NC Raleigh, B. T. Funderburk, Inc. 919-782-3493
OR Tualatin, NICOR 503-692-0421
PA Huntingdon Valley, Inacker Sls. 215-947-5660
TX Houston, Yeager, Sumners & Assocs. 713-271-8104
UT Salt Lake City, Aspen Sls. 801-943-1346
Can Mississauga, Ontario, Micronex Co. ... 416-624-1076

BERMAR CORP., P.O. Box 12844, Research Triangle Park, NC 27709, Tel: 919-489-4316; *Sls. Mgr.:* M. Conland

BA
BERTAN ASSOCIATES, INC.

BERTAN ASSOCS., 121 New South Rd., Hicksville, NY 11801, Tel: 516-433-3110, TWX: 510-221-2144; FSC No.: 6130; Empl.: 140; *Sls. Mgr.:* Howard Bertan ..... **D•1522-1535**

Local Sales Offices & Reps
AZ Phoenix, Thor Engrg. 602-437-1463
CA Encino, King-Way Assoc. 213-788-4124
CA Los Altos, Cain-White & Co. 415-948-6533
CO Boulder, H. Bass Assocs. 303-530-7509
CT Madison, Dave Minshall 203-421-4561
FL DeBary, DJE Assocs. 305-668-6827
GA Lawrenceville, Electramark 404-963-4793
IL Arlington Hgts., Coombs Assocs. 312-439-9810
IN Fort Wayne, Coombs Assocs. 219-747-4017
IA Cedar Rapids, Coombs Assocs. 319-362-4116
MD Randallstown, Beacon North 703-591-1300
MI Farmington, Carter, McCormic & Peirce 313-477-7700
MO Bridgeton, Electro Mechanical Assoc. 314-291-8661
NM Albuquerque, Thorson Co. 505-293-8555
NY Fairport, NACO Elctrns. Corp. 716-223-4490
NY Syracuse, NACO Elctrns. Corp. 315-699-2651
NY Utica, NACO Elctrns. Corp. 315-732-1801
OH Cleveland, Geotronix 216-526-2535
OR Portland, Showalter Instrs. 503-224-8487
PA Audubon, Holmes Assocs. 215-666-0636
TX Dallas, Automated Motion Control 214-340-4192
TX Denton, Automated Motion Control ... 817-382-4159
UT Bountiful, H. Bass Assoc. 801-295-7100
VA Fairfax, Beacon North 703-591-1300
WA Bellevue, Showalter Instrs. 206-746-6032
WI Milwaukee, Coombs Assocs. 414-351-6123

BERTSCH U.S., SYCAMORE RESCH. CTR., 2142F Industrial Ct., Vista, CA 92083, Tel: 619-727-7420; FSC No.: 619-727-4436; Empl.: 25; *Sls. Mgr.:* B. Linko

BEST ELECTRICS DIV., 400 Boren Ave. North, Seattle, WA 98109, Tel: 206-382-1300, TWX: 910-444-2154; Empl.: 8 ..... **B•1743**

Local Sales Offices & Reps
CA Mountain View, Straube Assocs. 415-969-6060
CO Westminster, Straube Assocs. 303-426-0890

BEST POWER TECHNOLOGY, P.O. Box 280, Necedah, WI 54646, Tel: 608-565-7200, 800-356-5794, Telex: 701934; Empl.: 60; *Sls. Mgr.:* Terrance D. Paul

BEST WAY TOOLS, 171 Brook Ave., Deer Park, NY 11729, Tel: 516-586-4702; Empl.: 49

BETA TRANSFORMER TECHNOLOGY CORP., One Comac Loop, Ronkonkoma, NY 11779, Tel: 516-588-2505

BG ELCTRNS., 30 South St., Mt. Vernon, NY 10550, Tel: 914-664-5591, Telex: 6818048; FSC No.: 33791; Empl.: 36

B-G INSTRUMENTS, P.O. Box 67, Alta Loma, CA 91701, Tel: 714-989-4802, 980-2826, Telex: 517174; *Sls. Mgr.:* John Baum ..... **D•1060**

Local Sales Offices & Reps
WA Spokane, B-G Instrs., Inc. 509-238-4757

B. G. LABORATORIES, INC., 75 Travis Ave., Binghamton, NY 13904, Tel: 607-722-2376, Telex: 510-252-0185; FSC No.: 26522; Empl.: 150; *Sls. Mgr.:* Carol Clason

B. H. ELCTRNS., 331 Bremer Bldg., St. Paul, MN 55101, Tel: 612-228-6463, Telex: 297080; FSC No.: 3677; Empl.: 300; *Sls. Mgr.:* Fred LaMarche ..... **A•2122-2123**

Local Sales Offices & Reps
AZ Fountain Hills, Halbar Assocs. 602-837-2464
CA Glendale, Halbar Assocs. 213-246-8263
CA San Mateo, Halbar Assocs. 415-349-4700
CO Denver, Electro Comp. Sys. 303-781-5904
IL Chicago, I. E. Hampton & Assocs. 312-593-2410
MI Detroit, I. E. Hampton & Assocs. 313-851-0820
MI St. Joseph, I. E. Hampton & Assocs. ... 616-983-0862
MN Osseo, Gaffney Sls. Co. 612-425-5484
NH Nashua, C & C Sls. 603-889-8350
NJ Dunellen, J. A. Maguire 201-752-8480
NY Syracuse, C & L Sales 315-451-7810
OR Portland, Halbar & Assocs. 206-696-0170
PA Broomall, TCA Assocs. 215-353-2022
TX Dallas, Aid Elctrns. 214-790-4761
WA Redmond, Halbar Assocs. 206-882-0990
WI Theinsville, TFL Assoc. 414-242-6800

B.H. INDS., INC., 5784 Venice Blvd., Los Angeles, CA 90019, Tel: 213-937-4763; Empl.: 6

BICC-VERO ELCTRNS., INC., 40 Linderman Drive, Trumbull, CT 06611, Tel: 203-372-0038, TWX: 510-227-8890; Empl.: 50; *Sls. Mgr.:* Michael Humphrey; *Dist. Mgr.:* Christine A. Martin

Local Sales Offices & Reps
AL Huntsville, Raycom 205-859-2017
CA Anaheim, Bicc-Vero Elctrns. 714-630-2030
CA San Diego, Professional Sls. 619-578-8831
CA San Jose, H Tech Sls. 408-279-2443
CA Sunnyvale, BICC-Vero (Wally Light) ... 408-738-6911
CO Arvada, Delconac 303-422-7023

CT Milford, Todino Engrg. 203-874-6643
FL Melbourne, Star-Tec 305-727-2247
FL Palm Bay, Star Tec 305-727-2247
GA Duluth, Raycom Inc. 404-446-9015
KS Overland Park, Barnes-Midwest Sls. .. 913-341-9317
MD Lutherville, J. A. Dougherty Sls. 301-321-7890
MA Needham Hgts., Todino Engrg. 617-444-7925
MN St. Paul, Proud Inds. 612-646-9428
NY Kingston, P.R.M. Elctrns. 914-331-0872
NY Macedon, PRM 315-986-3742
NY Pleasantville, BICC-Vero (Robert Hoffman) 914-769-6197
NC Raleigh, Raycom 919-847-8276
NC Raleigh, Tingen Tech. Sls. 919-781-1100
OH Chesterland, K-T Mktg. 216-729-3588
OH Cleveland, KT/Depco 216-442-6200
OH Westchester, KT/Depco 513-874-0236
OR Beaverton, Luscombe 503-636-6664
PA Hatboro, Delta Squared 215-441-4178
PA Hatboro, Rep Force 215-441-4178
PA Pittsburgh, KT/Depco 412-367-1011
TX Austin, Texport 512-834-8374
TX Garland, Texport 214-681-1376
TX Houston, Texport Elctrn. Sls. Co. 713-777-1443
TX Mesquite, BICC-Vero (Robert Land) ... 214-289-1153
UT Salt Lake City, Chuck Fields & Assocs. 801-531-6177
WA Renton, Luscombe Engrg. 206-223-1541

Local Distributors

CA Los Angeles, Dyna Svc. 213-268-8531
CT Wallingford, Mid-State Elctrns. 203-265-9900
FL Dania, Summit Distr. 305-920-6253,920-6509
IL Arlington Hgts., Redel Labs 312-253-5000, 529-0500
IN Ft. Wayne, Graham Elctrns. 219-423-3422
IN Indianapolis, Graham Elctrns. 317-634-8202
LA Baton Rouge, Menard 504-355-0323
MD Baltimore, Resco 301-823-0070
MA Framingham, NOW Elctrns. 617-872-5876
MI Lansing, Demco Controls 517-321-1700
MI Madison Heights, McNaughton-McKay Elec. Co. 313-399-7500
NJ Pennsauken, Resco 609-662-4000
NJ Springfield, Route Elctrns. 201-467-0266
NY Buffalo, Summit Distr. 716-884-3450
NY Hempstead, Davis Elctrns. 516-483-9200
NY Rochester, Summit Distr. 716-442-3494
NC Raleigh, Resco 919-781-5700
OH Cincinnatti, Graham Elctrns. 513-772-1661
PA Braddock, Leff Elctrs. 412-351-5000
PA Greensburg, Leff Elctrns. 412-834-5400
TX Houston, City Elctrns. 713-621-1060
TX Houston, Electrolot 713-957-1982
WI Mequon, Taylor Elctrns. 414-241-4321

BICRON ELCTRNS., Box 807, Barlow St., Canaan, CT 06018, Tel: 203-824-5125; FSC No.: 10617; Empl.: 105; *Sls. Mgr.:* Peter B. Kent

Local Sales Offices & Reps

CO Denver, Omega, Ltd. 303-762-1921
IL Rolling Meadows, KMA Sls. Co. 312-398-5300
OH Cleveland, Arthur H. Baier Co. 216-461-6161
OH Dayton, Arthur H. Baier Co. 513-276-4128
PA Media, Homer Smith Co. 215-543-2434
PA Pittsburg, Gormley Elec. 412-795-8010
UT Salt Lake City, Omega, Ltd. 303-762-1921
VA Salem, Homersmith, Inc. 215-543-2434
WI Milwaukee, KMA Sls. Co. 414-259-1771

BIDDLE INSTRUMENTS, A Thorn EMI Co., 510 Township Line Rd., Blue Bell, PA 19422, Tel: 215-646-9200, Telex: 83-4423 BIDDLE PMTG; Empl.: 285; *Sls. Mgr.:* R. S. Kennedy

BIKOR, 1504 W. 228th St., Torrance, CA 92718, Tel: 213-539-6320, TWX: 910-349-6667; Empl.: 50; *Sls. Mgr.:* James Rorke ..... **D•1536**

Local Sales Offices & Reps

MO St. Louis, B & H Assocs. 314-434-4425
NJ Hasbrouck Hgts., Comp. Tech. Sls. 201-288-7400
NY Rochester, Tae-Rep 716-586-8710

BINDICATOR, P.O. Box 9, 1915 Dove St., Port Huron, MI 48060, Tel: 313-987-2700; *Sls. Mgr.:* Rick Secord; *Dist. Mgr.:* Rick Secord

BIO-IMAGING RESEARCH, # 1 Bio-Imaging Plaza, 425 Barclay Blvd., Lincolnshire, IL 60069, Tel: 312-564-3190; *Sls. Mgr.:* J. G. Close

BIOSPHERICAL INSTRS., INC., 4901 Morena Blvd. # 1003, San Diego, CA 92117, Tel: 619-270-1315; *Sls. Mgr.:* Dennis Bryan

BIRD, RICHARD H., & CO., INC., 1 Spruce St., Waltham, MA 02154, Tel: 617-894-0160, Telex: 923-441; FSC No.: 17706; Empl.: 50; *Sls. Mgr.:* R.J. Cameron

BIRD ELCTRN., 30303 Aurora Rd., Cleveland, OH 44139, Tel: 216-248-1200, Telex: 706898 Bird Elec. UD; FSC No.: 70998; Empl.: 250; *Sls. Mgr.:* W. L. Yochum; *Dist. Mgr.:* Greg Johns

BIRTCHER CORP., See EG & G Birtcher

BISHOP ELECTRONICS CORP., 3729 San Gabriel River Pkwy., Pico Rivera, CA 90660, Tel: 213-695-0446, 213-692-9391, TWX: 910-586-1922

BISHOP GRAPHICS, INC., 5388 Sterling Center, Westlake Village, CA 91359, Tel: 818-991-2600, Telex: 66-2400 BISHOP WKVG; Empl.: 160; *Sls. Mgr.:* Lynn Knudsen

Bivar

BIVAR, INC., 4 Thomas, Irvine, CA 92718, Tel: 714-951-8808; FSC No.: 32559; Empl.: 22; *Sls. Mgr.:* E. 'Bill' Muldoon ..... **C•1025**

Local Sales Offices & Reps

CA San Diego, Qualtronics Co. 619-695-0118
CO Westminster, D. Barth 303-427-8679
IL Chicago, Berndt Assocs., Inc. 312-283-0713
IN Indianapolis, Wilson Tech. Sls. 317-298-3345
KS De Soto, Midtec Assocs. 913-441-6565
MA Newtonville, C. Segel 617-969-6900
MI Milford, Dodsworth 313-875-5755
MN Minneapolis, Berndt Assocs. 612-546-2021
MO Florissant, Midtec Assocs. 314-837-5200
NJ Berkeley Heights, Cambridge-Allen ... 201-464-0203
NY Syracuse, T-Squared Elctrns. 315-463-8592
NC Raleigh, B. T. Funderburk 919-782-3493
OH Cincinnati, Tri-State Mktg. 513-761-7993
OR Beaverton, Eclipse Mktg. Grp. 503-642-1661
OR Portland, Eclipse Mktg. Grp. 503-644-2550
PA Elkins Park, K. B. Erdman Co. 215-224-1833
TX Richardson, Draper Co. 214-680-1650
WA Redmond, Eclipse Mktg. Grp. 206-885-6991
WI Milwaukee, Berndt Assocs. 414-545-8400
Can Mississauga, Ont., Wilson Elctrns. 416-677-7280

Local Distributors

AZ Phoenix, EKO Sales 602-275-7501
CA Fountain Valley, Components Ctr. 714-979-0433
CA Mountain View, Energy Sls. 415-969-0800
CA San Diego, Sigma Elctrns. 619-565-2000
CA Santa Clara, Components Ctr. 408-988-3751
CA Santa Fe Springs, F T R Fasteners 714-957-0202, 213-946-6464
CA Sunnyvale, R. C. Dudek 408-734-3830
CA Sunnyvale, Vic/Tal Sls. 408-738-3450
CA Temple City, Fastening Sys. 213-579-4600
CA Westlake Village, R. C. Dudek 213-707-1310
CO Englewood, Indus. Elctrns. 303-694-9444
CT East Haven, J. V. Elctrns. 203-469-2321
CT Milford, Plastic & Metal Comps. Co. ... 203-877-2723
GA Norcross, Atlanta Hardware Specialty 404-449-3000
GA Peachtree City, Spyraflo, Inc. 404-487-7600
IL Chicago, EMF 800-621-0080,312-889-8323
IL Chicago, Waldom Elctrns. 312-585-1212
IL Elmhurst, Miltex Sls. 312-941-7100
MD Gaithersburg, Capitol Fasteners 301-948-9310
MA Burlington, Contact East 617-272-5051
MA Marlboro, Hardware Specialty Co. 617-481-8622
MA Waltham, Electronic Fasteners 617-890-7780
MA Winchester, RUSH 617-729-5800
MN Eden Prairie, S. W. Anderson Co. 612-941-4108
NH Londonderry, E.P.E. Corp. 603-669-9181
NY Central Islip, Domino Comps. 516-582-3050
NY Long Island City, Hardware Specialty Co. 212-361-9393
NY Mt. Vernon, QAR Elctrns. 914-699-2224
NY Plainview, Tower Fastener Co. 516-349-7670
NY Rochester, Masline Elctrns. 716-546-5373
NC Raleigh, Century Elctrn. Comps. 919-872-2203
NC Raleigh, Century Fasteners 919-787-1800
OH Cincinnati, Hughes-Peters 513-351-2000
OH Columbus, Hughes-Peters 614-294-5351
OH Englewood, Argent Inds. 513-836-8633
OH Solon, REH/Electra 216-248-1636
OR Beaverton, Component Resources 503-641-8488
OR Beaverton, Murphy Elctrns. 503-642-2001
PA Huntington Valley, Plastic & Metal Prods. 215-322-2000
PA Norristown, Century Elctrns. 215-631-5400
PA Pittsburgh, Alder-Tronics 412-821-5565
TX Grand Prairie, Tech Supp. 214-660-4888
WA Redmond, Energy Sls. 206-883-2343
WA Redmond, Murphy Elctrns. 206-881-1234
WA Seattle, Component Resources 206-454-8666
WA Seattle, Pacific Elctrns. 206-575-1050
Can Mississauga, Ont., Rush/Ontario 416-677-7280

BIW CABLE SYS., INC., 65 Bay St., Dorchester, MA 02125, Tel: 617-265-2102, Telex: 94-0604; FSC No.: 71102; Empl.: 600; *Sls. Mgr.:* E. McCormick

BLACK & WEBSTER, 219 Bear Hill Rd., Waltham, MA 02254, Tel: 617-890-9100, Telex: 951102; Empl.: 80

BLACK BOX CORP., Micom Sys., P.O. Box 12800, Pittsburgh, PA 15241, Tel: 412-746-5500, Telex: 510-697-3125; *Sls. Mgr.:* Peter Highberg

BLACKHAWK NETWORKS CORP., 14 N. Parker Dr., P.O. Box 919, Janesville, WI 53545, Tel: 608-752-8701, TWX: 910-350-8266; FSC No.: 12724; Empl.: 10

BLANCK, A. R., CO., Box 249, Rutherford, NJ 07070, Tel: 201-933-2091; Empl.: 6; *Sls. Mgr.:* Dr. A. R. Blanck; *Dist. Mgr.:* Dr. A. R. Blanck

BLATEK INDS., INC., Box 574, Bellefonte, PA 16823, Tel: 814-355-4910; Empl.: 20; *Sls. Mgr.:* Linda C. Feltman ..... **B•1787**

Local Sales Offices & Reps

CA Burbank, Modco 818-848-2215
CO Littleton, McCarthy Co. 303-773-0643
CT Woodbridge, Elctrn. Mktg. 203-397-1461
MI Benton Harbor, McNabb & Assocs. ... 616-925-2166

BLH ELCTRNS., 75 Shawmut Road, Canton, MA 02021, Tel: 617-821-2000, Telex: 92-3413, TWX: 710-324-0683; FSC No.: 03089; Empl.: 250; *Sls. Mgr.:* C. Wesley

BLILEY ELEC. CO., 2545 W. Grandview Blvd., Erie, PA 16506, Tel: 814-838-3571, Telex: 510-696-6886; FSC No.: 71034;3098; Empl.: 200; *Sls. Mgr.:* H. A. Yocum ..... **A•1316-1323**

Local Sales Offices & Reps

AL Huntsville, R. W. Mitscher Co. 205-882-6050

BLILEY REPRESENTATIVES COVER THESE STATES:

Southern California, Arizona
CAIN TECHNOLOGY, INC.

Northern California, Northwestern Nevada
GENE C. WOEMPNER COMPANY

Massachusetts, Connecticut, Maine, New Hampshire, Vermont, Rhode Island
STURGEON COMPANY

New York (Metropolitan NYC), Northern New Jersey
SCHMITT INDUSTRIAL MARKETING CORP.

New York State (excluding Metropolitan NYC), Virginia, North & South Carolina, Georgia, Mississippi, Alabama, Tennessee, Maryland, Delaware, Florida, Eastern Pennsylvania, Southern New Jersey, Canadian Provinces of Ontario & Quebec
R.W. MITSCHER CO., INC.

Washington, Oregon
DUSSAULT & ASSOCIATES, INC.

Texas, Louisiana, Arkansas, Oklahoma
VECTOR SALES CO., INC.

Missouri, Kansas, Nebraska, Southern Iowa, Middle & Southern Illinois
AME SALES, INC.

See adjacent listing for the address and telephone number of your Bliley representative.

Bliley
ELECTRIC COMPANY

CA Los Angeles, Cain Technology, Inc. ... 213-477-9054
CA Mountain View, Gene C. Woempner Co. ... 415-964-5454
CA Orange, Cain Technology, Inc. ... 714-997-7311
CT Hartford, Sturgeon Co. ... 203-249-7800
FL Altamonte Springs, R. W. Mitscher Co. ... 305-788-6844
FL Boca Raton, R. W. Mitscher Co. ... 305-368-3841
GA Lawrenceville, R. W. Mitscher Co. ... 404-923-3239
MD Laurel, R. W. Mitscher Co. ... 301-498-6090
MA Needham, Sturgeon Co. ... 617-444-6603
MO St. Louis, AME Sales, Inc. ... 314-965-1779
NY Bainbridge, R. W. Mitscher Co. ... 607-967-7192
NY Buffalo, R. W. Mitscher Co. ... 716-633-7970
NY Pittsford, R. W. Mitscher Co. ... 716-586-4012
NY Red Hook, R. W. Mitscher Co. ... 914-758-8375
NY Rochester, R. W. Mitscher Co. ... 716-227-0839
NY Utica, R. W. Mitscher Co. ... 315-733-0171
NY West Hempstead, Schmitt Indl. Mktg. Corp. ... 516-486-3510
NC Charlotte, R. W. Mitscher Co. ... 704-598-8644
NC Raleigh, R. W. Mitscher Co. ... 919-848-0941
OR Portland, Dussault & Assocs. Inc. ... 503-641-8780
PA Huntingdon Valley, R. W. Mitscher Co. ... 215-355-4452
TN Johnson City, R. W. Mitscher Co. ... 615-929-7258
TX Richardson, Vector Sls. Co. ... 214-234-4291
VA Midlothian, R. W. Mitscher Co. ... 804-744-4676
WA Seattle, Dussault & Assocs., Inc. ... 206-527-5454
EXP CT, Stamford, Dage Corp. ... 203-324-3123

BLUE M

BLUE M, A UNIT OF GENERAL SIGNAL, 138th & Chatham Sts., Blue Island, IL 60406, Tel: 312-385-9000, TWX: 910-689-3398; Empl.: 420; *Sls. Mgr.:* H. G. Mathews ... **D•1165**

Local Sales Offices & Reps

AZ Tempe, Blue M ... 602-894-2305
CA El Monte, Blue M ... 818-442-6672
CA Sunnyvale, Blue M ... 408-734-8734
DE Wilmington, Blue M ... 302-478-6983
FL Winter Park, Blue M ... 305-671-6655
GA Atlanta, Blue M ... 404-455-3452
KS Overland Park, Blue M ... 913-888-6483
MA Natick, Blue M ... 617-651-1616
MI Taylor, Blue M ... 313-281-2107
NY Nanuet, Blue M ... 914-623-0900
NY Syracuse, Blue M ... 315-437-0192
NC Charlotte, Blue M ... 704-527-2492
OH Cincinnati, Blue M ... 513-821-6278
OH Hudson, Blue M ... 216-656-1177
TX Garland, Blue M ... 214-272-2509
TX San Marcos, Blue M ... 512-353-8003
WA Seattle, Blue M ... 206-763-1030

BLUFFTON PRODUCTS, INC., Tegam, Inc., 7230 North Ridge Road, Madison, OH 44057, Tel: 216-946-3572; *Sls. Mgr.:* Doug Bradley

BLUM, JULIUS & CO., INC., Box 292, Carlstadt, NJ 07072, Tel: 201-438-4600, Telex: 13-3491; Empl.: 40

BMS DATA HANDLING, INC., 12155 Magnolia, Riverside, CA 92503, Tel: 714-359-8824; Empl.: 16; *Sls. Mgr.:* Thomas H. Mitchell

BODINE ELEC. CO., 2500 W. Bradley Pl., Chicago, IL 60618, Tel: 312-478-3515, Telex: 25-3646; Empl.: 800; *Sls. Mgr.:* R. E. Ford; *Dist. Mgr.:* R. E. Ford ... **B•1140**

Local Sales Offices & Reps

CA Al Hambra, C. E. Mello ... 818-282-2000
CA San Jose, E. W. Duemmlein ... 408-243-4800
KS Shawnee Mission, J. S. Gleeson & Assocs. ... 913-362-4422
MA Andover, L. R. Cascino ... 617-470-0050
MI Plymouth, Steve Cavender ... 313-453-2730
NY Massapequa, D. V. Mayorga ... 516-541-1611
NY Rochester, Application Specialists ... 716-586-6226
NY Syracuse, Application Specialists ... 315-437-2813
OH Hudson, J. H. Basten ... 216-656-4226
OR Portland, D. E. Johnson ... 503-246-3131
TX Richardson, General Power Equip. ... 214-783-8371
VA McLean, J. S. Hsia ... 703-734-1739
EXP IL., Chicago, Export Dept., Bodine Elec. ... 312-478-3515

Local Distributors

AL Mobile, Brownell Instrs. & Conts. Co. ... 205-479-5405
AK Anchorage, Airport Machinery Co ... 907-272-0544
AZ Phoenix, Minarik Elec. Co. ... 602-233-3000
CA Carson, Power Trans. Specialties ... 213-631-7502
CA Los Angeles, Minarik Elec. Co. ... 213-624-3161
CA Mountain View, King Bearing, Inc. ... 415-968-8316
CA San Diego, Minarik Elec. Co. ... 619-560-6632
CA San Jose, King Bearing, Inc. ... 408-998-5464
CA San Jose, Republic Supp. Co. ... 408-279-2202
CA San Leandro, Republic Supp. Co. ... 415-357-2211
CA Santa Clara, Minarik Elec. Co. ... 408-727-0575
CO Denver, Wazee Elec. Co. ... 303-623-8658
CT Berlin, B & B Motor & Control ... 203-828-8550
CT Hartford, Machine Drives & Controls ... 203-728-0403
CT Norwalk, Machine Drives & Controls ... 203-846-2007
FL Hialeah, Condo Elec. & Ind. Supp., Inc. ... 305-691-5400
FL Jacksonville, Electrical-Mech. Dr., Inc. ... 904-783-2730
FL Orlando, Brownell Instrs. & Conts. Co. ... 305-843-6770
FL Tampa, Electrical-Mech. Dr., Inc. ... 813-621-8675
GA Hapeville, Brownell Instrs. & Conts. Co. ... 404-762-5181
IL Aurora, Industrial Supp. Co. ... 312-844-5500
IL Chicago, Excel Elec. Svc. Co. ... 312-421-7220
IL Chicago, Harris & Lee ... 312-372-7272
IL Rockford, Harris & Lee ... 815-398-0606
IN Indianapolis, B & B Motor & Control ... 317-248-0396
IA Cedar Rapids, Precision Bearing Co. ... 319-365-5276
IA Des Moines, Precision Bearing Co. ... 515-265-9811
KS Kansas City, Kornfeld Thorp Elec. ... 913-321-7070
MA Medford, Empire Elctrl. Co. ... 617-395-5000
MA Somerville, Electro Sls. Co., Inc. ... 617-666-0500
MI Detroit, Howard Elec. Co. ... 313-923-0430
MI Grand Rapids, MacKay Ind. Sls. ... 616-241-1671
MN Minneapolis, Boustead Elec. & Mfg. ... 612-544-9131
MO St. Louis, Zeller Elec., Inc. ... 314-638-9641
NE Omaha, Precision Bearing Co. ... 402-444-3939
NV Reno, Republic Supp. Co. ... 702-677-1761
NJ Cherry Hill, Jos. T. Fewkes & Co. ... 609-424-5810
NJ Piscataway, B & B Motor & Control ... 201-572-0500
NY Binghamton, K. J. Elec. Corp. ... 607-772-1760
NY East Syracuse, K. J. Elec. Corp. ... 315-437-2826
NY Long Island City, B & B Motor & Control ... 718-784-1313
NY Rochester, B & B Motor & Control ... 716-424-7040
NC Charlotte, Brownell Instrs. & Conts. Co. ... 704-597-1270
NC Charlotte, Mize Co., Inc. ... 704-375-5761
OH Cleveland, Reserve Elec. Co. ... 216-771-5764
OH Dayton, Thal Mor Assoc., Inc. ... 513-298-9939
OK Oklahoma City, Dagwell Dixie Co. ... 405-232-7671
OK Tulsa, Southwest Drives, Inc. ... 918-834-4231
OR Portland, Campbell Ind. Supp. ... 503-231-4820
PA Altoona, Miller Elec. Svc. & Supp. ... 814-942-9943
PA Pittsburgh, Braunlich-Roessie ... 412-471-6995
SC Taylors, B & B Motor & Control ... 803-268-5702
TN Memphis, Brownell Instrs. & Conts. Co. ... 901-795-8487
TN Nashville, Tennessee Machinery Co. ... 615-244-8150
TX Dallas, Motion Inds. ... 214-351-2211
TX Fort Worth, Motion Inds. ... 817-335-8131
TX Houston, B & B Motor & Control ... 713-820-7931
TX Houston, Research Des., Inc. ... 713-995-8591
VA Richmond, Ind. Supp. Corp. ... 804-355-8041
WA Seattle, Campbell Ind. Supp. Co. ... 206-447-7100
WA Seattle, Industrial Elec. ... 206-329-3900
WA Spokane, Campbell Ind. Supp. Co. ... 509-838-8288
WA Tacoma, Campbell Ind. Supp. Co. ... 206-383-2431
WI Milwaukee, Trester Svc. Elec. ... 414-264-8170
WI New Berlin, Elec. Sls. & Engrg. ... 414-782-2400

BOEING MICROELECTRONICS, PCB OPNS., M/S: 88-34, Box 24666, Seattle, WA 98124, Tel: 206-773-1083, Telex: 32-9430, TWX: 910-423-1563; Empl.: 120; *Sls. Mgr.:* M.A. Schalk

BOKER'S, INC., 3104 Snelling Ave., Minneapolis, MN 55406, Tel: 612-729-9365

BOMAR CRYSTAL, 201 Blackford Ave., Middlesex, NJ 08846, Tel: 201-356-7787, 800-526-3935, TWX: 710-480-4560; Empl.: 75; *Sls. Mgr.:* Phil Casciano

BOMCO, See MuShield Co.

BONUS-BILT, INC., Hofmann Inds., 1096 Air Way, Glendale, CA 91201, Tel: 213-245-9177, 800-692-8888; Empl.: 100; *Sls. Mgr.:* Don Nunnery

BOONTON ELCTRNS. CORP., 791 Route 10, Randolph, NJ 07869, Tel: 201-584-1077, TWX: 710-986-8215 BOONTRONICS; FSC No.: 04901; Empl.: 180; *Sls. Mgr.:* J. Garthwaite ... **D•1197**

Local Sales Offices & Reps

AL Huntsville, Sci. Devices ... 205-536-1969
AZ Phoenix, Aztec Entprs. ... 602-943-8178
CA North Hollywood, O'Halloran Assocs. ... 213-877-0173
CA Palo Alto, O'Halloran Assocs. ... 415-326-1493
CO Denver, Aztec Entprs. ... 303-779-5285
CT Mt. Carmel, Sci. Devices ... 203-248-9361
FL Orlando, Sci. Devices ... 305-841-8180
FL Shalimer, Sci. Devices ... 904-651-4407
IL Elmhurst, Sector Engrg. Sls., Inc. ... 312-530-7850
IN Indianapolis, Sector Engrg. Sls., Inc. ... 317-842-1120
KS Overland Park, Ramsey Assoc. ... 913-649-6996
MD Silver Spring, Sel-Tronics ... 301-589-3391
MA Lexington, R. J. Sickles ... 617-862-5100
MN Minneapolis, Sector Engrg. Sls., Inc. ... 612-593-1809
MO Maryland Hgts., Ramsey Assoc. ... 314-878-5042
NJ Englewood Cliffs, Sci. Devices ... 201-871-3916
NM Albuquerque, Aztec Entprs. ... 505-262-1688
NY Rochester, Sci. Devices ... 716-334-2445
NC Winston-Salem, Sci. Devices ... 919-765-5776
OH Centerville, Micro Sls. ... 513-433-8171
OH N. Olmsted, Micro Sls. ... 216-734-3080
OR Portland, Sci. Devices ... 503-292-6934
PA Melrose Park, R. Meyers ... 215-224-1663
TX Austin, Testech ... 512-327-7033
TX Houston, Testech ... 713-956-0837
TX Richardson, Testech ... 214-644-5010
UT Ogden, Aztec Entprs. ... 801-621-1655
WA Bellevue, Sci. Devices ... 206-747-5169
WI Milwaukee, Sector Engrg. Sls., Inc. ... 301-589-3391

bopla ENCLOSURES SYSTEMS

BOPLA ENCLOSURES, 1350 Beverly Rd., Ste. 115-338, McLean, VA 22101, Tel: 703-549-7242, Telex: 298598 ROSE UR; FSC No.: 4Y520; Empl.: 17 ... **C•1026**

BORG-WARNER THERMOELECTRICS, BORG-WARNER CORP., See TECA, ThermoElectric Cooling America Corp.

BORROUGHS, Lear Siegler, Inc., 3002 N. Burdick St., Kalamazoo, MI 49007, Tel: 616-342-0161, Telex: 224322; Empl.: 417

BOSCH, ROBERT, CORP., 2800 S. 25th Ave., Broadview, IL 60153, Tel: 312-865-5200, Telex: 23-5563; *Sls. Mgr.:* Dieter Bloecks; *Dist. Mgr.:* Dave Robson ... **B•1296-1297**

Local Sales Offices & Reps

AL Huntsville, 20th Century Mktg. ... 205-533-9287
AZ Scottsdale, Luscombe Engrg. ... 602-949-9333
CA Campbell, Luscombe Engrg. ... 408-370-2020
CA Pasadena, Luscombe Engrg. ... 213-684-2000
CA San Diego, Luscombe Engrg. ... 619-295-4300
CO Longmont, Piper Sls. ... 303-651-2378
CT Madison, Conti Younger Assocs. ... 203-245-1136
FL Enterprise, D.J.E. Assocs., Inc. ... 305-321-6623
GA Norcross, 20th Century Mktg. ... 404-446-1999
IL Woodridge, Trend-Tronics, Inc. ... 312-985-0626
IA Davenport, Rush & West ... 319-326-3091
KS Kansas City, Rush & West ... 913-764-2700
MA Burlington, Conti Younger ... 617-273-1582
MN Minneapolis, H.M.R., Inc. ... 612-888-2122
MO Ballwin, Rush & West Assocs. ... 319-394-7271
NY Yonkers, Sonkin Assocs. ... 914-968-8282
NC Raleigh, 20th Century Mktg. ... 919-782-4333
PA Cornwells Hts., William Staats Co. ... 215-639-5231
TN Memphis, 20th Century Mktg. ... 901-756-4681
TX Dallas, P.J. Scanlon Co. ... 214-231-4661
WA Mercer Island, Electronic Comp. Sls. ... 206-232-9301
WI Waukesha, Trend-Tronics, Inc. ... 414-542-4919

Local Distributors

CA Santa Monica, Distributor Specialists ... 213-393-9666
IL Woodridge, Trend-Tronics, Inc. ... 312-985-0626
NY Yonkers, Sonkin Assocs. ... 914-968-8282

Boschert

BOSCHERT INC., 384 Santa Trinita Ave., Sunnyvale, CA 94086, Tel: 408-732-2440, TWX: 910-339-9241; Empl.: 1500; *Sls. Mgr.:* Lloyd Schiller; *Dist. Mgr.:* Lloyd Schiller ... **D•1537-1540**

Local Sales Offices & Reps

AZ Scottsdale, American Mktg. 602-948-2778
CA Fountain Valley, K-Two Sls. 714-968-4726
CA San Diego, Harvey King 619-566-5252
CA Santa Clara, Criterion 408-988-6300
CA Sunnyvale, Boschert 408-732-2440
CO Aurora, Electrodyne 303-695-8903
FL Clearwater, Dyne-A-Mark 813-441-4702
FL Ft. Lauderdale, Dyne-A-Mark 305-771-6501
FL Maitland, Dyne-A-Mark 305-831-2097
IL Elk Grove Village, Control Sls. 312-595-2110
IN Indianapolis, SAI Mktg. 317-241-9276
IA Cedar Rapids, Stan Clothier 319-395-0245
KS Augusta, Design Solutions 316-775-7424
MA Marlboro, Eastern Micro 617-480-0400
MI Brighton, SAI Mktg. 313-227-1786
MN Minneapolis, Stan Clothier Co. 612-944-3456
MO St. Louis, Design Solutions 314-961-7170
NJ Cherry Hill, Power Squared 609-424-6622
NJ Totowa, Boschert 201-256-4046
NY Huntington, Morgan Elctrns. 516-549-5180
OH Centerville, SAI Mktg. 513-435-3181
OH Shaker Hgts., SAI Mktg. 216-751-3633
TX Austin, O. M. Sales 512-452-1838
TX Houston, O. M. Sales 713-789-4426
TX Richardson, O. M. Sales 214-690-6746
UT Salt Lake City, Electrodyne 801-486-3801
WI Thiensville, Control Sls. 414-242-4580

Local Distributors

AL Huntsville, Arrow Elctrns. 205-882-2730
AL Huntsville, Marshall 205-881-9235
AZ Tempe, Anthem 602-244-0900
AZ Tempe, Arrow Elctrns. 602-968-4800
AZ Tempe, Marshall Inds. 602-968-6181
CA Canoga Park, Marshall Inds. 213-999-5001
CA Chatsworth, Anthem 213-700-1000
CA Chatsworth, Arrow Elctrns. 818-701-7500
CA El Monte, Marshall Inds. 213-442-7204
CA Irvine, Marshall Inds. 714-556-6400
CA San Diego, Anthem 619-453-9005
CA San Diego, Arrow Elctrns. 619-565-4800
CA San Diego, Marshall Inds. 619-578-9600
CA San Jose, Anthem 408-946-8000
CA Sunnyvale, Arrow Elctrns. 408-745-6600
CA Sunnyvale, Marshall Inds. 408-732-1100
CA Tustin, Anthem 714-730-8000
CA Tustin, Arrow Elctrns. 714-595-2860
CO Aurora, Arrow Elctrns. 303-696-1111
CO Denver, Marshall Inds. 303-427-1818
CO Englewood, Anthem 303-790-4500
CT Wallingford, Arrow Elctrns. 203-265-7741
CT Wallingford, Marshall Inds. 203-265-3822
FL Ft. Lauderdale, Marshall Inds. 305-928-0661
FL Palm Bay, Arrow Elctrns. 305-725-1480
GA Norcross, Arrow Elctrns. 404-449-8252
GA Norcross, Marshall Inds. 404-923-5750
IL Schaumberg, Marshall 312-490-0155
IL Schaumburg, Arrow Elctrns. 312-397-3440
IN Indianapolis, Arrow Elctrns. 317-243-9353
IA Cedar Rapids, Arrow Elctrns. 319-395-7230
KS Lexena, Marshall Ind. 913-492-3121
MD Gaithersburg, Marshall Inds. 301-840-9450
MA Burlington, Marshall Inds. 617-272-8200
MI Ann Arbor, Arrow Elctrns. 313-971-8220
MI Livonia, Marshall 313-525-5850
MN Edina, Arrow Elctrns. 612-830-1800
MN Plymouth, Marshall 612-559-2211
MO St. Louis, Arrow Elctrns. 314-567-6888
NJ Fairfield, Marshall Inds. 201-882-0320
NJ Marlton, Arrow Elctrns. 609-596-8000
NJ Mt. Laurel, Marshall Inds. 609-234-9100
NM Albuquerque, Arrow Elctrns. 505-243-4566
NY Endwell, Marshall 607-754-1570
NY Hauppauge, Arrow Elctrns. 516-231-1000
NY Hauppauge, Marshall Inds. 516-273-2424
NY Liverpool, Arrow Elctrns. 315-652-1000
NY Melville, Arrow Elctrns. 516-694-6800
NY Rochester, Arrow Elctrns. 716-427-0300
NY Rochester, Marshall 716-235-7620
NC Winston-Salem, Arrow Elctrns. 919-725-8711
OH Centerville, Arrow Elctrns. 513-435-5563
OH Dayton, Marshall 513-236-8088
OH Solon, Arrow Elctrns. 216-248-3990
OK Tulsa, Arrow Elctrns. 918-665-7700
OR Beaverton, Marshall 503-644-5050
OR Lake Oswego, Anthem Elctrns. 503-684-2661
PA Monroeville, Arrow Elctrns. 412-856-7000
TX Austin, Marshall 512-458-5654
TX Dallas, Arrow Elctrns. 214-386-7500
TX Dallas, Marshall Inds. 214-233-5200
TX Houston, Arrow Elctrns. 713-530-4700
TX Houston, Marshall Inds. 713-789-6600
WA Bellevue, Arrow Elctrns. 206-643-4800
WA Bellevue, Marshall Inds. 206-747-9100
WA Redmond, Anthem 206-881-0850
WI Oak Creek, Arrow Elctrns. 414-764-6600

BOSTON SYSTEMS OFFICE, 469 Moody St., Waltham, MA 02254-9164, Tel: 617-894-7800, TWX: 710-324-0760; Empl.: 80; *Sls. Mgr.:* Francis X. O'Brien; *Dist. Mgr.:* Debra DellaCamera (International)

BOURNS, INC., Resistive Components Group, 1200 Columbia Ave., Riverside, CA 92507, Tel: 714-781-5050, TWX: 910-332-1252; Empl.: 4000; *Sls. Mgr.:* R. A. Sickler; *Dist. Mgr.:* Dennis Lause ..... **A•1800-1803, 1996-2008**

Local Sales Offices & Reps

AL Huntsville, CSR Elctrns. 205-533-2444
AZ Phoenix, Shefler-Kahn 602-257-9015
CA Encino, Great American Rep Co. 818-990-4870
CA San Diego, SR Elctrns. 619-560-8330
CA San Jose, QuadRep, Inc. 408-946-4000
CA Tustin, Great American Rep Co. 714-954-0371
CO Parker, Parker Webster 303-841-4888
FL Altamonte Springs, Dyne-A-Mark 305-831-2097
FL Clearwater, Dyne-A-Mark 813-441-4702
FL Ft. Lauderdale, Dyne-A-Mark 305-771-6501
FL Palm Bay, Dyne-A-Mark 305-727-0192
GA Atlanta, CSR Elctrns. 404-396-3720
ID Boise, Intermountain Technlg. 208-322-5022
IL Elk Grove Village, John G. Twist Co. 312-593-0200
IN Carmel, Technlg. Mktg. Corp. 317-844-8462
IN Ft. Wayne, Technlg. Mktg. Corp. 219-432-5553
IA Cedar Rapids, REP Assocs. Corp. 319-373-0152
KY Louisville, Technlg. Mktg. Corp. 502-499-7808
MD Baltimore, Micro-Comp. 301-247-0400
MA Lexington, John E. Boeing Co. 617-862-2500
MI Detroit, Rathburg Assocs. 313-882-1717
MN Edina, Mel Foster 612-941-9790
MO Bridgeton, Centech 314-291-4230
MO Raytown, Centech 816-358-8100
NJ Bellmawr, Thomas Assocs. 609-933-2600
NM Albuquerque, Shefler-Kahn Co. 505-296-0749
NY Ithaca, B. Dean 607-257-1111
NY Melville, Comtronic Assocs. 516-249-0505
NY Wappingers Falls, Bourns 914-297-1180
NC Raleigh, CSR Elctrns. 919-878-9200
OH Richfield, Bear Mktg. 216-659-3131
OK Oklahoma City, Ammon & Rizos 405-942-2552
OR Portland, J. J. Backer 503-297-8744
OR Salem, J. J. Backer 503-362-0717
TX Austin, Ammon & Rizos 512-454-5131
TX Dallas, Ammon & Rizos 214-644-5591
TX Houston, Ammon & Rizos 713-781-6240
UT Salt Lake City, Parker Webster 801-266-9939
VA Huddleston, Micro-Comp 301-247-0400
WA Seattle, J. J. Backer 206-285-1300

Local Distributors

AL Huntsville, Hall-Mark Elctrns. 205-837-8700
AL Huntsville, Hamilton/Avnet Elctrns. 205-837-7210
AL Huntsville, Pioneer/Washington 205-837-9300
AL Huntsville, Schweber 205-882-2200
AZ Phoenix, Elctrn. Parts Co. 602-277-7281
AZ Phoenix, Hall-Mark Elctrns. 602-243-6601
AZ Phoenix, Schweber Elctrns. 602-997-4874
AZ Phoenix, TTI 602-861-0222
AZ Tempe, Acacia Sls. 602-894-2874
AZ Tempe, Bell Inds. 602-966-7800
AZ Tempe, Elctrn. Supp. 602-258-4769
AZ Tempe, Hamilton/Avnet 602-231-5100
CA Canoga Park, Schweber Elctrns. 213-999-4702
CA Chatsworth, Avnet Elctrns. 213-700-2600
CA Chatsworth, TTI 818-709-1010
CA Citrus Hts, Hall-Mark Elctrns. 916-443-7282
CA Compton, Harper S.I.D. 213-979-5090
CA Costa Mesa, Avnet Elctrns. 714-754-6111
CA Costa Mesa, Avnet Elctrns. 213-558-2313
CA Costa Mesa, Hamilton Elctrns. 714-641-4100
CA Culver City, Hamilton Electro Sls. 213-558-2883/84
CA Culver City, Hamilton Electro Sls. 213-558-2121
CA El Segundo, Hall-Mark Elctrns. 213-643-9101
CA Garden Grove, Bell Inds. 213-444-0301
CA Gardena, Bell Inds. 213-515-1800
CA Irvine, Acacia Sls. 714-549-0954
CA Irvine, Schweber Elctrns. 714-556-3880
CA Irvine, Schweber Elctrns. 714-863-0261
CA Oakland, Brill Elctrns. 415-834-5888
CA Riverside, Elctrn. Supp. Corp. 714-787-9220
CA Roseville, Bell Inds. 916-969-3100
CA Sacramento, Hamilton/Avnet 916-920-3150
CA Sacramento, Schweber Elctrns. 916-929-9732
CA San Diego, Acacia Sls. 619-565-4365
CA San Diego, Bell Inds. 619-268-1277
CA San Diego, Elctrn. Supp. 619-278-5020
CA San Diego, Hall-Mark Elctrns. 619-268-1201
CA San Diego, Hamilton/Avnet 619-571-7500
CA San Jose, TTI 408-943-9155
CA Santa Ana, Teknopak 714-558-8840
CA Santa Clara, Schweber Elctrns. 408-748-4700
CA Santa Clara, Schweber Elctrns. 408-496-0200
CA Sunnyvale, Acacia Sls. 408-745-7200
CA Sunnyvale, Bell Inds. 408-734-8570
CA Sunnyvale, Hall-Mark Elctrns. 408-773-9990
CA Sunnyvale, Hamilton/Avnet 408-743-3300
CA Tustin, Hall-Mark Elctrns. 714-669-0681
CA Woodland Hills, Avnet Elctrns. 213-884-3322
CO Denver, Newark Elctrns. 303-757-3351
CO Englewood, Hall-Mark Elctrns. 303-790-1662
CO Englewood, Hamilton/Avnet 303-779-9998
CO Lakewood, Acacia Sls. 303-232-2882
CO Wheat Ridge, Bell Inds. 303-424-1985
CT Danbury, Hamilton/Avnet 203-797-2856
CT Danbury, Schweber Elctrns. 203-792-3500
CT Hamden, Almo Elctrns. Corp. 203-288-6556
CT Norwalk, Pioneer Std. 203-853-1515
CT Statford, TTI 203-375-1400
CT Wallingford, Midan Elctrns. 203-265-2077
FL Altamonte Springs, Pioneer Std. 305-834-9090
FL Altamonte Springs, Schweber Elctrns. 305-331-7555
FL Clearwater, Hall-Mark Elctrns. 813-530-4543
FL Dania, Summit Distrs. 305-920-625
FL Ft. Lauderdale, Hall-Mark Elctrns. 305-971-9280
FL Ft. Lauderdale, Hamilton/Avnet 305-971-2900
FL Ft. Lauderdale, Hammond Elctrns. 305-973-7103
FL Ft. Lauderdale, Pioneer/Washington 305-771-7520
FL Hollywood, Schweber Elctrns. 305-927-0511
FL Largo, Graham Elctrns. 813-541-4434
FL Orlando, Hall-Mark 305-855-4020
FL Orlando, Hammond Elctrns. 305-849-6060
FL Orlando, Pioneer/Orlando 305-834-9090
FL Orlando, TTI 305-859-1000
FL St. Petersburg, Hall-Mark Elctrns. 813-576-8691
FL St. Petersburg, Hamilton/Avnet 813-576-3930
FL Winter Park, Hamilton/Avnet 305-628-3888
GA Norcross, Hall-Mark Elctrns. 404-447-8000
GA Norcross, Hamilton/Avnet 404-447-7500
GA Norcross, Hammond Elctrns. 404-449-1996
GA Norcross, Pioneer/Washington 404-448-1711
GA Norcross, Schweber Elctrns. 404-449-9170
GA Norcross, TTI 404-662-0911
IL Bensenville, Hall-Mark Elctrns. 312-860-3800
IL Bensenville, Hamilton/Avnet 312-860-8523
IL Chicago, Bell Inds. 312-982-9210
IL Chicago, Newark Elctrns. 312-638-4411
IL Elk Grove Village, Pioneer Std. 312-437-9680
IL Elk Grove Village, Schweber Elctrns. 312-364-3750
IL Palatine, Ohm Elctrns. 312-359-5500
IN Carmel, Hamilton/Avnet 317-844-9333
IN Fort Wayne, Graham Elctrns. 219-423-3422
IN Indianapolis, Graham Elctrns. 317-634-8202
IN Indianapolis, Pioneer Std. Elctrns. 317-849-7300
IN Lafayette, Graham Elctrns. 317-423-5564
IA Cedar Rapids, Bell Inds. 319-395-0730
IA Cedar Rapids, Hamilton/Avnet 319-362-4757
IA Cedar Rapids, Schweber Elctrns. 319-373-1417
KS Lenexa, Hall-Mark Elctrns. 913-888-4747
KS Overland Park, Schweber Elctrns. 913-492-2921
KS Overland Pk., Hamilton/Avnet Elctrns. 913-888-8900
LA New Orleans, Wm B Allen Supp. 504-525-8222
MD Baltimore, Radio Elec. Svc. Co. 301-529-0500
MD Beltsville, Radio Elec. Svc. Co. 202-937-9100
MD Columbia, Hall-Mark Elctrns. 301-796-9300
MD Columbia, Hamilton/Avnet 301-995-3500
MD Gaithersburg, Almo Elctrns. Corp. 301-670-0090
MD Gaithersburg, Pioneer/Washington 301-921-0660
MD Gaithersburg, Schweber Elctrns. 301-840-5900
MA Bedford, Schweber Elctrns. 617-275-5100
MA Burlington, Lionex Corp. 617-657-5170
MA Canton, Almo Elctrns. Corp. 617-821-1450
MA Lexington, Pioneer Std. 617-863-1200
MA Norwood, Gerber Elctrns. 617-769-6000
MA Wilmington, RC Comps. 617-273-1860
MA Woburn, Hall-Mark Elctrns. 617-935-9777
MA Woburn, Hamilton/Avnet 617-273-7500
MI Flint, RS Elctrns. 313-762-5800
MI Grand Rapids, Hamilton/Avnet 616-243-8805
MI Grand Rapids, RS Elctrns. 616-241-3483
MI Kalamazoo, RS Elctrns. 616-381-5470
MI Livonia, Hamilton/Avnet 313-522-4700
MI Livonia, Pioneer Std. Elctrns. 313-525-1800
MI Livonia, RS Elctrns. 313-525-1155
MI Livonia, Schweber Elctrns. 313-525-8100
MI Roseville, RS Elctrns. 313-779-2450
MI Wyandotte, RS Elctrns. 313-AV2-5880
MN Bloomington, Hall-Mark Elctrns. 612-854-3223
MN Eden Prairie, Schweber Elctrns. 612-941-5280
MN Edina, Schweber Elctrns. 612-941-5280
MN Minneapolis, Newark Elctrns. 612-331-6350
MN Minnetonka, Hamilton/Avnet 612-932-0600
MN Minnetonka, Pioneer Std. Elctrns. 612-935-5444
MO Earth City, Hamilton/Avnet 314-344-1200
MO Earth City, Schweber Elctrns. 314-739-0526
MO Maryland Hts, Hall-Mark Elctrns. 314-291-5350
NH Hudson, C&H Elctrns. 603-882-1133
NH Manchester, Schweber Elctrns. 603-625-2250
NJ Camden, General Radio 609-964-8560

NJ Cherry Hill, Hall-Mark Elctrns. 609-424-7300
NJ Cherry Hill, Hamilton/Avnet 609-424-0110
NJ Clifton, J-Mar Elctrns. 201-772-6400
NJ Fairfield, Hall-Mark Elctrns. 201-575-4415
NJ Fairfield, Hamilton/Avnet 201-575-3390
NJ Fairfield, Lionex 201-227-7960
NJ Fairfield, Schweber Elctrns. 201-227-7880
NJ Pine Brook, Pioneer Std. 201-227-1262
NM Albuquerque, Bell Inds. 505-292-2700
NM Albuquerque, Elctrn. Parts 505-293-6161
NM Albuquerque, Elctrn. Parts Co. 505-293-6161
NM Albuquerque, Hamilton/Avnet Elctrns. 505-765-1500
NM Las Cruces, Elctrn. Parts Co. 505-523-4578
NY Bohemia, TTI 516-567-1500
NY Buffalo, Summit Distrs. 716-884-3450
NY E. Syracuse, Hamilton/Avnet 315-437-2647
NY Fairport, Pioneer-Harvey 716-381-7070
NY Hauppauge, Hamilton/Avnet 516-231-9800
NY Hauppauge, Lionex 516-273-1660
NY Hauppauge, Mast Distrs. 516-273-4422
NY Hauppauge, Pioneer-Harvey 516-231-9200
NY Melville, Hamilton/Avnet 516-454-6000
NY Rochester, Hamilton/Avnet Elctrns. ... 716-475-9130
NY Rochester, Schweber Elctrns. 716-424-2222
NY Rochester, Summit Distrs. 716-334-8110
NY Ronkonkoma, Hall-Mark Elctrns. 516-737-0600
NY Vestal, Pioneer Std. 607-748-8211
NY Westbury, Schweber Elctrns. 516-334-7474
NC Charlotte, Pioneer/Washington 704-527-8188
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Raleigh, Hall-Mark Elctrns. 919-872-6286
NC Raleigh, Hall-Mark Elctrns. 919-872-0712
NC Raleigh, Hamilton/Avnet 919-878-0819
NC Raleigh, Schweber Elctrns. 919-876-0000
OH Beachwood, Schweber Elctrns. 216-464-2970
OH Cincinnati, Hall-Mark Elctrns. 513-563-5980
OH Cincinnati, Hughes-Peters 513-351-2000
OH Cleveland, CAM/Ohio 216-461-4700
OH Cleveland, Hamilton/Avnet 216-831-3500
OH Cleveland, Pioneer Std. 216-587-3600
OH Columbus, Graham Elctrns. 614-895-1590
OH Columbus, Hughes-Peters 614-294-5351
OH Dayton, Bell Inds. 513-434-8213
OH Dayton, Hamilton/Avnet 513-433-0610
OH Dayton, Pioneer Std. 513-236-9900
OH Dayton, Schweber Elctrns. 513-439-1800
OH Maumee, RS Elctrns. 419-893-0721
OH Solon, Hall-Mark Elctrns. 216-349-4632
OH Westerville, Hall-Mark Elctrns. 614-891-4555
OK Tulsa, Hall-Mark Elctrns. 918-665-3200
OK Tulsa, Schweber Elctrns. 918-622-8000
OR Beaverton, Acacia Sls. 503-646-3377
OR Beaverton, Almac Elctrns. 503-641-9070
OR Lake Oswego, Bell Inds. 503-241-4115
OR Lake Oswego, Hamilton/Avnet Elctrns. 503-635-8831
PA Horsham, Lionex Corp. 215-443-5150
PA Horsham, Pioneer/Washington 215-674-4000
PA Horsham, Schweber Elctrns. 215-441-0600
PA Lancaster, CAM/RPC 717-392-8141
PA Philadelphia, Almo Elctrns. Corp. 215-698-4000
PA Pittsburgh, Almo Elctrns. Corp. 412-931-5990
PA Pittsburgh, CAM/RCP 412-782-3770
PA Pittsburgh, Pioneer Std. Elctrns. 412-782-2300
PA Pittsburgh, Schweber Elctrns. 412-782-1600
SC Greenville, Hammond Elctrns. 803-233-4121
TN Nashville, Graham Elctrns. 615-242-2682
TX Austin, Hall-Mark Elctrns. 512-258-8848
TX Austin, Hamilton/Avnet 512-837-8911
TX Austin, Harrison Equip. Co. 512-458-3555
TX Austin, Pioneer Std. Elctrns. 512-835-4000
TX Austin, Schweber Elctrns. 512-458-8253
TX Dallas, Hall-Mark Elctrns. 214-343-5000
TX Dallas, Hall-Mark Elctrns. 214-341-1147
TX Dallas, Harrison Equip. Co. 214-239-2750
TX Dallas, Pioneer Std. Elctrns. 214-386-7300
TX Dallas, Schweber Elctrns. 214-661-5010
TX El Paso, Ideal Indl. Elctrn. Supp. 915-779-6647
TX Fort Worth, TTI 214-429-1440
TX Houston, Hall-Mark Elctrns. 713-781-6100
TX Houston, Hamilton/Avnet 713-975-3501
TX Houston, Harrison Equip. Co. 713-879-2600
TX Houston, Pioneer Std. 713-988-5555
TX Houston, Pioneer Std. Elctrns. 214-386-7300
TX Houston, Schweber Elctrns. 713-784-3600
TX Irving, Hamilton/Avnet 214-659-4100
TX Stafford, Harrison Equip. 713-879-2600
UT Salt Lake City, Bell Inds. 801-972-6969
UT Salt Lake City, Hamilton/Avnet 801-972-2800
WA Bellevue, Almac Elctrns. 206-643-9992
WA Bellevue, Bell Inds. 206-747-1515
WA Bellevue, Hamilton/Avnet 206-643-3950
WI Brookfield, Schweber Elctrns. 414-784-9020
WI Mequon, Taylor Elec. 414-241-4321
WI Milwaukee, Electronic Expd. 414-228-8100
WI New Berlin, Hamilton/Avnet 414-784-4510
WI Oak Creek, Hall-Mark Elctrns. 414-761-3000
WI Waukesha, Bell Inds. 414-547-8879

BOURNS INSTRS., INC., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506, Tel: 714-781-5433; *Sls. Mgr.:* Ken Pinkham; *Dist. Mgr.:* Ken Pinkham

BOURNS INSTRS., INC., Industrial Div., 1960 Chicago Ave., Unit F, Riverside, CA 92503, Tel: 714-781-5147, Telex: 676401, TWX: 910-332-1281; *Sls. Mgr.:* Tom McCarthy

BOURNS MAGNETIC DIV., Technical Products Group, Box 1398, Romoland, CA 92380, Tel: 714-657-5195, TWX: 910-332-1304; Empl.: 120; *Sls. Mgr.:* Dennis Dalbeck

BOWMAN INDUSTRIES, 9300 Hall Rd., Downey, CA 90241

Bowmar

BOWMAR/ALI, Bowmar Instr. Corp., 531 Main St., Acton, MA 01720, Tel: 617-263-8365, TWX: 710-347-1441; Empl.: 175; *Sls. Mgr.:* Allen Warner ..... **D•1331-1333**

Local Sales Offices & Reps

CA LaCanada, Brooks-Moore & Assocs. .. 818-790-8358
CA Orange, Brooks-Moore & Assocs. 714-771-1220
CA Palo Alto, Mollard Mktg. 415-961-0456
CA Santa Ana, Brooks-Moore & Assocs. .. 714-544-8900
CT Madison, Eastronix, Inc. 203-421-4514
IL Des Plaines, Lincoln, Hodges & Assocs. 312-297-3810
KS Overland Park, Barry Sls. 913-642-0270
LA Baton Rouge, Mid-South Sls. 504-924-0106
LA Lafayette, Mid-South Sls. 318-233-2546
LA Lake Charles, Mid-South Sls. 318-433-0356
LA Slidell, Mid-South Sls. 504-641-7480
ME Camden, Bernard Sullivan Assocs. 207-236-8394
MD Columbia, Tyler Griffin Co. 301-995-1215
MA Bedford, Eastronix, Inc 617-275-5775
MI Farmington, Amtech Reps. 313-474-8300
MN Minneapolis, Waltham Sls. Co. 612-781-2778
MO St. Louis, Barry Sls. 314-821-2525
NJ Plainfield, Cosine, Inc. 201-654-3551
NY Clarence, Trott Elctrns. 716-634-8500
NY Pittsford, Trott Elctrns. 716-586-8251
OH Cuyanoga Falls, J. C. Hofstetter Co. ... 216-929-8009
OH Dayton, J. C. Hofstetter Co. 513-296-1010
OH Medina, J. C. Hofstetter Co. 216-241-4880
OR Portland, Frank Jackson Assocs. 503-292-2638
PA Hickory, J. C. Hofstetter Co. 412-356-2305
PA Paoli, Tyler Griffin Co. 215-647-1550
TX Carrollton, Seaton Corp. 214-380-0414
UT Salt Lake City, Measurement Consits. 801-364-3174
VT Shelburne, Eastronix, Inc. 802-985-3743
WA Redmond, Frank Jackson Assocs. 206-881-7277
WI Waukesha, Lincoln, Hodges & Assocs. 414-542-3087

Local Distributors

AZ Phoenix, Metermaster 602-437-1425
CA Los Angeles, E. I. L. 213-685-7020
CA Palo Alto, Metermaster 415-968-0313
CA Ridgecrest, E. I. L. 619-375-5550
CA San Diego, Metermaster 619-560-4841
CA Santa Clara, E. I. L. 408-727-0396
CO Denver, E. I. L. 303-534-4160
CT Middletown, E. I. L. 203-346-6646
FL Palm Bay, E. I. L. 305-725-8300
GA Atlanta, Horton Instr. Co. 404-231-3131
GA Norcross, Metermaster 404-446-0166
IL Bridgeview, E. I. L. 312-430-2292
IL Chicago, DALEC 312-283-0300
IL Elk Grove Village, Metermaster 812-593-8650
IL Itasca, Metermaster 312-250-0606
IN Indianapolis, E. I. L. 317-545-1373
KY Louisville, E. I. L. 502-454-3420
LA Slidell, Mid-South Sls. Co., Inc. 504-641-7480
MD Sparks, E. I. L. 301-771-4800
MA Billerica, Metermaster 617-523-2580
MA Burlington, E. I. L. 617-272-9450
MN Minneapolis, Process Meas. Co. 612-544-4035
NJ North Caldwell, Hosica Labs. 201-256-7724
NJ Pennsauken, E. I. L. 609-488-0474
NJ Plainfield, Integral Control Sys. Corp. .. 201-561-2323
NY Hauppauge, E. I. L. 516-231-6333
NY Rochester, E. I. L. 716-442-2430
NC Charlotte, Trott Elctrns., Inc. 704-376-2237
OH Cleveland, Metermaster 216-651-4100
OH Dayton, E. I. L. 513-435-2134
OR Portland, Westcon, Inc. 503-283-0132
PA Philadelphia, Electric Tachometer Corp. 215-726-7723
PA Pittsburgh, E. I. L. 412-731-5230
TX Dallas, E. I. L. 214-931-1236
TX Garland, Metermaster 214-271-5671
TX Houston, E. I. L. 713-271-3100
TX Houston, Quality Instr. Lab., Inc. 713-524-0528
VA Alexandria, E. I. L. 703-354-4330
VA Virginia Beach, E. I. L. 804-499-3746
WA Seattle, E. I. L. 206-762-0880
Can Longueuil, Que., E. I. L. 514-651-4844
Can Mississauga, Tor., E. I. L. 416-624-6660
Can Woodbridge, Ont., R. H. Nichols Co., Ltd. 416-851-8871

Bowmar

BOWMAR INSTRUMENT CORP., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, Tel: 219-747-3121, TWX: 810-332-1510; FSC No.: 99479; Empl.: 215; *Sls. Mgr.:* Herb Black ..... **B•1707**

Local Sales Offices & Reps

CA Uplander Way, Westaironics, Inc. 213-641-4122
CO Castle Rock, Romulus Elctrns., Ltd. ... 303-688-5127
CT Haver Hill, LK Assocs. 617-373-1313
CT Lee, LK Assocs. 413-243-1158
FL Melbourne, Saber Assocs. 305-724-0920
GA Smyrna, Spartech 404-446-7300
IL Rolling Meadows, KMA Sls. Co. 312-398-5300
IA Cedar Rapids, Ard Sls. Inc. 319-393-6392
MN Bloomington, Electronic Sls. Agy. 612-884-8291
MO St. Louis, Abrams Assocs. 314-569-0447
NJ Matawan, Bowmar Instr. Corp. 201-526-0400
NY Syracuse, Fountain Young Co., Inc. ... 315-437-7733
OH Dayton, Raystan Controls 513-278-3559
TX Addison, Robert R. Thomas Co. 214-233-8235
WI Milwaukee, JM Sls. Co. 414-546-0040
Can Ottawa Ont., Subtec, Ltd. 613-738-1470

BOWMAR INSTRUMENT CORP., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520, Tel: 813-576-2525, TWX: 810-863-0375; Empl.: 127; *Sls. Mgr.:* Walt Kunz

BOWMAR/TIC, INC., 850 Lawrence Dr., Newbury Park, CA 91320, Tel: 805-498-2161, TWX: 910-336-1265; FSC No.: 99957; Empl.: 100; *Sls. Mgr.:* Reece Kendall

BOW SOLDER PRODS., 900 Hobson St., Union, NJ 07083, Tel: 201-686-6040, 800-526-4496; Empl.: 38; *Sls. Mgr.:* J. Moran

BRADY CO., 574A Somerset St., N. Plainfield, NJ 07060, Tel: 201-753-7988; *Sls. Mgr.:* Ed Brady; *Dist. Mgr.:* John Blaze

BRADY, W.H., CO., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201, Tel: 414-332-8100, Telex: 26-677; *Sls. Mgr.:* David D. Tatham

BRADY, W. H., CO., Indl. Prods. Div., 2221 W. Camden Rd., Milwaukee, WI 53201, Tel: 414-351-6630, Telex: 26-677, TWX: 910-262-3151; *Sls. Mgr.:* G. W. Gyllstrom; *Dist. Mgr.:* G. W. Gyllstrom

BRADY, W.H., CO. NAMEPLATE DIV., See Brady, W.H., Co., Elctrn. Prods. Div

BRADY, W. H., CO., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201, Tel: 414-355-8300, Telex: 26-677, TWX: 910-262-3151; FSC No.: 85480; *Sls. Mgr.:* G. R. Manich; *Dist. Mgr.:* G. R. Manich

BRAEMAR CORP., 11400 Rupp Drive, Burnsville, MN 55337, Tel: 612-890-5135; Empl.: 130; *Sls. Mgr.:* P. L. Musgrove

BRAILSFORD & CO., 670 Milton Rd., Rye, NY 10580, Tel: 914-967-1820; Empl.: 25

BRAND DIELECTRICS, INC., Route 203, N. Windham, CT 06256, Tel: 203-423-6321; Empl.: 5; *Sls. Mgr.:* Philip Harvey

BRANDEN, T. G., CORP., 5565 S.E. Intl. Way, Portland, OR 97222, Tel: 503-659-9366; Empl.: 8; *Sls. Mgr.:* Ted Brandt

BRAND-REX, Electronic & Indl. Cable Div., Box 498, Willimantic, CT 06226, Tel: 203-456-8000, TWX: 710-440-2247; FSC No.: 71124; Empl.: 1000; *Sls. Mgr.:* J. F. Cichy

Local Sales Offices & Reps

CA Laguna Hills, Brand-Rex 714-835-0802
CA San Jose, Brand-Rex 408-247-9811
CO Boulder, Component Prod. Sls., Inc. ... 303-530-2800
CT Manchester, Manu-Rep, Inc. 203-646-6064
FL Maitland, E.I.R., Inc. 305-660-9600
IN Indianapolis, Insulation Reps. 317-251-1994
MD Hanover, J. A. Maguire & Co. 301-796-0970
MA Clinton, CWS, Inc. 617-368-8753
MI Albuquerque, Power Entprs., Ltd. 505-298-1918
MI Farmington Hills, Joseph H. Clark Sls. Co. 313-553-0610
MN Edina, Grayden & Flemmer 612-941-1120
MO Chesterfield, Durnin & Assocs. 314-532-9774
NJ Dunellen, J. A. Maguire & Co. 201-752-8480
NJ Pennsauken, J. A. Maguire & Co. 609-665-5136
NY Pittsford, Kirby Mktg. 716-248-8750
OH Chagrin Falls, Joseph H. Clark Sls. 216-247-7848
OR Beaverton, Barrett, Squibb & Assocs. 503-642-1661
SC Greenwood, Bamco 803-229-6801
TN Knoxville, Insul-Reps 615-691-7586
TX Richardson, C. J. Tellier Co. 214-231-6348
VA Portsmouth, J. A. Maguire & Co. 804-398-0202
WA Redmond, Eclipse Mktg. Grp. 206-885-6991

Local Distributors

AZ Tucson, A.E. Petsche Co., Inc. 602-746-3128
CA Carson, A. E. Petsche Co., Inc. 213-639-9500
CA Inglewood, Storm Prods. 213-649-6141
CA Santa Clara, Storm Prods. 408-749-9400
CA Torrance, Blake Wire & Cable 213-515-0561
CO Broomfield, Storm Prods. 303-466-1991
FL Ft. Lauderdale, K.S.M. Elctrns. 305-971-5900
FL Orlando, Cablematics/Action Wire 305-293-1618
GA Norcross, A. E. Petsche Co., Inc. 404-441-1709
IL Addison, K.S.M. Elctrns. 312-953-9473
IL Rosemont, Dearborn Wire & Cable ... 312-696-1000
KS Wichita, A.E. Petsche Co., Inc. 316-943-9358
MA Woburn, Pacer Elctrns. 617-935-8330
MN Minneapolis, Bergquist Co. 612-835-2322
NH Amherst, North Country Wire Supp. ... 603-889-0063
NY Endicott, Rogan Elctrns. 607-754-3590
NY Fairport, Pacer Elctrns. 716-377-0462
NY Farmingdale, Vertx Elctrns. 516-293-9880
NY Farmingdale, Weico Elctrns. 516-293-0050
NY Hauppauge, Wintronics, Inc. 516-234-8040
NY Johnson City, Help Elctrns. 607-729-3528
OR Beaverton, Murphy Elctrns. 215-534-3900
PA Folcroft, Delphi Elctrns. 215-534-3900
TX Dallas, Storm Prods. 214-330-1381
TX Garland, Southwest Cable 214-494-4009
TX Houston, A.E. Petsche Co., Inc. 713-641-3386
WA Redmond, Murphy Elctrns. 206-881-1234

BRANDT ELCTRNS., INC., 1220 Alderwood Ave., Sunnyvale, CA 94086, Tel: 408-734-8310, TWX: 910-339-9560; FSC No.: 57837; *Sls. Mgr.:* Frank D. Brandt

BRAXTON MFG., Echo Lake Rd. N., P.O. Box 429, Watertown, CT 06795, Tel: 203-274-6781, TWX: 710-477-0621; Empl.: 115; *Sls. Mgr.:* Mark W. Ritucci

BREEZE-ILLINOIS, TransTechnology Corp., 401 S. Main Street, P.O. Box 368, Wyoming, IL 61491, Tel: 309-695-2511, TWX: 510-390-3691; Empl.: 180; *Sls. Mgr.:* Patrick Banakis ..... **C•1171, 1790-1792**

Local Sales Offices & Reps

CA Woodland Hills, Cal Ward Sls. 213-883-2202
CO Longmont, Todd & Fry Assocs. 303-776-7331
FL St. Petersburg, Tech. Reps. Assocs. ... 813-577-2779
IL Berkeley, Cadre Tech. Rep., Inc. 312-449-3900
KS Desoto, Midtec Assocs., Inc. 913-441-6565
MI Madison Heights, Pine Sls., Inc. 313-589-0350
MN Bloomington, Merrill Franklin 612-854-9446
NY Great Neck, Trionic Assocs. 516-466-2300
OH Chagrin Falls, Pine Sls., Inc. 216-247-6198
PA Pittsburgh, Pine Sls., Inc. 412-456-7471
TX Bedford, DeArmond Entprs. 817-267-2048
WA Bellevue, Lehr Assocs. 206-453-9993

BRELONIX, 106 No. 36th St., Seattle, WA 98103, Tel: 206-633-1964; Empl.: 10; *Sls. Mgr.:* A. L. DeVore

BREN-TRONICS, INC., 10 Brayton Ct., Commack, NY 11725, Tel: 516-499-5155, Telex: 22-1213 TTCUR; FSC No.: 51828; Empl.: 75; *Sls. Mgr.:* R. Mainzer

BREVEL MOTORS, INC., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072, Tel: 201-933-0220; *Sls. Mgr.:* Jack Dominice ..... **B•1141**

Local Sales Offices & Reps

AR El Dorado, Industrial Control Assocs. 501-862-2051
CA Los Angeles, Electric Motor Engrg. 213-469-7393
CT Old Saybrook, M. L. Assocs. 203-388-9718
FL Altamonte Springs, Machine Controls 305-788-6607
IL Chicago, Jerry Golten Co. 312-792-1991
KS Prairie Village, Darco Sls. 913-381-7913
MA Ashland, M. L. Assocs. 617-485-6190
MN St. Paul, Vikeland Sls. 612-645-4647
NJ Teaneck, Herbert Rude & Assocs. 201-836-6778
NY Penfield, Upstate Comps. 716-381-6070
NC Raleigh, Leigh Sls. 919-872-1484
OH Bucyrus, Sissler & Assocs. 419-562-9311
OH Columbus, Sissler & Assocs. 614-488-4455
PA Exton, Kiley Elec. Co. 215-363-8550
TN Cleveland, Hicks Sls. 615-472-7398

Local Distributors

AZ Phoenix, Johnstone 602-269-9354
CA Baldwin Park, Johnstone 213-962-7138
CA Los Angeles, Minarik 213-624-3161
CO Denver, Johnstone 303-573-5626
CT New Haven, Star Supp. Co. 203-772-2240
FL Ft. Lauderdale, Johnstone 305-971-9350
GA Norcross, Johnstone 404-446-0400
ID Boise, Johnstone 208-377-1600
IL Chicago, Harry Alter 312-376-3505
KS Wichita, Johnstone 316-267-3629
LA New Orleans, Harry Alter Co. 504-488-4435
MD Rockville, Johnstone 301-251-0281
MA Medford, Empire 617-395-5000
MI Farmington Hills, Universal Elec. Prod. 313-476-9500
MO Kansas City, Johnstone Corp. 816-842-3250
MT Billings, Johnstone Corp. 406-252-1207
NE Omaha, Johnstone Corp. 402-339-2342
NV Sparks, Johnstone Corp. 702-356-6668
NJ Cherry Hill, Motor and Control Sys. ... 609-424-5810
NJ Gafield, The Harry Alter Co. 201-478-0455
NY Manhattan, The Harry Alter Co. 212-255-5300
OH Cleveland, Reserve Elec. 216-771-5764
OK Oklahoma City, Johnstone Corp. 405-232-8576
OR Portland, Johnstone Corp. 503-233-1151

BREW, RICHARD D., & CO., INC., 90 Airport Rd., Concord, NH 03301, Tel: 603-225-6605, Telex: 943-483; FSC No.: 98913; Empl.: 43

BRIAN INSTRUMENTS, INC., 626 S. State College Blvd., Fullerton, CA 92631, Tel: 714-992-5540, TWX: 910-350-7019; Empl.: 30; *Sls. Mgr.:* E. 'Chuck' Ouellette; *Dist. Mgr.:* Barbara M. Semain

BRIDGE COMPUTER CO., Sea Data Corp., 1 Bridge St., Newton, MA 02158, Tel: 617-244-8190, Telex: 951107; *Sls. Mgr.:* Elaine Doll

BRIGGS, C. A., CO., P.O. Box 151, Glenside, PA 19038, Tel: 215-885-2244, Telex: 83-4753; Empl.: 10; *Sls. Mgr.:* C. A. Briggs, Jr.

BRIM ELCTRNS., 120E Home Pl., Lodi, NJ 07644, Tel: 201-796-2886; FSC No.: 57834 ..... **C•1793-1800**

Local Sales Offices & Reps

FL De Bary, DJE Assocs. 305-668-6827
FL Enterprise, DJE Assocs., Inc. 305-321-6623
MA Millis, R G Assocs. 617-376-2044
MA Stow, R G Assocs. 617-897-7146
EXP NY, N.Y.C., Roburn Agencies 212-989-5939

Local Distributors

AL Dothan, Carmichael Whls. Supp. 205-793-7066
CA Canoga Park, Tim-Co. Sls. 213-992-5040
CA San Diego, Shanks & Wright 619-239-0176
CT Manchester, IMS 203-649-4415
CT Waterbury, Suburban Supp. 203-757-1251
GA Marietta, Atlanta Elec. Wire & Cable ... 404-955-6800
LA New Orleans, Radio Parts 504-581-5959
MA Billerica, Eastern Video Sys. 617-667-0009
MA Lexington, Wholesale Elect. Supp. 617-862-3590
MA Springfield, Electro-Term 413-734-6469
MA Waltham, Linear Elect. 617-894-7300
MI Troy, Northern Wire & Cable 313-589-0510
NH Dover, American Radio Corp. 603-742-6800
NJ Hackensack, Milcor 201-489-1313
NY LIC, H.L. Dalis 212-361-1100
NY N.Y.C., Center Indl. 212-YU9-6363
OK Tulsa, Radio 918-587-9123
PA Philadelphia, Spectrum Elec. 215-748-3010
RI Newport, J & S Elctrn. Distb. 401-847-2977
TN Knoxville, Bondurant Bros. Co. 615-573-9151
TX Grand Prairie, Southwest Hardware & Fastever 214-264-4711
TX Texarkana, Lavender Elec. 501-773-4631
TX Texarkana, McCulloch Elctrns. 214-792-6923
VA Norfolk, Todd Elec. 804-855-3111
WA Seattle, Amateur Radio Supp. 206-767-3222

BRISTOL BABCOCK INC., 40 Bristol St., Waterbury, CT 06708, Tel: 203-575-3000, Telex: 962417, TWX: 203-754-1477; Empl.: 600; *Sls. Mgr.:* William H. Seeley

BRISTOL SAYBROOK, 97 Coulter St., Old Saybrook, CT 06475, Tel: 203-388-3414, Telex: 966-435; Empl.: 125; *Sls. Mgr.:* George S. Willis

Local Sales Offices & Reps

CA Alhambra, C.E. Mello Co. 818-282-2000
CT Old Saybrook, M-L Assoc. 203-388-9718
FL Largo, Kirk Sls, Inc. 813-595-7353

Local Distributors

AL Arab, Timer & Control Engr. Svc. 205-586-7671
CA Los Angeles, Minarik Electic Co. 213-624-3161
MA Somerville, Electro Sls. Co. 617-666-0500
NY Sodus, AED Distributors 315-483-6561

BROOKS INSTR. DIV., Emerson Elec. Co., 407 W. Vine St., Hatfield, PA 19440, Tel: 215-362-3500, Telex: 846-181; Empl.: 1500; *Sls. Mgr.:* William Weierbach

BROOKS MFG. CO., 2016/24 Amber St., Philadelphia, PA 19125, Tel: 215-425-3395, 800-523-0130; Empl.: 70; *Sls. Mgr.:* G. Brooks; *Dist. Mgr.:* G. Brooks

Local Sales Offices & Reps

CA Irvine, Mike Roth Sls. 714-850-1254
CA San Francisco, Maddox Sls. 415-647-5560
FL Miami, Roulson & Co. 305-666-4240
GA Atlanta, Dewitt Austin Co. 404-393-3519
IL Glenview, Reigel Assocs. 312-729-3824
MD Towson, Ernie Stefkovic Assocs. 301-321-6008
MI East Detroit, Jack M. Thorpe Co. 313-779-6363
NJ Cherry Hill, Ernie Stefkovic Assocs. ... 609-667-4066
NY New Hyde Park, Harris & Aldrich Sls. 516-488-2622
NC Charlotte, Dewitt Austin Co. 704-334-0174
OH Cincinnati, John O. Olsen Co. 513-574-7711

BROOKS MKTG. CORP., 3569 Bristol Pike Bldg. 2 Ste 102, Bensalem, PA 19020, Tel: 215-244-0264, 1-800-523-1551; Empl.: 90; *Sls. Mgr.:* Joseph E. Brooks

BROWN BOVERI ELEC., Norristown Rd., Spring House, PA 19477, Tel: 215-628-7400, TWX: 510-661-0168; Empl.: 3,500

BROWN BOVERI ELECTRIC, INC., 167 Overland Drive, P.O. Box 648, West Columbia, SC 29171, Tel: 803-796-9502

BRUEL & KJAER INSTRS. INC., 185 Forest St., Marlboro, MA 01752, Tel: 617-481-7000, TWX: 710-347-1187; FSC No.: 617-485-0519; Empl.: 40

Local Sales Offices & Reps

CA Anaheim, Bruel & Kjaer Instrs. 714-978-8066
CA Foster City, Bruel & Kjaer Instrs. 415-574-8155
IL Hoffman Estates, Bruel & Kjaer Instrs. 312-358-7582
MD Gaithersburg, Bruel & Kjaer Instrs. 301-948-0494
MA Marlborough, Bruel & Kjaer Instrs. ..... 617-481-7000, ext. 139
MI Livonia, Bruel & Kjaer Instrs. 313-522-8600
NJ West Caldwell, Bruel & Kjaer Instrs. ... 201-526-2284
TX Houston, Bruel & Kjaer Instrs. 713-645-0167
WA Seattle, Bruel & Kjaer Instrs. 206-625-1112

BRUSH MAGNETIC HEADS, Div. of Brush Ind., Inc., 3rd & Reagan Sts., P.O. Box 638, Sunbury, PA 17801-0638, Tel: 717-286-5611, 800-233-0362, TWX: 510-655-0222; FSC No.: 19418; Empl.: 80; *Sls. Mgr.:* D. Stephen Morrison

WESTINGHOUSE ELEC. CORP., Bryant Circuit Devices Div., 500 Sylvan Ave., Bridgeport, CT 06606, Tel: 203-334-5561, Telex: 643-817, TWX: 710-453-8709; Empl.: 1000; *Sls. Mgr.:* G. V. Curtin

BSR (USA) LTD, Route 303, Blauvelt, NY 10913

BTU ENGRG. CORP., Bruce Sys., Esquire Rd., N. Billerica, MA 01862, Tel: 617-667-4111, Telex: 94-7489; Empl.: 600; *Sls. Mgr.:* D. Barry

BUBBL-TEC, 6800 Sierra Ct., Dublin, CA 94566, Tel: 415-829-8705, TWX: 910-389-6890; Empl.: 19; *Sls. Mgr.:* T. J. Netoff

BUCHANAN, See Control Prods. Div., Amerace Corp.

BUCKBEE-MEARS CO., Nashua Div., 100 Northeastern Blvd., P.O. Box 888, Nashua, NH 03062, Tel: 603-883-5541, Telex: 94-0340; *Sls. Mgr.:* Randolph Roody

BUCKEYE STAMPING CO., 555 Marion Rd., Columbus, OH 43207, Tel: 614-445-8433; Empl.: 85; *Sls. Mgr.:* R. E. Osborne VP Mktg. ..... **C•1027**

Local Sales Offices & Reps
CA Pasadena, P. Nurches Co. 213-MU1-8957
CA Santa Clara, Engrg. Assocs. 408-988-5001
CO Denver, Moss Mktg. 303-455-7205
GA Atlanta, Par Assoc. 404-391-9117
IL Mt. Prospect, Robert Adams Sls. 312-297-8733
KS De Soto, Midtec Assoc. 913-441-6565
MA Belmont, Elctrn. Comps. & Svc. 617-484-8680
MN Minneapolis, A. J. Warner Co. 612-729-7371
NY Lynbrook, P. Saftler Assoc. 516-593-7880
OH Columbus, McFadden Sls. 614-459-1280
PA Paoli, T. Griffin Co. 215-647-1550
TX Dallas, Advance Tech. Sls. 214-340-1300
WA Mercer Island, Elctrns. Comp. Sls. 206-232-9301

Local Distributors
CA Los Angeles, Elect. Switches 213-664-1141
CA Redwood City, Hi-Cor 415-368-3849
GA Atlanta, Lakeland Engrg. Equip. 404-696-7334
MI Ann Arbor, Wedemeyer Elctrns. 313-665-8611
NY Hauppauge, Broadline Elctrn. Dist. 516-231-4100
TX El Paso, Ideal Indl. Elctrn. 915-779-6647
WA Redmond, Dorn Sls. Assocs. 206-885-1885
WA Seattle, Radar Elec. 206-282-2511

BUD INDS., INC., 4605 E. 355th St., Willoughby, OH 44094, Tel: 216-946-3200, Telex: 810-427-2604; FSC No.: 71218; Empl.: 200; *Sls. Mgr.:* A. N. Haas; *Dist. Mgr.:* B. K. Haas

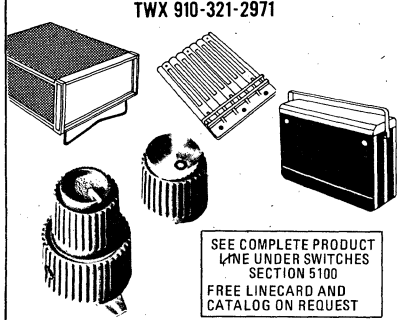
BUD RADIO, 4605 E. 355th St., Willoughby, OH 44094, Tel: 216-946-3200, TWX: 810-427-2604; Empl.: 200; *Sls. Mgr.:* A.N. Haas; *Dist. Mgr.:* Blair Haas

BUDWIG MFG., P.O. Box 829, Ramona, CA 92065-0829, Tel: 619-789-0900; Empl.: 7

BUEHLER PRODUCTS, INC., P. O. Box 33400, Raleigh, NC 27606, Tel: 919-469-8522, TWX: 510-924-2474; Empl.: 400; *Sls. Mgr.:* R. B. Davis ..... **B•1142**

BUGGIE H. H., See Caton Connector Corp.

BUGTRAP INSTRUMENTATION, 1209 Alderwood Avenue, Sunnyvale, CA 94089, Tel: 408-734-1118, TWX: 910-333-1168 BUGTRAPSUNNYVA; FSC No.: 5Z365; *Sls. Mgr.:* Jeff Liming

Buckeye
Stamping Co.
FULL LINE
AUTHORIZED DISTRIBUTOR
E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

BULBTRONICS®

BULBTRONICS, INC., 45 Banfi Plaza, Farmingdale, NY 11735, Tel: 516-249-2272; Empl.: 22; *Sls. Mgr.:* Elaine Grey; *Dist. Mgr.:* Diana Jacobson ..... **B•1021**

BULOVA SYS. & INSTR., Green Acres Rd., W., Valley Stream, NY 11582, Tel: 516-561-2600, TWX: 510-225-8709; Empl.: 850

BULOVA WATCH CO., See Frequency Control Prods., Inc., American Time Prods. Div.

BUMPER PRODUCTS CORP., 14 King St., P.O. Box 45, Mt. Holly, NJ 08060, Tel: 609-261-8100, 800-541-2500, Telex: 244437 ACTP-UR; *Sls. Mgr.:* Ed Rosenthal ..... **C•1694**

Local Distributors
CA Covina, Arow Fasteners 818-967-6335
CA Hayward, Arow Fasteners 800-227-2901
CA San Leandro, Boyd Corp. 415-278-8000
CA Santa Clara, San Jose Screw Prods. .. 408-988-3771
CA Temple City, Fastening Systems 818-579-4600
FL Tampa, Spencer Prods. 813-877-8276
GA Atlanta, Georgia Rubber & Supply 404-355-0830
IL Schaumburg, Engineered Fastener Co. 312-980-4082
IN Ft. Wayne, Spencer Prods. 219-482-4882
MA South Boston, Accurate Fasteners 617-268-8300
MI Detroit, Tri-West Prods. 313-273-0400
MO St. Louis, Engineered Fastener Co. 314-434-2888
NY Buffalo, J.M. Cranz 716-832-3300
NY Mt. Vernon, S.D. Christie Co. 914-699-7223
OH Bedford, Spencer Prods. 216-475-8700
OH Cincinnati, Spencer Prods. 513-771-6821
PA Southampton, M & C Specialties 215-322-1600
TX Dallas, Wilshire Foam Prods. 214-869-1727
TX Ft. Worth, Cut-Craft 817-737-8207
WA Spokane, Boyd Corp. 509-928-7200
WI Brookfield, Cable Comps. 414-785-1060
Can Quebec, Simfer Indl. Prod. 515-354-0886

BUNKER RAMO, see Amphenol, An Allied Co.

BUNTING MAGNETICS, 500 So. Spencer Rd., Newton, KS 67114, Tel: 316-284-2020; Empl.: 100; *Sls. Mgr.:* Robert J. Bunting

BUREAU OF ENGRAVING, INC., Ind'l. Div., 3311 Broadway N.E., Minneapolis, MN 55413, Tel: 612-623-0900, TWX: 910-576-2733; Empl.: 750; *Sls. Mgr.:* Darrell Chayer

BURGESS SWITCH CO., INC., 638 Anthony Trail, North Brook, IL 60062, Tel: 312-291-1760, Telex: 206774; FSC No.: 6U850; *Sls. Mgr.:* Robin Dick; *Dist. Mgr.:* Robin Dick ..... **B•1510-1512**

Local Sales Offices & Reps
CA Mountain View, Westech Sls. 415-961-1422
CA Tustin, Sierra Pacific Engrg. 714-731-3411
FL Casselberry, SEMI 305-831-2822
FL Ft. Lauderdale, SEMI 305-475-3686
GA Atlanta, Murphy and Cota 404-875-2525
IL Des Plaines, Lincoln, Hodges and Assocs. 312-297-3810
KS Mission, Mertens Co. 913-432-9323
MA Cambridge, R.J.C. Assocs. 617-492-5858
MI Ferndale, Hilltronics 313-398-5556
MN St. Paul, Kencotronics 612-645-7717
MO St. Louis, Mertens Co. 314-993-6600
NJ Palisades Park, A. P. Technical Sls. ... 201-461-8875
NY Albany, Niagara Elec. Sls. 518-869-0130
NY Buffalo, Niagara Elec. Sls. 716-886-4000
NY East Syracuse, Niagara Elec. Sls. 315-437-1656
NY Rochester, Niagara Elec. Sls. 716-271-1223
NC Burlington, Murphy & Cota 919-584-6450
OH Cincinnati, Anderson-Bolds, Inc. 513-528-5680
OH Cleveland, Anderson-Bolds, Inc. 216-229-4700
OH Worthington, Anderson-Bolds Inc. 614-885-3933
PA Philadelphia, Kenneth B. Erdman, Co. 215-224-1833
TX Dallas, William Reese Assocs. 214-351-0703
TX Houston, William Reese Assocs. 713-463-1453
WA Seattle, Anthem Corp. 206-824-3399
WI Janesville, Antek Mktg. Corp. 608-754-4214
WI Waukesha, Lincoln, Hodges and Assocs. 414-542-3087

Local Distributors
AL Muscle Shoals, Jones Elctrns., Inc. 205-383-1241
CA Burlingame, Elec. Control Devices 415-348-0791
CA Redondo Beach, Elctrl. Power & Controls 213-498-6699
FL Miami, B & R Elctrns. Supp. Inc. 305-255-4510
FL Miami, Electro-Standards Labs 305-593-6060
IL Chicago Heights, Helsel-Jepperson ... 312-756-5600
MA Fall River, Broadway Elec. Sls. 617-673-3339
MA Holyoke, Falcetti & Clark Elec. 413-532-9402
MA Springfield, Yankee Elec. 413-739-2101
MI Grand Rapids, S & F Elctrns. Supp. ... 616-459-0216
MI St. Clair Shores, Spemco 313-771-2700
MN Minneapolis, Elctrn. Center Inc. 612-371-5200
NH Manchester, Cohen Machinery Co. Inc. 603-624-4324
NJ Fairlawn, Relay Specialties 201-797-3313
NY Gloversville, Montano Elctrl. Supp. 518-725-3139
NY Woodside, Switches Unlimited 212-478-5000
NC Durham, Triangle Elec. Motor 919-596-1333
NC Gastonia, JMT Elctrns. & Control 704-867-4401
OH Cincinnati, Richards Elec. Supp. 513-242-8800
PA Harrisburg, Cumberland Elctrns. 717-233-5883
PA Philadelphia, Esco Elctrl. Supp. 215-923-6050
RI Providence, J & H Elec. Co., Inc. 401-421-7840
TX San Antonio, Sherman Elec. Supp. Inc. 512-224-1001
VA Roanoke, Peoples Elctrn. Supp. 703-342-8933

BURGESS SWITCH CO., LTD., 4800 Sheppard Ave. E, Unit 125, Scarborough M1S4N5; Empl.: 7; *Sls. Mgr.:* Richard Maxwell; *Dist. Mgr.:* Ewan Hannis

BURLEIGH INSTRS., Burleigh Pk., Fishers, NY 14453, Tel: 716-924-9355, Telex: 978379; Empl.: 50; *Sls. Mgr.:* Dr. Gary Forrest; *Dist. Mgr.:* Dr. Gary Forrest

BURLING INSTR., P.O. Box 298, Chatham, NJ 07928, Tel: 201-635-9481; Empl.: 29; *Sls. Mgr.:* Roger Nation

BURNDY/BERCO, 226 Brookside Road, Waterbury, CT, Tel: 203-574-4766

BURNDY CORPORATION, Richards Ave., Norwalk, CT 06852, Tel: 203-838-4444, TWX: 710-468-2546; Empl.: 3500; *Sls. Mgr.:* J. Bradley

BURR-BROWN CORP., P.O. Box 11400, Tucson, AZ 85734, Tel: 602-746-1111, Telex: 66-6491, TWX: 910-952-1111; Empl.: 1500; *Sls. Mgr.:* T.W. Fern

BURROUGHS CORP., Borroughs Place, Rm. 4C-51, Detroit, MI 48232, Tel: 313-972-7000, Telex: 164125; Empl.: 65,000

BURTON ELECTRICAL ENGINEERING, Wyle Laboratories, 111 Maryland Street, P.O. Box 217, El Segundo, CA 90245-0217, Tel: 213-772-1406, Telex: 858485, TWX: 910-348-6699; FSC No.: 81861; Empl.: 55; *Sls. Mgr.:* Howard Doty

BUSSCO INC., 119 Standard St., El Segundo, CA 90245, Tel: 213-322-6580, TWX: 910-348-6295; FSC No.: 29593; Empl.: 87

BUSSMANN DIV., P.O. Box 14460, St. Louis, MO 63178, Tel: 314-394-2877, Telex: 44 841; FSC No.: ;Multiple; Empl.: 3000; *Sls. Mgr.:* George Ockuly; *Dist. Mgr.:* George Ockuly

BYTEK COMPUTER SYSTEMS CORP., 1021 S. Rogers Circle, Boca Raton, FL 33431, Tel: 305-994-3520, Telex: 510-952-7637; Empl.: 15; *Sls. Mgr.:* Madeline Selwitz

Local Distributors
CA Costa Mesa, Tekcom 714-645-5263
CO Denver, Aurora Mktg. 303-758-3051
FL Miami Beach, Infotech Intl. 305-948-7951
MN Minneapolis, Amex Inc. 612-375-9191

BYTEX CORP., 2 California Ave., Framingham, MA 01701, Tel: 617-879-5050, Telex: 951151; Empl.: 80; *Sls. Mgr.:* Ralph W. Lowry

CABLE SYSTEMS, INC., 210 Broadway, Everett, MA 02149, Tel: 617-389-7080, TWX: 710-348-1760; FSC No.: 33426; Empl.: 175; *Sls. Mgr.:* A. Janelle

Local Sales Offices & Reps
AZ Tucson, Clemick-Neenan & Assocs. .. 910-495-1722
CA Santa Ana, Wyne Champa Assocs. ... 714-557-2959
CT Tolland, TMR Corp. 203-872-3624
MD Ellicott City, Marketing Technlg. 301-465-5944
MA Tewksbury, Sequel Assocs. 617-851-4010
NY Commack, MTR Technlg. 516-543-1200

CABLEWAVE SYSTEMS, INC., 718 North Colony Road, Wallingford, CT 06492, Tel: 203-265-6560

CABLEWAVE SYS., 60 Dodge Ave., North Haven, CT 06473, Tel: 203-239-3311, TWX: 710-465-0244; Empl.: 250; *Sls. Mgr.:* William Meola/Ed Hurley; *Dist. Mgr.:* Ed Hurley

CABLEX, INC., 14 Inverness Dr. E. H-136, Englewood, CO 80112, Tel: 303-792-5760; Empl.: 50; *Sls. Mgr.:* Reed C. Mulder; *Dist. Mgr.:* Reed C. Mulder

CABOT BERYLCO, Div. Cabot Corp., PO Box 1296, Reading, PA 19603, Tel: 215-921-5000, TWX: 510-651-0677; Empl.: 600; *Sls. Mgr.:* Thomas N. Marks

CABTRON SYS., INC., 200 N. Anets Dr., Northbrook, IL 60062, Tel: 312-498-6090; Empl.: 30; *Sls. Mgr.:* Mike Gober ..... **C•1029**

Local Sales Offices & Reps

AZ	Tempe, Sierra Tech. Grp.	602-894-2335
CA	San Jose, Warren Assoc.	408-988-7762
CO	Englewood, Sierra Tech. Grp.	303-741-0227
CT	Reading, Meco, Inc.	617-944-6660
MD	Silver Spring, Ansell Engrg.	301-949-1655
MA	Reading, Meco, Inc.	617-944-6660
MI	Livonia, H. Lowell Co.	313-464-2722
MN	St. Paul, Countryman Assocs.	612-645-9151
MO	Kansas City, Prod. Automation	816-737-3030
MO	St. Charles, Prod. Automation	314-441-6600
NJ	Mt. Lakes, N.J. Comps. for Elctrns.	201-334-2921
NM	Albuquerque, Sierra Tech. Grp.	505-294-8408
NY	Syracuse, Ossmann Instrs.	315-437-7052
OH	Cleveland, Geotronix	216-526-2535
OH	Columbus, Geotronix	614-457-8472
PA	Albrightville, Centurion Linear	717-722-0166
TX	Addison, Dunbar Assocs.	214-239-7151

CADDELL-BURNS MFG., 40 E. 2nd St., Mineola, NY 11501, Tel: 516-746-2310; Empl.: 30 ..... **A•1218-1229**

CADDELL COIL CORP., 35M Main St., Poultney, VT 05764, Tel: 802-287-4055, Telex: 752092; Empl.: 6; *Sls. Mgr.:* James Caddell

Local Sales Offices & Reps

FL	Sebastian, R.B. Caddell	305-562-4496

CADDOCK ELECTRONICS, INC., 1717 Chicago Ave., Riverside, CA 92507, Tel: 714-788-1700, TWX: 910-332-6108; FSC No.: 19647; Empl.: 300 ..... **A•1804-1827**

Local Sales Offices & Reps

OH	Cleveland, Arthur H. Baier Co.	216-461-6161
OH	Dayton, Arthur H. Baier Co.	513-276-4128
OR	Portland, Elctrn. Sources	503-684-0040
WA	Bellevue, Elctrn. Sources	206-451-3500

Local Distributors

TX	Houston, Lenert Co.	713-225-1465

CADILLAC PLASTIC & CHEM., 1221 Bowers St., P.O. Box P-2020, Birmingham, MI 48012, Tel: 313-646-5100, TWX: 810-232-1886; Empl.: 1000

CADNETIX CORPORATION, 5757 Central Ave., Boulder, CO 80301, Tel: 303-444-8075; Empl.: 150

CAELUS COMPUTER, Equipment & Supplies, P.O. Box 6297, San Jose, CA 95150, Tel: 408-729-1800; Empl.: 25; *Sls. Mgr.:* Elaine Green

CAERE CORP., 100 Cooper St., Los Gatos, CA 95030, Tel: 408-395-7000, Telex: 910-597-5391; Empl.: 60+; *Dist. Mgr.:* Terry Livermore

CAI, 550 W. Northwest Hwy., Barrington, IL 60010, Tel: 312-381-2400, Telex: 25-4268, TWX: 910-651-1904; Empl.: 650

CAIG LABS., 1175-0 Industrial Ave., Escondido, CA 92025, Tel: 619-743-7143; Empl.: 15

Local Distributors

CA	Glendale, Western Elctrn. Supp.	213-246-4861
DE	Wilmington, Wholesale Elctrn.	302-656-9988
IL	Champaign, Klaus Radio	309-691-4840
IL	Hillsdale, Complete Reading Elec.	312-547-5400
LA	Lafayette, Ralphs Elctrns. Supp.	318-233-0105
MI	Grand Rapids, Stotts-Friedman	616-459-0216
MO	Kansas City, Walters Radio Supp.	816-531-7015
NY	New York, Argil Elctrns.	212-691-8111
OH	Cleveland, Complete Reading Elec.	216-267-1000
TX	El Paso, Midland Specialty Co.	915-533-9555
VA	Norfolk, Priest Elctrns.	703-855-0105
VA	Norfolk, Radio Parts Distr. Co.	703-461-8095

CALABRO INDS., INC., See UNITRACK Div., Calabro Inds., Inc.

CALAY SYSTEMS, INC., 2698 White Road, Irvine, CA 92714, Tel: 714-863-1700, Telex: 6711321; Empl.: 44

CALCOMP, 2411 W. La Palma Ave., Anaheim, CA 92801, Tel: 714-821-2011, TWX: 910-591-1154; Empl.: 2100; *Sls. Mgr.:* James F. Waltz

CAL CONTROLS INC., 1155 Waukegan Rd., Glenview, IL 60025, Tel: 312-998-5720, Telex: 256293; *Sls. Mgr.:* Alan Bates

CAL COUNT, 5407 Port Royal Rd., Springfield, VA 22151, Tel: 703-321-9625, Telex: 440732, TWX: 440733; Empl.: 35

CAL CRYSTAL LAB., INC., 1142 N. Gilbert, Anaheim, CA 92801, Tel: 714-991-1580, 800-854-XTAL, TWX: 910-591-1892; *Sls. Mgr.:* Herb Plumhoff

Local Sales Offices & Reps

AZ	Scottsdale, Western High Tech. Mktg.	602-949-0873
CA	Arcadia, H.M.C. Inc.	818-447-0958
VA	Front Royal, Eltron Sls., LTD.	703-635-7201

Local Distributors

CA	Chatsworth, Passive Comp.	818-341-1745
CA	Mountain View, Target Elctrns.	415-961-1170

CALEX MFG. CO., INC., 3355 Vincent Rd., Pleasant Hill, CA 94523, Tel: 415-932-3911, Telex: 338 506; FSC No.: 29988; Empl.: 50; *Sls. Mgr.:* Steven M. Mathias ..... **D•1006, 1542-1545**

Local Sales Offices & Reps

AZ	Glendale, Adtek Inc.	602-931-9289
CA	Inglewood, Basic Sys.	213-673-4300
CA	San Diego, Basic Sys.	619-729-9641
CA	Santa Clara, Basic Sys.	408-727-1800
CT	Collinsville, Dynamic Sls.	203-693-6567
FL	Melbourne, Raycom, Inc.	305-259-7988
GA	Duluth, Raycom, Inc.	404-446-9015
MA	Burlington, Dynamic Sls.	617-272-5676
NY	White Plains, Cane Techn. Sls.	914-694-9240
OH	Chesterland, EQS	313-961-3042
TX	Garland, Carey, McMahill & Zerbe Co.	214-681-1414
TX	Houston, Carey, McMahill & Zerbe Co.	713-771-1500
WA	Bellevue, Topp Engrg. Sls. Co.	206-747-5401

Local Distributors

CA	Inglewood, Basic Sys.	213-673-4300
CA	Pleasant Hill, Calex Mfg. Co.	415-932-3911

CALIBRON INSTRS., Burton-Rogers Co., 220 Grove St., Waltham, MA 02154, Tel: 617-894-6440; Empl.: 14; *Dist. Mgr.:* W. Burton

CALIFORNIA AVIONICS LABS., Box 701, Palo Alto, CA 94302, Tel: 415-328-7999; Empl.: 5 ..... **D•1198**

CALIFORNIA COMPUTER SYSTEMS, 740 S. Milpitas Blvd., Milpitas, CA 95035, Tel: 408-945-0500, Telex: 171959; Empl.: 37; *Sls. Mgr.:* William Crane; *Dist. Mgr.:* William Crane

CA DC CALIFORNIA DC

CALIFORNIA DC, 2150 Anchor Ct., Newbury Park, CA 91320, Tel: 805-499-3621, 213-706-8221; Empl.: 100; *Sls. Mgr.:* Peter Gajewski ..... **D•1546**

Local Sales Offices & Reps

AZ	Phoenix, Relcom	602-893-1209
CA	Calabasas, Quadrep Cen.	818-887-3711
CA	Irvine, Quadrep S.	714-261-8141
CA	San Diego, Power Assocs.	619-275-0641
CA	San Jose, Quad Rep	408-946-4000
MA	Falmouth Heights, RJC Assocs.	617-366-0399
OR	Portland, Crown Elctrns.	503-620-8320
TX	Austin, Technlg. Sls.	214-346-9940
TX	Dallas, Technlg. Sls.	214-380-0200
TX	Houston, Technlg. Sls.	713-266-2473
WA	Bellevue, Crown Elctrns.	206-643-8100
Can	Don Mills, Ont., RD Assocs.	416-444-0959

Local Distributors

CA	South Gate, Cetec Elctrns.	213-773-6521

CALIFORNIA EASTERN LABS. INC., 3005 Democracy Way, Santa Clara, CA 95050, Tel: 408-988-3500, Telex: 346393, TWX: 171197; Empl.: 85; *Sls. Mgr.:* Jim McAuley; *Dist. Mgr.:* Jim McAuley

California INSTRUMENTS
Invertron® AC Power Equipment

CALIFORNIA INSTRUMENTS, A Div. of Amstar Tech. Prods. Co., Inc., 5150-Convoy St., San Diego, CA 92111, Tel: 619-279-8620, 800-356-2244, 800-821-1634, Telex: 695047 CALICO SDG; FSC No.: 16067; Empl.: 102; *Sls. Mgr.:* Don Chilcoat (East)/Don Flarich (West) ..... **D•1907**

Local Sales Offices & Reps

AZ	Phoenix, Aztec Ent., Inc.	602-944-9185
CA	Huntington Beach, Sci. Dvcs. West	714-840-3501
CA	Los Altos, Jay Stone Assocs.	415-948-4563
CO	Denver, Aztec Entprs.	303-779-5285
FL	Melbourne, Saber Assocs.	800-327-0853
IL	Chicago, EIA, Inc.	312-298-2290
IN	Indianapolis, EIA, Inc.	317-257-7231
KS	DeSoto, Midtec Assocs.	913-441-6565
LA	Baton Rouge, SESCO	510-993-3103
MA	Waltham, McBar Assocs.	617-890-0233
MN	Minneapolis, Prairie Assocs.	612-559-7550
MO	Florissant, Midtec Assocs.	314-837-5200
NJ	Teaneck, Sci. Dvcs. East, Inc.	201-837-1004
NM	Albuquerque, Aztec Entprs.	505-262-1688
NY	Fayetteville, Andrews Co.	315-637-3144
OH	Dayton, Hocker Assocs.	513-298-8638
OK	Tulsa, SESCO	918-622-3868
PA	Springhouse, Sci. Dvcs. East.	215-643-3335
TX	Austin, SESCO	512-892-2490
TX	Dallas, SESCO	214-231-9364
TX	Houston, SESCO	713-999-3510
UT	Ogden, Aztec Ent., Inc.	801-621-1655
VA	McLean, Creative Mktg. Assoc. Ltd.	703-442-9100
WA	Bellevue, Showalter Instrs., Inc.	206-746-7970
Can	Ottowa, Ont., A.I.M.	613-722-8286

CALIFORNIA MICRO DEVICES, INC., 215 Topaz Street, Milpitas, CA 95035, Tel: 408-263-3214

CALIFORNIA MICROWAVE, 990 Almanor Ave., Sunnyvale, CA 94086, Tel: 408-732-4000, Telex: 35 2016, TWX: 910-339-9231; Empl.: 1200

CALIFORNIA MINICOMPUTER SYS., 5534 Westlawn Ave., Los Angeles, CA 90066, Tel: 213-640-2930, TWX: 910-343-6489; Empl.: 50; *Dist. Mgr.:* R. D. Mowry

CALLYER INSULATED WIRE CO., 100 Higginson Ave., Lincoln, RI 02865, Tel: 401-723-7800

CALMARK CORPORATION

CALMARK CORP., 4915 Walnut Grove Ave., San Gabriel, CA 91776, Tel: 818-287-0451, TWX: 910-589-1540; FSC No.: 52094; Empl.: 70; *Sls. Mgr.:* R. L. Rosenthal; *Dist. Mgr.:* R. L. Rosenthal ..... **C•1030-1044**

Local Sales Offices & Reps

AL	Huntsville, Remco	205-533-3763
AZ	Tempe, Delta Elctrn. Sls.	602-224-1601
CA	San Diego, Noo Rep. Tech. Sls.	619-483-4861
CA	Santa Clara, Calmark Corp.	408-984-2618
CO	Denver, Spectrum Mktg.	303-480-9991
FL	Clearwater, WMM Assocs.	813-461-7074
GA	Atlanta, Remco	404-447-6937
IL	Elk Grove, Martec	312-956-8090
KS	DeSoto, Midtec Assocs.	913-441-6565
MA	Westboro, Tech. Mktg. Svcs. Co.	617-366-6655
MN	Minneapolis, Comps. Grp.	612-374-1250
MO	Florissant, Midtec Assocs.	314-837-5200
NH	Windham, Tech. Mktg. Svcs.	603-434-2716
NJ	Madison, Livera-Polk Assocs.	201-377-3220
NY	Cooperstown, Fitzelle Assocs.	607-547-9333

NY Glen Head, Livera-Polk Assocs. 516-759-9300
NC Raleigh, Remco 919-847-5079
OH Miamisburg, Electronics, Inc. 513-866-3340
OR Troutdale, Comtec 503-227-2111
PA Horsham, Dalbrook Corp. 215-441-8380
TX Richardson, Zonk Assocs. 214-238-7651
UT Ogden, Spectrum Mktg. 801-972-8552
WA Bellevue, Comtec 206-453-1188
EXP Cappoquin, Ireland, Calmark-Kileen, Ltd. .. 058-54205
EXP San Gabriel, CA, Calmark Corp. 213-287-0451

Local Distributors

AZ Phoenix, Aero-Space Computer Supps. 602-861-1785
AZ Phoenix, Scottsdale Tool & Supp. 602-273-7376
CA Anaheim, Henry Mann West 213-995-3900
CA Fremont, Terminal Sls. Corp. 415-656-7722
CA San Jose, Cypress Elctrns. 408-945-8400
CA Torrance, Cypress Elctrns. 213-533-6005
CO Denver, Solder Tec. 303-922-6214
FL Longwood, Intertec Comps. 305-834-7777
IL Elk Grove, Martec Assocs. 312-956-8090
MA Waltham, Etchomatic 617-893-2020
MA Westboro, TMSC Elctrn. Supp. 617-366-8462
MN Minneapolis, Aero-Space Computer Supp. 612-884-4725
NJ Collingswood, Index 609-429-4055
NJ Nutley, Nationwide Circuit Prods. 201-667-1333
NY Elmsford, Multimetrics Co. 914-347-3667
PA Huntingdon Valley, Henry Mann, Inc. .. 215-355-7200
TX Dallas, Cypress Elctrns. 214-869-1435
TX Richardson, Zec Sls. 214-238-7651
UT Salt Lake City, Solder Tec 801-974-0444
EXP Cappoquin, Ireland, Calmark-Kileen, Ltd. .. 058-54205
EXP CA, San Gabriel, Calmark Corp. 213-287-0451
EXP Osaka, Japan, Settsu Metal Inds. 06-992-2331
EXP Ramat-Gan, Israel, Shaham Elctrn. 03-700303
EXP Singapore, Singapore, Mazda Elctrn. 2987851

CAL-METEX CORP., See Shielding Techn.

CAL-POWER CORP., 140 Kansas St, El Segundo, CA 90245, Tel: 213-772-2171, TWX: 910-348-6678; Empl.: 30

CAL-R, INC.

CAL-R, INC., P.O. Box 1397, Santa Monica, CA 90406, Tel: 213-450-1761, TWX: 910-343-6966; FSC No.: 14193; Empl.: 130; *Sls. Mgr.:* J. F. Catrambone ..... **A•1829-1831; B•1745-1747**

Local Sales Offices & Reps

AZ Phoenix, Toward Engrg. Assocs. 602-277-1453
CA Cupertino, F & F Assocs. 408-446-2349
CA San Diego, Interstate Mktg. Assocs. ... 619-292-8117
CA Woodland Hills, Interstate Mktg. Assocs. 818-883-7606
IN Kokomo, Schillinger & Assocs. 317-452-4057
IN South Bend, Schillinger & Assocs. 219-291-6258
MN Minneapolis, Bill Deming & Assocs. ... 612-888-5000
NH Milford, D. A. Crowley & Assocs. 603-673-8274
PA Rydal, Espy Sls. 215-576-0780
EXP CA, Santa Monica, Trans-World Trade 213-472-0444

Local Distributors

CA Canoga Park, Timco Sls. 818-992-5040
CA Long Beach, El-Comp Sls. 213-421-7316
CA San Fernando, Petell Elctrns. 818-365-9841
CT Fairfield, Sound Elctrns. 203-254-2003
FL Tampa, Impala Elctrns. 813-885-4747
IN Indianapolis, Meunier Elctrns. Supp. ... 317-635-3511
MD Timonium, Sebra Elctrns. 800-638-1103
MI Grand Rapids, S. F. Elctrns. 616-459-0216
NJ East Hanover, State Elctrns. Parts Corp. 201-887-2550
NY Bohemia, Justin Elctrns. 516-589-4008
NY Hauppauge, Fairmont Elctrns. 516-231-3313
NY New York, Centaur Elctrns. 212-685-6984
NY Valley Stream, L & S Elctrns. 516-561-2474
EXP CA, Santa Monica, Cal-R, Inc. 213-450-1761

CAL-TEK ENGRG., 36 Riverside Drive, Kingston, MA 02364, Tel: 617-585-5666; Empl.: 5

CAMBION DIV., See Midland-Ross, Cambion Div.

CAMBRIDGE AERO INSTRUMENTS, INC., 6A Dunham Rd., Billerica, MA 01821, Tel: 617-275-0889, Telex: 948503; Empl.: 25 ..... **D•1116**

Local Sales Offices & Reps

AZ Fountain Hills, Halbar Assocs. 602-837-2464
CA Glendale, Halbar Assocs. 818-246-8263
CA San Mateo, Halbar Assocs. 415-349-4700
CO Denver, Comp. Technlg., Inc. 303-758-5750
CT Canton, Motoreps of New England 203-693-6366
MA Needham, Motoreps of New England 617-449-3252
MN St. Paul, Arkco, Inc. 612-777-7454
NJ Red Bank, Motoreps of New York 800-631-2138
OR Beverton, Halbar Assocs. 503-226-0451
WA Redmond, Halbar Assocs. 206-882-0990

CAMBRIDGE DIGITAL SYS., Compumart, P.O. Box 568, 65 Bent St., Cambridge, MA 02139, Tel: 617-491-2700, Telex: 92-1401 COMPUMART/CAM; *Sls. Mgr.:* James O. Tropp

CAMBRIDGE ELECTRONICS LABS, P. O. Box 205, Cambridge, MA 02140, Tel: 1-617-625-7654, Telex: 948580; *Sls. Mgr.:* Mrs. Charlotte Bissell

CAMBRIDGE FILTER CORP., P.O. Box 4906, Syracuse, NY 13221-4906, Tel: 315-457-1000, Telex: 322096; *Sls. Mgr.:* Sam Stenger

CAMBRIDGE PRODS., Tridex, 244 Woodland Ave., Bloomfield, CT 06002, Tel: 203-243-1761; Empl.: 32; *Sls. Mgr.:* A. Horowitz

CAMBRIDGE TECHNOLOGY, INC., 2464 Massachusetts Ave., Cambridge, MA 02140, Tel: 617-876-0891; *Sls. Mgr.:* Bruce Rohr

C.A.M. GRAPHICS CO., INC., 145 Toledo St., Farmingdale, NY 11735, Tel: 516-694-1315, TWX: 510-224-6181; FSC No.: 63203; *Sls. Mgr.:* Manny Cardinale

CANADIAN THERMOSTATS & CONTROL DEV. LTD., 8415 Mountian Sights, Montreal, PQ, Canada H4P2B8, Tel: 514-739-3274, Telex: 05-825619; Empl.: 15; *Sls. Mgr.:* R. Marquis

CANBERRA IND., One State St., Meriden, CT 06450, Tel: 203-238-2351, Telex: 643251, TWX: 710-461-0192; Empl.: 600; *Sls. Mgr.:* Peter Devecchis; *Dist. Mgr.:* Peter Devecchis

C&D POWER SYSTEMS, Allied Corp., 3043 Walton Rd., Plymouth Meeting, PA 19462, Tel: 215-828-9000; Empl.: 1500; *Sls. Mgr.:* L. D. Zachau

C&K

The Primary Source Worldwide...

C & K COMPONENTS, INC., 15 Riverdale Ave., Newton, MA 02158, Tel: 617-964-6400, Telex: 92-2544, TWX: 710-335-1163; FSC No.: 09353; Empl.: 600; *Sls. Mgr.:* P. Kincaid; *Dist. Mgr.:* R. Benshimol ..... **B•1513**

Local Sales Offices & Reps

AL Huntsville, Beacon Elctrns. 205-881-5031
AZ Scottsdale, Sls. Engrg. 602-994-3230
AR Little Rock, Beacon Elctrns. 501-224-5449
CA Los Altos, Ewing-Foley 415-941-4525
CA Los Angeles, Universal Comps. 213-641-4255
CO Boulder, Front Range Mktg. 303-443-4780
CT Glastonbury, Barton Assoc. 203-633-9417
FL Boca Raton, Beacon Elctrns. 305-392-3500
FL Clearwater, Beacon Elctrns. 813-796-2378
FL Maitland, Beacon Elctrns. 305-647-3498
FL Melbourne, Beacon Elctrns. 305-724-8010
GA Atlanta, Beacon Elctrns. 404-256-9640
IL Elk Grove Vlg., Control Sls. 312-595-2110
IN Carmel, Technlg. Mktg. Corp. 317-844-8462
IN Ft. Wayne, Technlg. Mktg. Corp. 219-432-5553
KY Louisville, Technlg. Mktg. Corp. 502-499-7808
MD Randallstown, Beacon North 703-591-1300
MA Ludlow, Gerber Sls. Corp. 413-589-9817
MA Newton Upper Falls, Gerber Sls. Corp. 617-969-2620
MI Brighton, AP Assocs. 313-229-6550
MN Minnetonka, Gibb Elctrns. 612-935-4600
MO Bridgeton, Dy-Tronix 314-291-4777
MO Independence, Dy-Tronix 816-373-6600
NJ W. Berlin, Quality Comps. 609-428-6266
NM Albuquerque, Reptronix 505-292-1718

CAL POWER CORPORATION

CUSTOM, HI-REL, MIL-SPEC POWER SUPPLIES

MIL: AIRBORNE MIL-E-5400
SHIPBOARD MIL-E-16400
GROUND MIL-E-4158

QUAL: MIL-Q-9858
MIL-I-45208A

REL: PER NAVMAT P4855-1
MIL HDBK 217

EMI: MIL-STD-461B

ENV: SHOCK, VIBRATION, ALTITUDE, HUMIDITY

ENCAPSULATED, ISOLATED, OPEN FRAME, PROGRAMABLE, TTL COMPATIBLE

STATE-OF-THE-ART SWITCH MODE TOPOLOGIES

140 KANSAS STREET, EL SEGUNDO, CA 90245
TEL: (213) 772-2171/322-5320 TWX 910-348-6678

NY Babylon, Astrorep 516-422-2500
NY Latham, L-Tron Corp. 518-785-5032
NC Raleigh, Beacon Elctrns. 919-787-0330
OH Beachwood, Thompson & Assocs. 216-831-6277
OH Dayton, Thompson & Assocs. 513-435-7733
OR Beaverton, LD Elctrns. 503-649-6177
TX Houston, R. F. Kimball Co. 713-890-8810
TX Richardson, R. F. Kimball Co. 214-231-3447
UT Salt Lake City, Front Range Mktg. 801-364-6481
VA Fairfax, Beacon North 703-591-1300
VA Forest, Beacon North 804-239-8486
WA Snohomish, LD Elctrns. 206-568-0511
WA Spokane, LD Elctrns. 509-922-4883
WI Thiensville, Control Sls. 414-242-4580

CANOGA DATA SYS., 6740 Eton Ave., Canoga Park, CA 91303, Tel: 213-888-2003, Telex: 182341

CANON U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, Tel: 516-488-6700, Telex: 96-1333; Empl.: 500; *Sls. Mgr.:* P. Specter ..... **B•1143**

Local Sales Offices & Reps

AL Birmingham, Motion Technlg. 404-972-4040
AZ Phoenix, Thor Engrg. 602-437-1463
AR El Dorado, Industrial Control Assocs. 501-863-2051
CA Los Angeles, Motion Dynamics 818-345-2127
CA San Jose, J.T. McFarland Assoc. 408-286-9333
CT Wolcott, Vanguard Elctrns. 203-879-9310
FL Orlando, Motion Technology 404-972-5050
GA Lilburn, Motion Techn. 404-972-5050
IL Elgin, JHS & Assocs. 312-741-9070
IL Glenview, JHS Assocs. 312-998-1960
IN Ft. Wayne, J&B Engrg. 219-483-2813
IN Indianapolis, J & B Engrg. 317-842-2681
MA Needham Hgts., Vanguard Elctrns. 617-449-5578
MI Farmington Hills, W. R. Hummon & Associates 313-474-0661
MN Minneapolis, Components Grp. 612-374-1250
NJ Wayne, SHL Assocs. 201-790-1714
NY E. Rochester, A & D Devices 716-385-2778
NY Sidney, A & D Devices 607-563-8488
NC Charlotte, Motion Technology 704-525-9855
OH Galion, Retronics 419-468-3253
OR Portland, Controltek 503-641-0877
PA Wayne, Technical Indl. Sls. 215-688-0220
TX Dallas, Blackburn Assocs. 214-692-8885
TX Houston, Blackburn Assocs. 713-463-1356
WA Spokane, Controltek 509-922-2971
WI Milwaukee, EMCO 414-242-0800

CANRAD-HANOVIA, 100 Chestnut St., Newark, NJ 07105, Tel: 201-589-4300, Telex: 13-8531; Empl.: 250; *Sls. Mgr.:* George Baer

Local Sales Offices & Reps

CA Anaheim, Lou Arti 714-385-1433
FL Winter Park, R. Evans 305-671-8716
IL Bloomingdale, Ron Searls 312-980-6391
KS Wichita, J. O'Reilly 316-744-0851
NJ Bridgewater, Semi-Matic Co. 201-231-0606
OH Cincinnati, G. Nichols 513-891-5104
TX Dallas, Charles Schleeweis 214-386-9747

CANSTAR COMMUNICATIONS, Canada Wire & Cable, Ltd., 1240 Ellesmere Rd., Scarborough, ON, Canada M1P2X4, Tel: 416-293-9722, Telex: 065-25403

CANYON ELCTRNS., 2001 W. North Lane, Phoenix, AZ 85021, Tel: 602-944-4421; *Sls. Mgr.:* George J. Mitlak ..... **B•1022**

CAPACITOR SPECIALIST, See CSI Capacitors

CAPACITOR TECHNOLOGY, INC., 5015 Speedway Dr., Ft. Wayne, IN 46825, Tel: 219-484-9054 .... **A•1012**

CAPAR COMPONENTS CORP., Div. of Diplomat Electronics, 25 Dubon Ct., Farmingdale, NY 11735, Tel: 516-454-6390, Telex: 221794 ..... **A•1013**

Local Sales Offices & Reps

AL Huntsville, South Eastern Mktg. 205-882-1633
CA Redwood City, & 415-368-3849
CA San Diego, Professional Sls. 619-578-8831
CA San Jose, Class One 408-297-8666
CA Santa Ana, Caper West 714-547-7034
CA Santa Ana, El Dorado Sls. 714-954-0285
CO Lakewood, Andale 303-693-4331
CT Woodbury, Lindco Assoc. Inc. 203-263-0629
FL Altamonte Springs, C-Assocs. 305-831-1717
GA Alpharetta, Futron, Inc. 404-587-3853
IL Wilmette, Wasserman Assocs. 312-256-3566
IN Indianapolis, Willson Technical Sls. ... 317-298-3345
IA Marion, M-S-B Assocs., Inc. 319-377-6261
KS Shawnee, M-S-B Assocs., Inc. 913-432-2131
MD Pillesville, Imagitron Sls. Co. 301-521-2020
MA Tyngsboro, Comptech, Inc. 617-649-3030
MN Minneapolis, DeBeck-Hays Assocs. ... 612-835-3610
MO St. Charles, M-S-B Assocs., Inc. 314-946-5577
NJ Fort Lee, Neeco 201-461-2789
NC Raliegh, Hi-Tech Assocs. 919-781-4139
TX Plano, B & R Electrnc. Sls. Corp. 214-985-0028
WA Redmond, Doran Sls. Assocs. 206-885-1885

Western states call Capar West at 714-547-7034 for distributor information. All other states call Capar East at 516-454-6390 for distributor information

CAPCO, Box 1028, Grand Junction, CO 81502, Tel: 303-243-8751, TWX: 910-929-6989; Empl.: 110

CAPINTEC INSTRS., 6 Arrow Rd., Ramsey, NJ 07446, Tel: 201-825-9500, Telex: 642375; FSC No.: 6666;6685; Empl.: 150; *Sls. Mgr.:* R. J. Kanzler

CAPITOL MACHINE & SWITCH CO., Box 890, Danbury, CT 06810, Tel: 203-744-3300; FSC No.: 01548; Empl.: 90; *Sls. Mgr.:* E. P. DiMarco

CAPITOL MAGNETIC PRODS., 6902 Sunset Blvd., Hollywood, CA 90028, Tel: 213-461-2701, Telex: 67-3271, TWX: 910-321-3500; Empl.: 700

CAPITOL TEMPTROL, 5 Coulton Rd., Old Lyme, CT 06371, Tel: 203-739-4421; FSC No.: 4100; *Sls. Mgr.:* James M. Kronick

CAPTOR CORP., 5040 S. County Rd. (25A), Tipp City, OH 45371, Tel: 513-667-8484; FSC No.: 23939; Empl.: 92; *Sls. Mgr.:* Omer B. Bruns

CARBONE-FERRAZ, INC., Eastmans Rd., Parsippany, NJ 07054, Tel: 201-428-8400, 800-526-9067, Telex: 136045; *Sls. Mgr.:* John Harper

CARBONE LORRAINE INDS., 400 Myrtle Ave., Boonton, NJ 07005, Tel: 201-DE4-0700, Telex: 136407; Empl.: 450

CARBONE USA CORP., Carbone Lorraine Inds. Corp., 402 Myrtle Ave., Boonton, NJ 07005, Tel: 201-334-0700, Telex: 136407; *Sls. Mgr.:* Norman Carver; *Dist. Mgr.:* Norman Carver

CARDINAL CONTROL CO., 110 Kensington Rd., Kensington, CT 06037, Tel: 203-828-6379; *Sls. Mgr.:* L.E.P. Beatman; *Dist. Mgr.:* L.E.P. Beatman

CARDION ELCTRNS., Div. of Gen. Sig. Conts., Inc. Unit of Gen. Sig. Corp., Long Island Expwy., Woodbury, NY 11797, Tel: 516-921-7300, Telex: 221683 CARD, TWX: 510-221-2179; FSC No.: 12909; Empl.: 680; *Sls. Mgr.:* J. J. Murphy

CARDON CORP., P.O. Box 2371, Boston, MA 02107, Tel: 617-357-5898; Empl.: 10

CAREY ELCTRN. ENGRG. CO., 1880 Clifton Ave., Springfield, OH 45505, Tel: 513-323-6300; Empl.: 10-25

CARLINGSWITCH
INNOVATION BY DESIGN

CARLINGSWITCH, INC., 505 New Park Ave., W. Hartford, CT 06110-0641, Tel: 203-233-5551, TWX: 710-425-0034; Empl.: 1200; *Sls. Mgr.:* Mark Facey ..... **B•1514-1515**

Local Sales Offices & Reps

Call toll free 1-800-243-8556 for locations of Representatives and Distributors

AL Huntsville, CSR Elctrn. 205-533-2444
AZ Phoenix, Robert Anderson Co. 602-266-2070
AR Little Rock, Welch & Dolby 501-455-2199
CA Encino, Scott Johnson 818-708-0478
CA Fullerton, Dave Berryman 714-870-6258
CA Fullerton, David Berryman 714-870-6258
CA San Rafael, Wright & Assoc. 415-457-9940
CO Denver, Quorum 3 Sls. Grp. 303-696-8480
CT Clinton, Berkshire Elect. 203-669-0752
FL Tampa, J-R Controls 813-961-9478
GA Atlanta, CSR Elctrns. 404-396-3720
GA Atlanta, CSR Elect. 404-396-3720
IL Schiller Park, Wm. Bolles Assocs. 312-678-7888
IN Indianapolis, D-M Assoc. 317-842-4424
KS Mission, Merdens Co. 913-432-9323
MD Woodbine, Naudain Assocs. 301-442-2270

C&K

IN STOCK • IN STOCK

Franchised Distributor

LOGICOMP
ELECTRONICS, INC.

1009 W. BOSTON POST ROAD
MAMARONECK, NEW YORK 10543
PHONE: (914) 698-9332

TOLL FREE
(Outside N.Y.)
800/431-2625

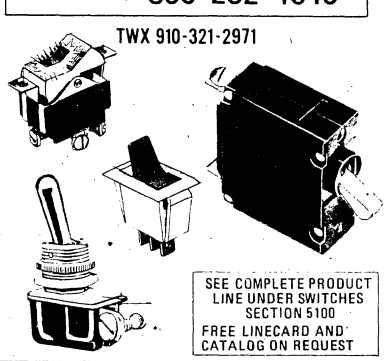
CARLINGSWITCH

FULL LINE
AUTHORIZED DISTRIBUTOR

E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

MA Hopkinton, Berkshire Elctrns. 617-435-6025
MI Lathrup Village, R. C. Nordstrom & Co. 313-559-7373
MN Edina, Monroe-Hanna Assoc. 612-925-5700
MS Jackson, Welch & Dolby 601-932-5534
MO Clayton, Mertens Co. 314-993-6600
NJ Burlington, VDE Elctrns. 609-387-9331
NJ Union, Pacent Engrg. 201-687-7197
NY Great Neck, Pacent Engrg. 516-482-4678
NY Rochester, VDE Elctrns. 716-473-5015
NC Raleigh, Crossroads Elctrns. 919-362-4099
OH Columbus, Gerry Bryant 614-294-7103
OR Aloha, Elctrn. Comp. Sls. 503-245-2342
OR Tigard, Electronic Comp. Sls. 503-245-2342
PA Carnegie, Brown-Yates 412-279-1101
SC W. Columbia, Crossroads Elctrns. 919-362-4099
TX Dallas, Control Comps. 214-458-8877
UT Salt Lake City, Quorum 3 Sls. Grp. 801-943-9227
WA Mercer Island, Elctrn. Comp. Sls. 206-232-9301
WI Mequon, Wm. Bolles Assocs. 414-241-3320
Can Markham, Ont., Deskin Sls. 416-475-1412

Local Distributors

CA Anaheim, Electro Comps. 714-666-0180
CA Hayward, Electro Comps. 415-783-5800
CA Los Angeles, Electric Switches 213-660-1310
CA Van Nuys, Pacific Switch Controls 213-873-4802
CT Hartford, Atlantic Switch Controls 203-527-7705
FL Lakeland, Switch Controls 813-644-7564
IL Carol Stream, Conectrix 312-653-1460
MI St. Clair Shores, Spemco 313-771-2700
MN Minneapolis, Carl Bergquist Co. 612-835-2322
NJ Fair Lawn, Relay Specialties 201-797-3313
NJ Mt. Laurel, Jerseyswitch 609-778-8190
NY Rochester, Simcona Elctrns. Corp. 716-328-3230
NY Woodside, Switches Unltd. 718-478-5000
OH Columbus, Ohioswitch 614-885-0319
SC Columbia, Dixie Elctrns. 803-779-5332
TX Dallas, Texaswitch 214-357-1768

CAROL CABLE CO. WEST, 2665 E. Del Amo Blvd., Rando Dominquez, CA 90221, Tel: 213-537-8050

CAROL

CAROL CABLE CO., INC., Columbia Elctrn. Cables Div., 249 Roosevelt Ave., Pawtucket, RI 02862, Tel: 401-724-9605, Telex: 927-750; FSC No.: 53909; Empl.: 1,000; *Dist. Mgr.:* Patrick E. Rush ..... **C•1801-1819**

Local Sales Offices & Reps

AL Huntsville, Cartwright & Bean 205-830-1540
AZ Phoenix, J. R. Morgan 602-268-3464
CA Aptos, West Cal Sls./Ind. 408-688-6568
CA Costa Mesa, Berman-Gravley 714-549-2122
CA San Francisco, Technical Sls. 415-467-1434
CO Denver, William J. Purdy Co. 303-753-6800
FL Maitland, Hutto, Hawkins, Peregoy 305-831-2474
GA Atlanta, Cartwright & Bean 404-233-2939
HI Honolulu, West Pacific Agy. 808-395-3152
IL Chicago, IRI, Inc. 312-647-7755
IN Indianapolis, Mktg. Engrs. 317-872-5665
KS Shawnee Mission, Lowell-Kangas 913-631-3515
LA Covington, Cartwright & Bean 504-892-1780
MD Columbia, Lowery & Assoc. 301-964-0225
MA Seekonk, Rudolph Mktg. 617-399-6270
MI E. Detroit, J. M. Thorpe 313-779-6363
MN Edina, Mel Foster Tech. Sls. 612-941-9790
MO St. Louis, Lowell-Kangas 314-821-4050
NJ Cedar Grove, Legtronics 201-239-4098
NY Rochester, Apex Assocs. 716-254-6050
NY Tuckahoe, L-C-A Sales 914-961-4700
NC Raleigh, Cartwright & Bean 919-876-4130
OH Cleveland, Marlow Assoc. 216-991-6500
OK Oklahoma City, J. Y. Schoonmaker Co. 405-685-4477
OR Beaverton, Wm. J. Purdy Co. 503-641-9373
PA Broomall, L. D. Lowery 215-356-5300
TN Knoxville, Cartwright & Bean 615-693-7450
TX Dallas, J. Y. Schoonmaker Co. 214-349-1650
TX Houston, J. Y. Schoonmaker Co. 713-686-0371
UT Salt Lake City, W. J. Purdy Co. 801-486-8557
VA Charlottesville, Lowery & Assoc. 804-973-6672
WA Redmond, William J. Purdy Co. 206-882-3144
WI Milwaukee, IRI, Inc. 414-259-0966

CAROLINA STEEL & WIRE, I-20 & S.C. 6, Lexington, SC 29072, Tel: 803-359-5501, Telex: 573355; FSC No.: 72954; Empl.: 125

CARPENTER MFG. CO., INC., Fairgrounds Dr., P.O. Box 188, Manlius, NY 13104-0188, Tel: 315-682-9176; *Sls. Mgr.:* Joseph T. De Peter

CARPENTER TECHN., Box 662, Reading, PA 19603, Tel: 215-371-2000, Telex: 836-432; Empl.: 4500; *Sls. Mgr.:* R. J. Weiler

CARROLL TOUCH TECHNOLOGY, P.O. Box 1309, Round Rock, TX 78680, Tel: 512-244-3500; *Sls. Mgr.:* Alan Hochman

CARSON MFG. CO., INC., 5453 N. Rural St., P.O. Box 20464, Indianapolis, IN 46220, Tel: 317-257-3191; Empl.: 75

CARTER MFG. CORP., Sugar Rd., Bolton, MA 01740, Tel: 617-779-5501; FSC No.: 03929; Empl.: 35; *Sls. Mgr.:* L. W. Tedstone

CARTER MOTOR, 2707 W. George St., Chicago, IL 60618-7898, Tel: 312-588-7700

CASSO-SOLAR, P.O. Box 163, U.S. Route 202, Pomona, NY 10970, Tel: 914-354-2500, Telex: 475-4099; Empl.: 50; *Sls. Mgr.:* Rolf Kates

CASTALL, INC., Weymouth Indl. Park, E. Weymouth, MA 02189, Tel: 617-337-6075, Telex: 955-439; FSC No.: 04-2459700; Empl.: 30; *Sls. Mgr.:* Joe McDonough

Local Sales Offices & Reps

AL Huntsville, B.J.R. Mfr. Rep. 205-881-3569
CA Tarzana, Power Comp. Sls. 818-881-9111
CO Denver, Electro Indl. 303-623-5534
FL Indian Harbour, Bill Toy Assocs. 305-773-5805
IL Chicago, Electro-Mech Sls. Co. 312-777-0554
MN Minneapolis, Norton Assocs. 612-881-6226
NJ Berkeley Heights, Cambridge-Allen & Assoc. 201-464-0203
TX Austin, Delta Comp. 512-458-4288
TX Seagoville, Delta Comp. 214-287-6333
WA Seattle, J. J. Assocs. 206-246-6619
Can Markham, Ontario, Matrix Technlg. 416-477-4442

CATALYST RESEARCH, Mine Safety Appliances Co., 1421 Clarkview Rd., Baltimore, MD 21209, Tel: 301-296-7000, Ext. 304, Telex: 87-768; Empl.: 400; *Sls. Mgr.:* Edward S. Hatch, Jr.; *Dist. Mgr.:* Edward Hatch ... **D•1417**

CATEL TELECOMMUNICATIONS, United Scientific Corp., 4800 Patrick Henry Dr., Santa Clara, CA 95054, Tel: 408-988-7722, TWX: 910-338-2263; Empl.: 190; *Sls. Mgr.:* Dick Old; *Dist. Mgr.:* Wendell Woody

CATON

CATON CONNECTOR CORP., Jones River Indl. Pk., 20 Wapping Rd., Kingston, MA 02364, Tel: 617-585-4315, TWX: 710-391-7546; FSC No.: 52196; Empl.: 25; *Sls. Mgr.:* D. Galambos ..... **C•1172**

Local Sales Offices & Reps

CA Fullerton, ISI 714-773-0411
FL Enterprise, DJE Assocs. 305-321-6623
OH Dayton, Delta Sales 513-271-5444
TX Dallas, CCI 817-484-9691
TX Ft. Worth, CCI 817-292-5803

CATRONIX CORP., 620 P/T Stne, Suite 1802, Atlanta, GA 30308, Tel: 404-881-1100; *Sls. Mgr.:* Dr. Charls Pearson

CAYPIN INDUSTRIES, INC., P. O. Box 9737, Ft. Wayne, IN 46899, Tel: 219-432-1515, 1-800-348-1771, Telex: 232-409; FSC No.: 6850

CCD IMAGING, Fairchild Camera & Instr. Corp., 450 National Ave., Mountain View, CA 94043, Tel: 415-493-8001; *Sls. Mgr.:* John Miller

C-COR ELCTRNS., 60 Decibel Rd., State College, PA 16801, Tel: 814-238-2461, TWX: 510-670-3513; FSC No.: 12775; Empl.: 600; *Sls. Mgr.:* D. Pisarcik

CDRL DATA, INC., 320 West Lone Cactus Drive Ste. 6, Phoenix, AZ 85027, Tel: 602-582-8844; FSC No.: 56060; Empl.: 25; *Sls. Mgr.:* James J. Edwards

CDS - COLORADO DATA SYS., 3301 W. Hampden, Unit C, Englewood, CO 80110, Tel: 303-762-1640, TWX: 910-933-0193; Empl.: 35; *Sls. Mgr.:* Louis Klahn

CEA DIVISION OF BERKLEONICS, INC., A Subsidiary of EG & G, 1 Aerovista Pk., San Luis Obispo, CA 93401, Tel: 805-544-5454, TWX: 910-351-6705; FSC No.: 04932; Empl.: 120; *Sls. Mgr.:* Jerry Satuloff

CEAG ELEC. CORP., Power Supp. Div., 1324 Motor Pkwy., Hauppauge, NY 11788, Tel: 516-582-4422, TWX: 510-227-4904; FSC No.: 57973; *Dist. Mgr.:* Bryce Wiedeman

CEC, 330 W. Taft Ave., Orange, CA 92665, Tel: 714-637-2970; Empl.: 50

CELANESE PLASTICS, 26 Main St., Chatham, NJ 07928, Tel: 201-635-2600; *Sls. Mgr.:* L. F. Bond

CELCO, 70 Constantine Dr., Mahwah, NJ 07430, Tel: 201-327-1123, TWX: 710-988-1018; Empl.: 45; *Sls. Mgr.:* P. S. Christaldi

celesco

CELESCO TRANSDUCER PRODS., INC., 7800 Deering Ave., Canoga Pk., CA 91304, Tel: 818-884-6860, Telex: 499-8137; *Sls. Mgr.:* James P. Callahan; *Dist. Mgr.:* James P. Callahan ..... **B•1788-1789**

Local Sales Offices & Reps

AK Soldotna, C. Hillhouse, Inc. 907-262-7340
AZ Tempe, Trembly Assocs. 602-967-2058
CA Palo Alto, Gado Instr. Sls. 415-961-2222
CA Westminster, Transducer Sys. 714-840-5357
CO Denver, Innovative Prods. 303-691-3575
FL Indian Rocks Beach, PAR Assocs. 813-596-8841
GA Atlanta, PAR Assocs. 404-391-9117
IL Hindsdale, I & C Sls. 312-323-8205
LA Baton Rouge, Charles Instrs. 504-273-3233
MA Sharon, Reptek 617-784-6700
MI Trenton, I & C Sls. 313-671-1320
MN Minneapolis, CMI Corp. 612-566-6930
MO Manchester, Universal Precision 314-394-4693
NV Las Vegas, Trembly Assocs. 702-739-9770
NJ Hillsdale, C.B. Assocs. 201-664-6230
NM Albuquerque, Trembly Assocs. 505-266-8616
NY Clarence, Trott Elctrns. 716-634-8500
NY Pittsford, Trott Elctrns. 716-586-8251
NC Charlotte, Par Assocs., Inc. 704-375-9403
OH Cincinnati, I & C Sls. 513-772-3101
OK Tulsa, Advance Tech. Sls. 918-664-0482
OR Portland, Fry Controls, Inc. 412-339-3565
PA Cheltenham, Test Equip. Sls. 215-379-5431
PA New Kensington, Bobar Instr., Inc. 412-339-3565
TX Austin, Advance Tech. Sls. 512-440-7677
TX Dallas, Advance Tech. Sls. 214-340-1300
TX Houston, Advance Tech. Sls. 713-440-3888
UT Salt Lake City, Trembly Assocs. 801-486-5292
WA Bellevue, Fry Controls, Inc. 206-282-9270

Local Distributors

CA Ventura, Vacumed 805-644-7461

CELESTION INDS., INC., Kuniholm Dr., Box 521, Holliston, MA 01746, Tel: 617-429-6706, Telex: 948417

CENTENT CO., 3879 S. Main St., Santa Ana, CA 92707, Tel: 714-979-6491; Empl.: 12; *Sls. Mgr.:* A. Freimanis

CENTERFLEX TECHN. CORP., 221 Seventh Ave., P.O. Box 21, Hawthorne, NJ 07507, Tel: 201-423-0505, TWX: 710-988-4147; Empl.: 50; *Sls. Mgr.:* Rolf Fasth

CENTIGRAM CORP., 155A Moffett Park Dr., Sunnyvale, CA 94086, Tel: 408-734-3222, Telex: 171-994; *Sls. Mgr.:* Leonard H. Magnuson; *Dist. Mgr.:* Paul W. Masters

CENTRALAB, INC., A North American Philips Co., 4561 Colorado Blvd., Los Angeles, CA 90039, Tel: 818-240-4880, TWX: 910-497-2282; *Sls. Mgr.:* G. Ollen

CENTRALAB, INC., A North American Philips Co., 2566 Northwestern Ave., McClure Pk., West Lafayette, IN 47906, Tel: 317-463-2536, TWX: 810-342-1889

CENTRALAB, INC., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501, Tel: 515-573-1300, TWX: 910-520-2493; *Sls. Mgr.:* L. Fette

CENTRALAB, INC., A North American Philips Co., 7158 Merchant Ave., El Paso, TX 79915, Tel: 915-779-3961, TWX: 910-964-1311

CENTRALAB, INC., A North American Philips Co., 5855 N. Glen Park Rd., Milwaukee, WI 53209, Tel: 414-228-7380, TWX: 910-262-3083; Empl.: 5000; *Sls. Mgr.:* F. Funk; *Dist. Mgr.:* R. Booker

CENTRAL DATA CORP., 1602 Newton Dr., Champaign, IL 61820, Tel: 217-359-8010, Telex: 910-245-0787; *Sls. Mgr.:* N. E. Mac Gregor

CENTRAL MICROWAVE CO., Alpha Inds., Inc., 12180 Prichard Farm Rd., Maryland Heights, MO 63043, Tel: 314-291-5270, Telex: 949436, TWX: 710-393-1236; FSC No.: 17540; Empl.: 120; *Sls. Mgr.:* William A. Ruff

CENTRE ENGRG., 2820 E. College Ave., State College, PA 16801, Tel: 814-237-0321, TWX: 510-670-3517; FSC No.: 51642; Empl.: 278; *Sls. Mgr.:* H.D. Shirey

CENTRONIC INC., 1101 Bristol Rd., Mountainside, NJ 07092, Tel: 201-233-7200, TWX: 910-350-3290; FSC No.: 7P396; Empl.: 300; *Sls. Mgr.:* Tony Green ..... **B•1204-1205**

Local Sales Offices & Reps

AZ	Tempe, Griot Assocs.	602-968-4428
CA	Los Altos, Griot Assocs.	415-941-2533
CA	Santa Ana, Griot Assocs.	714-662-7525
CA	Santa Clara, Griot Assocs.	408-727-2880
CO	Denver, Griot Assocs.	303-427-1111
FL	Melbourne Bch., Millett Assocs.	305-725-5055
GA	Roswell, Electro Comp Sls.	404-992-2344
IL	Chicago, Coomb Assocs.	312-439-9810
MA	Concord, Nortech. Engrg. Sls.	617-259-0032
MI	Jackson, Norwood Scroggs Co.	517-750-1170
MN	Minneapolis, Intl. Sls.	612-831-8423
NY	Commack, RC Engrg.	516-543-3325
OH	Dayton, Ohmer Assocs.	513-434-1454
PA	Glenside, Koebert & Assocs.	215-887-2310

Local Distributors

AZ	Tempe, Griot Assocs.	602-968-4428
CA	Agoura Hills, Griot Assocs.	818-706-7601
CA	Los Altos, Griot Assocs.	414-941-2533
CA	Santa Ana, Griot Assocs.	714-662-7525
CA	Santa Clara, Griot Assocs.	408-727-2880
CO	Westminster, Griot Assocs.	303-427-1111
FL	Melbourne Beach, Millett Assocs.	305-725-5055
GA	Roswell, Electro Comp Sls.	404-992-2344
IL	Arlington Heights, Coombs Assocs.	312-439-9810
IN	Ft. Wayne, Coombs Assocs.	219-747-7661
MA	Concord, Nortech Engrg.	617-259-0032
MI	Jackson, Norwood Scroggs	517-750-1170
MN	Minneapolis, International Sls.	612-831-8423
NM	Alburquerque, Griot Assocs.	505-883-1022
NY	Commack, RC Engrg.	516-543-3325
OH	Kettering, Ohmer Assocs.	513-434-1454
OR	Beaverton, Griot Assocs.	206-454-8592
PA	Glenside, Koebert Assocs.	215-887-2310
UT	Salt Lake City, Griot Assocs.	801-328-9471
WA	Seattle, Griot Assocs.	206-646-5627

CENTURY DATA SYS., Xerox Corp., 1270 N. Kraemer Blvd., Anaheim, CA 92806, Tel: 714-632-7500, Telex: 655437; Empl.: 901; *Sls. Mgr.:* Richard Brechtlein; *Dist. Mgr.:* Don Wilder

CERAMASEAL, Box 25, New Lebanon Center, NY 12126, Tel: 518-794-7800, Telex: 14-5442; FSC No.: 07601; Empl.: 80; *Sls. Mgr.:* Gene D. Sawin ..... **C•1173**

Local Sales Offices & Reps

AL	Huntsville, Physimetrics	205-881-8483
AZ	Phoenix, Wadsworth/Bryant	602-275-7366
CA	Atherton, Wadsworth/Bryant	415-321-3619
CA	Hacienda Hgts., Wadsworth/Bryant	213-330-5592
CO	Golden, J. F. Hurlbut Co.	303-279-7796
FL	Orlando, Physimetrics	305-894-8081
GA	Atlanta, Physimetrics	464-955-0155
IL	Mt. Prospect, Automation Equip. Co.	312-398-7550
KS	De Soto, Midtec Assocs.	913-441-6565
MD	Baltimore, R. A. Wafer Assoc.	301-744-1133
MA	Boston, P-J Engrg. Sls.	617-783-0510
MO	Florissant, Midtec Assocs.	314-837-5200
NY	Rochester, Canavan-Scanlon Assoc.	716-424-1830
NY	Syracuse, Canavan-Scanlon Assoc.	315-437-1271
NC	Charlotte, JWL Assoc.	704-523-3001
PA	Feasterville, Knowles Assocs.	215-322-7100
PA	Pittsburgh, Kurt J. Lesker Co.	412-892-2996
TN	Knoxville, Physimetrics	615-966-7553
TX	Richardson, Spectra Sls.	214-234-3600
WA	Seattle, J.J. Assocs.	206-246-6619

CERAMAWIRE, Box 1084, Cranford, NJ 07016, Tel: 201-276-1170; *Sls. Mgr.:* Joe Savare

CERAMIC MAGNETICS, INC., 87 Fairfield Rd., Fairfield, NJ 07006, Tel: 201-227-4222, Telex: 138 730; Empl.: 50

CERA-MITE CORP., 1327 Sixth Ave., Grafton, WI 53024, Tel: 414-377-3500

CERMETEK MICROELECTRONICS INC., 1308 Borregas Ave., Sunnyvale, CA 94088, Tel: 408-752-5000, TWX: 910-379-6931; Empl.: 110; *Sls. Mgr.:* Ken Archbold

CES ELCTRNS., 2968 Avenue Z, Brooklyn, NY 11235; Empl.: 20 ..... **D•1606**

Local Sales Offices & Reps

NY Brooklyn, Microwave Labs of America

CETA CORP., See Laser Sonics Power Supply Operations

CETEC RAYMER, 7315 Fulton Ave., No. Hollywood, CA 91605, Tel: 213-875-0423; Empl.: 50; *Sls. Mgr.:* Hugh T. Wilcox

CGIS, A COMSAT CO., 7701 N. Lamar Blvd., Austin, TX 78752, Tel: 512-451-7938; Empl.: 150; *Sls. Mgr.:* Jack Johannsen

CGRS MICROTECH, P. O. Box 102, Langhorne, PA 19047, Tel: 215-757-0284; Empl.: 5; *Sls. Mgr.:* J. Swope; *Dist. Mgr.:* J. Swope

CGTI, 2 Windward Ave., White Plains, NY 10605, Tel: 914-949-3719, TWX: 710-568-1305; Empl.: 210; *Sls. Mgr.:* G. N. Snider

CHABIN CORP., 890 Fortress St., Chico, CA 95926, Tel: 916-891-6410, TWX: 910-536-1001; *Sls. Mgr.:* Peter Tunis

CHADWICK-HELMUTH, 4601 N. Arden Dr., El Monte, CA 91731, Tel: 213-575-6161, Telex: 194-271; Empl.: 75; *Sls. Mgr.:* John Beach

CHA INDUSTRIES, 3565 Haven Avenue, Menlo Park, CA 94025, Tel: 415-363-8011, Telex: 334426; *Sls. Mgr.:* Jack Patten

CHALCO ENGRG., 15126 S. Broadway, Gardena, CA 90248, Tel: 213-FA1-0121, TWX: 910-346-7026; Empl.: 95

CHAMPLAIN CABLE, PO Box 7, Winooski, VT 05404, Tel: 802-655-2121, TWX: 510-299-0018; FSC No.: 05973; Empl.: 425; *Sls. Mgr.:* J. Brooks

CHANNEL INDS., 839 Ward Dr., Santa Barbara, CA 93111, Tel: 805-967-0171, Telex: 658416; Empl.: 75

CHAPMAN CORP., P.O. Box 10700, Portland, ME 04104, Tel: 207-773-4726; Empl.: 60; *Dist. Mgr.:* Elizabeth Angell

CHARLES RIVER DATA SYSTEMS, INC., 983 Concord St., Framingham, MA 01701, Tel: 617-626-1000, Telex: 681-7373; Empl.: 170; *Sls. Mgr.:* S. K. Stephenson

CHARTPAK, 1 River Rd., Leeds, MA 01053, Tel: 413-584-5446; Empl.: 195

CHASSIS-TRAK, General Devices Co., Inc., P.O. Box 39100, Indianapolis, IN 46239, Tel: 317-897-7000, Telex: 27-2169; FSC No.: 06666; Empl.: 190; *Sls. Mgr.:* H. L. Crouch ..... **C•1062-1063**

Local Sales Offices & Reps

AL	Huntsville, Hughes Assoc.	205-533-9108
AZ	Phoenix, Snyder Engr.	602-279-2010
CA	Fullerton, Groh Assocs.	714-738-7105
CA	Mountain View, G. Woempner	415-964-5454
CO	Boulder, R. F. Mayo Assoc.	303-499-2155
CT	Waterbury, Coakley, Boyd & Abbett	617-444-5470
FL	Lighthouse Point, J. Krutek & Assoc.	305-941-6544
GA	Atlanta, Hughes Assoc.	404-252-7486
IL	Glencoe, Howard Benjamin Assoc.	312-835-0150
IN	Noblesville, Century Elctrns.	317-849-2026
KS	Shawnee Mission, Lowell, Kangas & Assoc.	913-631-3515
MA	Needham, Coakley, Boyd & Abbett	617-444-5470
MN	St. Paul, Northport Engrg.	612-457-8000
MS	Corinth, Hughes Assoc.	601-287-2915
MO	St. Louis, Lowell, Kangas & Assocs.	314-821-4050
NH	Plaistow, Coakley, Boyd & Abbett	617-444-5470
NJ	Mountainside, Henry G. Richter	201-233-4615
NY	Fayetteville, H. G. Richter	315-637-6713
NC	Raleigh, Hughes Assoc.	919-782-2065
OH	Cleveland, Electronic Comps.	216-261-4103
OH	Miamisburg, Electronic Comps.	513-866-3340
OK	Tulsa, Advance Tech. Sls.	918-664-0482
PA	Doylestown, Monterio Assoc.	215-345-5855
TN	Morristown, Hughes Assoc.	615-587-2433
TX	Austin, Advance Tech. Sls.	512-440-7677
TX	Dallas, Advance Tech. Sls.	214-340-1300
TX	Houston, Advance Tech. Sls.	713-440-3888
WA	Olympia, Bergford Assoc.	206-866-2001
EXP	IN, Indianapolis, General Devices	317-897-7000

CHATHAM CONTROLS, 33 River Rd., Chatham, NJ 07928, Tel: 201-635-8892; FSC No.: 04814; Empl.: 11

CHATSWORTH DATA CORP, Cablemaster Div., 20710 Lassen St., Chatsworth, CA 91311, Tel: 818-341-9200; Empl.: 65; *Sls. Mgr.:* Hank Boehm ..... **D•1199**

Local Sales Offices & Reps

MA	Waltham, W. M. Hague	617-863-5600
NJ	Marlton, Javie Pickle	609-596-6900
OH	Cleveland, Triad Assoc	216-248-3350

CHATSWORTH DATA CORP, Impact-o-Graph Div., 20710 Lassen St., Chatsworth, CA 91311, Tel: 213-341-3000; Empl.: 50

CHEM-MIXX CORP., 55 North St., Medford, MA 02155, Tel: 617-395-7270; Empl.: 9; *Sls. Mgr.:* James Hart

Local Sales Offices & Reps

CA	South Gate, A. G. Barstow Co.	213-569-8125
GA	Lilburn, Georgia Airtech	404-925-3084
IN	Lawrence, American Indl.	317-897-9900
MN	Edina, Adhesive Sys. Technlg.	612-944-7999
MO	Maryland Hgts., T. B. Moore Co.	314-434-6844
PA	Philadelphia, Air Draulics Div.	215-457-1940
PA	Pittsburgh, Kurt J. Lesker Co.	412-892-2996
TX	Dallas, Lomax Eng.	214-361-1134
TX	El Paso, Southwest Tech. Sys.	915-532-7079

A NORTH AMERICAN PHILIPS COMPANY // CENTRALAB

FULL LINE
AUTHORIZED DISTRIBUTOR

E S I

ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr. Los Angeles, California 90039

213-660-1310

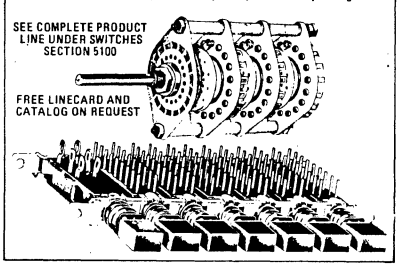
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX: 910-321-2971

WE ASSEMBLE TO FIT YOUR DESIGN REQUIREMENTS.
SELECTASHAFT ROTARY & MULTI-PUSHBUTTON SWITCHES
•Immediate Delivery •No Factory Delay •No Set-up Charges

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100

FREE LINECARD AND CATALOG ON REQUEST



CHEMTRONICS INC., 681 Old Willets Path, Hauppauge, NY 11788, Tel: 516-582-3322, Telex: 968567; FSC No.: 21267; Empl.: 40; *Sls. Mgr.:* Louis Friedman; *Dist. Mgr.:* Scott Friedman

CHERRY ELECTRICAL PRODS. CORP., 3623 Sunset Ave., Waukegan, IL 60087, Tel: 312-578-3500, TWX: 910-235-1572; Empl.: 2000; *Sls. Mgr.:* Robert Terwall; *Dist. Mgr.:* George Seyk ..... **B•1024, 1521-1533, 1708-1712**

Local Sales Offices & Reps

AL	Huntsville, CSR Elec.	205-533-2444
AZ	Phoenix, O'Donnell Assocs. S.W.	602-944-9542
CA	Palo Alto, Abbott Engrg. Co.	415-968-2265
CA	San Diego, O'Donnell Assocs.	619-578-1645
CA	Torrance, O'Donnell Assocs.	213-539-9664
CO	Boulder, Front Range Mktg.	303-443-4780
CT	North Haven, Coakley, Boyd & Abbett	203-239-6217
FL	Coral Springs, CBC Elctrns.	305-755-1111
FL	Longwood, CBC Elctrns.	305-831-5380
GA	Atlanta, CSR Elctrns.	404-396-3720
IL	Waukegan, Cherry Elec. Prod. Corp.	312-578-3500
IN	Ft. Wayne, Menze Sls.	219-747-5616
IA	Cedar Rapids, Dy-Tronix	319-377-8275
IA	Wichita, Dy-Tronix, Inc.	316-838-0884
MA	Needham Hgts., Coakley, Boyd & Abbett	617-444-5470
MI	Grand Rapids, Miltimore Sls.	616-942-9721
MI	Novi, Miltimore Sls.	313-349-0260
MI	Southfield, Cherry Elec. Prod.	313-358-5588
MI	Southfield, Cherry Elec. Prod. Corp.	313-358-5588
MN	St. Paul, Cahill, Schmitz & Cahill	612-646-7217
MO	Bridgeton, Dy-Tronix	314-291-4777
MO	Raytown, Dy-Tronix, Inc.	816-356-6340
NH	Plaistow, Coakley, Boyd & Abbett	617-444-5470
NJ	Perrineville, Schmitt Inds. Corp.	201-446-2937
NJ	Pitman, Colrud Corp.	609-589-5866
NY	Rochester, Elcom Sls.	716-385-1400
NY	Syracuse, Elcom Sls.	315-685-8245
NY	W. Hempstead, Schmitt Indl. Mktg. Corp.	516-486-3510
NC	Mathews, CSR Elctrns.	704-847-1927
NC	Raleigh, CSR Elctrns.	919-878-9200
OK	Tulsa, Genzel Sls. & Assoc.	918-622-7744
OR	Portland, Jas. J. Bacher Co.	503-297-8744
TN	Knoxville, CSR Elctrns.	615-557-0890

CHERRY

FULL LINE
AUTHORIZED DISTRIBUTOR

E S I

ELECTRIC SWITCHES
INCORPORATED

2478 Fletcher Dr, Los Angeles, California 90039

213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

TX	Austin, Bonser-Philhower Sls.	512-346-9186
TX	Houston, Bonser-Philhower Sls.	713-531-4144
TX	Richardson, Bonser-Philhower Sls.	214-234-8438
UT	Salt Lake City, Front Range Mktg.	801-364-6481
VA	Reston, Colrud Corp.	703-620-6612
WA	Seattle, Jas. J. Bacher Co.	206-285-1300
WI	Wauwatosa, Larsen Assocs.	414-258-0529

Local Distributors

AL	Birmingham, Ack Radio Supp. Co.	205-322-0588
AL	Huntsville, Powell Elctrns.	205-539-2731
AZ	Phoenix, Cetec Elctrns.	602-277-7951
AZ	Phoenix, Elctrn. Parts	602-277-7281
AZ	Tempe, Fisher-Brownell	602-967-1464
AR	Little Rock, Carlton-Bates	501-562-9100
CA	Alhambra, Fisher-Brownell	213-289-0255
CA	Chatsworth, Diplomat Elctrns.	213-341-4411
CA	Costa Mesa, Diplomat Elctrns.	714-549-8401
CA	Gardena, Cal Switch	213-770-2330
CA	Irvine, Cetec Elec.	714-250-4141
CA	Los Angeles, Electric Switches	213-660-1310
CA	Oakland, Brill Elctrns.	415-834-5888
CA	San Diego, Diplomat Elctrns.	619-292-5693
CA	San Diego, Fisher-Brownell	619-560-8545
CA	Santa Clara, Cetec Elec.	408-980-0110
CA	Santa Clara, Fisher-Brownell	408-988-6041
CA	Southgate, Cetec Elctrns.	213-773-6521
CA	Sunnyvale, Diplomat Elctrns.	408-744-1555
CO	Denver, Denver Wintronics	303-431-7161
CO	Denver, Integrated Elec.	303-292-6121
CT	Wallingford, Midan Elec.	203-265-2077
FL	Ft Lauderdale, Powell Elec.	305-972-4300
FL	Ft. Lauderdale, KSM Elctrns.	305-971-5900
GA	Atlanta, Ack Radio Supp. Co.	404-351-6340
GA	Atlanta, KSM Elctrns.	404-458-2013
IL	Bensenville, Diplomat Elctrns.	312-595-1000
IL	Champaign, Klaus Radio	217-356-1896
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Palatine, OHM Elctrns.	312-359-5500
IL	Wheeling, Hawk Elctrns.	312-459-4030
IN	Ft. Wayne, Graham	219-423-3422
IN	Indianapolis, Genesis Elctrn.	317-637-5571
IN	Indianapolis, Graham Elec.	317-634-8202
IN	South Bend, Genesis Elctrns.	219-287-2911
IA	Cedar Rapids, Advent Elctrn.	319-363-0221
KS	Edwardsville, C. Tennant Sons & Co.	913-441-1801
KY	Louisville, P. I. Burks Co.	502-589-3960
MD	Columbia, Maryland	301-621-4070
MD	Savage, Pyttronic Ind.	301-792-0780
MA	Billerica, A. W. Mayer Co.	617-229-2255
MA	Needham, Cronin Elctrns.	617-449-5000
MI	Livonia, Rep-Tron Elctrns.	313-525-2700
MI	Troy, Empire Elec. Inc.	313-585-8130
MN	Minneapolis, Newark Elec.	612-331-6350
MN	Minneapolis, Stark Elctrns.	612-332-1325
MO	Kansas City, Walters Radio Supp.	316-531-7015
MO	St. Charles, Finnigan Elctrns.	314-946-6201
NJ	Bellmawr, Mid-Atlantic Elec.	609-931-5303
NJ	Clifton, J-Mar Elec., Inc.	201-772-6400
NM	Albuquerque, Elctrn. Parts	505-293-6161
NY	Hauppage, C. Tennant Sons & Co.	516-434-8200
NY	Liverpool, Diplomat Elec.	315-652-5000
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NY	Melville, Diplomat Elec.	516-454-6334
NY	Mt. Vernon, QAR Ind'l. Elctrn. Sls.	914-699-2224
NY	Rochester, Rochester Radio & Supp. Co.	716-454-7800
NC	Cary, Powell Elctrns.	919-467-1212
NC	Winston-Salem, Kirkman Elctrn.	919-722-9131
OH	Cincinnati, Graham Elec.	513-772-1661
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Columbus, Hughes-Peters	614-294-5351
OH	Dayton, Esco Elec.	513-293-1133
OH	Middlesburg Hts., Selectronics	216-243-9700
OH	Worthington, Reptron	614-436-6675
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Portland, Radar Elctrns.	503-232-3404
OR	Portland, Tekelectric Control	503-246-5451
PA	Montgomeryville, Pyttronic Ind.	215-643-2850
PA	Phildelphia, Powell Elec.	215-365-1900
TN	Nashville, Graham Elec.	615-242-2682
TX	Dallas, Wallace Elec. Co.	214-340-0400
TX	Houston, Force Elec.	713-561-8644
TX	Irving, Solid State Elctrns. Co.	214-438-5700
TX	Richardson, Fisher-Brownell	214-235-3177
TX	San Antonio, Sherman Elctrns. Supp.	512-224-1004
TX	Stafford, Southwest Elctrn.	713-240-4000
UT	Salt Lake City, Diplomat Elctrns.	801-486-4134
UT	Salt Lake City, Standard Supp. Co.	801-486-3371
VA	Richmond, Sterling Elctrns.	804-226-2190
WA	Bellevue, Integrated Elec., Inc.	206-455-2727
WA	Seattle, Radar Elctrns.	206-282-2511
WI	Milwaukee, Marsh Elctrns.	414-475-6000
Can	Burnaby, B.C., Rae Ind. Elec., Ltd.	604-291-8866
Can	Downsview, Ont., Trade Elctrns. Supp.	416-661-7111
Can	Edmonton, Alb., Rae Ind. Elec., Ltd.	403-451-4001
Can	London, Ont., C. M. Peterson Co., Ltd.	519-434-3204
Can	Mississauga, Ont., Prelco Elec., Ltd.	416-678-0401
Can	Montreal, Que., Prelco Elec., Ltd.	514-389-8051
Can	Nepean, Ont., Prelco Elec., Ltd.	613-726-1800

CHERRY SEMICONDUCTOR CORP, 2000 S. County Trail, East Greenwich, RI 02818, Tel: 401-885-3600; Empl.: 200

CHESSELL CORP., Penns Trail, Newtown, PA 18940, Tel: 215-968-0660, Telex: 83-1701; Empl.: 50; *Sls. Mgr.:* D. Neal ..... **D•1403**

Local Sales Offices & Reps

AL	Birmingham, Spader & Assocs.	205-879-1366
AZ	Phoenix, Southwest Controls, Inc.	602-267-1171
CA	Fountain Valley, Yardley Instrs.	714-963-1000
CA	Oakland, Sabre Controls	415-444-0635
CO	Lakewood, Process Controls	303-232-4996
FL	Clearwater, TCI	813-446-8628
GA	Aeworth, Elam Engrg.	404-974-3300
IL	Lombard, Patricie & Douglas	312-971-1800
IL	Peoria, Tecco	309-692-2312
IN	Ft. Wayne, Domino Unltd.	219-747-5621
KY	Louisville, Domino	502-425-2848
LA	Baton Rouge, Rise Inc.	504-766-4645
MD	Towson, Flotech	301-321-6565
MA	Waltham, Techn. Entprs.	617-890-5300
MI	Farmington Hills, Anderson Elctrns.	313-553-7600
MN	Minneapolis, The Mark Co.	612-920-6280
MO	St. Louis, Adelphi, Inc.	314-821-1232
NV	Reno, Applied Indl. Controls Corp.	702-356-7401
NM	Albuquerque, Southwest Controls, Inc.	505-884-6202
NY	Rochester, Cascade Control Corp.	716-385-1410
NY	White Plains, MIT Sls.	914-946-5077
NC	Charlotte, Algay Controls	704-366-6976
OH	Dayton, P. J. Navin Co.	513-434-8940
OH	Willoughby, P. J. Navin Co.	216-255-1411
OK	Tulsa, Dave Allert Co.	918-743-7705
TN	Knoxville, George C. Paris	615-966-2141
TX	Arlington, Pan-Tech Controls Co.	817-640-3232
TX	Burleson, Chessell Corp.	817-572-4392
TX	Corpus Christi, Cecorp	512-289-6181
TX	Houston, Process Instruments, Inc.	713-893-3310
UT	Midvale, Bee and Tee Controls	801-566-7722
VA	Richmond, Advance Control Equip. Co.	804-270-7182
WA	Bellevue, Topp Engrg. Sls. Corp.	206-747-5400
WI	Brookfield, Bll, Inc.	414-786-1980

CHESTER CABLE, Oakland Ave., Chester, NY 10918, Tel: 914-469-2141, TWX: 510-249-4813; *Sls. Mgr.:* William R. Dungan

CHESTERFIELD PRODS., 37 Midland Ave., Elmwood Park, NJ 07407, Tel: 201-797-9655; Empl.: 35; *Sls. Mgr.:* M. Perry ..... **A•1593**

Local Sales Offices & Reps

AZ	Tucson, WJM Sls.	602-888-4847
CA	Burbank, Biztek Co., Inc.	818-766-4890
CA	Palo Alto, J M Assocs.	415-857-1260
CO	Loveland, Morbak Mktg.	303-669-8900
FL	Maitland, D. J. Ellis & Assocs., Inc.	305-645-1101
IN	South Bend, Schillinger Assocs., Inc.	219-282-4570
KS	Overland Park, Barnes-Midwest Sls.	913-341-9317
MD	Towson, Holden Engrg.	301-823-3763
MA	Framingham, Bengal Assocs.	617-877-2639
MA	Randolph, Bengal Assocs.	617-961-4120
MN	Chanhassen, Barnes Sls. Assocs.	612-934-2907
NJ	Elmwood Park, L & M Assocs.	201-797-0441
NY	New York, L & M Assocs.	212-243-6155
OH	Dayton, Markus Barnett Assocs., Inc.	513-433-0758
PA	Andalusia, L & M Assocs.	215-245-6658
TX	Richardson, Carl Tinch Sls. Co.	214-231-1322

CHICAGO CONDENSER CORP., 2900 West Chicago Ave., Chicago, IL 60622, Tel: 312-227-7070

CHICAGO LASER SYSTEMS, INC., 4034 N. Nashville Ave., Chicago, IL 60634, Tel: 312-282-2710, Telex: 671-1269; *Sls. Mgr.:* Bernard Alpiner, V.P.

CHICAGO LOCK CO., 4311 W. Belmont Ave., Chicago, IL 60641, Tel: 312-282-7177, Telex: ITT 4994023; Empl.: 426; *Sls. Mgr.:* Don Meisinger; *Dist. Mgr.:* Dale N. Padjen ..... **B•1534**

Local Sales Offices & Reps

CA	Oceanside, Sales Engineer	619-726-9499

CHICAGO MINIATURE, 4433 N. Ravenswood Ave., Chicago, IL 60640, Tel: 312-784-1020

CHICAGO SWITCH, INC., 1714 N. Damen, Chicago, IL 60647, Tel: 312-489-5500, TWX: 910-221-5252; Empl.: 250; *Sls. Mgr.:* A. Steiner; *Dist. Mgr.:* A. Steiner

CHLORIDE POWER ELECTRONICS, 10931 Pellicano Drive, El Paso, TX 79935, Tel: 915-592-9985, Telex: 910-964-1364; FSC No.: 08715; Empl.: 1000; *Sls. Mgr.:* Gordon Goodygar

CHOMERICS, INC., 77 Dragon Ct., Woburn, MA 01888, Tel: 617-935-4850, TWX: 710-393-0173; Empl.: 500; *Sls. Mgr.:* Kevin A. Dunne

CHORUS DATA SYSTEMS, P.O. Box 810, 27 Proctor Hill Rd., Hollis, NH 03049, Tel: 603-465-7100; *Sls. Mgr.:* Bruce Monk

CHR INDS., 407 East St., P.O. Box 1911, New Haven, CT 06509, Tel: 203-777-3631, TWX: 710-465-0264; Empl.: 116

CHRISLIN INDS., 31352 Via Colinas, Westlake Village, CA 91362, Tel: 818-991-2254, TWX: 910-494-1253; Empl.: 38; *Sls. Mgr.:* Edward M. Ross; *Dist. Mgr.:* Edward M. Ross

CHRISTIANSEN RADIO INC., 1950 San Remo, Laguna Beach, CA 92651, Tel: 714-497-1506; Empl.: 9

CHRISTIE, S. D., ASSOCS. INC., 693 Locust St., Mt. Vernon, NY 10552, Tel: 212-597-1773, 914-699-7223; Empl.: 8; *Sls. Mgr.:* Sam D. Christie

CHRISTIE
ELECTRIC CORP.

CHRISTIE ELEC. CORP., 20665 Manhattan Pl., Torrance, CA 90501, Tel: 213-320-0808, TWX: 910-349-6260; FSC No.: 02294; Empl.: 200; *Sls. Mgr.:* Alan C. Augusta; *Dist. Mgr.:* Alan C. Augusta ..... **D•1547-1549**

Local Sales Offices & Reps

AZ	Phoenix, PLS Assocs.	602-246-6614
CA	Tustin, John Franek Co.	714-832-0290
CO	Englewood, Omega Ltd.	303-762-1921
CO	Englewood, PLS Assocs.	303-773-1218
FL	Orlando, Newco & Assocs.	305-422-7700
GA	Lithia Springs, Newco, Inc.	404-941-6077
MD	Laurel, CSDS	301-490-3800
MA	Needham, Shain Assocs.	617-449-4380
MO	St. Louis & Grandview, Harris-Hanson	816-763-6200,314-432-3611
NJ	Hohokus, Hansen & Hughes	201-652-7055
NM	Albuquerque, Fry Gates Inc.	505-262-1525
NC	Charlotte, Newco, Inc.	704-527-7070
OH	Chesterland, EQS Systems	216-729-2222
PA	Philadelphia, Technical Instr. Sls. Co.	215-836-2222
SC	Florence, Newco, Inc.	803-662-4878
TX	Richardson, C. Tinch	214-231-1322
TX	Richardson, Carl Tinch Sls. Co.	214-231-1322
UT	Midvale, PLS Assocs.	801-566-0671
UT	Salt Lake City, Omega Ltd.	801-277-8061

CHROMALOX INSTRS. & CONTROLS, 100 Heil-Quaker Blvd., La Vergne, TN 37086-3536, Tel: 615-793-3900, Telex: 55-5129; Empl.: 110; *Sls. Mgr.:* John Cox

CHROMATICS, 2558 Mountain Indl. Bldg., Tucker, GA 30084, Tel: 404-493-7000, TWX: 810-766-8099

CHRONO-LOG CORP., 2 W. Park Rd., Havertown, PA 19083, Tel: 215-853-1130, Telex: 831579; Empl.: 20; *Sls. Mgr.:* David Biberman ..... **D•1061**

CHRONOMITE LABS, 21011 S. Figueroa St., Carson, CA 90745, Tel: 213-320-9452; Empl.: 15

CHURCHILL CORP., 344 Franklin St., Melrose, MA 02176, Tel: 617-665-4700; FSC No.: 94867; Empl.: 30; *Sls. Mgr.:* W. Schermerhorn

CIMCO WIRE & CABLE, INC., See Pirelli Cable

CINCH, See TRW Connector Div.

CINCINNATI ELCTRNS., 2630 Glendale Milford Rd., Cincinnati, OH 45241, Tel: 513-733-6100, Telex: 21-4452, TWX: 810-464-8151; FSC No.: 80045; Empl.: 1100; *Sls. Mgr.:* Samuel M. Thomas, Jr.

CINCINNATI ELECTRONICS

CINCINNATI ELECTROSYS., 469 Wards Corner Rd., Loveland, OH 45140, Tel: 513-831-4347

Local Sales Offices & Reps

GA	Atlanta, GM Assocs.	404-487-9409
IN	Indianapolis, Dan Larner	513-831-4347

CINCINNATI SUB-ZERO PRODS., 12011 Mosteller Rd., Cincinnati, OH 45241, Tel: 513-772-8810, Telex: 214390 SUBZERO CIN; Empl.: 80; *Sls. Mgr.:* George Molenaar ..... **D•1166**

Local Sales Offices & Reps

CA	Diamond Bar, Benedict Mktg.	714-861-9940
IA	Cedar Rapids, Arrow Tech. Sls.	319-396-8030
MI	Orchard Lake, Schober & Assocs., Inc.	313-363-1888
MN	Minneapolis, Arrow Tech. Sls., Inc.	612-545-4481
MO	St. Louis, Arrow Tech. Sls., Inc.	314-991-1399
NJ	Teaneck, Irv Rudnick, Inc.	201-836-7392
NY	Buffalo, Davies Indl. Svcs., Inc.	716-896-3600
OH	Dayton, Boco, Inc.	513-224-0220
TX	Dallas, Merit Co.	214-620-0021

CIPHER DATA PRODS., INC., P.O. Box 85170, San Diego, CA 92138, Tel: 619-578-9100, TWX: 910-335-1251; Empl.: 1750; *Sls. Mgr.:* Frank Kirchhoff; *Dist. Mgr.:* Ruth Lewellyn

CIPRICO INC., 2955 Xenium Lane, Plymouth, MN 55441, Tel: 612-559-2034; Empl.: 71; *Sls. Mgr.:* Stu Reile ..... **D•1062**

Local Sales Offices & Reps

AL	Huntsville, Interep Assocs.	205-533-1730
AL	Mobile, Interep Assocs.	205-478-1036
AZ	Scottsdale, Frontier Technlg.	602-998-4438
CA	Larkspur, Data Rep.	415-461-8776
CA	Los Alamitos, Gemini Assocs.	213-594-9618
CA	Los Gatos, Data Rep	408-279-1212
CA	North Hollywood	818-846-2633
CA	San Diego	619-268-1181
CA	Sepulveda	818-891-1000
CO	Parker, Advanced Data Mktg.	303-841-4908
FL	Jupiter, Southeastern First Rep.	305-746-8587
FL	Kissimmee, Southeastern First Rep.	305-846-1306
FL	Melbourne, Southeastern First Rep	305-259-6373
GA	Norcross, Interep Assocs.	404-449-8680
HI	Honolulu, Sam O. Hirota	808-533-3070
IL	Elmhurst, First Rep	312-530-2450
IN	Indianapolis, Carter, McCormic & Peirce	317-844-4175
KS	Shawnee Mission, Panatek	913-362-3349
MD	Baltimore, L. G. White & Co., Inc.	301-358-7803
MD	Silver Spring, L. G. White	301-434-1555
MI	Farmington Hills, Carter, McCormic & Peirce	313-477-7700
MN	Golden Valley, J. R. Assocs.	612-546-4110
NJ	Springfield, Gebhardt Marketing	201-376-4415
NY	New Hartford, PDQ Assocs.	315-768-8167
NY	W. Seneca, PDQ Assocs.	716-674-7816
NC	Carey, Engineering Dvcs., Inc.	919-469-9323
OH	Cleveland, Carter, McCormic & Peirce	216-779-5100
OH	Cleveland, Diamond Point Intl.	216-238-0200
OH	Dayton, Carter, McCormic & Peirce	513-836-0951
OK	Tulsa, Microlog, Inc.	918-665-7788
OR	Portland, Northwest Mktg. Assoc.	503-620-0441
PA	Jenkintown, Monument Technical Assocs.	215-884-3737
PA	Pittsburgh, Carter, McCormic & Peirce	412-372-4415
TN	Greenville, Interep Assocs.	615-639-3491
TX	Austin, Microlog.	512-327-7033
TX	Houston, Microlog.	713-956-0837
TX	Richardson, Microlog.	214-644-5010
WA	Bellevue, Northwest Mktg. Assoc.	206-455-5846
Can	Nepean, Ontario, Multilek Inc.	613-226-2365

CIRCLE ELECTRONICS, A Division of F-Dyne Elctrns., 3501 Electronics Way, W. Palm Beach, FL 33407, Tel: 305-844-1310; *Sls. Mgr.:* John Strickland

CIRCUIT ASSEMBLY CORP., 18 Thomas St., Irvine, CA 92718-2703, Tel: 714-855-7887, TWX: 910-595-1971; FSC No.: 52072; Empl.: 275; *Sls. Mgr.:* Edward Cadden

Local Sales Offices & Reps

AL	Brownsboro, JHU Assocs.	205-536-7455
AZ	Scottsdale, Harris & Croy Sls.	602-941-9059
AZ	Tucson, Harris & Croy Sls.	602-293-5393
CA	Chatsworth, Raltech, Inc.	818-700-0933
CA	Los Altos, Elrepco	415-962-0660
CA	San Diego, Varigon Assocs.	619-576-0100
CO	Aurora, Sage Sls.	303-750-3591
CT	Wallingford, Com Sls.	203-269-7964
FL	Orlando, Tech-Rep Assocs.	305-855-2648
GA	Atlanta, JHU Assocs.	404-662-0792
IL	Itasca, L-Tec, Inc.	312-773-2900
IN	Indianapolis, Frank Kahsar Sls.	317-888-8396
MA	Needham, Com Sls.	617-444-8071
MI	Grand Haven, Frank Kahsar Sls.	616-846-7590
MN	Osseo, Gaffney Sls.	612-425-5484
MO	Grandview, Harris Hanson Co.	816-763-6200
MO	St. Louis, Harris-Hanson Co.	314-432-3611
NJ	Englewood Cliffs, Masin Esco, Inc.	201-569-8868
NM	Albuquerque, Syntech	505-266-7951
NY	Hauppauge, Masin Esco, Inc.	516-273-3500
NY	Rochester, Apex Assocs., Inc.	716-254-6050
OH	Cincinnati, Frank Kahsar Sls.	513-922-3133
OH	Columbus, Frank Kahsar Sls.	614-252-4009
OH	Hudson, Frank Kahsar Sls.	216-650-1089
PA	Hatboro, Jacobsen Assoc.	215-674-2937
TX	Austin, Barry Sls., Inc.	512-837-3616
TX	Houston, Barry Sls., Inc.	713-784-5860
TX	Richardson, Barry Sls., Inc.	214-234-0255
UT	Salt Lake City, Sage Sls.	801-467-5451
VA	Front Royal, Eltron Sls., Ltd.	703-635-7201
WI	Milwaukee, L-Tec, Inc.	414-774-1000
EXP	CASanta Ana, Mann Overseas	714-250-0622
Can	Rexdale, Ont., Source Elctrns.	416-675-6235

Local Distributors

AZ	Phoenix, Arizona Comps.	602-279-9446
AZ	Phoenix, Tri-Tek	602-995-9352
AZ	Tempe, Circuit Specialist	602-966-0764
CA	Fullerton, Carden Elctrns.	714-526-7882
CA	San Diego, Mann San Diego	619-578-1550
CA	San Diego, Ryno Elctrns.	619-453-8430
CA	San Jose, Rose Elctrns.	408-263-9700
CA	Santa Ana, Mann Southwest Corp.	714-558-3202
CA	Santa Clara, Mann Elctrns.	408-988-6061
CO	Denver, C.S.I.D.	303-292-9594
CT	Norwalk, Park Distrs.	800-243-5006
CT	Wallingford, Midstates Elctrns.	203-265-9900
FL	Miami, Electronic Equip.	305-871-3500
FL	W. Palm Beach, Nurmi Elctrn. Supp.	305-684-0321
ID	Spirit Lake, Al Elctrns.	208-623-3111
IL	Chicago, Bell Inds.	312-982-9210
IL	Elk Grove Village, GBL Gould Elctrns.	312-593-3220

CHICAGO MINIATURE
MILITARY SPECIFICATION
INDUSTRIAL AND COMMERCIAL

FULL LINE
AUTHORIZED DISTRIBUTOR

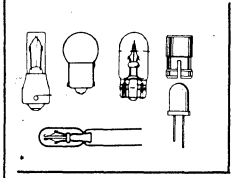
E S I

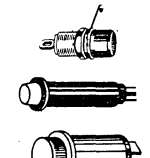
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039

213-660-1310

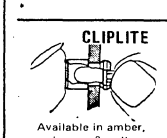
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971





CLIPLITE



Available in amber, red green & yellow

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

IL Melrose Park, Belford Elctrns. 312-865-2400
IA Marion, Brenneman & Assoc. 319-377-6394
MA Newton Upper Falls, In Stock Prods. .. 617-964-6200
MA Norwood, Gerber Elctrns. 617-769-6000
MN Minneapolis, Cassidy Elctrns. 612-944-0100
MN St. Paul, Connectron 612-481-0320
MO St. Louis, Gateway Elctrns. 314-427-6116
NH Manchester, Yankee Elctrns. 603-625-9746
NJ Bellmawr, Mid Atlantic Elctrn. Corp. ... 609-931-5303
NJ E. Hanover, State Elctrns. 201-887-2550
NJ Englewood, Technical Elctrn. Distr. 201-894-0800
NM Albuquerque, Betatron Elec., Inc. 505-344-2381
NM Albuquerque, Connecting Comps. 505-345-8921
NY Bohemia, CAR Lac Indl. 516-567-4200
NY Bohemia, Key Comp. 516-567-7500
NY Farmingdale, Pride Elctrns. 516-293-4020
NY Mt. Vernon, QAR 914-699-2224
OR Lake Oswego, Rose Elctrns. 503-635-8823
PA Levittown, G.W. Elctrns. 215-547-7422
TX McKinney, Prime Distrbg. 214-231-0170
UT Provo, Omega Elctrns. 801-375-4664
UT Salt Lake City, Standard Supp. 801-486-3371
WA Costa Mesa, Mann Overseas 714-557-4080
WI Waukesha, Bell Inds. 414-547-8879

CIRCUITECH, INC., FCS Industries, 527 Industrial Way West, Eatontown, NJ 07724, Tel: 201-493-4102; Empl.: 75; *Sls. Mgr.:* Jim Harrison

CIRCUITS, INC., 59 Deming Rd., Berlin, CT 06037, Tel: 203-828-3526; Empl.: 105

CIRCUIT TECHN., 160 Smith St., Farmingdale, NY 11735, Tel: 516-293-8686, TWX: 510-224-6555; Empl.: 600; *Sls. Mgr.:* Mel Spitz

CIRTECH, EG & G, 15237 Cherry St., Stanley, KS 66223, Tel: 913-681-2801, TWX: 910-749-6806; FSC No.: 5915; Empl.: 75; *Sls. Mgr.:* Dick Spingler

Local Sales Offices & Reps
AZ Tempe, Chapman & Assocs. 602-894-6775
CA Los Angeles, Cain Technlg., Inc. 213-477-9054
CA San Jose, Frequency Control Assocs. 408-446-0200
FL Winter Park, Microwave Mktg. 305-678-2141
IN Ft. Wayne, Technology Mktg. Corp. ... 219-432-5553
IA Cedar Rapids, J.R. Sls. Engrg. 319-393-2232
MD Potomac, Cetech Elctrns. 301-983-2140
NY Melville, RF Elctrn. Sls. 516-420-8890
PA Lancaster, Electro-Rep 717-299-5877

CITEL, INC., 3060 Raymond St., Santa Clara, CA 95050, Tel: 408-727-6562, TWX: 910-338-0540; *Sls. Mgr.:* Paul Macdonald

CLAIREX ELECTRONICS, 560 S. 3rd Ave., Mt. Vernon, NY 10550, Tel: 914-664-6602, Telex: 137308; Empl.: 300; *Sls. Mgr.:* Gerald Smith ..... **B•1206-1209**

Local Sales Offices & Reps
AL Huntsville, K & E Assocs. 205-883-9720
CA Escondido, Clairex Elctronics 619-749-8474
IL Chicago, Berndt Assoc. 312-283-0713
IN Carmel, Berndt Assoc. 317-884-0114
KS Overland Park, Advanced Techn. Sls. 913-492-4333
MD Silver Springs, Youth Assoc. Inc. 301-598-5740
MA Bolton, Clairex 617-779-2780
MI Ferndale, Hilltronics 313-398-5556
MN Minneapolis, H.M.R. 612-920-8200
MO St. Louis, A.T.S. Inc. 314-227-4448
NY Seaford, Abbott Assoc. 516-781-5256
NC Raleigh, Crossroads Elect. Assoc. 919-362-4099
OH Cleveland, Geotronix 216-526-2535
OH Trotwood, Geotronix Inc. 513-854-5939
PA Media, W. Reeves 215-566-6709
TX Austin, J. B. Guenther 512-258-0004
TX Dallas, J. B. Guenther 214-691-8500
WA Seattle, H. Levinson 206-323-5100
WI Milwaukee, Berndt Assoc. 414-545-8400
EXP NJ, Oradell, Sylvan Ginsbury 201-261-3200

Local Distributors
CA Culver City, EV Roberts 213-870-9561
CT Wallingford, Sager Elctrns. 203-265-4600
FL Miami, Elctrn. Equip. 305-871-3500
IL Chicago, Bell Indus. 312-982-9210
IN Indianapolis, Graham Elctrns. 317-634-8486
MD Rockville, All American Transistor 301-251-1205
MA Hingham, Sager Elctrns. 617-749-6700
MA Norwell, Bordewieck Eng. Sls. 617-659-4915
MI Ann Arbor, Wedemeyer Elctrn. 313-665-8611
MN Minneapolis, Stark Elctrns. 612-332-1325
MO St. Louis, Van Sickle Radio Elect. 314-621-5000
NJ Mt. Laurel, D.F. Assocs. 609-234-5324
NY Buffalo, Summit Distr. 716-884-3450
NC Charlotte, Dixie Elctrns. 704-377-4348
OH Columbus, Hughes Peters 614-294-5351
OK Tulsa, Altair 918-665-0523
SC Columbia, Dixie Radio 803-779-5332
TN Knoxville, Dixie Elctrns. 615-938-4131
TX Houston, Altair 713-462-2410
TX Richardson, Altair 214-231-5166
WA Seattle, Radar Elec. 206-282-2511
Can Willowdale, Ont., Electro Sonic 416-494-1666

CLARE RELAYS

CLARE DIVISION, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, Tel: 312-262-7700, Telex: 25-3775; Empl.: 2400; *Sls. Mgr.:* S. N. Horowitz; *Dist. Mgr.:* S. N. Horowitz ..... **B•1260, 1302-1306**

Local Sales Offices & Reps
AL Huntsville, General Instr., Clare Div. ... 205-883-9130
AZ Scottsdale, Summit Sls. 602-998-4850
CA El Segundo, General Instr., Clare Div. 213-322-7745
CA Irvine, J. V. Earley & Assocs. 714-833-1806
CA San Jose, Ruppert Sls. & Engrg. 408-998-8717
CO Westminster, Western Region Mktg. .. 303-430-8883
CT Brookfield, Kanan Assocs. 203-775-0494
FL Casselberry, Sales Engrg. Concepts .. 305-834-6225
GA Norcross, Electramark 404-446-7915
IL Arlington Heights, General Instr., Clare Div. 312-981-0630
IL Rolling Meadows, Sumer, Inc. 312-991-8500
IN Indianapolis, Schank Elctrn. Mktg. 317-842-6204
IA Des Moines, SPS Assocs. 515-225-0607
KS Olathe, SPS Assocs. 913-764-4460
MD Randallstown, Beacon North, Inc. 703-591-1300
MA Needham Heights, Kanan Assocs. 617-449-7400
MA Woburn, General Instr., Clare Div. 617-938-0666
MN Eden Prairie, Aldridge Assocs. Inc. 612-944-8433
MO St. Ann, SPS Assocs. 314-423-7673
NJ Palisades Park, Janco Technlg. 201-941-4008
NY Buffalo, Quality Comps., Inc. 716-837-5430
NY Hicksville, General Instr., Clare Div. ... 516-933-3645
NY Manlius, Quality Comps., Inc. 315-682-8885
NC Raleigh, Zucker Assocs. 919-782-8433
OH Columbus, Baehr, Greenleaf & Assoc. 614-486-4046
OH Lakewood, Baehr, Greenleaf & Assoc. 216-221-9030
OR Hillsboro, Western Tech. Sls. 503-640-4621
PA Erdenheim, Omni Sls. 215-233-4600
TX Dallas, Electra Reps 214-248-3852
TX Houston, Electra Reps 512-339-1163
UT Salt Lake City, Western Region Mktg. 801-355-7239
VA Forest, Beacon North, Inc. 804-239-8486
WA Bellevue, Western Tech. Sls. 206-641-3900
WI Brookfield, Sumer, Inc. 414-784-6641
Can Rexdale, Ont., Generl Instr. Of Can., Ltd. 416-249-8341

CLARKE-HESS COMM. RESCH. CORP., 17 West 17th St., New York, NY 10011, Tel: 212-255-2940, Telex: 971308 RAPID NYK ATT: CH, TWX: 710-582-2292 RAPID NYK ATT: CH; FSC No.: 34423; Empl.: 14 ..... **D•1200-1201**

Local Sales Offices & Reps
CA Burlingame, B.H.L. Assocs. 415-342-7850
IL Chicago, Pat Lind Elctrns. 312-726-3513
IN Indianapolis, Pat Lind Elctrns. 317-632-7444
MN Circle Pines, Pat Lind Elctrns. 612-786-5770
WI Milwaukee, Pat Lind Elctrns. 414-224-0146

CLAROSTAT MFG., Washington St., Dover, NH 03820, Tel: 603-742-1120, TWX: 510-297-4455; FSC No.: 12697; Empl.: 600; *Sls. Mgr.:* H. E. Taylor

CLARY CORP., Precision Instrs. Div., 320 W. Clary Ave., San Gabriel, CA 91776, Tel: 818-287-6111, TWX: 910-589-3369; Empl.: 50; *Sls. Mgr.:* John R. Janner

CLAUSS CUTLERY CO., Box 667, Fremont, OH 43420, Tel: 419-332-7344; Empl.: 175

CLEAN ROOM PRODS., 56 W. Penataquit Ave., Bay Shore, NY 11706, Tel: 516-968-8282, Telex: 645151; Empl.: 52; *Sls. Mgr.:* Florence Gaconnier

CLEMENS MFG., 630 So. Berry Rd., St. Louis, MO 63122, Tel: 314-961-7228; Empl.: 3

CLEVELAND CRYSTALS, Box 17157, Euclid, OH 44117, Tel: 216-486-6100, TWX: 810-421-8031; FSC No.: 8K400; Empl.: 45; *Sls. Mgr.:* P. D. Marlowe

CLEVELAND MICA CO., 1360 Hird Ave., Lakewood, OH 44107, Tel: 216-226-1360; Empl.: 50

CLIFFORD, INC., 83 Main Street, Bethel, VT 05032, Tel: 800-451-4381; Empl.: 42; *Sls. Mgr.:* Martha C. McKinney

CLIFTON PRECISION, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018, Tel: 215-622-1000, TWX: 510-669-9782; FSC No.: 86197; Empl.: 1000; *Sls. Mgr.:* J. Gum ..... **B•1144**

Local Sales Offices & Reps
AZ Phoenix, Clifton Precision 602-242-0910
CA Cupertino, Clifton Precision 408-996-7507
CA Norco, Clifton Precision 714-736-6515
CA San Clemente, Clifton Precision 714-492-6904
CA Woodland Hills, Clifton Precision 818-347-0603
CO Aurora, Midwest Meridian 303-341-7550
FL Longwood, Boetto Corp. 305-331-1771
IL Elk Grove Village, Midwest Meridian .. 312-640-9540
IA Cedar Rapids, Midwest Meridian 319-365-6561
MA W. Newton, Larcom Inc. 617-244-2053
MN Prior Lake, Midwest Meridian 612-447-8222
MO Maryland Hgts., Midwest Meridian 314-878-4441
NY Greenlawn, Reflex Elctrn. 516-549-1888
OH Fairborn, Midwest Meridian 513-879-7100
OR Beaverton, Ravencraft 503-646-9261
PA Clifton Heights, Eastern Sls. 215-622-1000
TX Ft. Worth, Midwest Meridian 817-654-2132

CLIMATRONICS, 140 Wilbur Pl., Bohemia, NY 11716, Tel: 516-567-7300, Telex: 971329; Empl.: 46

CLINTON ELCTRNS., 6701 Clinton Rd., Rockford, IL 61111, Tel: 815-633-1444, Telex: 257-484; *Sls. Mgr.:* John Hartman

CLIPLITE, See Visual Communications

CMC INSTR. DIV., Connecticut microComputer Inc., 568 Danbury Road, New Milford, CT 06776, Tel: 203-354-9395, TWX: 710-456-0052; *Sls. Mgr.:* Shirley Fletcher

CML MACARR
POWER SUPPORT EQUIPMENT

CML MACARR DIV., Marine Electric RPD, Inc., 666 Pacific St., Brooklyn, NY 11217, Tel: 718-857-2400, Telex: 12-5327; FSC No.: 00062; Empl.: 100; *Sls. Mgr.:* Gary Mandell ..... **D•1908-1909**

Local Sales Offices & Reps
MA Sharon, Adcour Inc. 617-784-8123
MI Detroit, Bill Teplitz Associates 216-439-3265
OH Cincinatti, Teplitz Assocs. 513-481-1648
OH Cleveland, Teplitz Assocs. 216-439-3265

CMV SOFTWARE SPECIALISTS INC., 2720 W. 12th Street, Sioux Falls, SD 57104, Tel: 605-338-6645

COAST COIL CO., 5333 W. Washington Blvd., Los Angeles, CA 90016, Tel: 213-936-6188; Empl.: 50

COASTCOM, P.O. Box 27068, Concord, CA 94527, Tel: 415-825-7500, TWX: 910-481-5781; FSC No.: 415 682-2015; Empl.: 180; *Sls. Mgr.:* Scott Ledgerwood

COAXIAL DYNAMICS, 15210 Industrial Parkway, Cleveland, OH 44135, Tel: 216-267-2233, Telex: 980630; Empl.: 36; *Sls. Mgr.:* R. J. Scott ..... **D•1203**

Local Sales Offices & Reps
AZ Tucson, W.J.M. Sales 602-888-4847
CA North Highlands, Robert H. Hutter & Assoc. 916-961-6391
DE Newark, Tom Wright & Assoc. 301-398-3748
IA Cedar Rapids, S & O Sales 319-393-1845
OH Dayton, R.P.A. Co. 513-252-7067

COBA

COBA, INC., P. O. Box 14920B 28TH Ave. N., Plymouth, MN 55441, Tel: 612-559-3772; Empl.: 6 ..... **B•1535-1537**

Local Sales Offices & Reps

AZ	Phoenix, Eltron	602-266-2164
CA	Brea, Masco	714-529-0867
CA	Los Angeles, Masco	213-295-7782
CO	Aurora, Mountain View Mktg.	303-360-9641
CT	Guilford, A & M Electrns.	203-453-1612
IN	Indianapolis, Insul-Reps, Inc.	317-251-1994
MA	Needham, A & M Electrns.	617-444-8170
MI	Brighton, AP Assocs.	313-229-6550
MN	Mound, Allyn Assocs.	612-472-4784
MO	Gladstone, Delltron Co., Inc.	816-436-7445
MO	St. Louis, Delltron Co., Inc.	314-869-4779
NY	Great Neck, MOS Assocs.	516-487-3966
OH	Dublin, AP Assocs.	1-800-624-5496
OH	Fairview Park, AP Assocs.	1-800-624-5496
OR	Tigard, Electronic Comp. Sls.	503-245-2342
PA	Horsham, Dalbrook	215-441-8380
UT	Murray, Mountain View Mktg.	801-264-8488
WA	Mercer Island, Electronic Comp. Sls.	206-232-9301
Can	Point Claire, Quebec, COBA Elctrns., Inc.	514-694-1335

Local Distributors

AL	Huntsville, Component Distrs.	205-883-7501
AR	Little Rock, Component Distrs.	501-227-6278
CA	Hollywood, Yale Elec.	213-465-3186
CA	Manhattan Beach, Prime Electro	213-379-3642
CA	San Carlos, Logan Elctrns.	415-594-0700
CA	Santa Monica, Master Distrs.	213-452-1229
CA	Sunnyvale, Target Elctrns.	408-734-5611
CO	Englewood, Industrial Elctrns.	303-694-9444
CT	Shelton, Century Elec. Supp.	203-736-2684
FL	Fort Lauderdale, Component Distrs.	305-971-4950
FL	Fort Lauderdale, KSM Elctrns.	305-971-5900
GA	Atlanta, KSM Elctrns.	404-458-2013
GA	Norcross, AP Sls. Co.	1-800-624-5496
IL	Chicago, UPCO Distrs.	312-631-1122
MD	Beltsville, Petricko Sls., Inc.	301-937-4960
MO	Valley Park, Beckwith Computer & Elctrns.	314-225-4846
NC	Raleigh, Component Distrs.	919-834-9465
TX	Dallas, Heilind Elctrns., Inc.	214-351-2050

COBEHN, INC., 226 Passaic Ave., Fairfield, NJ 07006, Tel: 201-227-6675; Empl.: 5; *Sls. Mgr.:* George L. Henzel

COBER ELCTRNS., 102 Hamilton Ave., Stamford, CT 06902, Tel: 203-327-0003, TWX: 710-474-3371; FSC No.: 28909; Empl.: 100; *Sls. Mgr.:* Saul Haffner

CODAR TECHNOLOGY, INC., 1428 Florida Avenue, Longmont, CO 80501, Tel: 303-776-0472; Empl.: 18

CODENOLL TECHNOLOGY CORP., 1086 N. Bwy., Yonkers, NY 10701, Tel: 914-965-6300, Telex: 646159; *Sls. Mgr.:* Lori Principe

CODI SEMICONDUCTOR, INC., 350 Hurst Ave., Linden, NJ 07036, Tel: 201-862-8484, Telex: 844-796; FSC No.: 16352;19500; Empl.: 48; *Sls. Mgr.:* Joe LaBruna; *Dist. Mgr.:* Joe LaBruna

COGENEL/ENTRELEC DIV., 2 Ram Ridge Rd., Spring Valley, NY 10977, Tel: 914-425-7460, Telex: 0996619; Empl.: 50; *Sls. Mgr.:* F. D. Leynaert

COGNITRONICS, 25 Crescent St., Stamford, CT 06906, Tel: 203-327-5307, TWX: 710-474-3523; Empl.: 200; *Sls. Mgr.:* Vincent Harrison/Lawrence Ganzall

COHERENT COMMUNICATIONS SYS. CORP., 60 Commerce Dr., Hauppauge, NY 11788, Tel: 516-231-1550, Telex: 94-1439; Empl.: 175; *Sls. Mgr.:* Bertram J. Ralph

COHERENT, INC., 3210 Porter Dr., Palo Alto, CA 94304, Tel: 415-493-2111, Telex: 34-8304; Empl.: 1,300; *Sls. Mgr.:* William Shiner/Paul Crosby

COHU, INC., Elctrns. Div., Box 85623, San Diego, CA 92138, Tel: 619-277-6700, TWX: 910-335-1244; Empl.: 178; *Sls. Mgr.:* H. Winter

COILCRAFT, 1102 Silver Lake Rd., Cary, IL 60013, Tel: 312-639-6400, TWX: 910-651-2251

COIL-Q CORP., 340 Bronxville Rd., Bronxville, NY 10708, Tel: 914-337-4775; Empl.: 12

Advertisement

Our line of tunable RF coils affords highest Q and stability in filter applications from audio thru VHF. Values of .027 to 100,000 uH spaced in a 10% series have overlapping turning ranges. We also make wideband matching transformers, power splitter combiners, Directional couplers, audio transformers, fixed and tunable filters. We will also design and fabricate any of the above items to your specific requirements.

COILTRONICS INC., 984 SW 13th Court, Pompana Beach, FL 33069, Tel: 305-781-8900, TWX: 510-956-3142; Empl.: 130; *Sls. Mgr.:* Lynn A. Hayden

the Colber Corporation

COLBER CORP., 26E Buffington St., Irvington, NJ 07111, Tel: 201-371-9500, TWX: 710-995-4416; Empl.: 50; *Sls. Mgr.:* Roberta Bryner ..... **A•1832**

Local Sales Offices & Reps

CT	Vernon, G.M. Assocs.	203-646-4443
IN	Fort Wayne, Walter W. Bieberich	219-432-2537
MI	Grosse Pointe Farms, Ed Walter	313-882-3746
PA	Oreland, CMS Mktg.	215-887-1325
TN	Fairview, Walter W. Bieberich	615-799-0120

COLE-HERSEE CO., 20 Old Colony Ave., Boston, MA 02127-2467, Tel: 617-268-2100, Telex: 94-0901; *Sls. Mgr.:* Wesley L. Peterson

COLE INSTRUMENT CORP.

COLE INSTR., 2650 S. Croddy Way, Santa Ana, CA 92704, Tel: 714-556-3100; Empl.: 50; *Sls. Mgr.:* P. Hanson ..... **B•1538**

Local Sales Offices & Reps

AL	Huntsville, Rakes Engrg. & Mktg.	205-533-3763
AZ	Scottsdale, Semi Systems Arizona Inc.	602-991-1151
CA	Anaheim, Gabriel & Assocs.	714-666-0660
CA	Santa Clara, Context Engrg.	408-748-8676
CT	Glastonbury, Barton Assocs.	203-633-9417
HI	Lihei, Aloha Assocs.	808-941-1574
IL	Wheaton, Chadra Schilke & Assocs.	312-653-8126
KS	Merriam, Midwest Technical Sls.	913-236-8555
MD	Silver Spring, Carwithen Assocs.	301-589-9040
MA	Salem, Barton Asscos.	617-745-4310
MI	Birmingham, Forand Sls. Co.	313-644-0087
MN	Minneapolis, Voltage Control Sls.	612-553-1051
MO	St. Charles, Midwest Technical Sls.	314-441-1012
NJ	Garwood, E.R. Mertz & Assocs.	201-232-4643
NM	Albuquerque, Semi Systems Arizona Inc.	505-344-1517
NY	Fayetteville, R.D. Sherman Inc.	315-637-9861
OH	Cleveland, Jim Finnegan & Co.	216-238-5905
PA	Broomall, TCA	215-353-2022
TX	Dallas, Control Components Inc.	214-458-8877

COLEX, INCORPORATED, 15028 Beltway Dr., Dallas, TX 75234, Tel: 214-458-2779, TWX: 703143 CLEX US; Empl.: 25; *Sls. Mgr.:* Joe Dean; *Dist. Mgr.:* Joe Dean

COLLINS AVIONICS DIVISIONS, Rockwell Intl., 400 Collins Rd. NE, Cedar Rapids, IA 52498, Tel: 319-395-1000, Telex: 464-421, TWX: 910-525-1321; Empl.: 4,325; *Sls. Mgr.:* R. D. Thorpe

COLLINS TRANSMISSION SYS. DIV., See Rockwell Intl., Commercial Elctrns. Opers.

COLLMER SEMICONDUCTOR, INC., 14368 Proton Rd., Dallas, TX 75234-3335, Tel: 214-233-1589, TWX: 910-860-5462; Empl.: 20; *Sls. Mgr.:* Gene Uecker

COLMAN MOTOR PRODUCTS, INC., A Barber-Colman Co., P. O. Box 1240, Rockford, IL 61105-1240, Tel: 815-968-0660, Telex: 4330367; Empl.: 600

Local Sales Offices & Reps

AR	Fort Smith, Electro-Related Prods.	501-452-4030
CA	San Jose, Motion Control, Inc.	408-997-0544
CA	San Marino, Motion Control Southern	818-796-0189
CO	Longmont, Todd & Fry Assoc.	303-776-7331
CT	So. Windsor, Maher Assoc.	203-644-2481
FL	Boca Raton, E. A. Kershaw & Co.	305-482-3003
IL	Northfield, Lenhart Assocs., Inc.	312-446-7460
IN	Ft. Wayne, Menze Sls.	219-747-5616
MA	Lynn, Maher Assocs.	617-581-3244
MI	Detroit, B.L. Hitt & Assoc.	414-476-2210
MN	Minneapolis, Jos-Co/Melius, Inc.	612-861-3343
NJ	River Edge, Maher Assoc.	201-261-2225
NJ	Williamstown, Precision Motion Sls.	609-629-4757
NY	Albany, Robert F. Lamb Co.	518-869-3355
NY	Buffalo, Robert F. Lamb Co.	716-874-4900
NY	Rochester, Robert F. Lamb Co.	716-323-1250
NY	Syracuse, Robert F. Lamb Co.	315-455-2469
NC	Garner, Candor Co.	919-779-1855
OR	Portland, DHS Sls., Inc.	503-285-9790
OK	Tulsa, J. B. Guenther, Inc.	918-660-5126
PA	Abington, Indl. Mkts. Specialists	215-659-0444
SC	Greenville, Candor Co.	803-297-6261
SC	Myrtle Beach, Candor Co.	803-448-8361
TN	Chattanooga, Candor Co.	615-894-9686
TX	Austin, J.B. Guenther, Inc.	512-472-3825
TX	Dallas, J. B. Guenther, Inc.	214-691-8500
VA	Blacksburg, Candor Co.	703-953-2197
WI	Milwaukee, Badgerep	414-258-6630
EXP	WI, Milwaukee, Dummann World Trade	414-464-0100

COLORADO CRYSTAL CORP., 2303 W. 8th St., Loveland, CO 80537, Tel: 303-667-9248; FSC No.: 33096; Empl.: 135; *Sls. Mgr.:* David Lind ..... **A•1324**

Local Sales Offices & Reps

CA	Los Altos, Kolm Mktg. Assoc.	415-948-2635
CO	Loveland, Morbak Mktg.	303-669-8900
KS	Mission, Robinson & Assocs.	913-262-1374
MA	Randolph, Bengal	617-961-4120
OR	Beaverton, L. D. Elctrns.	503-649-6177
PA	Glenside, Koebert	215-887-2310
WA	Spokane, L. D. Elctrns.	509-922-4883

COLORADO DATA SYSTEMS, INC., 3301 W. Hampden Ave., Unit C, Englewood, CO 80110, Tel: 303-762-1640, TWX: 910-933-0193; Empl.: 35; *Sls. Mgr.:* Louis J. Klahn, Jr.; *Dist. Mgr.:* Louis J. Klahn, Jr.

Local Sales Offices & Reps

AZ	Phoenix, Odyssey 1	602-246-8846
NY	Rochester, Scientific Dvcs., New York, Inc.	716-334-2445
CA	San Jose, Moxon Elctrns.	408-298-7290
CT	Mt. Carmel, Scientific Dvcs.-CT.	203-248-9361
PA	Springhouse, Pennsylvania Sci. Dvcs.	215-643-3335
WA	Bellevue, Showalter Instrs., Inc.	206-746-7970
MA	Waltham, Scientific Dvcs.-New Eng., Inc.	617-890-2252
MO	Maryland Heights, Dytec/South, Inc.	314-569-2990
Can	N. Vancouver, B.C., Jerome & Francis Co., Ltd.	604-986-1286
NJ	Teaneck, Scientific Dvcs. East, Inc.	201-837-8720
NM	Albuquerque, Odyssey 1	505-265-6645
CA	Anaheim, Moxon Elctrns.	714-635-7600
OH	Dayton, WKM, Inc.	513-434-7500
CO	Englewood, Odyssey 1	303-773-8176
TX	Dallas, Data Mktg. Assocs., Inc.	214-661-0300
FL	Melbourne, Saber Assocs., Inc.	800-327-0853
IL	Arlington Heights, Dytec/Central, Inc.	312-394-3380
VA	McLean, Creative Mktg. Assocs., Ltd.	703-442-9100
Can	Ottawa, Ont., A.I.M. Elctrns., Inc.	613-722-8286
MN	St. Paul, Dytec/North, Inc.	612-645-5816

COLORADO VIDEO, INC., Box 928, Boulder, CO 80306, Tel: 303-444-3972, TWX: 910-940-3248; Empl.: 47; *Sls. Mgr.:* Jim Dole

COLORGRAPHIC COMMUNICATIONS CORP., 2379 John Glenn Dr. Ste. 105, P.O. Box 80448, Atlanta, GA 30366, Tel: 404-455-3921, Telex: 700574; Empl.: 50; *Sls. Mgr.:* H. Woody Pritchett

COLUMBIA CHASE CORP., HUMISEAL DIV., See HumiSeal Div.

COLUMBIA COMPS., 9 Division St., Sidney, NY 13838, Tel: 607-563-3520; FSC No.: 59178; Empl.: 12; *Sls. Mgr.:* Helen Montren

COLUMBIA ELEC. MFG., 4519 Hamilton Ave. N.W., Cleveland, OH 44114, Tel: 216-361-8060; Empl.: 60; *Sls. Mgr.:* H. W. Sussman

COLUMBIA ELCTRN. CABLES DIV., See Carol Cable Co., Inc., Columbia Elctrn. Cables Div.

COLUMBIA RESCH. LABS., Macdade Blvd. & Bullens La., Woodlyn, PA 19094, Tel: 215-532-9464, TWX: 510-669-3625; FSC No.: 07571; Empl.: 90; *Sls. Mgr.:* Jack Sarty

COLUMBUS ELEC. MFG., Box 289A Rt # 2, Piney Flats, TN 37686, Tel: 615-538-8191; Empl.: 160

COLUMBUS INSTRUMENTS, 950 N. Hague Ave., Columbus, OH 43204, Tel: 614-488-6176, Telex: 246514; *Sls. Mgr.:* Jan Czekajewski

COMARK CORP., 93 W St., P. O. Box 474, Medfield, MA 02052, Tel: 617-359-8161, Telex: 703156; Empl.: 50

COMCLOK, INC., 1142 N. Gilbert St., Anaheim, CA 92801, Tel: 714-991-1580, 800-854-XTAL, TWX: 910-591-1892; *Sls. Mgr.:* Herb Plumhoff ..... **A•1325**

Local Sales Offices & Reps

AZ	Scottsdale, Western High Tech Mktg.	602-949-0873
CA	Arcadia, HMC	818-447-0958
MA	Malden, J-K Assocs.	617-321-2922
NM	Albuquerque, Western High Tech Mktg.	505-262-2461
TX	Houston, TCI Elctrns.	713-774-5019
VA	Front Royal, Eltron Sls., Ltd.	703-635-7201

COMDATA CORP., 7900 N. Nagle Ave., Morton Grove, IL 60053, Tel: 312-470-9600

COMDESIGN, 751 S. Kellogg Ave., Goleta, CA 93117, Tel: 805-964-9852, TWX: 910-334-1189; Empl.: 125; *Sls. Mgr.:* Ralph M. Armstrong; *Dist. Mgr.:* Donald Sullivan

COMLINEAR CORP., 2468 E. 9th St., Loveland, CO 80537, Tel: 303-669-9433, Telex: 45-0881; FSC No.: 62839; Empl.: 40; *Sls. Mgr.:* John Perzow

COMMERCIAL ELEC. HEATING DEVICES & MFG., INC., 1008 E. Garvey Blvd., Monterey Park, CA 91754, Tel: 213-288-9445; Empl.: 12

COMMERCIAL SYS. LABS., Commercial Sys. Grp., P.O. Box 2710, Auburn, AL 36831, Tel: 205-821-1133; *Sls. Mgr.:* Buzz Mershon; *Dist. Mgr.:* Buzz Mershon

COMMUNICATION ASSOCS., 200 McKay Rd., Huntington Sta., NY 11746, Tel: 516-271-0800, Telex: 510-226-6998; Empl.: 150; *Sls. Mgr.:* Alfred Carlson

COMMUNICATION CABLE, 5 Glen Rd., Manchester, CT 06040, Tel: 203-647-1468; Empl.: 40; *Sls. Mgr.:* E. V. Marozzi

COMMUNICATION CABLES & CONNECTORS, The Dutton Co., 8255 Black Run Rd., Nashport, OH 43830, Tel: 614-828-2468; Empl.: 30; *Sls. Mgr.:* Don Ritterbusch; *Dist. Mgr.:* Don Ritterbusch

COMMUNICATION MACHINERY CORP., 1421 State St., Santa Barbara, CA 93101, Tel: 805-963-9471, TWX: 910-334-3508; Empl.: 50; *Sls. Mgr.:* Russ Sharer

COMMUNICATIONS INSTRS., INC., Box 520, Fairview, NC 28730, Tel: 704-628-1711, Telex: 577436; FSC No.: 58614; Empl.: 450; *Sls. Mgr.:* R. McClinton ..... **B•1298-1301**

Local Sales Offices & Reps

AL	Huntsville, Conley Assocs.	205-882-0316
AZ	Phoenix, PLS Assoc. Inc.	602-246-6477
CA	Los Angeles, Wiley Co.	213-666-1611
CA	San Diego, Wiley Co.	619-571-2881
CA	Santa Clare, Ross Mktg.	408-988-8111
CO	Englewood, PLS Assocs.	303-773-1218
CT	Guilford, A & M Elctrns.	203-453-1612
FL	Boca Raton, Conley Assocs.	305-395-3108
FL	Ovieda, Conley Assocs.	305-365-3283
FL	Tampa, Conley Assocs.	813-885-7658
GA	Atlanta, Conley Assocs.	404-447-6992
IL	Glenview, CII	312-792-2508
IN	Indianapolis, Schank Elctrn. Mktg.	317-842-6204
IA	Cedar Rapids, C. H. Horn & Assocs.	319-393-8703
KS	Desoto, Midtec Assocs.	913-441-6565
MD	Ellicott City, Doss Elctrns.	301-465-1336
MA	Needham, A & M Elctrns.	617-444-8170
MO	St. Louis, John G. Macke Co.	314-432-2830
NM	Albuquerque, PLS Assocs.	505-255-2330
NY	Lynbrook, HLJ Comp. Tech.	516-599-2999
NY	Macedon, M. M. Hare Co.	315-986-3742
NC	Raleigh, Conley Assocs.	919-876-9862
OH	Cleveland, Baehr-Greenleaf & Assocs.	216-221-9030
OH	Columbus, Baehr-Greenleaf & Assocs.	614-486-4046
OH	Dayton, Baehr-Greenleaf & Assocs.	513-439-0724
OR	Portland, Syscom Sls. Co.	503-644-2505
UT	Salt Lake City, PLS Assocs.	801-466-8729
WA	Bellevue, Syscom Sls. Co.	206-641-5080

COMMUNICATIONS TECHNOLOGY CORP., 2237 Colby Ave., Los Angeles, CA 90064, Tel: 213-478-5061, TWX: 910-342-6983; Empl.: 250

COMMUNICATION TECHNIQUES INC., 36 Route 10, East Hanover, NJ 07936, Tel: 201-884-2580, TWX: 710-986-8265; FSC No.: 53213; *Sls. Mgr.:* Louis R. Trummel

COMPAC™

COMPAC, 279 Skidmore Rd., Deer Park, NY 11729, Tel: 516-667-3933, TWX: 510-227-1064; FSC No.: 62099; Empl.: 50; *Sls. Mgr.:* Peter C. Rao ..... **A•1594, 1706-1707; C•1046-1049**

Local Sales Offices & Reps

AZ	Scottsdale, Territorial Mktg.	602-994-8665
CA	Agoura, Cal-Rep	213-991-1940
CA	Cupertino, Dura Elctrn. Sls.	408-255-2084
FL	Clearwater, Beacon Elctrn. Assoc.	813-796-2378
IL	Prospect Heights, R-Tek, Inc.	312-459-6170
IN	Ft. Wayne, R-Tek, Inc.	219-432-8783
MA	Haverill, L-K Assoc.	617-373-1313
NJ	Haddonfield, Mills-Brown Assoc.	609-429-1005
NY	Deer Park, Compac	516-667-3933
NY	Stoney Brook, Gama Metro	516-751-2072
NY	Utica, B. D. Hummel Co.	315-736-7821
TN	Johnson City, Beacon Elctrn. Assoc.	615-282-2421
TX	Garland, Carey, McMahill & Zerbe	214-681-1414
TX	Houston, Carey, McMahill & Zerbe	713-771-1500
VA	Fairfax, Schibley Assocs.	703-591-3008

Local Distributors

AL	Huntsville, Component Distrs.	205-883-7501
AR	Little Rock, Component Distrs.	501-227-6278
CA	Cupertino, Elctrn. Resources	408-996-8858
FL	Ft. Lauderdale, Component Distrs.	305-971-4950
LA	New Orleans, Component Distrs.	504-525-9668
NY	Deer Park, R. F. Comp. Sources	516-242-6748
NY	Utica, B. D. Hummel Co.	315-736-7821
NC	Raleigh, Component Distrs.	919-781-0262
VA	Falls Church, Component Distrs.	703-241-8227

COMPACT SOFTWARE, INC., Comsat Corp., 1131 San Antonia Rd., Palo Alto, CA 94303, Tel: 415-966-8440; *Sls. Mgr.:* Henry Wong

COMPEX CORP., 35A East Main St., Marlton, NJ 08053, Tel: 609-596-9388; Empl.: 13

Local Sales Offices & Reps

AZ	Phoenix, Odyssey 1	602-246-8846
CA	North Hollywood, Crown Elctrns., Inc.	213-877-3550
CA	Saratoga, E. Reid Miller, Corp.	408-257-6927
FL	Boca Raton, R.W. Mitscher Inc.	305-368-3841
NH	Amherst, Callahan & Tremblay	603-883-9000
NJ	Englewood, Cooper Assocs.	201-871-4985
NJ	Morrestown, Stern Assocs.	609-234-0661
NM	Alburquerque, Odyssey 1	505-265-6645
NY	Buffalo, R.W. Mitscher Co., Inc.	716-633-7970
OH	Lancaster, Cain-Forlaw Co., Inc.	614-654-4800
TX	Dallas, Texas Avionics	214-363-6324
Can	Neapean, Ont., Intrade Canada, Inc.	613-727-1272

COMPLEXX SYSTEMS INC., 4930 Research Dr., Huntsville, AL 35805, Tel: 205-830-4310, Telex: 880114; Empl.: 30; *Sls. Mgr.:* Bill Thomas; *Dist. Mgr.:* Pat Bourgeois

COMPLIANCE DESIGN INC., 593 Massachusetts Ave., Boxboro, MA 01719, Tel: 617-264-4668; *Sls. Mgr.:* Ira Barry

COMPONENT GENERAL, INC., 13620 Wright Cir., Tampa, FL 33625, Tel: 813-855-6655; Empl.: 30; *Sls. Mgr.:* James A. Cook

Local Sales Offices & Reps

CA	Irvine, EBA	714-857-6079
CA	Los Angeles, EBA	213-822-7510
CA	Palo Alto, Mollard Mktg.	415-961-0456
DC	Washington, M. Lader Co.	202-296-2497
MA	Andover, Bee Assoc.	617-475-2124
MN	Minneapolis, Comstrand	612-788-9234
MO	Grandview, R. R. Burton	816-763-5385
NY	Bayside, Robert Diamond Inc.	718-423-7330
NY	Buffalo, Ed Westgren Assoc.	716-632-0011
PA	Lafayette Hill, M. Lader Co.	215-825-3177
PA	Murrysville, Pittsburgh Sls. Assoc.	412-327-3268
EXP	CT, Stamford, Control Devices	203-322-7300

COMPONENT MFG. SVC., INC., 1 Component Park, W. Bridgewater, MA 02379, Tel: 617-580-0111, TWX: 710-390-1081; Empl.: 500; *Sls. Mgr.:* R. E. Owens; *Dist. Mgr.:* R. E. Owens

COMPONENT RESEARCH CO. INC., 1655-26 St., Santa Monica, CA 90404, Tel: 213-829-3615, TWX: 910-343-6864; FSC No.: 12517;Multiple; Empl.: 230; *Sls. Mgr.:* Sylvia Kellerman ..... **A•1014-1063**

COMPONENTS CORP., 6 Kinsey Pl., Denville, NJ 07834, Tel: 201-627-0290; FSC No.: 26364; Empl.: 20; *Sls. Mgr.:* W. H. Gordon

COMPONENT SPECIALTIES CORP., 9143 E. La Rosa Dr., Temple City, CA 91780, Tel: 213-283-0015; FSC No.: 28984; Empl.: 45; *Sls. Mgr.:* D.R. Heins

COMPUTER PRODUCTS™
POWER CONVERSION GROUP

COMPOWER DIV., Computer Prods., Inc., 2220 Lundy Ave., San Jose, CA 95131, Tel: 408-942-1600, Telex: 172760 Compower Corp.; Empl.: 116; *Sls. Mgr.:* Lyle Bennett; *Dist. Mgr.:* Tazz A. Pettebone ..... **D•1446, 1552-1558, 1584-1585**

Refer to Computer Prods., Inc., Pompano Beach, FL for sales offices and representatives and for distributor listings.

COMPUCART, Versa Tec Corp., 107 N. Rome Ave., Tampa, FL 33606, Tel: 800-237-9024, 813-251-2431

COMPUCORP, 2211 Michigan Ave., Santa Monica, CA 90404, Tel: 213-829-7453, Telex: 4720106, TWX: 910-342-6510; Empl.: 450; *Sls. Mgr.:* Joe Thorpe; *Dist. Mgr.:* Richard Venn

COMPU-LITE CORP., 711 W. 17th St. # F12, Costa Mesa, CA 92627, Tel: 714-645-1501; FSC No.: 51420; Empl.: 50; *Sls. Mgr.:* W.D. Cobben

COMPUNETICS, INC., 2000 Eldo Rd., Monroeville, PA 15146, Tel: 412-373-8110; Empl.: 100; *Sls. Mgr.:* Jerry Schmitt

Local Sales Offices & Reps

CT	Marion, Sands Co., Inc.	203-628-4363
FL	Ft. Lauderdale, Southland Comp., Inc.	
MI	Troy, C. B. Jensen & Assocs.	313-643-0506
MN	Mound, Allyn Assocs.	612-472-4784
MO	St. Louis, Harris-Hauson Co.	314-432-3611
NJ	Wayne, SHL Assocs.	201-790-1714
NC	Smithfield, ADI	919-934-8136
OH	Cleveland, Jim Finnegan & Co.	216-238-5905

COMPUPRO, 3506 Breakwater Ct., Hayward, CA 94545, Tel: 415-786-0909; *Sls. Mgr.:* Jim Lanphear; *Dist. Mgr.:* Kevin Coonan

COMPUSCAN, INC., 81 Two Bridges Rd. Bldg. No. 2, Fairfield, NJ 07006, Tel: 201-575-0500; Empl.: 300 + ; *Sls. Mgr.:* Peter F. Polizzano

COMP-U-STAFF, 1 Investment Pl., Towson, MD 21204, Tel: 301-828-0788; Empl.: 180; *Sls. Mgr.:* Catherine Harper

COMPUTALKER, Compuvoice, Inc., 1730 21st Street, Santa Monica, CA 90404, Tel: 213-828-6546; Empl.: 5; *Sls. Mgr.:* Ron Anderson; *Dist. Mgr.:* Ron Anderson

COMPUTER AVIONICS, 2 Southgate Dr., Mt. Carmel, IL 62863, Tel: 618-263-4343; Empl.: 64; *Sls. Mgr.:* Jerry R. Hart

COMPUTER CABLE & PRODS. INC., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735, Tel: 516-293-1610, Telex: 14-3155, TWX: VERTEX FDLE; FSC No.: 6T500; Empl.: 100; *Sls. Mgr.:* Michael Scanzano; *Dist. Mgr.:* Penny Shaw

COMPUTER COMPONENTS INC.
629 FIFTH AVENUE, PELHAM, NEW YORK 10803

COMPUTER COMPONENTS, INC., 629 Fifth Ave., Pelham, NY 10803, Tel: 914-738-1611; FSC No.: 12965; Empl.: 25; *Sls. Mgr.:* G. Tsokris ..... **B•1307**

COMPUTER CONVERSIONS CORP., 6 Dunton Ct., E. Northport, NY 11731, Tel: 516-261-3300, TWX: 510-226-0448; FSC No.: 51086; Empl.: 100; *Sls. Mgr.:* S. J. Renard ..... **D•1140-1141**

Local Sales Offices & Reps

CA	Buena Park, Motion Control	714-994-6952
CA	N. Hollywood, Crown Elctrns.	213-877-3550
CO	Denver, WH Howard Co.	303-426-3499
IL	Downers Grove, GnH Sls.	312-985-3764
MA	Brookline, Technology Prods.	617-731-0858
MI	Newport, Industrial Sensors	313-289-3374
MN	Minneapolis, Busch Elctrns.	612-835-2044
NY	Penfield, Barthel Entprs.	716-377-3018
NC	Kannapolis, Bass & Assocs.	704-933-1762
PA	Ingoma, Greye Glass	412-366-6664
TX	Dallas, Jacobson Co.	214-363-7584

COMPUTER CORP. OF AMERICA, 675 Massachusetts Ave., Cambridge, MA 02139, Tel: 617-492-8860, Telex: II 710-320-6479, TWX: 710-320-6479; *Sls. Mgr.:* Mr. Robert Roda

COMPUTER DESIGN & APPLICATIONS INC., 411 Waverly Oaks Rd., Waltham, MA 02154, Tel: 617-647-1900, Telex: 232-2240; *Sls. Mgr.:* Thomas Goliash

COMPUTER DETAILING CORP., 301 York Rd., Warminster, PA 18974, Tel: 215-675-4831; Empl.: 10; *Sls. Mgr.:* Norman Atterman

COMPUTER DEVICES, 749 Middlesex Turnpike, Nutting Lake, MA 01865, Tel: 617-663-4980, Telex: 949398; Empl.: 100; *Sls. Mgr.:* Robert L. Hengen; *Dist. Mgr.:* Dick Leeman

COMPUTER DEVICES CORP., 63 Austin Blvd., Commack, NY 11725, Tel: 516-543-4220; Empl.: 50 ..... **A•1487**

Local Sales Offices & Reps

MD	Baltimore, R. A. Wafer Assocs.	301-744-1133
EXP	NY, New Rochelle, Montclair Elctrns.	914-576-1400

COMPUTER DYNAMICS, 105 S. Main St., Greer, SC 29651, Tel: 803-877-7471; *Sls. Mgr.:* Kurt Priester

COMPUTER FIELD SERVICES, INC., 6 Federal Street, Danvers, MA 01923, Tel: 617-774-2930; *Sls. Mgr.:* Stephen B. Miles

COMPUTER INSTRS., 100 Madison Ave., Hempstead, NY 11550, Tel: 516-483-8200, TWX: 510-222-4189; Empl.: 50; *Sls. Mgr.:* F. Cooper; *Dist. Mgr.:* F. Mitchell

COMPUTER MAINTENANCE CORP., 405 Murray Hill Pkwy, East Rutherford, NJ 07073, Tel: 201-866-6400; Empl.: 61; *Sls. Mgr.:* Anthony Scordo

COMPUTER OPTICAL PRODUCTS, INC.
Subsidiary of Hathaway Corp.

COMPUTER OPTICAL PRODS., INC., Sub. of Hathaway Corp., 9353 Eton Ave., Chatsworth, CA 91311-5866, Tel: 818-882-0424, TWX: 215-406; Empl.: 150; *Sls. Mgr.:* Brian Gillespie

THE COMPUTER PLACE, D & D Financial Entprs. Inc., 4595 Van Epps Rd., Brooklyn Hts., OH 44131, Tel: 216-351-7444, TWX: 810-421-8446; Empl.: 41; *Sls. Mgr.:* William C. Briggs

COMPUTER POWER, 124E W. Main St., High Bridge, NJ 08829, Tel: 201-735-8000, Telex: 847481; FSC No.: 3643; Empl.: 145; *Sls. Mgr.:* George A. Ardolino; *Dist. Mgr.:* Stanley A. Smith, Jr.

COMPUTER PRODUCTS
POWER CONVERSION GROUP

COMPUTER PRODS. INC., Power Conversion Grp., 2981 Gateway Dr., Pompano Bch., FL 33069-4803, Tel: 305-974-5500, TWX: 510-956-3098; FSC No.: 62125; Empl.: 800; *Sls. Mgr.:* Martin L. Gross; *Dist. Mgr.:* Dale T. Raveney ..... **D•1446, 1551-1585**

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech Sls. Engrg.	205-533-2100
AZ	Tempe, Elec-Com Assocs.	602-967-8644
CA	Danville, Power Conversion Grp.	415-837-8593
CA	Folsom, Manco	916-985-0370
CA	Los Angeles, Power Partners, Inc.	213-215-0800
CA	Santa Clara, Manco	408-496-6611
CO	Parker, Parker Webster Co.	303-841-4888
FL	Coral Springs, EPM Corp.	305-755-5387
FL	Orlando, EPM Corp.	305-425-6149
GA	Atlanta, Electro-Mech Sls. Engrg.	404-447-6478
ID	Boise, Intermountain Technlg.	208-322-5022
IL	Des Plaines, Janus, Inc.	312-298-9330
IL	Glenview, Power Conversion Grp.	312-998-6715
IN	Indianapolis, Fred A. Dorsey & Assocs.	317-842-0060
KS	Overland Park, J. F. Guernsey Co.	913-381-2225
KY	Louisville, Fred A. Dorsey & Assocs.	502-426-3540
MD	Columbia, Professional Reps.	301-992-7460
MA	Woburn, Power Conversion Grp.	617-933-0237
MI	Livonia, Lowell Wendt Mktg.	313-464-2722
MN	Bloomington, Smiley Scott Assocs.	612-888-5551
MO	Florissant, J. F. Guernsey Co.	314-921-5720
NJ	Englewood, Tecnimat	201-569-4200
NM	Albuquerque, Elec-Com Assocs.	505-898-6101
NY	Binghamton, Empire Tech. Assocs.	607-772-0651
NY	Fayetteville, Power Unltd.	315-637-5291
NC	Raleigh, Electro-Mech Sls. Engrg.	919-851-8165
OH	Cleveland, Geotronix	216-526-2535
OH	Trotwood, Geotronix	513-252-6700
OK	Bixby, MGR Elctrns.	918-369-5186
OR	Portland, Power Sources Unltd.	503-292-0820
PA	Norristown, Denco	215-630-8990
TN	Nashville, Electro-Mech Sls. Engrg.	615-885-0073
TX	Austin, MGR Elctrns.	512-250-0926
TX	Dallas, MGR Elctrns.	214-238-5246
UT	Salt Lake City, Parker Webster	801-266-9939
WA	Lynnwood, Power Sources Unltd.	206-743-6641
WI	Milwaukee, Janus, Inc.	414-476-9104

Local Distributors

CA	Milpitas, Power Systems Distrs.	408-263-1063
CA	N. Hollywood, B. J. Wolfe Entprs.	213-877-5518
CT	Milford, R. C. Comps.	203-847-0006
FL	Ft. Lauderdale, Dielco	305-973-8700
IL	Chicago, Bell Inds.	312-982-9210
MD	Columbia, Aztech Elctrs.	301-995-1760
MA	Wilmington, RC Comps.	617-273-1860
MI	Livonia, LWC Distrs.	313-464-7700
OH	Cleveland, Alpha Distrs.	216-526-3716
OK	Tulsa, Norvell Elctrns.	918-663-1247
OR	Lake Oswego, Bell Inds.	503-241-4115
PA	Norristown, Century Elctrn. Comps.	215-631-5400
TX	Austin, Norvell Elctrns.	512-458-8106
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Houston, Norvell Elctrns.	713-777-1666
WA	Bellevue, Bell Inds.	206-747-1515
WI	Waukesha, Bell Inds.	414-547-8879
Can	Concord, Ontario, Kaytronics	416-669-2262
Can	Kanata, Ontario, Kaytronics	613-592-6606
Can	Surrey, BC, Kaytronics	604-581-5005
Can	Ville St. Pierre, Quebec, Kaytronics	514-367-0101

COMPUTERS INTERNATIONAL, 3540 Wilshire Blvd., Los Angeles, CA 90010, Tel: 213-386-3111, TWX: 910-321-4209; FSC No.: 381-7467; *Dist. Mgr.:* Jim Baker

COMPUTER SYSTEM ASSOCS., 7564 Trade St., San Diego, CA 92121, Tel: 619-566-3911; Empl.: 10; *Sls. Mgr.:* Patricia Chovinard; *Dist. Mgr.:* Patricia Chovinard

COMPUTER SYSTEMS PRODUCTS, 740 Washington Ave N, Minneapolis, MN 55401, Tel: 612-338-0995, 800-422-2537; Empl.: 20+; *Sls. Mgr.:* Tom Kalgrem; *Dist. Mgr.:* Gary Doan

COMPUTER TALK, INC., Box 148, Morrison, CO 80465, Tel: 303-697-5485; Empl.: 20

COMPUTER TERMINAL SYS., 89 Arkay Drive, Hauppauge, NY 11788, Tel: 516-435-2916, Telex: 291411, 291413, TWX: 510-224-6050; FSC No.: 33948; Empl.: 120; *Sls. Mgr.:* K. Oliver

COMPUTERVISION CORP., 201 Burlington Rd., Bedford, MA 01730, Tel: 617-275-1800

COMPUTERWARE, INC., 8480-I Tyco Rd., Vienna, VA 22180, Tel: 703-821-8200; Empl.: 14; *Sls. Mgr.:* Betsy Henderson

COMPUTERWISE, 4006 E 137th Terr., Grandview, MO 64030, Tel: 816-765-3330; Empl.: 20; *Sls. Mgr.:* William W. Brown; *Dist. Mgr.:* William W. Brown

COMPUTROL DIV. KIDDE AUTOMATED SYS., INC., 15 Ethan Allen Hwy., Ridgefield, CT 06877-6297, Tel: 203-544-9371, Telex: 643358; Empl.: 90; *Sls. Mgr.:* Chuck Brewer

COMPUTYPE, INC., 2285 W. County Road "C", St. Paul, MN 55113, Tel: 612-633-0633, 800-328-0852, TWX: 910-563-3699

COMSPEC INC., 10700 Hammerly 5120, Houston, TX 77043, Tel: 713-461-4487, TWX: 910-881-4763; Empl.: 41; *Sls. Mgr.:* Rick Risinger; *Dist. Mgr.:* Rick Risinger

COMSTRON CORP., 200 E. Sunrise Hwy., Freeport, NY 11520, Tel: 516-546-9700, TWX: 510-225-3699; Empl.: 97 ..... **A•1327-1329, 1595; D•1204-1205**

Local Sales Offices & Reps

AZ	Phoenix, Odyssey 1	602-246-8846
CA	Anaheim, Blair Assocs.	714-635-1350
CA	San Diego, Interstate Mktg. Assocs.	714-292-8117
CA	Sunnyvale, Applied Sys.	408-773-0616
CA	Woodland Hills, Interstate Mktg. Assocs.	213-883-7606
CO	Castle Rock, Odyssey I	303-688-3555
FL	Altamonte Springs, Dyne-A-Mark Corp.	305-831-2097
FL	Clearwater, Dyne-A-Mark Corp.	813-441-4702
FL	Fort Lauderdale, Dyne-A-Mark Corp.	305-944-5031
FL	Ft. Lauderdale, Reynolds & Assocs.	305-581-6611
FL	Melbourne, Reynolds Assocs.	305-259-7000
FL	Palm Bay, Dyne-A-Mark Corp.	305-727-0192
FL	St. Petersburg, Reynolds & Assocs.	813-360-1484
GA	Acworth, Reynolds & Assocs.	404-451-9558
GA	Marietta, Comstron/Southeast	404-973-3325
IL	Arlington Heights, Dytec Cen.	312-394-3380

COMPUTER PRODUCTS™
POWER CONVERSION

AUTHORIZED & STOCKING DISTRIBUTOR

ALPHA DISTRIBUTOR CORP

550 E. ROYALTON ROAD
CLEVELAND, OHIO 44147
PHONE 216/526-3716

IN Indianapolis, Dytec Cen. 317-247-1316
KS Lenexa, Dytec South 913-888-0215
MI Madison Hts., WKM Assocs. 313-588-2300
MN St. Paul, Dytec North 612-645-5816
MO Maryland Hts., Dytec South 314-569-2990
NJ Englewood Cliffs, Sci. Dvcs. East 201-871-3916
NM Albequerque, Odyssey 1 505-265-6645
NC Spring Hope, Reynolds & Assocs. 305-259-7000
OH Dayton, WKM Assocs., Inc. 513-434-7500
OH Independence, WKM Assocs., Inc. 216-524-5930
PA Pittsburgh, WKM Assocs., Inc. 412-892-2953
PA Spring House, Sci. Dvcs. East 215-643-3335
TX Dallas, Marcom 214-351-4532
VA McLean, Creative Mktg. Assocs. 703-442-9100
VA McLean, Creative Mktg. Assocs. 703-440-9100

COMTECH MICROWAVE CORP., Comtech Corp., 63 Oser Ave., Hauppauge, NY 11788, Tel: 516-435-4646, Telex: 971403 COMMIC HAUP; FSC No.: 61381; *Sls. Mgr.:* M. Javits

COM/TECH SYSTEMS, 505 Eighth Ave., New York, NY 10018, Tel: 212-594-5377; Empl.: 9

COMTEC INFOR. SYS., INC., 53 John St., Cumberland, RI 02864, Tel: 401-724-8500, TWX: 710-387-1171; Empl.: 75; *Sls. Mgr.:* R. A. Hamilton

COMTEK, INC., 309 Breesport, San Antonio, TX 78216, Tel: 512-340-8253

C-con™ COMPONENTS CONCEPT INDUSTRIES

CONCEPT INDUSTRIES, App-Rep, Inc., 3641 San Gabriel River Pkwy., Pico Rivera, CA 90660, Tel: 213-699-0918, Telex: 883123; Empl.: 17; *Sls. Mgr.:* Brad Marsh; *Dist. Mgr.:* Kathy Sawyer ..... **A•1064-1065, 1833**

Local Sales Offices & Reps
CA Huntington Beach, Mil-Com Sls. 714-840-2424
CA Livermore, O'Reilly Elctrns. 415-443-5343
FL Indian Harbor Beach, Bill Toy Assocs. 305-773-5805
IL Medina, Gentry Sls. 312-893-9352
SC Tega Cay, NU South Sls. 803-548-2238

Local Distributors
CA Irvine, Kelex Elctrns. 714-863-1230
CA La Selva Beach, Coast Comps. 408-684-1185
CA Livermore, O'Reilly Elctrns. 415-443-5343
CA Los Angeles, All Elctrns. 213-380-8000
CA San Diego, Sigma Elctrns. 619-565-2000
CA Santa Clara, Capacitors Unlimited 408-946-7676
CA Tustin, Caltronics 714-730-0350
FL Melbourne, T. C. Pridmore 305-727-2491
NY Dix Hills, Aries Elctrns. 516-499-0369
TX Garland, J & S Elctrns. 214-487-8808

CONCORD DATA SYSTEMS, 303 Bear Hill Rd., Waltham, MA 02154, Tel: 617-890-1394, Telex: 95-1793; Empl.: 160

CONCORD ELCTRNS., 30 Great Jones St., Dept. JE, New York, NY 10012, Tel: 212-777-6571, TWX: 710-581-4930; Empl.: 225; *Sls. Mgr.:* Josie Wheaton ..... **C•1174-1175**

CONDENSER PRODS., P.O. Box 997, Brooksville, FL 33512, Tel: 904-796-3561; Empl.: 26; *Sls. Mgr.:* Pat K. Johnson

CONDITIONING SEMICONDUCTOR DEVICES, Box 2116, Wayne, NJ 07470, Tel: 201-335-6723, Telex: 219023; FSC No.: 60644; Empl.: 20; *Sls. Mgr.:* A. G. Zimmerly; *Dist. Mgr.:* Jill Mullen

CONDOR INC. D.C. POWER SUPPLIES

CONDOR D.C. POWER SUPPLIES, INC., 201 Flynn Rd., Camarillo, CA 93010, Tel: 805-484-2851, 800-235-5929, Telex: 910-336-1140; Empl.: 220; *Sls. Mgr.:* Fred Adams ..... **D•1587-1599**

Local Sales Offices & Reps
AL Huntsville, Pen-Tech 205-881-9298
CA Pasadena, RDX Corp. 213-681-3451
CA San Diego, RDX Corp. 619-292-7744
CA Sunnyvale, RDX Corp. 408-734-4500
CO Denver, R. Mktg. 303-455-5360
FL Casselberry, Pen-Tech 305-645-3444
FL Deerfield Beach, Pen-Tech 305-421-4989
GA Marietta, Pen-Tech 404-424-1931
IL Schaumberg, Engrg. Prods. 312-882-7640
IN Greenfield, Engrg. Prods. 317-894-7156
IA Coralville, Engrg. Prods. 319-354-5344
MD Wheaton, Brimberg Sls. 301-946-2670
MA Wayland, Daner Hayes, Inc. 617-655-0888
MN Edina, Engrg. Prods. 612-835-9022
NJ Bellmawr, TAI 609-933-2600,215-627-6615
NY Yonkers, Sonkin Assocs. 914-968-7736
NC Greensboro, Pen-Tech 919-852-6000
OH Dayton, Thompson Assocs. 513-435-7733
PA Mars, Thompson Assocs. 412-776-6495
TX Dallas, Seaton Corp. 214-380-0414
UT N. Salt Lake City, R. Mktg. 801-298-2631
WA Bellevue, Al Smith Co. 206-746-6770

Local Distributors
CA Costa Mesa, FLW 800-225-5359
CA Hayward, FLW 415-786-9070
FL Orlando, GMI 305-894-3354
IL Schaumberg, Engrg. Prods. 312-882-7640
MD Wheaton, Brimberg Sls. 301-946-2760
MI Madison Heights, McNaughton-McKay 313-399-7500
MN Edina, Engrg. Prods. 612-835-9022
NY Yonkers, Kintronics 914-968-8282
TX Houston, American Analog 713-941-7265
Intl Belgium, Mulder-Hardenburg 031-680032
Intl Denmark, Danika Supp. 09-432122
Intl England, Gresham/Powerdyne ..... (025-672)4246
Intl Finland, Oy Ferrado AB 0-550002
Intl France, AK Electronique 01-5755353
Intl Holland, Mulder-Hardenburg BV 023-319184
Intl Norway, Powerbox AS 02-535-837
Intl Sweden, Power Box AB 0518-11920
Can Toronto, Ont., Duncan-Inst. Ltd. 416-742-4448

CONDOR PACIFIC INDS., INC., 8053 Deering Ave., Canoga Park, CA 91304, Tel: 818-347-8331, Telex: 65-1442; Empl.: 40

CONDOR SYSTEMS, INC., 2605 S. Winchester Blvd., Campbell, CA 95008, Tel: 408-866-5900, Telex: 184819 Systems SANTA; FSC No.: 62065; *Sls. Mgr.:* Dick Keenly; *Dist. Mgr.:* Ed Brown

CONDUCTIVE RUBBER TECHNLG., 1235 Coast Village Rd., Santa Barbara, CA 93108, Tel: 805-969-5805, Telex: 658-305

CONECTRIX, INC., 376 E. Gunderson St., Carol Stream, IL 60188, Tel: 312-653-1460

CONFORMING MATRIX, Box 5126, Pt. Pl. Sta., Toledo, OH 43611, Tel: 419-729-3777; Empl.: 35

CONKLIN INSTR. CORP., West Rd., Pleasant Valley, NY 12569, Tel: 914-635-2136; FSC No.: 914-635-2510; Empl.: 65; *Sls. Mgr.:* Tom Dolan

Local Sales Offices & Reps
CT Bethel, Gemini Elctrn. Sls. 203-748-5506
GA Newnan, Dolan Assocs. 404-251-1102
NJ Kinnelon, R.J. Alvarez, Inc. 201-838-5641
OH Howard, Denman Assocs. 614-397-6240
WA Seattle, BF Sls. & Engrg. 206-364-3287

CONNECT-AIR INTERNATIONAL, INC., 50 37th St. N.E., Auburn, WA 98002, Tel: 206-939-4880, TWX: 910421-1492; Empl.: 50; *Sls. Mgr.:* Ron Jones

CONNECTICUT HARD RUBBER CO., See CHR Inds.

CONNECTICUT MICROWAVE CORP., 106 Powder Mill Rd., Box 389, Canton, CT 06019, Tel: 203-693-4247; FSC No.: 50974; Empl.: 16; *Sls. Mgr.:* S. T. Urbank

CONNECTOR CORP., 6025 N. Keystone Ave., Chicago, IL 60646, Tel: 312-539-3108, TWX: 910-221-6059 ..... **C•1176-1177**

CONNECTOR INDS. OF AMER. DIV., Microdot Mfg., 639 N. Wayne, Cincinnati, OH 45215, Tel: 513-733-3680; FSC No.: 32076; Empl.: 35; *Sls. Mgr.:* K. C. Neal

HCW

CONNOR-WINFIELD CORP., 109 Turner Ct., POB L, W. Chicago, IL 60185, Tel: 312-231-5270, TWX: 910-230-3231; FSC No.: 21022; Empl.: 35; *Sls. Mgr.:* John Hoag ..... **A•1331-1334**

Local Sales Offices & Reps
CA Agoura Hills, C.D.H. Assocs. 818-707-1970
CA Los Altos, Frauman Assocs. 415-941-0660

CONOLOG CORP., 5 Columbia Rd., Somerville, NJ 08876, Tel: 201-722-8081

CONRAC CORP., System Comps. Div., 1700 S. Mountain Ave., Duarte, CA 91010, Tel: 213-359-9141, Telex: 96-5978; Empl.: 200; *Sls. Mgr.:* Albert N. Caputo

CONRAC DIV., Conrac Corp., 600 N. Rimsdale Ave., Covina, CA 91722, Tel: 213-966-3511, Telex: 67-0437; Empl.: 450

CONSELL, 463 Payne Dr., Cheshire, CT 06410, Tel: 203-272-5750; Empl.: 3; *Sls. Mgr.:* A. R. Aikman

CONSOLIDATED CONTROLS, 15 Durant Ave., Bethel, CT 06801, Tel: 203-743-6721, Telex: 969615, TWX: 710-456-0446; FSC No.: 02750; Empl.: 650; *Sls. Mgr.:* A.F. Jakubauskas

CONSOLIDATED ELECTRONIC WIRE & CABLE, 11044 King St., Franklin Park, IL 60131, Tel: 312-455-8830, TWX: 910-227-1705; FSC No.: 73612; Empl.: 57; *Sls. Mgr.:* Karl Rankin; *Dist. Mgr.:* Steve Boynton

CONSOLIDATED PRODUCTS CORP., P.O. Box 67, Idyllwild, CA 92349, Tel: 714-659-2183

CONSOLIDATED RESISTANCE CO. AMERICA, 222 Lake Ave., Yonkers, NY 10701, Tel: 914-YO3-5900; Empl.: 20

CONSOLINK CORP., 1275 S. Sherman Dr., Longmont, CO 80501, Tel: 303-651-2014, TWX: 910-320-0786; Empl.: 40; *Sls. Mgr.:* Dan Zec; *Dist. Mgr.:* Rhonda Cashion

CONSUMERTRONICS, 2011 Crescent Dr., Alamogordo, NM 88310, Tel: 505-434-0234; Empl.: 5; *Sls. Mgr.:* Laurie Laurencia

CONTACT, INC., 5 Elm Ave., Hudson, NH 03051, Tel: 603-883-7708; FSC No.: M07015; Empl.: 11; *Sls. Mgr.:* T. Foresta; *Dist. Mgr.:* R. Reid

CONTACT EAST, 7 Cypress Dr., Burlington, MA 01803, Tel: 617-272-5051; *Sls. Mgr.:* Kai Juel

CONTACT ELECTRONICS, INC., 30 Plymouth St., Fairfield, NJ 07006, Tel: 201-575-7660, 800-221-1451, Telex: 130-216; Empl.: 50; *Sls. Mgr.:* Thomas E. Bodnar; *Dist. Mgr.:* Jaime N. Korosler

CONTEL INFO. SYS., INC., Continental Tel. Corp., 130 Steamboat Rd., Great Neck, NY 11024, Tel: 516-829-5900; Empl.: 450

CONTINENTAL DATA SYS., 131 N. Ludlow St., Dayton, OH 45402, Tel: 513-222-8626; Empl.: 4

CONTINENTAL ELECTRONICS MFG. CO., P.O. Box 270879, Dallas, TX 75227, Tel: 214-381-7161, Telex: 73-398; FSC No.: 52151; Empl.: 400; *Sls. Mgr.:* R. L. Floyd, Domestic Broadcast

CONTINENTAL RESOURCES, INC., 175 Middlesex Tpke., Bedford, MA 01730, Tel: 617-275-0850, TWX: 710-326-0833; Empl.: 275; *Sls. Mgr.:* Michael Mattleman

CONTINENTAL SPECIALTIES CORP., See Global Specialties Corp.

CONTINENTAL WIRE & CABLE, Gulton Rd., P. O. Box 1863, York, PA 17405, Tel: 717-792-2644, Telex: 84-0437; Empl.: 250; *Sls. Mgr.:* Edward W. Holland III; *Dist. Mgr.:* William L.Druck

CONTOURS, INC., P.O. Box 1041, Middletown, CT 06457, Tel: 203-347-5694; FSC No.: 033501; *Sls. Mgr.:* Peter L. DeVit

CONTRAVES GOERZ CORP., 610 Epsilon Dr., Pittsburgh, PA 15238, Tel: 412-967-7700, Telex: 86-6237, TWX: 710-664-2082; FSC No.: 51261; *Sls. Mgr.:* Henry M. Voss; *Dist. Mgr.:* Ronald L. Ekas

CONTROL CONCEPTS CORP., P.O. Box 1380, Binghamton, NY 13902-1380, Tel: 607-724-2484; Empl.: 41; *Sls. Mgr.:* Oral R. Evans ..... **B•1233**

Local Sales Offices & Reps

AL	Huntsville, Saber Assocs.	800-327-0853
AZ	Scottsdale, Power Specialists	602-996-4100
CA	Los Alamitos, Power Specs.	213-594-9418
CA	Redwood City, Ault Assocs.	415-367-1710
CA	Simi Vally, Power Specialist Co.	
CA	Vista, Power Specialist Co.	619-726-4799
FL	Melbourne, Saber Assocs.	800-432-6288
GA	Norcross, Saber Assocs.	800-327-0853
IL	Elk Grove Village, Loren Green Assocs.	312-593-0282
IN	Fort Wayne, Domino	219-747-5621
MA	Needham, Shain Assocs.	617-449-4380
MI	Livonia, Electro Sls. Assocs.	313-474-7320
MI	Portage, Electro Sls. Assocs.	616-323-2416
MN	Springlake Park, Holmgren Assocs.	612-786-7641
NY	Binghamton, TAE-Rep, Inc.	607-692-3705
NY	Great Neck, Phase 4, Inc.	516-482-1790
NY	Rochester, TAE-Rep, Inc.	726-586-8710
NC	Clayton, Saber Assocs.	800-327-0853
OH	Cleveland, Electro Sls. Assocs.	216-261-5440
OH	Dayton, Electro Sls. Assocs.	513-426-5551
OK	Edmond, Data Aids	405-478-5000
OR	Portland, SPS Elctrns.	503-297-6919
PA	Montgomeryville, Eastern Sci. Mktg.	215-368-4570
NJ	Vincentown, Eastern Scientific Mktg.	609-268-0250
TX	Austin, Data Aids	512-327-8600
TX	Dallas, Data Aids	214-620-1551
TX	The Woodlands, Data Aids	713-363-3838
WA	Redmond, SPS Elctrns.	206-392-5256
WI	Glendale, Stapleman Corp.	414-352-5777
Can	Toronto, Ont., Norgay Entrps., Ltd.	416-239-3025

CONTROL DATA CORP., P.O. Box O, Minneapolis, MN 55440, Tel: 1-800-828-8001 Operator 82, In MN 612-921-4400; Empl.: 50,000

CONTROL ELCTRNS. CO., INC., 107-B Allen Blvd., Farmingdale, NY 11735, Tel: 516-694-0125; FSC No.: 95924; Empl.: 60; *Sls. Mgr.:* Harold Goldstein; *Dist. Mgr.:* Jack Leonard ..... **A•1488**

Local Sales Offices & Reps

CA	Sherman Oaks, R.T. Assocs.	213-788-7588
FL	Melbourne, VPI	305-727-3305
FL	Tampa, VPI	813-832-2041
IL	Chicago, Electro-Tech Mktg. Assoc.	312-676-3151
MD	Ellicott City, VPI	301-461-2525
MA	W. Medway, J. Gallagher	617-533-7292
MN	Fridley, Teskey & Assocs.	612-571-0876
PA	Montgomery, VPI	215-474-3200
TX	Dallas, Texas Avionics Co.	214-363-6324
WI	Brookfield, Electro-Tech Mktg. Assocs.	414-785-9554
EXP	FL, Hallandale, Emec	305-925-6366

CONTROL ENGRG., INC., 1686 Riverdale St., West Springfield, MA 01089, Tel: 413-781-1330; Empl.: 7; *Sls. Mgr.:* Mark Kimball

CONTROL EQUIP. CORP., 171 Lincoln St., Lowell, MA 01851, Tel: 617-459-0573; Empl.: 10

CONTROLEX/EANCO, See Fincor

CONTROL INDS. INC., 530 Burnside Ave., Inwood, NY 11696, Tel: 212-471-9800; Empl.: 40

CONTROL LASER CORP., 11222 Astronaut, Orlando, FL 32821, Tel: 305-851-2540, Telex: 564407; *Sls. Mgr.:* John F. Rogers

CONTROLLED ENVIR. EQUIP. CORP., 3 Delta Drive, Westbrook, ME 04092, Tel: 207-854-9126; Empl.: 5; *Sls. Mgr.:* M. F. Peck

CONTROLLED POWER COMPANY

CONTROLLED POWER CO., 1955 Stephenson Hwy., Troy, MI 48083, Tel: 1-800-521-4792, TWX: 810-232-3401 ..... **D•1876, 1910-1915**

Local Sales Offices & Reps

AL	Birmingham, James E. Heusser Agy., Inc.	205-836-3896
AK	Anchorage, Alaska Computer Environment	907-562-2406
AZ	Phoenix, Gruber Assocs.	602-863-2655
CA	LaJolla, Wheelock	619-454-3473
CA	Mountainview, Westech Sls.	415-961-1422
CO	Monument, Precision Environments	303-480-3330
DE	Wilmington, Data Concepts Corp.	302-654-3388
GA	Atlanta, United Engrg. Co. Inc.	404-256-4871
IL	Hoffman Estates, Carvel Engrg.	312-885-8800
IN	Carmel, Ralph Wendel	317-844-2230
KS	Mission, West & Assocs.	913-246-5356
KY	Louisville, Jenkins & Assocs.	502-451-4441
MI	Lansing, Hammond Assocs., Inc.	517-372-4112
MI	Lathrup Village, Carpenter-Cunningham & Assocs.	313-559-9610
MN	Edina, Carvel Engrg.	612-835-7929
MO	Ballwin, Cassidy & Assocs.	314-391-1802
NJ	Cherry Hill, Data Concepts Corp.	609-429-1510
NJ	Englewood Cliffs, Power Conversions & Control	201-569-0015
NM	N.E. Albequerque, Sun Data Sys., Inc.	505-292-1022
NY	Buffalo, Bromor Co.	716-874-4595
NC	Winston Salem, Carrington Elctrl.	919-968-8580
OH	Cleveland, Carter, McCormick & Peirce	216-779-5100
OH	Englewood, Carter, McCormick & Peirce	513-836-0951
OR	Beaverton, Ratec Corp.	503-643-5824
PA	Pittsburgh, Carter, McCormick & Peirce	412-372-4415
SC	Maldin, Carrington Elec. Sls.	803-297-9769
TN	Nashville, Jenkins & Assocs., Inc.	615-256-7606
TX	Dallas, Engineered Computer Rooms	214-644-1963
WA	Seattle, R. W. Campbell	206-622-3403
WV	Charleston, Dave Gandy & Assocs.	304-343-7414
WI	New Berlin, Carvel Engrg.	414-784-7007
Can	Nepean, Ontario, Mech-Co., Ltd.	613-225-0210

CONTROL MODULE, 380 Enfield St., Enfield, CT 06082, Tel: 203-745-2433, Telex: 643167; Empl.: 160; *Sls. Mgr.:* Peter C. DiMaria

CONTROL-O-MATION, INC, 7300 W. Huron River Dr., Dexter, MI 48130, Tel: 313-426-3935; Empl.: 70; *Sls. Mgr.:* Richard Lundy

CONTROL PRODUCTS, INC., 280 Ridgedale Ave., E. Hanover, NJ 07936, Tel: 201-887-9400; FSC No.: 81901; Empl.: 62; *Sls. Mgr.:* J. R. Nile

CONTROL PRODS., Devar, Inc., P.O. Box 589, Bridgeport, CT 06601, Tel: 203-368-6751, Telex: 96-4234; Empl.: 80; *Sls. Mgr.:* T. W. Tomasko

CSI CONTROL SCIENCES INCORPORATED

CONTROL SCIENCES, INC., 9509 Vassar Ave., Chatsworth, CA 91311, Tel: 818-709-5510, Telex: 4970496(CSI); FSC No.: 53317; Empl.: 14; *Sls. Mgr.:* Rhod Zimmerman ..... **D•1142-1146**

Local Sales Offices & Reps

IL	Rolling Meadows, KMA Sales	312-398-5300
IN	Ft. Wayne, J & B Engrg.	219-483-2813
MN	St. Paul, Northstar Motion & Control	612-770-5311
MO	Peculiar, PEM Sales	816-884-4784
MO	St. Louis, PEM Sales	314-427-7200
NY	Victor, A & D Devices	716-924-9171
OH	Cleveland, Geotronix	216-526-2535
OH	Columbus, Geotronix	614-457-8472
PA	Media, Homer Smith Sls.	215-543-2434
WI	Milwaukee, KMA	414-259-1771

CONTROLS UNLIMITED, INC., 4823 North Ridge Rd., Perry, OH 44081, Tel: 216-259-2500; Empl.: 35

CONTROL SYSTEMS, 2855 Anthony Lane, Minneapolis, MN 55418, Tel: 612-789-2421, Telex: 756601

CONTROL TECHNOLOGY CO., 41-16 29th St., Long Island City, NY 11101, Tel: 718-361-2133; FSC No.: 14545; Empl.: 35; *Sls. Mgr.:* H. Cooper ..... **D•1986-1987**

Local Sales Offices & Reps

CA	Claremont, W. Roth & Assocs.	714-621-1019
Can	Montreal, Que., Control Tech. Elctrns. CTC Canada, Ltd.	514-733-3279

CONTROL TECHNOLOGY, INC., 8200 N. Classen Blvd., Ste. 101, Oklahoma City, OK 73114, Tel: 405-840-3163, Telex: 910-831-3231; *Sls. Mgr.:* Charles Weddington; *Dist. Mgr.:* Charles Weddington

CONVER CORP., 10629 Bandley Dr., Cupertino, CA 95014, Tel: 408-255-0151, TWX: 910-338-2036; Empl.: 40; *Sls. Mgr.:* Robert Lloyd; *Dist. Mgr.:* Lyne Hare

CONVERSION EQUIP. CORP., 330 W. Taft Avenue, Orange, CA 92665, Tel: 714-637-2970; Empl.: 50; *Sls. Mgr.:* Patrick M. D'Acre

CONVERTER CONCEPTS, INC., Industrial Pkwy., Pardeeville, WI 53954, Tel: 608-429-2144, TWX: 910-280-2630; Empl.: 120; *Sls. Mgr.:* Michael J. Schoenwald; *Dist. Mgr.:* Michael J. Schoenwald ..... **D•1600-1603**

Local Sales Offices & Reps

AL	Huntsville, JWL Assocs.	205-883-1712
AZ	Phoenix, Thor Engrg.	602-437-1463
CA	Goleta, The Thorson Co.	805-964-8751
CA	Hayward, Pacific Mktg.	415-887-1620
CA	Signal Hill, The Thorson Co.	213-595-0361
FL	Boca Raton, Perrott Assocs.	305-792-2211
FL	Clearwater, Perrott Assocs.	813-443-5214
FL	Orlando, Perrott Assoc.	305-298-7748
GA	Atlanta, JWL Assocs.	404-429-8010
IL	Rolling Meadows, KMA Sls.	312-398-5300
MA	Natick, Wayland Engrg. Sls.	617-655-6080
MN	Minneapolis, JMI	612-861-3343
NY	Syracuse, Pi-Tronics	315-455-7346
NC	Raleigh, JWL Assocs.	919-787-4826
OH	Dayton, Bradcor	513-294-5477
OH	Euclid, Bradcor Elctrns.	216-261-0888
PA	Glenside, Koebert Assoc.	215-887-2310
TX	Garland, Tesco	214-681-1376
TX	Houston, Tesco	713-777-1443
WA	Linnwood, Power Sources Unltd.	206-784-3336
WI	Milwaukee, KMA Sales	414-259-1771
Can	Rexdale, Ont., Electro-Source, Inc.	416-675-4490

CONVEX CORP., P.O. Box 17225, Dulles Intl. Airport, Washington, DC 20041, Tel: 703-661-8900; Empl.: 24

COOL-AMP CONDUCTO-LUBE CO., 8621 S.W. 17th Ave., Portland, OR 97219, Tel: 503-244-2230; Empl.: 5; *Sls. Mgr.:* Audrea Dick

COONER WIRE CO., 9186 Independence Ave., Chatsworth, CA 91311, Tel: 818-882-8311; *Sls. Mgr.:* Steven W. Smith ..... **C•1820-1826**

Local Sales Offices & Reps

CA	Cupertino, Cooner Wire Co.	408-773-1444

COOPER GROUP, PO Box 30100, Raleigh, NC 27622, Tel: 919-781-7200, Telex: 579497

CO-ORD SWITCH DIV., See LVC Inds., Inc.

COORS PORCELAIN, 600 Ninth St., Golden, CO 80401, Tel: 303-278-4000, Telex: 45593; Empl.: 1700

COOSOL, 3013 Harbor Blvd., Costa Mesa, CA 92626, Tel: 714-545-2216; Empl.: 20; *Sls. Mgr.:* Aram Solomonian; *Dist. Mgr.:* Aram Solomonian

CORBY INDS. INC., P. O. Box 2838, Allentown, PA 18001, Tel: 215-433-1412, Telex: 847318 CORBYUHL; Empl.: 22; *Sls. Mgr.:* Glenn M. Matz; *Dist. Mgr.:* Lewis S. Walters

CORCOM, INC., 1600 Winchester Rd., Libertyville, IL 60048, Tel: 312-680-7400, TWX: 687-1058; FSC No.: 05245; Empl.: 1000 ..... **A•1596**

Local Sales Offices & Reps

AL	Huntsville, Robert O. Whitesell	205-883-5110
AZ	Phoenix, I.S.D.S.	602-971-6250
CA	Los Angeles, I.S.D.S.	213-478-0183
CA	Mountain View, Straube Assocs.	415-969-6060
CA	San Diego, I.S.D.S.	619-571-1544
CA	Santa Ana, I.S.D.S.	714-973-2162
CA	Woodland Hills, I.S.D.S.	818-883-7130
CO	Arvada, Straube Assocs.	303-426-0890
CT	Madison, Conti-Younger Assocs.	203-245-1136
CT	Norwalk, Wincor Sls.	203-348-7741
FL	Maitland, E.I.R. Inc.	305-660-9600
FL	Oldsmar, E.I.R. Inc.	813-786-2156
FL	Plantation, E.I.R. Inc.	305-581-6905
FL	Plantation, E.I.R. Inc.	305-791-8243
ID	Boise, Cascade Comps.	208-343-9886
IL	Rolling Meadows, Sumer, Inc.	312-991-8500
IN	Ft. Wayne, Robert O. Whitesell	219-432-5591
IN	Indianapolis, Robert O. Whitesell	317-359-9283
IN	Kokomo, Robert O. Whitesell	317-457-9127
IA	Cedar Rapids, PMR, Inc.	319-362-9177
KS	Overland Park, PMR, Inc.	913-381-0004
KS	Wichita, PMR, Inc.	316-684-4141
KY	Louisville, Robert O. Whitesell	502-426-7696
MD	Ellicott City, Marketing Technlg.	301-465-5944
MA	Burlington, Conti-Younger Assocs.	617-273-1582
MI	Grand Rapids, Robert O. Whitesell	616-942-5420
MI	Southfield, Robert O. Whitesell	313-559-5454
MI	St. Joseph, Robert O. Whitesell	616-983-7337
MN	Edina, Mel Foster Co.	612-941-9790
MO	Maryland Heights, PMR, Inc.	314-569-1220
NM	Albuquerque, Straube Assocs.	505-292-0428
NY	Endicott, Noeth-Honsinger Assocs.	607-754-3214
NY	Manhasset, Win-Cor Elctrn. Sls.	516-627-9474
NY	Pittsford, Noeth-Honsinger Assocs.	716-586-9002
NC	Raleigh, Zucker Assoc.	919-782-8433
OH	Cincinnati, Robert O. Whitesell	513-521-2290
OH	Cleveland, Robert O. Whitesell	216-447-9020
OH	Columbus, Robert O. Whitesell	614-888-9396
OH	Dayton, Robert O. Whitesell	513-298-9546
OR	Lake Oswego, Cascade Comps.	503-635-2227
PA	Pittsburgh, Robert O. Whitesell	412-963-6161
PA	Trevose, Professional Svc. Assoc.	215-245-0513
TN	Knoxville, Robert O. Whitesell	615-694-9476
TX	Austin, K & H Sls.	512-258-8841
TX	Plano, K & H Sls.	214-423-6520
UT	Salt Lake City, Straube Assocs.	801-263-2640
VA	Lynchburg, Marketing Technlg.	804-384-6459
WA	Seattle, Cascade Comps.	206-888-3717
WI	Brookfield, Sumer, Inc.	414-784-6641

Local Distributors

AL	Huntsville, Pioneer	205-837-9300
AZ	Phoenix, Cetec Elctrns.	602-272-7951
CA	Canoga Park, Marshall Inds.	818-999-5004
CA	Chatsworth, Diplomat Elctrns.	818-314-4411
CA	Costa Mesa, Diplomat Elctrns.	714-549-8401
CA	El Monte, Marshall Inds.	213-442-7204
CA	Irvine, Cetec Elctrns.	714-250-4141
CA	Irvine, Marshall Ind.	714-660-0951
CA	San Diego, Cetec Elctrns.	619-278-5020
CA	San Diego, Diplomat Elctrns.	619-292-5693
CA	San Diego, Marshall Ind.	619-578-9600
CA	Santa Clara, Cetec Elctrns.	408-263-7373
CA	South Gate, Cetec Elctrns.	213-773-6521
CA	Sunnyvale, Diplomat/Westland	408-734-1900
CA	Sunnyvale, Marshall Ind.	408-732-1100
CO	Denver, Marshall Ind.	303-427-1818
CO	Wheatridge, Diplomat Elctrns.	303-422-9229
CT	Danbury, Diplomat Elctrns.	203-797-9674
CT	E. Haven, J.V. Elctrns.	203-499-2457
FL	Clearwater, Diplomat Elctrns.	813-443-4515
FL	Deerfield Beach, Pioneer	305-771-7520
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Orlando, Hammond Elctrns.	305-849-6060
FL	Orlando, Pioneer	305-834-9090
GA	Atlanta, Marshall Ind.	404-923-5750
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Elk Grove Village, Pioneer/Chicago	312-437-9680
IL	Palatine, OHM Elctrns.	312-359-5500
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	Indianapolis, Pioneer	317-849-7300
MD	Beltsville, Resco/Washington	301-937-9100
MD	Gaithersburg, Pioneer	301-921-0660
MD	Savage, Pyttronic Inds.	301-792-0780
MD	White Marsh, Resco	301-529-0500
MA	Burlington, Marshall Ind.	617-272-8200
MA	Newton, Greene Shaw	617-969-8900
MA	Norwood, Gerber Elctrns.	617-769-6000
MI	Livonia, Pioneer	313-525-1800
MI	Livonia, R.S. Elctrns.	313-525-1155
MN	Minneapolis, Newark Elctrns.	612-331-6350
MN	Minnetonka, Pioneer/Twin Cities	612-935-5444
MN	St. Paul, Gopher Elctrns.	612-483-3322
MO	St. Louis, Olive Elctrns.	314-426-4500
NJ	Bellmawr, Mid Atlantic Elctrns. Corp.	609-931-5303
NJ	Totowa, Diplomat Elctrns.	201-785-1830
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Melville, Diplomat Elctrns.	516-454-6400
NY	Mt. Vernon, QAR Indl. Elctrn. Sls.	914-699-2224
NY	Rochester, Rochester Radio Supp.	716-454-7800
NY	Rochester, Summit Distrs.	716-334-8110
NC	Greensboro, Hammond Elctrns.	919-275-6391
OH	Cleveland, Pioneer	216-587-3600
OH	Dayton, Pioneer	513-236-9900
OR	Beaverton, Almac Elctrns.	503-641-9070
PA	Montgomeryville, Pyttronic Inds.	215-242-6700
PA	Philadelphia, Almo Elctrns. Corp.	215-698-4000
PA	Pittsburgh, Pioneer	412-782-2300
SC	Columbia, Dixie Elctrns.	803-779-5332
TX	Austin, Pioneer	512-835-4000
TX	Dallas, Pioneer	214-386-7300
TX	Fort Worth, TTI	817-831-0441
TX	Houston, Pioneer	713-988-5555
UT	Salt Lake City, Diplomat/Alta Land	801-486-4134
WA	Bellevue, Almac Elctrns.	206-643-9992
WI	Milwaukee, Marsh Elctrns.	414-475-6000

CORD ELECTRONICS, INC., 177 Cantiague Rock Rd., Westbury, NY 11590, Tel: 516-935-3640, Telex: 475-8020; FSC No.: 516-935-0780; Empl.: 25; *Sls. Mgr.:* William Mercurio .... **A•2009; B•1023; C•1827; D•1024, 1605**

Local Sales Offices & Reps

AL	Huntsville, DHR Mktg., Inc.	205-533-5165
AR	Little Rock, Welch & Doby, Inc.	501-455-2199
CA	San Diego, Littlefield & Smith Assocs.	619-455-0055
CA	Saratoga, Frequency Control Assocs.	408-446-0200
CA	Saratoga, Santana Sls.	714-827-9100
CO	Aurora, Sage Sls.	303-750-3501
CT	Manchester, G. M. Assocs.	203-646-4443
FL	Casselberry, HAI Elctrns., Inc.	305-831-4892
FL	Coral Springs, HAI	305-752-7520
GA	Atlanta, DHR Mktg.	404-451-9848
IL	Highland Park, Bransky Sls.	312-433-2375
IN	Indianapolis, Elctrn. Reps.	317-894-1414
IA	Bettendorf, Weisler & Assocs., Inc.	319-344-0566
LA	Manderville, Design Mktg.	713-237-2319
MD	Timonium, Eastern Comps. Sls. Corp.	301-561-5811
MA	Framingham, G.M. Assocs.	617-872-4871
MI	Adrian, Elctrn. Salesmasters	517-263-2500
MI	Livonia, Elctrn. Salesmasters	313-421-2520
MN	Minneapolis, O.E.M. Elctrl. Sls., Inc.	612-559-2448
MS	Jackson, Welch & Doby, Inc.	601-932-5534
MO	Ellisville, Weisler Assocs.	314-394-4543
MO	N. Kansas City, Weisler Assocs.	816-421-1679
NH	Exeter, G. M. Assocs.	603-778-7472
NM	Alburquerque, Syntech	505-266-7951
NY	Jericho (Downstate), J-Square Mktg., Inc.	516-935-3200
NY	Rochester, J. G. Welch Assocs., Inc.	716-244-1100
NY	Utica, J. G. Welch Assocs., Inc.	315-736-7821
NC	Charlotte, DHR Mktg., Inc.	704-335-1215
NC	Greensboro, DHR Mktg., Inc.	919-273-2671
NC	Raleigh, DHR Mktg.	919-876-5450
OH	Beachwood, Elctrn. Salesmasters	800-328-1848
OH	Cleveland, Arthur H. Baier & Assocs.	216-461-6161
OH	Dayton, Arthur H. Baier & Assocs.	513-276-4128
OK	Tulsa, Design Mktg., Inc.	918-622-7744
OR	Beaverton, Quest Mktg., Inc.	503-641-7377
PA	W. Conshohocken, Eastern Comps.	215-825-8610
SC	Greenville, DHR Mktg.	803-235-3594
TN	Memphis, Welch & Doby, Inc.	901-683-8099
TX	Dallas, Design Mktg., Inc.	214-680-9767
TX	Hurst, Design Mktg., Inc.	817-268-2004
TX	Round Rock, Design Mktg., Inc.	512-255-9896
UT	Salt Lake City, Sage Sls.	801-467-5451
WA	Bellevue, Quest Mktg., Inc.	206-747-9424
WI	Cedarburg, Bransky Sls.	414-377-6837
PR	Puerto Rico, Casanova Indl. Sls.	809-753-8674
Can	Waterloo, Ont., Rytech Co.	519-743-4521

CORLUND ELCTRNS. CORP., 3543 Old Conejo Rd., Newbury Park, CA 91320, Tel: 805-499-6947; Empl.: 45; *Sls. Mgr.:* John Redmond

CORNELL-DUBILIER ELECTRONICS, 150 Avenue 'L', Newark, NJ 07105, Tel: 201-589-7500, Telex: 03-8366

CORNELL-DUBILIER ELECTRONICS, Div. of Federal Pacific Electric Co., 1605 East Rodney French Blvd., New Bedford, MA 02744, Tel: 617-996-8561

CORNELL-DUBILIER ELCTRNS., Wayne Interchange, Plaza 1, Wayne, NJ 07470, Tel: 201-256-2000; *Sls. Mgr.:* A. Cavuto ..... **A•1067, 1597; B•1309**

Local Sales Offices & Reps

AZ	Tempe, Electronics Dvcs. & Sls.	602-438-1547
CA	Los Altos, Ewing-Foley, Inc.	415-941-4525
CA	San Diego, Harvey King	619-566-5252
CO	Westminster, Western Region Mktg.	303-430-8883
FL	Fort Lauderdale, Dyne-A-Mark Corp.	305-771-6501
IL	Rolling Meadows, Eagle Tech. Sls., Inc.	312-991-0700
IN	Carmel, Technology Mktg.	317-844-8462
MD	Glen Burnie, Faion Lott & Co.	301-744-4611
MA	Needham Heights, Coakley, Boyd & Abbett	617-444-5470
MI	Detroit, Rathsburg Assocs.	313-882-1717
MN	Minneapolis, Electric Comp. Sls.	612-933-2594
MO	Bridgeton, Dy-Tronix, Inc.	314-291-4771
NY	Syracuse, Leonard D. Allen	315-437-8387
NC	Cary, Montgomery Mktg., Inc.	919-467-6319
OH	Dayton, The Lyons Corp.	513-278-0714
TX	Richardson, R. F. Kimball Co, Inc.	214-231-3447
WA	Bellevue, Northwest Mktg. Assocs.	206-455-5846
PR	Santurce, Sudouest Import Sls. Corp.	809-726-7635

Local Distributors

AL	Huntsville, Arrow Elctrns., Inc.	205-882-2730
AL	Huntsville, Hall-Mark Elctrns.	205-837-8700
AZ	Phoenix, Arizona Comp. Co.	602-269-5655
AZ	Phoenix, Hall-Mark Elctrns.	602-243-6601
AZ	Tempe, Arrow Elctrns., Inc.	602-968-4800
AZ	Tempe, Bell Inds.	602-966-7800
CA	Chatsworth, Arrow Elctrns., Inc.	213-701-7500
CA	Chatsworth, Integated Elctrns. Corp.	213-009-2200
CA	Chatsworth, QC Comps.	818-700-2622

CORD ELECTRONICS

PASSIVE COMPONENTS—Meters, Lamps, Potentiometers, Quartz Crystals & Filters, Xenon Flash Tubes & Trigger Coils, Miniature Speakers & Phone Capsules, Chokes, Coils, IFT, Inductors, Headsets, Boom Mic Headsets, Microphones, Mic Cartridges & Cables, Cords, Cables, Plugs, Jacks, Assemblies, Telephone Handsets, Modular Cords & Jacks, Switches.

POWER PRODUCTS—SPS (30W to 200W, 1 to 5 outputs), DC to DC (30W to 150W, 1 to 5 outputs), Magnetic Components.

FIBER OPTICS—Fiber Phone, Terminated Fiber Cables, Active Connectors.

CUSTOM MANUFACTURED PRODUCTS

CORD ELECTRONICS INCORPORATED

177 Cantiague Rock Road,
Westbury, N.Y. 11590
Phone: (516) 935-3640
Telex: 4758020 FAX: (516) 935-0780

CORD ELECTRONICS
INCORPORATED (Formerly the OEM Division of MURA)

CA Chatsworth, Shelley Elctrns. 213-009-3333
CA Englewood, Hall-Mark Elctrns. 303-694-1662
CA Fountain Valley, Component Ctr., Inc. 714-979-0433
CA Garden Grove, Bell Inds. 714-895-7801
CA Garden Grove, National Capacitor Corp. 714-892-7749
CA Irvine, Integrated Elctrns. Corp. 714-540-5600
CA Palo Alto, Zack Elctrns. 415-326-5432
CA Sacramento, Arrow Elctrns. Inc. 916-925-7456
CA San Diego, Arrow Elctrns., Inc. 619-565-4800
CA San Diego, Hall-Mark Elctrns. 619-268-1201
CA San Diego, Shelley Elctrns. 619-453-7133
CA San Fernando, Petell Elctrns. 818-365-9841
CA San Francisco, Zack Elctrns. 415-626-1444
CA San Jose, Integrated Elctrns. Corp. 408-287-6488
CA San Jose, Shelley Elctrns. Corp. 408-942-9111
CO Lakewood, Acacia Sls. 303-232-2882
CO Wheatridge, Bell Inds. 303-424-1985
CT Greenwich, Wise Comp. 203-531-4880
CT Stratford, Utronics, Inc. 203-378-4201
CT Wallingford, Arrow Elctrns. 203-265-7741
FL Ft. Lauderdale, Arrow Elctrns. 305-776-7790
FL Ft. Lauderdale, Hall-Mark Elctrns. 305-971-9280
FL Ft. Lauderdale, Hammond Elctrns., Inc. 305-973-7103
FL Orlando, Hall-Mark Elctrns. 305-855-4020
FL Orlando, Hammond Elctrns., Inc. 305-849-6060
FL Palm Bay, Arrow Elctrns., Inc. 305-725-1480
GA Norcross, Arrow Elctrns., Inc. 404-449-8252
GA Norcross, Hall-Mark Elctrns. 404-447-8000
IL Bensenville, Hall-Mark Elctrns. 312-860-3800
IL Chicago, Bell Inds. 312-982-9210
IL Chicago, Newark Elctrns. 312-638-4411
IL Elk Grove Village, GBL/Goold Elctrns. 312-593-3220
IL Itasca, Voyager Elctrns. 312-773-4900
IL Palatine, OHM Elctrns. 312-359-5500
IL Rosemont, Advent Elctrns., Inc. 312-297-6200
IL Schaumburg, Arrow Elctrns., Inc. 312-397-3440
IL Skokie, Kellner Elctrns. 312-677-1120
IN Fort Wayne, Graham Elctrns. 219-423-3422
IN Indianapolis, Arrow Elctrns. 317-243-9353
IN Indianapolis, Graham Elctrn. Supp., Inc. 317-634-8202
IA Cedar Rapids, Advent Elctrns., Inc. 319-363-0221
IA Cedar Rapids, Bell Inds. 319-395-0730
IA Cedar Rapids, Deeco, Inc. 319-365-7551
IA Cedar Rapids, Arrow Elctrns., Inc. 319-395-7230
KS Lenexa, Hall-Mark Elctrns. 913-888-4747
KS Wichita, RSC Elctrns., Inc. 316-267-5213
LA New Orleans, William B. Allen, Inc. 504-525-8222
MD Baltimore, A.S.I. Elctrns. 301-265-5200
MD Baltimore, Arrow Elctrns., Inc. 301-247-5200
MD Bethesda, Arrow Elctrns., Inc. 301-564-3000
MD Columbia, Hall-Mark Elctrns. 301-621-4228
MD Gaithersburg, Pioneer Washington Elctrns. 301-948-0710
MD Rockville, Capital Radio Whls., Inc. 301-881-2270
MA Hingham, Sager Elctrl. Supp. 617-749-6700
MA Newton, Green-Shaw, Inc. 617-969-8900
MA North Chelmsford, Pilgrim Elctrns. 617-251-8746
MA Wilmington, RC Comp., Inc. 617-657-4310
MA Woburn, Arrow Elctrns., Inc. 617-933-8130
MA Woburn, Jaco Elctrns., Inc. 617-933-7760
MI Ann Arbor, Arrow Elctrns. 313-971-8220
MI Grand Rapids, Arrow Elctrns. 616-243-0912
MI Livonia, Pioneer/Michigan 313-525-1800
MN Bloomington, Hall-Mark Elctrns. 612-852-3223
MN Edina, Arrow Elctrns., Inc. 612-830-1800
MN Minneaolis, Stark Elctrrns. Supp. 612-332-1325
MO Kansas City, Electronics Supp. 816-931-0250
MO Maryland Heights, Hall-Mark Elctrns. 314-291-5350
MO St. Louis, Arrow Elctrns. 314-567-6888
MO St. Louis, Olive Elctrns. 314-426-4500
NH Manchester, Arrow Elctrns., Inc. 603-668-6968
NJ Cherry Hill, Hall-Mark Elctrns. Corp. 609-424-7300
NJ East Brunswick, Brothers Elctrns. 201-238-2200
NJ East Hanover, State Elctrns. Parts Corp. 201-887-2550
NJ Fairfield, Arrow Elctrns. 201-575-5300
NJ Fairfield, Hall-Mark Elctrns. 201-575-4415
NJ Kenilworth, Federated Purchased 201-272-0505
NJ Marlton, Arrow Elctrns., Inc. 609-596-8000
NJ Moorestown, Arrow Elctrns., Inc. 609-235-1900
NM Albuquerque, Arrow Elctrns., Inc. 505-243-4566
NM Albuquerque, Electronic Parts Co., Inc. 505-293-6161
NY Biminghamton, Help Elctrns., Inc. 607-729-3528
NY Bohemia, Key Comps., Inc. 516-567-7500
NY Buffalo, Summit Distrs., Inc. 716-877-2800
NY Central Islip, Semicap Elctrns. Corp. 516-582-4400
NY Elmsford, Ancar Elctrns. Supp., Inc. 914-592-7100
NY Farmingdale, Arrow Intl. 516-293-6363
NY Farmingdale, Semispecialists of Amer. 516-293-2710
NY Hauppauge, Arrow Elctrns., Inc. 516-231-1030
NY Hauppauge, Broad Line Elctrns. 800-645-5444
NY Hauppauge, Fairmont Elctrn.Sls. Corp. 516-231-3312
NY Hauppauge, Jaco Elctrns., Inc. 516-273-5500
NY Liverpool, Arrow Elctrns., Inc. 315-652-1000
NY Melville, Arrow Elctrns., Inc. 516-391-1300
NY Rochester, Arrow Elctrns., Inc. 716-275-0300
NY Rochester, Masline Elctrns. 716-546-5373
NY Rochester, Rochester Radio Supp. Co. 716-454-7800
NY Rochester, Simcona Elctrns. Corp. 716-238-3230
NY Rochester, Summit Elctrns. of Roch., Inc. 716-334-8110
NY Rockville Center, Douglas Elctrns. 716-764-5710
NY Rome, Rome Elctrns. 315-337-5400
NY Ronkonkoma, Hall-Mark Elctrns. 516-737-0600
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Raleigh, Arrow Elctrns. 919-876-3132
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
OH Akron, Akron Electrns. Supp. Co. 218-762-8818
OH Centerville, Arrow Elctrns., Inc. 513-435-5563
OH Cincinnati, Hall-Mark Elctrns. 513-563-5980
OH Cincinnati, Hughes Peters, Inc. 513-351-2000
OH Cleveland, Pioneer/Cleveland 216-587-3600
OH Columbus, Arrow Elctrns. 614-885-8362
OH Columbus, Hughes Peters 614-294-5351
OH Dayton, Bell Inds. 513-434-8231
OH Dayton, Pioneer Elctrns. 513-236-9900
OH Dayton, Stotts Friedman 513-298-5555
OH Highland Heights, Hall-Mark Elctrns. 216-473-2907
OH Solon, Arrow Elctrns., Inc. 216-248-7500
PA Montgomeryville, Pyttronic Inds. 215-242-6700
PA Norristown, Century Elctrn. Co., Inc. 215-631-5400
PA Phildelphia, Shap Elctrns. Co., Inc. 215-969-3300
PA Pittsburgh, Pioneer/Pittsburgh 412-782-2300
SC Columbia, Dixie Elctrns. 803-779-5332
TX Austin, Arrow Elctrns., Inc. 512-835-4180
TX Austin, Hall-Mark Elctrns. 512-258-8858
TX Dallas, Arrow Elctrns., Inc. 214-386-7500
TX Dallas, Captronics, Inc. 214-340-3592
TX Dallas, Hall-Mark Elctrns. 214-343-5000
TX Dallas, Harrison Equip. Co. 214-239-2750
WI Madison, Arrow Elctrns. 608-273-4977
WI Milwaukee, Electronic Exp. 414-228-8100
WI Milwaukee, Industrial Elctrns. Corp. of Wis. 414-276-1212
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI New Berlin, Hall-Mark Elctrns. 414-707-7844
WI Oak Creek, Arrow Elctrns. 414-764-6600
WI Waukesha, Bell Inds. 414-784-0235
Can Calgary, Alb., Varah's 403-255-9550
Can Don Mills, Ont., Saynor Elctrns. 416-445-2340
Can Downsview, Ont., Future Elctrns. 416-638-4771
Can Hamilton, Ont., Varah's 416-561-9311
Can Ottawa, Ont., Carsten Elctrns. 613-729-5138
Can Ottawa, Ont., Future Elctrns. 613-820-8313
Can Ottawa, Ont., Varah's 613-726-8884
Can Pointe Claire, Que., Future Elctrns. 514-694-7710
Can Scarborough, Ont., Carsten Elctrns. 416-495-9999
Can St. Laurent, Que., Carsten Elctrns. 514-334-8321
Can Vancouver, BC, Future Elctrns. 604-438-5545
Can Vancouver, BC, Varah's 604-873-3211
Can Winnipeg, BC, Varah's 204-633-6190

CORNING GLASS WORKS, Materials Business, Main Plant, MP 21-3, Corning, NY 14831, Tel: 607-974-4102, Telex: 932-499; Empl.: 30000; *Sls. Mgr.:* Bryan Lanahan

CORNING GLASS WORKS, Corning Elctrns., Houghton Pk., Bldg. A-2, Corning, NY 14830, Tel: 607-974-8725, Telex: 932481; Empl.: 8000; *Sls. Mgr.:* Graham Wells; *Dist. Mgr.:* Betsey Murray .. **A•1068-1069, 1835**

Local Sales Offices & Reps

AL Huntsville 205-830-4030
AZ Phoenix 602-943-6602
CA Escandido 619-741-0496
CA Orange 714-771-5160
CA Santa Clara 408-249-6481
CO Denver 303-422-4547
FL Plantation 305-581-3251
FL St. Petersberg 813-894-1171
FL Tampa 813-932-1723
FL W. Palm Beach 305-686-1325
GA Rosewell 404-992-7240
IL Arlington Heights 312-228-6070
MD Columbia 301-964-0225
MA Littleton 617-486-3125
MN Eagon 612-544-0206
MN Shore View 612-780-5044
NY Horse Head 607-974-8615
NC Raleigh 919-876-1100
OH Gahanna 614-476-0028
OR Beaverton 503-649-9199
PA Broomall 215-356-5300
PA Pittsburgh 412-531-2002
TX Plano 214-578-9360
TX Round Rock 512-445-1686
Can Montreal, Que. 514-866-9581

CORNING GLASS WORKS, Memory Prods Dept., 3900 Electronic Dr., Raleigh, NC 27604, Tel: 919-876-1100, TWX: 510-928-1840; Empl.: 17; *Sls. Mgr.:* A. Greenlaw

CORNING GLASS WORKS, Telecomm Prods Dept., BH-5, Corning, NY 14830, Tel: 607-974-9000, Telex: 932498; Empl.: 28,000

CORNING MEDICAL & SCIENTIFIC, See Corning Glass Works, Corning Elctrns.

CORTEC, INC., 15811 Chemical La., Huntington Bch., CA 92649, Tel: 714-897-2529; Empl.: 35

CORTRON DIV., 400 W. Grand Ave., Elmhurst, IL 60126, Tel: 312-279-9110, TWX: 910-254-0154; Empl.: 300; *Sls. Mgr.:* Bob Inglis

COSAR, 3121 Benton St., Garland, TX 75042, Tel: 214-276-9487, 800-527-1207, Telex: 730-764; FSC No.: 20891; Empl.: 50; *Sls. Mgr.:* Jerry Jarka

COSMO PLASTICS CO., 3239 W. 14th St., Cleveland, OH 44109, Tel: 216-861-5594; Empl.: 500; *Sls. Mgr.:* B. Gordon

COSMOS, INC., 19530 Pacific Hwy. S. Suite 102, Seattle, WA 98188, Tel: 206-824-9942, TWX: 910-380-8627; Empl.: 18; *Sls. Mgr.:* Jim Harding; *Dist. Mgr.:* Jim Brewer

COST EFFECTIVE SYSTEMS, INC., Two LeMans Pl., Pine Brook, NJ 07058, Tel: 201-575-5514, Telex: 4944668; *Sls. Mgr.:* Phyllis Gross

COTO CORPORATION

COTO CORPORATION, 55 DuPont Drive, Providence, RI 02907, Tel: 401-943-2686, TWX: 710-381-8016; Empl.: 200; *Sls. Mgr.:* W. Poisson ..... **B•1310-1311**

Local Sales Offices & Reps

CA Lomita, Component Mktg. Assoc. 213-326-1460
CA San Diego, D Squared Sls. 619-560-6266
CA Saratoga, Testco Inc. 408-253-1900
CO Denver, Spectrum Sls. 303-480-9991
IL Downers Grove, Richmar Elctrns. 312-968-0118
IN Indianapolis, Richmar Elctrns. 317-846-6383
NY Melville, Jarms Assoc. 516-752-0404
OR Portland, Ecco Mktg. 503-254-5588
PA Gladwyn, Manreps 215-649-6300
TX Plano, Richmar Elctrns. 214-867-8224
VA Front Royal, Eltron Sls. Ltd. 703-635-7201
WA Seattle, Ecco Mktg. 206-364-0200
WA Spokane, Ecco Mktg. 509-924-4410
WI Butler, Richmar Elctrns. 414-781-1730

Local Distributors

Intl England, Surrey, Rhopoint 08833-OX-7988

COTRONICS, 3379 Shore Pkwy., Brooklyn, NY 11235, Tel: 718-646-7996; Empl.: 15; *Sls. Mgr.:* Alan Marks

COUNTIS INDS., 2670 Lockheed Way, Carson City, NV 89701, Tel: 702-882-6123; Empl.: 12; *Sls. Mgr.:* T. J. Countis; *Dist. Mgr.:* T. J. Countis

CREATIVE MICRO SYSTEMS, 3822 Cerritos Ave., Los Alamitos, CA 90720, Tel: 213-493-2484; Empl.: 40; *Sls. Mgr.:* Elaine Prossen

COVER CRAFT CORP., 540 Commercial St., Manchester, NH 03102, Tel: 603-889-6811; *Sls. Mgr.:* Terry M. Pratt; *Dist. Mgr.:* Terry M. Pratt

COVOX, INC., 675 D Conger St., Eugene, OR 97402, Tel: 503-342-1271, Telex: 706017; Empl.: 25; *Sls. Mgr.:* M. R. Stewart

CPS INC., 110 Wolfe Rd., Sunnyvale, CA 94086, Tel: 408-738-0530, Telex: 35-7450; FSC No.: 31640; Empl.: 80; *Sls. Mgr.:* Wanda Shearin ..... **D•1607**

Local Sales Offices & Reps

MA	Burlington, Intersell	617-273-3844
NY	Great Neck, Industron Assocs.	516-487-2620

CRAIG SYSTEMS CORP., 10 Industrial Way, Amesbury, MA 01913-4848, Tel: 617-388-5662, TWX: 710-347-0590; FSC No.: 81902; Empl.: 300; *Sls. Mgr.:* Robert A. Legrow; *Dist. Mgr.:* Robert A. Legrow

CRAMER INC., 625 Adams St, Kansas City, KS 66105, Tel: 913-621-6700, TWX: 910-743-6856; Empl.: 200; *Sls. Mgr.:* Thomas R. Hyland

CRAMER COIL & TRANSFORMER CO., INC., 1121 15th Ave., Grafton, WI 53024, Tel: 414-377-7040; Empl.: 65; *Sls. Mgr.:* Philia G. Hayes

CRAMER CO., Mill Rock Rd., Old Saybrook, CT 06475, Tel: 203-388-3574, Telex: 966-453; Empl.: 200; *Sls. Mgr.:* A. V. Beauregard; *Dist. Mgr.:* E. Latourette

Local Sales Offices & Reps

CA	Anaheim, Spectrum Assocs.	714-630-6977
CA	Palo Alto, Mollard Mktg.	415-961-0456
IL	Elk Grove, Martec Assocs.	312-956-8090
NJ	East Orange, Willgold Sls. Corp.	201-678-7700
NY	East Syracuse, Application Specialists Inc.	315-437-2813
NY	Rochester, Application Specialists Inc.	716-586-6226
NC	Charlotte, Motion Tech.	704-525-9855
OH	Medina, J. C. Hofstetter	216-241-4880
PA	Edgemont, White/Whiddett Co.	215-353-6343
WA	Mercer Island, Andersen Assocs.	206-232-0484

CREARE, INC., Etna Rd., P.O. Box 71, Hanover, NH 03755, Tel: 603-643-3800, Telex: 953101; Empl.: 75; *Sls. Mgr.:* R. M. Zieserl

CREATIVE PACKAGING CO., 1202 Kentucky Ave., Indianapolis, IN 46285

CRESTRON ELEC., 101 Broadway, Cresskill, NJ 07626, Tel: 201-894-0660

Stil/Crestronics

A Division of Applied Electro Technology Int.

CRESTRONICS DIV., Applied Electro Technlg., Int., 2220 S. Anne St., Santa Ana, CA 92704, Tel: 714-556-6570, TWX: 910-595-1797; FSC No.: 52797; Empl.: 25; *Sls. Mgr.:* D. Core; *Dist. Mgr.:* D. Dore ..... **D•1609**

CROMEMCO, 280 Bernardo Ave., Mountain View, CA 94043, Tel: 415-964-7400, TWX: 910-379-6988; Empl.: 500; *Sls. Mgr.:* Tom Keating; *Dist. Mgr.:* Tom Keating

CROMPTON INSTRS., 2763 Higgins Road, Elk Grove Village, IL 60007, Tel: 714-841-2901, Telex: 280540, TWX: 692309; FSC No.: 53498; *Sls. Mgr.:* J. Berger

CROMPTON INSTRS., Hawker Siddley, 2763 Old Higgins Rd., Elk Grove Village, IL 60007, Tel: 312-593-1107, Telex: 28-0540; *Sls. Mgr.:* Tony A. Pitt

CROSS ELCTRNS., 100 Commonwealth Dr., Warrendale, PA 15086, Tel: 412-776-1591; Empl.: 35; *Sls. Mgr.:* L. R. Craig

CROSSPOINT, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, Tel: 201-941-4455; FSC No.: FSCM 52116; Empl.: 13; *Sls. Mgr.:* Joseph M. Cartelli; *Dist. Mgr.:* Joseph M. Cartelli ..... **B•1539**

Local Sales Offices & Reps

CA	No. Hollywood, Crown Elctrns.	213-877-3550
CA	Redwood City, Caltronic Assocs.	415-365-2545
CT	Weston, CJA Assoc.	203-226-4317
FL	St. Petersburg, R. L. Matus & Assocs.	813-896-4133
GA	Buford, R. L. Matus & Assocs.	404-945-2946
MI	Brighton, Michigan Mktg. & Sls.	313-229-6218
NJ	Wayne, GT Assocs.	201-694-6040
NY	Syracuse, Lenard Co.	315-479-9191
OH	Cleveland, A.S.A.	216-662-6080
OH	Dayton, Mohawk Intronics	513-434-8873
TX	Dallas, Glidden Electro Equip.	214-341-0610
TX	Houston, Glidden Electro Equip.	713-681-1415

CROUSE HINDS CO. - AV. LTG., 1200 Kennedy Rd., Windsor, CT 06095, Tel: 203-683-4300

CROUZET CONTROLS, INC., 1083 State Pkwy., Schaumburg, IL 60195, Tel: 312-843-2200, Telex: 206 297; Empl.: 18; *Sls. Mgr.:* Ben Delcourt ..... **B•1145, 1315-1316, 1541**

Local Sales Offices & Reps

AZ	Phoenix, Flexible Technlg.	602-996-6421
CA	San Marino, Motion Control of So. CA	818-796-0189
CA	Santa Clara, Cummings & Assocs.	408-247-8656
CO	Denver, Control Agency	303-936-6641
FL	Tamarac, Davmik Sls.	305-920-2222
IA	Des Moines, Jos-Co/Melius, Inc.	515-277-8597
MA	Wellesley, Electro Kinetics	617-235-9415
MN	Minneapolis, Jos-Co/Melius.	612-861-3343
MO	Webster Grove, Schutz & Assocs. Ind. Sls., Inc.	314-962-2622
NY	Fairport, Tac Sls.	716-425-1070
NY	Syosset, Motion Control Sls.	516-921-5656
NC	Tryon, Halliday & Assoc.	704-894-8205
OH	Cincinnati, Bob Gilbert & Assocs.	513-574-1932
PA	Bensalem, William D. Staats Co.	215-639-5231
TX	Dallas, Automated Motion Control	214-340-4192
UT	Salt Lake City, Control Agency	801-328-4305
WA	Bellevue, Sea Inc.	206-883-4999
WA	Vancouver, Sea Inc.	206-573-5161
Can	St. Hubert, Que., Decofer	514-678-2252
Can	Weston, Ont., Keldco Controls	416-743-6356

Local Distributors

CA	Burlingame, Elec. Control Devices	415-348-0791
CA	Los Angeles, Master Distr.	213-452-1229
FL	Lakeland, A. A. Elec.	813-665-6941
FL	Pembroke Pines, Donza Intl.	305-987-1122
IN	Ft. Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	Indianapolis, Vonnegut Indl. Prods.	317-899-8800/8877
IA	Bettendorf, Custom Controls Ltd.	319-335-4787
MA	Wellesley, Electro-Mechanical Distr.	617-235-1565
MI	Comstock Park, Mor Elec.	616-784-1121
MI	Grand Rapids, S-F Electronics	616-459-0216
MI	Royal Oak, George Instr. Co.	313-280-1111
MI	Saginaw, Fischer-Flack	517-752-4181
MN	St. Paul, Powermation	612-645-0781
NE	Omaha, Lakeland Engrg.	402-734-2600
NJ	Edison, Howman Applied Control Prods.	201-797-3313
NJ	Fair Lawn, Relay Specialties	201-797-3313
NJ	W. Trenton, Electronic Svc. Div.(Roller Bearing Co)	609-882-7400
NY	Commack, Monarch Comps.	516-499-1770
NC	Asheville, Electric Supply Co.	704-255-8899
NC	Gastonia, J.M.T. Elctrn. Supp.	704-867-4401
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
ND	Bismarck, Border States Elec.	701-258-6060
OH	Cincinatti, Hughes-Peters.	513-351-2000
OH	Cleveland, Reserve Elec. Co.	216-771-5764
OH	Columbus, Hughes-Peters.	614-294-5351
OH	Dayton, Duellman Elctrns.	513-461-5010
OK	Tulsa, Radio.	918-587-9123
OR	Portland, Familian Automated Valve	503-287-8383
PA	Allentown, P. A. Peters.	215-434-5237
PA	Philadelphia, Herbach & Rademan	215-426-1700
SC	Greenville, Holder Elec. Supp.	803-271-7111
TX	Ft. Worth, Swieco.	817-335-6521
WA	Kent, Motors & Controls Corp.	206-872-8010
WA	Seattle, Eicher-Richards Co.	206-523-7888
WI	Waukesha, Powermation	414-542-2868

CROVEN CRYSTALS, 500 Beech St., Whitby, ON, Canada L1N 5S5, Tel: 416-668-3324, TWX: 610-384-2750; FSC No.: 00809; Empl.: 250; *Sls. Mgr.:* R. McCormick ..... **A•1335**

Local Sales Offices & Reps

AZ	Mesa, Sedco Sls.	602-835-6281
CA	San Mateo, Melvin Sls.	415-349-7444
CA	Van Nuys, R.L. Assocs.	213-782-7826
FL	Palm Bay, Spartech Assocs.	305-727-8045
GA	Smyrna, Spartech Assocs.	404-432-3644
MA	Milton, Naton Assoc.	617-698-0670
MO	Blue Springs, Chesco	816-229-1404
MO	St. Charles, Chesco	314-946-6677
NJ	Cherry Hill, Harry J. White	609-428-4544
NY	Melville, Carnes Assocs.	516-694-1600
OH	Englewood, Clayton-Ellier Co.	513-836-3556
TX	Arlington, W. Pat Fralia	817-640-9101
VA	Springfield, Tech Reps Inc.	703-569-6868
WI	Mequon, Artmor Ltd.	414-241-4040

IOR CRYDOM

A DIVISION OF INTERNATIONAL RECTIFIER

CRYDOM DIVISION, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245, Tel: 213-322-4987, Telex: 67-4660, TWX: 910-348-6283; Empl.: 100; *Sls. Mgr.:* John Deith; *Dist. Mgr.:* Bob Arnstein ..... **B•1312-1314**

Local Sales Offices & Reps

AL	Huntsville, EMA, Inc.	205-830-4030
AZ	Phoenix, Eltron	602-266-2164
CA	Pleasanton, Sierra Sls. Engrg.	415-463-2250
CA	San Diego, Cerco	619-450-1754
CA	Tustin, Morgan Johnson Co., Inc.	714-832-7282
CO	Westminster, Control Agy.	303-427-4179
CT	Fairfield, NRG, Ltd.	203-384-1112
GA	Rosswell, EMA, Inc.	404-992-7240
ID	Boise, N.R. Schultz Co.	208-377-8686
IL	Schaumberg, Microtex, Inc.	312-885-1131
IN	Carmel, Technology Mktg. Corp.	317-844-8462
IN	Ft. Wayne, Technology Mktg. Corp.	219-432-5553
KS	Merriam, Midwest Tech. Sls.	913-236-8555
KS	Wichita, Midwest Tech. Sls.	316-262-7240
KY	Louisville, Technology Mktg. Corp.	502-449-7808
MD	Phoenix, Phoenix Elctrn. Sls.	301-628-2066
MA	Lexington, AD Sys. Sls.	617-861-6370
MI	Royal Oaks, Dave Ray & Assocs.	313-280-0000
MN	Eden Prairie, Electronic Innovators, Inc.	612-941-0830
MO	St. Charles, Midwest Tech. Sls.	314-441-1012
NV	Reno, Unitronics Mktg., Inc.	702-825-1978
NJ	Glen Rock, North East Comps. Co., Inc.	201-447-0600
NY	Binghamton, GEN-TECH Elctrns.	607-648-8833
NY	Liverpool, GEN-TECH Elctrns.	315-451-3480
NY	Melville, Parallax Sls.	516-351-1000
NY	Pittsford, GEN-TECH Elctrns.	716-381-2820
NY	Pleasant Valley, GEN-TECH Elctrns.	914-635-3233
NC	Pineville, EMA, Inc.	704-541-0929
NC	Winston Salem, EMA, Inc.	919-784-6953
OH	Cincinnati, Luebbe Sls. Co.	513-891-5770
OH	Cleveland, Cleveland Luebbe Sls.	216-333-0425
OH	Columbus, Luebbe Sls. Co.	614-431-0474
OH	Dayton, Luebbe Sls. Co.	513-294-0426
OK	Tulsa, ION Assocs., Inc.	918-664-0186
OR	Beaverton, N.R. Schultz Co.	503-643-1644
PA	Pittsburgh, Luebbe Sls. Co.	412-931-0414
PA	Spring House, Deltatronics Inc.	215-542-0250
TN	Donelson, EMA, Inc.	615-883-1414
TN	Jonesboro, EMA, Inc.	615-742-8081
TX	Austin, ION Assocs., Inc.	512-331-7251
TX	Grand Prairie, ION Assocs., Inc.	214-647-8225
TX	Houston, ION Assocs., Inc.	713-977-4354
UT	Salt Lake City, Control Agy.	801-972-8787
WA	Bellevue, N.R. Schultz Co.	206-454-0300
WI	Waukesha, Microtex, Inc.	414-542-5352

Local Distributors

CA	Los Angeles, Kierulff Electronics	213-725-0325
CA	Los Angeles, Master Distrs.	213-452-1229
CA	Pico Rivera, Arnfac Elec. Supp.	213-949-7841
CA	San Francisco, South, Stevens Engineering	415-588-9200
IL	Chicago, Newark Elect.	312-784-5100
MA	Hingham, Sager Electric	617-749-6700
NJ	Fair Lawn, Relay Specialties	201-797-3313
NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	Melville, Arrow Elctrns.	516-694-6800
NY	Westbury, Schweber Electronics	516-334-7474

CRYOMAGNETICS, INC., 795 Oak Ridge Tpk., Oak Ridge, TN 37830, Tel: 615-482-9551; *Sls. Mgr.:* R. M. Ennis, Jr.

CRYSTALOID ELCTRNS., Box 628, Hudson, OH 44236, Tel: 216-655-2429, Telex: 241-244; Empl.: 130; *Sls. Mgr.:* Sharon Werstler

CRYSTEK CORP, P.O. Box 06135, Ft. Myers, FL 33906, Tel: 813-936-2109, TWX: 510-951-7448; FSC No.: 13454; Empl.: 150

CSI Capacitors

CSI CAPACITORS, CSI Technlgs., 810 Rancheros Dr., San Marcos, CA 92069, Tel: 619-747-4000, Telex: 697832; FSC No.: 10026; Empl.: 50; *Sls. Mgr.:* H. R. Smith ..... **A•1070**

Local Sales Offices & Reps

AZ Tempe, Cleveland Entprs. of AZ 602-820-1127
CA San Jose, Comtech Mktg. 408-365-7474
CA San Jose, Silicon Valley Sls. 408-286-7510
CA Tarzana, High Voltage Sls. 213-881-9194
FL Orlando, Glenn Tech. Sls. Co. 305-299-8700
IL Chicago, Esco Assocs. 312-763-0800
KY Louisville, K. W. Elctrn. Sls. 512-451-1860
MA Framingham, Sullivan Tech. Sls. 617-620-0195
NJ Leonia, Peter E. Schmitt Co. 201-944-2806
NM Albuquerque, Cleveland Entprs. 505-265-7893
NY Cazenovia, S. T. Woolard 315-655-8145
OH Dayton, K. W. Elctrn. Sls. 513-890-2150
PA Washington Crossing, DVS Co. 215-493-4642
TX Dallas, Cunningham Comps. Corp. 214-233-4303
TX Houston, Cunningham Comps. Corp. .. 713-461-4197

CPSI, 40 Linnell Circle, Billerica, MA 01821, Tel: 617-272-6020, 800-325-3110, TWX: 710-347-0176; Empl.: 150; *Sls. Mgr.:* S. Corbit

C-TEK INCORPORATED

C-TEK INC., 4 Railroad Ave., Wakefield, MA 01880, Tel: 617-246-1720, Telex: 882485; Empl.: 15; *Sls. Mgr.:* John Vanaman ..... **D•1114-1115**

Local Sales Offices & Reps

AZ Phoenix, Thor Eng. 602-437-1463
CT Ansonia, R. H. Sturdy Co. 203-734-2186
MA Waltham, Calibron Instrs. 617-894-6440
MA Wellesley Hills, R. H. Sturdy Co. 617-235-2330
MI Southfield, Fred H. Gehrke & Assocs. 313-559-5363
MN St. Paul, Northstar Motion & Control .. 612-770-5311
NJ Sparta, E.S. Williams 201-729-4049
NY Champlain, Premier Automation 514-684-6610
NY Syosset, Motion Control Sls. 516-921-5656
NC Charlotte, Jake Rudisill Assocs. 704-377-6901
OH Cincinatti, KCH Co. 513-931-1686
VA Richmond, Jake Rudisill Assocs. 804-320-0201
WA Seattle, Eicher-Richards Co. 206-523-7888

Local Distributors

NY Clarence, Trott Elctrns. 716-634-8500
NY Pittsford, Controlled Motion Prods. 716-381-1933
NY Pittsford, Trott Elctrns. 716-586-8251
NC Charlotte, Trott Elctrns. 704-376-2237

CTI-CRYOGENICS, 266 Second Ave, Waltham, MA 02254, Tel: 617-890-9400, Telex: 92-3442; Empl.: 350; *Sls. Mgr.:* R. A. Bryce

CTS CORPORATION, 905 North West Blvd., Elkart, IN 46514, Tel: 219-293-7511, TWX: 810-294-2167; Empl.: 8,200; *Dist. Mgr.:* J. C. Wells ..... **A•1336-1357, 1663-1667; B•1542-1546**

Local Sales Offices & Reps

AL Huntsville, Interep Assocs. 205-533-1730
AL Mobile, Interep Assocs., Inc. 205-478-1036
AZ Phoenix, Compass Mktg. & Sls. 602-996-0635
AZ Tucson, Compass Mktg. & Sls., Inc. ... 602-293-1220
CA Calimesa, Eltronics 714-795-1521
CA Fremont, CTS Corp. 415-659-1704
CA Los Altos, Ewing & Foley, Inc. 415-941-4525
CA South Pasadena, CTS Corp. 213-682-1137
CO Denver, ELCOM 303-337-2300
CT Wallingford, CompRep Assocs. 203-269-1145
FL Altamonte Springs, Electrocomp Assocs. 305-429-0802
FL Deerfield Beach, Electrocomp Assocs. 305-429-0802
FL Melbourne, Electrocomp Assocs. 305-242-0621
FL St. Petersburg, Electrocomp Assocs. .. 813-327-9677
GA Norcross, Interep Assocs. 404-449-8680
IL Addison, CTS Corp. 312-543-5021
IN Carmel, Brainard-Wilson Mktg. 317-844-2800
IN Indianapolis, Elctrn. Reps. 317-894-1414
IA Cedar Rapids, Seltec Sls. Corp. 319-393-1114
KS Overland Park, Advanced Tech. Sls. .. 913-642-6675
MD Columbia, Professional Reps. 301-992-7460
MA Westwood, CompRep Assocs. 617-329-3454
MI Southfield, J. L. Montgomery Assocs. 313-358-2616
MN Minneapolis, Robert W. Marshall Co. .. 612-929-0457
MN Minneapolis, S & R Sls. 612-559-3090
MO St. Charles, Buckman & Assocs. 314-946-6201
MO St. Louis, Advanced Tech. Sls. 314-878-2921
NM Albuquerque, Compass Mktg. & Sls. .. 505-888-0800
NY E. Syracuse, Nycom 315-437-8343
NY Jamaica, S-J Sales Assocs. 212-291-3232
NY Pittsford, Kirby Mktg., Inc. 716-248-8750
NC Raleigh, Zucker Assocs. 919-782-8433
OH Cleveland, Baehr, Greenleaf & Assocs. 216-221-9030
OH Columbus, Baehr, Greenleaf & Assocs. 614-486-4046
OH Dayton, Baehr, Greenleaf & Assocs. .. 513-439-0724
OK Tulsa, Southern States Mktg. 918-665-8338
OR Beaverton, Electronics Tech. Sls. 503-641-5180
PA Mars, Baehr, Greenleaf & Assocs. 412-776-2151
PA Trevose, P.S.A. Inc. 215-245-0513
TN Greeneville, Interep Assocs. 615-639-3491
TX Austin, Southern States Mktg. 512-452-9459
TX Houston, Southern States Mktg. 713-558-4900
TX Richardson, Southern States Mktg. ... 214-238-7500
UT Salt Lake City, ELCOM 801-485-7415
WA Kirkland, Electronics Tech. Sls. 206-827-8086
PR Mayaguez, CompRep de Puerto Rico 809-832-9529
Can Streetsville, Ont., CTS of Canada, Ltd. 416-826-1141

Local Distributors

AL Huntsville, Hall-Mark/Huntsville 205-837-8700
AL Huntsville, RM Elctrns. Co., Inc. 205-852-1550
AZ Tempe, Bell Inds. 602-966-7800
AZ Tempe, Marshall Inds. 602-968-6181
CA Canoga Park, Marshall Inds. 213-999-5001
CA Chatsworth, Arrow Elctrns., Inc. 213-701-7500
CA Garden Grove, Bell Inds. 714-895-7801
CA Gardena, Bell Inds. 213-515-1800
CA Irvine, Marshall Inds. 213-443-3724,714-556-6400
CA Irvine, Ratel Elctrns. 714-768-0855,213-637-0839
CA Los Angeles, Richey/Western Elctrns., Inc. 213-820-3777
CA Newport Beach, Arrow Elctrns., Inc. ... 714-851-8961
CA Orange, Richey/Western Elctrns., Inc. 714-634-2811
CA Roseville, Bell Inds. 916-969-3100
CA San Diego, Arrow Elctrns., Inc. 714-565-4800
CA San Diego, Marshall Inds. 714-578-9600
CA San Diego, Richey/Western Elctrns., Inc. 714-271-4511
CA San Jose, Ratel Elctrns. 408-946-4300
CA San Jose, Rose Elctrns. 408-263-9700
CA Santa Clara, Richey/Western Elctrns., Inc. 408-727-7411
CA Sunnyvale, Arrow Elctrns., Inc. 408-745-6600
CA Sunnyvale, Bell Inds. 408-734-8570
CA Sunnyvale, Marshall Inds. 408-732-1100
CO Aurora, Arrow Elctrns., Inc. 303-696-1111
CO Denver, Integrated Elctrns. Co., Inc. ... 303-292-6121
CO Englewood, Industrial Elctrns., Inc. 303-694-9444
CT New Haven, The Green-Shaw Co., Inc. 203-393-0710
CT Wallingford, Arrow Elctrns., Inc. 203-265-7741
CT Wallingford, Marshall Inds. 203-265-3822
CT Wallingford, MIDAN Elctrns., Inc. 203-265-2077
FL Deerfield Beach, Arrow Elctrns., Inc. ... 305-429-8200
FL Fort Lauderdale, Hall-Mark/Miami 305-971-9280
FL Largo, Graham Elctrns./Bell Inds. 813-541-4434
FL Orlando, Hall-Mark/Orlando 305-855-4020
FL Orlando, Marshall Inds. 305-841-1878
FL Palm Bay, Arrow Elctrns., Inc. 305-725-1480
GA Norcross, Arrow Elctrns., Inc. 404-449-8252
GA Norcross, Graham Elctrns./Bell Inds. .. 404-662-0923
GA Norcross, Hall-Mark/Georgia 404-447-8000
GA Norcross, Marshall Inds. 404-923-5750
IL Bensenville, Hall-Mark Elctrns. Corp. .. 312-860-3800
IL Chicago, Bell Inds. 312-982-9210
IL Lombard, RM Elctrns. Co., Inc. 312-932-5150
IL Schaumburg, Arrow Elctrns., Inc. 312-397-3440
IL Shaumburg, Marshall Inds. 312-490-0155
IN Fort Wayne, Graham Elctrns./Bell Inds. 219-423-3422
IN Indianapolis, Arrow Elctrns., Inc. 317-243-9353
IN Indianapolis, Graham Elctrns./Bell Inds. 317-634-8202
IN Indianapolis, RM Elctrns. Co., Inc. 317-291-7110
IN Lafayette, Graham Elctrns./Bell Inds. 317-423-5564
KS Lenexa, Hall-Mark/Kansas City 913-888-4747
KS Lenexa, Marshall Inds. 913-492-3121
MD Baltimore, Arrow Elctrns., Inc. 301-247-5200
MD Baltimore, Hall-Mark/Baltimore 301-796-9300
MD Gaithersburg, Marshall Inds. 301-840-9450
MA Newton, The Greene-Shaw Co., Inc. .. 617-969-8900
MA Woburn, Arrow Elctrns., Inc. 617-933-8130
MI Ann Arbor, Arrow Elctrns., Inc. 313-971-8220
MI Ann Arbor, Graham Elctrns./Bell Inds. 313-971-9093
MI Grand Rapids, RM Elctrns. Co., Inc. ... 616-531-9300
MI Livonia, Marshall Inds. 313-525-5850
MI Livonia, RS Elctrns. 313-525-1155
MN Bloomington, Hall-Mark/Minneapolis .. 612-854-3223
MN Edina, Arrow Elctrns., Inc. 612-830-1800
MN Minneapolis, Industrial Comps., Inc. ... 612-831-2666
MN Plymouth, Marshall Inds. 612-559-2211, 612-559-2255
MO Maryland Hgts., Hall-Mark/St. Louis ... 314-291-5350
MO St. Louis, Arrow Elctrns., Inc. 314-567-6888
MO St. Louis, Graham Elctrns./Bell Inds. .. 314-821-1541
MO St. Louis, Olive Elctrns., Inc. 314-426-4500
NE Lincoln, Scott Elctrn. Supp. Corp. 402-466-8221
NH Manchester, Arrow Elctrns., Inc. 603-668-6968
NJ Cherry Hill, Hall-Mark/Cherry Hill 215-355-7300
NJ Clifton, Vantage Comps., Inc. 201-667-1840
NJ Fairfield, Arrow Elctrns., Inc. 201-575-5300
NJ Fairfield, Marshall Inds. 201-882-0320
NJ Marlton, Arrow Elctrns., Inc. 609-235-1900
NJ Mt. Laurel, Marshall Inds. 609-234-9100, 215-627-1920
NM Albuquerque, Arrow Elctrns., Inc. 505-243-4566
NM Albuquerque, Bell Inds. 505-292-2700
NY Buffalo, Summit Distrs. 716-884-3450
NY East Syracuse, Marshall Inds. 315-432-0644
NY Endwell, Marshall Inds. 607-754-1570
NY Farmingdale, Semispecialists of America, Inc. 516-293-2710
NY Hauppauge, Arrow Elctrns., Inc. ..... 516-694-6800, Ext. 316/317
NY Hauppauge, Marshall Inds. 516-273-2424
NY Jamaica, Archer Ind. Distrs., Inc. 212-291-3232
NY Liverpool, Arrow Elctrns., Inc. 315-652-1000
NY Melville, Arrow Elctrns., Inc. 516-694-6800
NY Mt. Vernon, QAR Ind. Elctrn. Sls., Inc. .. 914-699-2224
NY Rochester, Arrow Elctrns., Inc. 716-427-0300
NY Rochester, Marshall Inds. 716-235-7620
NY Rome, Rome Elctrns., Inc. 315-337-5400
NC Raleigh, Hall-Mark/Raleigh 919-832-4465
NC Raleigh, RESCO/Raleigh 919-781-5700
NC Winston Salem, Arrow Elctrns., Inc. 919-725-8711
OH Centerville, Arrow Elctrns., Inc. 513-435-5563
OH Cincinnati, Graham Elctrns./Bell Inds. 513-772-1661
OH Columbus, Graham Elctrns./Bell Inds. 614-895-1590
OH Dayton, Marshall Inds. 513-236-8088
OH Solon, Arrow Elctrns., Inc. 216-248-3990
OH Solon, Hall-Mark/Cleveland 216-349-4632
OH Solon, Marshall Inds. 216-248-1788
OH Westerville, Hall-Mark Elctrns. Corp. ... 614-891-4555
OK Tulsa, Hall-Mark/Tulsa 918-665-3200
OR Tigard, Moore Elctrns. 503-684-3100
PA McKean, ADVACOM/Erie 814-476-7774
PA Monroeville, Arrow Elctrns., Inc. 412-856-7000
PA Philadelphia, Philadelphia Elctrns., Inc. 215-568-7400
TN Nashville, Graham Elctrns./Bell Inds. 615-242-2682
TX Austin, Arrow Elctrns., Inc. 512-835-4180
TX Austin, Hall-Mark/Austin 512-258-8848
TX Austin, Southwest Elctrns., Inc. 512-837-8971
TX Dallas, Arrow Elctrns., Inc. 214-386-7500
TX Dallas, Hall-Mark Elctrns., Inc. 214-341-1147
TX Dallas, Marshall Inds. 214-233-5200
TX Houston, Arrow Elctrns., Inc. 713-491-4100
TX Houston, Hall-Mark/Houston 713-781-6100
TX Richardson, Southwest Elctrns., Inc. ... 214-234-3050
TX Stafford, Southwest Elctrns., Inc. 713-491-4900
UT Salt Lake City, Bell Inds. 801-972-6969
WA Bellevue, Arrow Elctrns., Inc. 206-643-4800
WA Seattle, Zepher Elctrn. Sls. Corp. 206-241-1980
WI Oak Creek, Arrow Elctrns., Inc. 414-764-6600
WI Oak Creek, Hall-Mark/Milwaukee 414-761-3000
WI Waukesha, Bell Inds. 414-547-8879

CTS CORPORATION, Asheville Division, P.O. Box 100, Skyland, NC 28776, Tel: 704-684-6451, TWX: 510-935-0059; *Sls. Mgr.:* T. B. Haney

'Refer to CTS Corp., Elkhart, IN, for sales offices & representatives & for distributor listings.'

CTS CORPORATION*
BERNE DIVISION

CTS CORPORATION, Berne Division, 406 Parr Rd., Berne, IN 46711, Tel: 219-589-3111, TWX: 810-323-1580; Empl.: 1100; *Sls. Mgr.:* Scott Bowman; *Dist. Mgr.:* Cliff Stults ..... **A•1836-1844, 2011**

'Refer to CTS Corp., Elkhart, IN, for sales offices & representatives & for distributor listings.'

CTS CORPORATION, Bentonville Division, 1300 S.E. 8th St., Bentonville, AR 72712, Tel: 501-273-9036

Refer to CTS Corp., Elkhart, IN, for sales offices and representatives and for distributor listings.

CTS OF CANADA, LTD., 80 Thomas St., Streetsville, Ontario, Can. L5M 1Y9, Tel: 416-826-1141

Refer to CTS Corp., Elkhart, IN, for sales offices and representatives and for distributor listings.

CTS ELECTRONICS CORP., PASO ROBLES DIV., Electromechanical Gp., 500 Linne Rd., Paso Robles, CA 93446, Tel: 805-238-0350, TWX: 910-351-6796; *Sls. Mgr.:* Jack Bell; *Dist. Mgr.:* Bob Tarkenton ..... **B•1542-1546**

'Refer to CTS Corp., Elkhart, IN, for sales offices & representatives & for distributor listings.'

CTS FABRI-TEK CONNECTOR INC., 9210 Science Center Dr., Minneapolis, MN 55428, Tel: 612-533-3533, TWX: 910-576-2717; FSC No.: 16512; Empl.: 300; *Sls. Mgr.:* John B. McKee

'Refer to CTS Corp., Elkhart, IN, for sales offices & representatives & for distributor listings.'

CTS FABRI-TEK, INC., CTS Corporation, 6900 Shady Oak Rd., Eden Prairie, MN 55344, Tel: 612-941-9100, TWX: 910-576-2913; FSC No.: 21542; Empl.: 1400; *Sls. Mgr.:* Bruce Richardson

'Refer to CTS Corp., Elkhart, IN, for sales offices & representatives & for distributor listings.'

CTS CORPORATION, Elkhart Division, 1142 W. Beardsley Ave., Elkhart, IN 46514, Tel: 219-295-3575

Refer to CTS Corp., Elkhart, IN, for sales offices and representatives and for distributor listings.

CTS ELECTRONICS CORP.,, Knights Division, 400 Reimann Ave., Sandwich, IL 60548, Tel: 815-786-8411, TWX: 910-642-0860; Empl.: 500; *Sls. Mgr.:* Larry Barbary; *Dist. Mgr.:* Larry Barbary ..... **A•1336-1357**

'Refer to CTS Corp., Elkhart, IN, for sales offices & representatives & for distributor listings.'

CTS CORPORATION, Microelectronics Div., 1201 Cumberland Ave., W. Lafayette, IN 47906, Tel: 317-463-2565, TWX: 810-342-1882; Empl.: 505; *Sls. Mgr.:* David C. Anderson ..... **A•1662-1667**

'Refer to CTS Corp., Elkhart, IN, for sales offices & representatives & for distributor listings.'

CTS ELECTRONICS CORP., Halex Division, 1202 McGaw Ave., Irvine, CA 92714, Tel: 714-261-6381, TWX: 910-595-2648; Empl.: 70; *Sls. Mgr.:* Gene P. Markley ..... **A•1662-1667**

'Refer to CTS Corp., Elkhart, IN, for sales offices & representatives & for distributor listings.'

CTS CORPORATION, Monon Division, Highway 16 West, Monon, IN 47959, Tel: 219-253-6666

Refer to CTS Corp., Elkhart, IN, for sales offices and representatives and for distributor listings.

CTS ELECTRONICS CORP., San Jose Division, 660 Lenfest Rd., San Jose, CA 95133, Tel: 408-251-1600, Telex: 910-997-8006; Empl.: 500; *Sls. Mgr.:* Ed King; *Dist. Mgr.:* Charles Nadler

'Refer to CTS Corp., Elkhart, IN, for sales offices & representatives & for distributor listings.'

CTS FABRI-TEK CONNECTOR, INC., 400 Cokato St., Cokato, MN 55321, Tel: 612-941-9100

Refer to CTS Corp., Elkhart, IN, for sales offices and representatives and for distributor listings.

CTS PRINTEX, INC., Circuits Division, 47010 Kato Rd., Fremont, CA 94538, Tel: 415-659-1770

Refer to CTS Corp., Elkhart, IN, for sales offices and representatives and for distributor listings.

CTS CORPORATION, Tool, Die & Machine Division, 3000 Engle Rd., Fort Wayne, IN 46809, Tel: 219-747-0531

Refer to CTS Corp., Elkhart, IN, for sales offices and representatives and for distributor listings.

CUESTA SYSTEMS, INC., 3440 Roberto Ct., San Luis Obispo, CA 93401, Tel: 805-541-4160; *Sls. Mgr.:* David V. Dickey

CUPLEX, INC., 1500 E. Hwy. 66, Garland, TX 75040, Tel: 214-276-0333, TWX: 910-860-5098; *Sls. Mgr.:* Grady C. Young

CURRENTECHNOLOGY CORP., 135 Prestige Pk. Circle, E. Hartford, CT 06108, Tel: 203-289-6831, TWX: 710-425-6063; *Sls. Mgr.:* Bob Ramage

CURRENT TECHNOLOGY, INC., 1400 S. Sherman, #202, Richardson, TX 75081, Tel: 214-238-5300; *Sls. Mgr.:* Barry Epstein; *Dist. Mgr.:* Peter Diamond

CURTIS ELECTRO DEVICES, INC., Box 4090, Mountain View, CA 94040, Tel: 415-964-3846; Empl.: 12; *Sls. Mgr.:* J. Curtis

CURTIS INDS., 8000 West Tower Ave., Milwaukee, WI 53223, Tel: 414-354-1500, TWX: 910-262-3035; FSC No.: 73631; Empl.: 160; *Sls. Mgr.:* P. J. McDonnell; *Dist. Mgr.:* A. M. Hungsberg ..... **A•1599; C•1178; D•1978**

Local Sales Offices & Reps

AL	Huntsville, K & E Assocs.	205-883-9720
AZ	Scottsdale, Memco Sls., Inc.	602-952-2254
AR	Hot Springs, Automation Supp., Inc.	501-767-5444
CA	Fullerton, GRU Assocs.	714-738-0903
CA	Santa Clara, Gagner-Toomey Assocs., Inc.	408-244-2200
CO	Parker, TMA/COLORADO	303-841-3435
CT	Milford, Sales Engrg.	203-877-2001
CT	New Fairfield, Sales Engrg. Co.	203-746-5604
FL	Altamonte Springs, Lawrence Assocs.	305-339-3855
FL	Boca Raton, Lawrence Assocs.	305-368-7373
FL	Clearwater, Lawrence Assocs.	813-584-8110
FL	W. Melbourne, Lawrence Assocs.	305-724-8294
GA	Doraville, K & E Assocs.	404-448-7025
IL	Downers Grove, Richmar Elctrns. Corp.	312-968-0118
MD	Gaithersberg, Naudain Assocs., Southern	301-258-5040
MI	Farmington Hills, W. R. Hummon & Assocs. Inc.	313-474-0661
MN	Spring Lake Park, Holmgren Assocs. Inc. of MN	612-786-7641
MO	Kansas City, Delltron Co., Inc.	816-436-6445
MO	St. Louis, Delltron Co., Inc.	314-869-4779
NH	Salem, Sales Engrg. Co.	603-893-5521
NJ	Manville, DynoRep, Inc.	201-685-0135
NJ	Marlton, Naudain Assocs.	609-235-1801
NY	Rochester, Ossmann Comp. Sls.	716-424-4460
NY	Syracuse, Ossmann Comp. Sls.	315-455-6611
NY	Vestal, Ossmann Comp. Sls. Corp.	607-754-3264
NC	Raleigh, Crossroads Elctrn. Assocs.	919-362-4099
OH	Aurora, Nationwide Comps., Inc.	216-425-3896
OH	Carmel, Nationwide Comp., Inc.	317-872-7207
OH	Dayton, Nationwide Comps., Inc.	513-299-5174
OH	Willoughby, Nationwide Comp.	216-946-3226
OR	Portland, Electronic Mktg., Inc.	503-252-0610
RI	Warwick, Sales Engrg.	401-738-1319
TN	Signal Mountain, Automation Supp., Inc.	615-866-6623
TX	Arlington, ProComp Sls. Co.	817-640-4336
TX	Houston, ProComp Sls. Co.	713-556-9622
UT	Salt Lake City, TMA/COLORADO	801-483-1009
WA	Redmond, Electronic Mktg. Grp.	206-883-0962
WI	Milwaukee, Richmar Elctrns.	414-781-1730
Can	Ontario, Chartwell Elctrns.	416-477-0400

Local Distributors

AL	Birmingham, M. G. Elctrns. & Equip.	205-328-4525
AL	Montgomery, Southern Controls	205-277-5030
AZ	Phoenix, Dalis Elctrns. Supp.	602-258-8151
AZ	Phoenix, Electro-Comps. Distr.	602-258-2665
AZ	Phoenix, McGraw Edison Co.	602-275-4731
AR	El Dorado, Electra Inc.	501-862-4901
CA	Buena Park, Control Design	714-521-5040
CA	Burlingame, Rose Elctrns.	415-348-2740
CA	Orange, County Wholesale Elec.	714-633-6440
CA	San Carlos, Control Design Supp.	415-592-4806
CA	San Jose, Rose Elctrns.	408-263-9700
CA	Santa Clara, Allied Elctrns.	408-985-2323
CA	Santa Monica, Master Distrs.	213-395-2637
CA	So. San Francisco, Steven Engrg.	415-583-5868
CO	Colorado Springs, Summit Fasteners	303-593-7700
CO	Denver, Integrated Elctrns.	303-534-6121
CT	Fairfield, W.M. Entprs.	203-333-0129
CT	Hartford, Electrical Supp.	203-527-7111
FL	Alta Monte, Control Des. Supp.	305-788-3220
FL	Lakeland, A-A Electric	813-665-6941
FL	Miami, Elctrn. Equip.	305-871-3500
FL	Miami, Hummel Indl. Sls.	305-651-0196
FL	Winter Park, Deanco	305-671-5100
GA	Atlanta, A.C. Equip.	404-451-2747
GA	Atlanta, A-A Electric	404-449-8670
GA	Dalton, Dick Henderson Indl.	404-278-8307
GA	Marietta, Deanco	404-429-0126
GA	Stone Mountain, Control Des. Supp.	404-979-3500
IL	Addison, Lectro Comps.	312-543-1680
IL	Chicago, Electro-Kinetics	312-595-6700
IL	Elgin, Allied Elctrns.	312-697-8200
IL	Elk Grove Village, Nu-Way Elctrns.	312-437-7120
IL	Genoa, Control Des. Supp.	815-784-6515
IL	Hoffman Estates, Control Design	312-882-7232
IL	Palatine, OHM Elctrns.	312-359-5500
IL	Peoria, Klaus Radio & Elec.	309-691-4840
IL	Quincy, Klaus Radio, Inc.	217-223-7560
IL	Rockford, Muntz Elec.	815-968-8866
IN	Elkhart, Elkhart Supp.	219-264-4156
IN	Ft. Wayne, Graham Elec.	219-423-3422
IN	Indianapolis, Control Design	317-788-4559
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	Indianapolis, Peerless Elctrn.	317-635-2361
IN	Mishawaka, Panel Parts	219-259-0026
IN	South Bend, Koontz-Wagner Elec.	219-232-2051
IN	Wabash, Wabash Elec. Supp.	219-563-4146
IA	Marion, Brenneman & Assocs.	319-377-6394
IA	Marion, Control Des. Supp.	319-373-2923
IA	West Des Moines, Ramco	515-225-6933
KS	Kansas City, Kornfeld-Thorp Elec.	913-321-7070
KS	Wichita, L Comp	316-265-5100
KY	Lexington, American Elec. Supp.	606-353-5664
KY	Louisville, Peerless Elctrn. Equip.	502-637-7677
LA	Harahan, MG Elctrn.	504-733-0070
LA	Lafayette, Ralph's Indl. Elctrns.	318-234-4507
ME	Aberdeen, Harco Elctrns.	301-838-7990
ME	Portland, Leen Co.	207-774-6266
ME	Portland, Rockingham Elec. Supp.	207-772-4614
MD	Gaithersburg, Deanco	301-948-5444
MA	Allston, Apparatus Svc.	617-787-1300
MA	Middleboro, Glynns Elctrns.	617-947-4262
MA	Springfield, T. F. Cushing	413-788-7341
MA	West Springfield, Control Engrg.	413-781-1330
MA	Woburn, Brownell-Electro	617-935-7820
MI	Augusta, Great Lakes Elctrns.	616-731-4156
MI	Detroit, Madison Elec.	313-875-1560
MI	Grand Rapids, S-F Elctrn. Supp.	616-495-0216
MI	Hibbing, NWR Elctrns. Corp.	218-262-5228
MI	Madison Hgts., McNaughton-McKay	313-399-7500
MI	Muskegon, Fitzpatrick Elec. Supp.	616-722-6621
MN	Minneapolis, Control Design	612-721-1628
MN	Minneapolis, Stark Elctrn. Supp.	612-332-1325
MO	Maryland, Lcomp St. Louis	314-291-6200
MO	St. Louis, Control Design	314-426-3150
MO	St. Louis, L Comp, Inc.	314-291-6200
NJ	Englewood, Techn. Elctrn. Distrs.	201-894-0800
NJ	Fairfield, Relay Specialties	201-797-3313
NY	Albany, Adirondack Elctrns.	518-456-0203
NY	Bohemia, Kay Comp.	516-567-7500
NY	Buffalo, Wehle Elec.	716-854-3270
NY	Farmingdale, Pride Elctrns.	516-293-4020
NY	Hempstead, Elctrn. Equip.	516-538-5510
NY	Henrietta, CAM/RPC Ind.	716-334-5510
NY	Ithaca, Deanco, Inc.	607-257-4444
NY	Mamaroneck, Logicomp Elec.	914-698-9332
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Rochester, Wehle Elec.	716-275-0200
NC	Charlotte, Dixie Elctrns.	704-377-5413
NC	Greenboro, Hammond Elec.	919-275-6391
NC	Greensboro, Hammond Elect.	919-275-6391
NC	Winston-Salem, Dixie Elctrns.	919-724-5961
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Akron, Akron Elctrn. Supp.	216-773-9183
OH	Cincinnati, Hughes-Peters	513-251-2000
OH	Cleveland, Gateway Megatech	216-944-5801
OH	Columbus, Hughes-Peters	614-294-5351
OH	Columbus, McJunkin Corp.	614-294-3711
OH	Dayton, Esco Inc.	513-226-1133
OH	Toledo, Girkins Elec.	419-243-9238
OH	Warren, REM Elctrn. Supp.	216-373-1300
OH	Wickliffe, Gateway Megatech	216-444-5801
OK	Tulsa, Altair Co.	918-252-5781
OK	Tulsa, Oil Capitol Elctrns.	918-622-8520

PA Erie, REM Elctrns. 814-453-5626
PA Malvern, Control Design 215-296-0150
PA McKean, Advacom 814-476-7774
PA Philadelphia, Lindley Elec. 215-329-7005
PA Pittsburgh, CAM/RPC Indl. Elctrns. ... 412-782-3770
PA Pittsburgh, Mosebach Elec. 412-488-5000
PA Yeadon, Earl B. Beach Co. 215-622-2210
PA York, Electronic Comp. 717-843-8971
SC Columbia, Dixie Elctrns. 803-779-5332
SC Florence, Dixie Elctrns. 803-669-8201
SC Greenville, Dixie Elctrns. 803-232-5357
SC Greenville, Hammond Elctrns. 803-233-4121
TN Knoxville, Dixie Elctrns. 615-938-4131
TX Austin, Active Comp. Tech. 512-452-5254
TX Austin, Altair Co. 512-837-4970
TX Dallas, Active Comp. Tech. 214-980-1880
TX Dallas, Control Design 214-358-1441
TX Fort Worth, Allied Elctrns. 817-336-5401
TX Houston, Active Comp. Tech. 713-496-4000
TX Houston, Altair Co. 713-462-3029
TX Richardson, Altair Co. 214-231-5166
UT Salt Lake City, Kimball Elctrn. 801-328-2075
VA Richmond, Sterling Elctrns. 804-226-2190
WA Kent, C. B. Parsons & Co. 206-762-7373
WA Seattle, C. B. Parsons & Co. 206-762-7373
WI Cedarburg, A-A Electric 414-377-8000
WI Green Bay, A-A Elec. 414-499-0258
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI Milwaukee, Midwestern Elec. 414-449-1500
WI New Berlin, Control Design 414-784-1015

CURTIS

CURTIS INSTRS., INC., 200 Kisco Ave., Mt. Kisco, NY 10549, Tel: 914-666-2971, TWX: 710-571-2163; FSC No.: 18530; Empl.: 95; *Sls. Mgr.:* Rhoda McDonald ..**D•1117**

Local Sales Offices & Reps

CA Burlingame, Polach & Bensinger 415-697-2525
CA Seal Beach, Texel Engrg. 213-596-9411
CO Littleton, Grifco 303-795-1989
FL Longwood, NSL Assocs. 305-629-5226
IL La Grange Park, Bierhaus Sls. 312-354-5100
IN Ft. Wayne, Aktron Sls. 219-747-3650
MA Brookline, Harman Assocs. 617-232-6687
MN Minnetonka, S. J. Collins 612-933-7661
NY Manhasset, WinCor Elctrn. Sls. Corp. .. 516-627-9474
OH Chagrin Falls, K. F. Naverz 216-338-8450
PA Media, W. Reeves Assocs. 215-566-6709
TX Dallas, Etron Corp. 817-498-8924
WA Lynnwood, Blum & Assocs. 206-775-6656
WI Milwaukee, Bierhaus Sls. 414-963-0318

CUSHMAN ELCTRNS., 2450 N. 1st St., San Jose, CA 95131, Tel: 408-263-8100, TWX: 810-338-0556; Empl.: 400; *Sls. Mgr.:* Harris Fuller

CUSTOM CABLE, 242 Butler, Westbury, NY 11590, Tel: 516-334-3600; Empl.: 15; *Sls. Mgr.:* J. Michelman; *Dist. Mgr.:* D. Pollack

CUSTOM COIL & TRANSFORMER, Box 2369, Zanesville, OH 43701, Tel: 614-452-6973, TWX: 810-238-2629; Empl.: 80

CUSTOM CONNECTOR, 1738 E. 30th St., Cleveland, OH 44114, Tel: 216-241-1679; Empl.: 36; *Sls. Mgr.:* Larry Weider

CUSTOM CONTROL SYS., 21 E. Canon Perdido St., Santa Barbara, CA 93101, Tel: 805-965-7577; Empl.: 2; *Sls. Mgr.:* Fred Winter

CUSTOM ELCTRNS., Browne St., Oneonta, NY 13820, Tel: 607-432-3880, TWX: 510-241-8292; FSC No.: 23280; Empl.: 110; *Sls. Mgr.:* D. Hathaway

Local Sales Offices & Reps

CA Brea, Masco Elec. 714-529-0866
CA San Jose, Richards Assocs. 408-297-3010
IL Chicago, Rozner Sls. 312-283-0022
MD Ellicot City, Nelson Assocs. 301-747-7887
MA Stow, Musello Assocs. 617-369-5900
TX Houston, Custom Elctrns., Inc. 713-686-4874
EXP NY, Baldwin, Milano Bros. Intl. 516-223-9000

CUSTOM PRODS. GRP., Sys. Dev. Corp.-A Burroughs Co., P.O. Box 517, Paoli, PA 19301, Tel: 215-648-7660, Telex: 215-647-9961, TWX: 510-668-7243; *Sls. Mgr.:* Spiro Greenwood; *Dist. Mgr.:* Sarah Jones-Chambers

CUSTOM SCI. INSTRS., 13 Wing Dr., Cedar Knolls, NJ 07927, Tel: 201-538-8500, Telex: 25-4328; Empl.: 20; *Sls. Mgr.:* Henry J. Bultman, Jr.

CUTLER HAMMER GRP., EATON CORP., Aerospace Controls/Systems Div., 2074 Whitfield Ave. East, Sarasota, FL 33578, Tel: 813-758-7726

CUTLER-HAMMER, INC., SHALLCROSS RESISTOR PRODS., See RCL Shallcross, Inc.

CUTLER-HAMMER PRODS., See Eaton Corp./Cutler-Hammer Prods.

CVC PRODS., 525 Lee Rd., Rochester, NY 14603, Tel: 716-458-2550, Telex: 97-8269; Empl.: 160; *Sls. Mgr.:* Steven Rothstein

CW INDUSTRIES, 130 James Way, Southhampton, PA 18966, Tel: 215-355-7080, Telex: 831470; FSC No.: 79727; Empl.: 450; *Sls. Mgr.:* Keith D. Nelson

CYBERNETIC MICRO SYS., P.O. Box 3000, 3000 Hwy. 84, San Gregorio, CA 94074, Tel: 415-726-3000, Telex: 171-135 Attn: CYBERNETICS; *Sls. Mgr.:* K. Moty

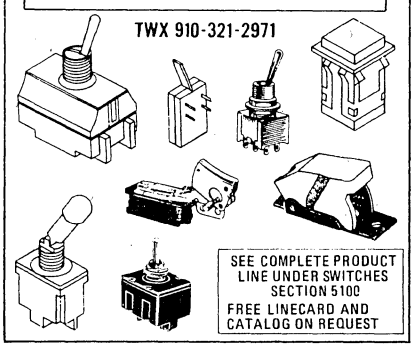
CYBERSONIC CORP., Box 38, Glenside, PA 19038, Tel: 215-885-1734, Telex: 83-4753; Empl.: 11; *Sls. Mgr.:* Norman Rivers

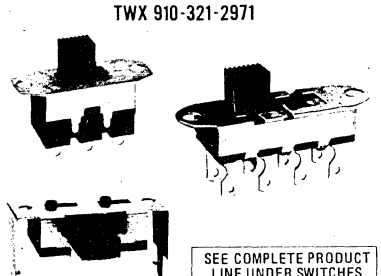
CYBERSYSTEMS, INC., 7540 South Memorial Pkwy., Huntsville, AL 35802, Tel: 205-883-4410; FSC No.: 66; Empl.: 25; *Sls. Mgr.:* Mike Long

CYBER SYS., INC., 2031 E. Cerritos Ave., Anaheim, CA 92806, Tel: 714-722-2051, Telex: 692-375; *Sls. Mgr.:* Charles Muhle

CYCLO-TRONICS, INC., 1345 N. Old Rand Rd., Wauconda, IL 60084, Tel: 312-526-0800; Empl.: 10

CURTIS
TERMINAL BLOCKS
•
RELAY SOCKETS
•
FILTERS
IN STOCK • IN STOCK
Franchised Distributor
LOGICOMP
ELECTRONICS, INC.
1009 W. BOSTON POST ROAD
MAMARONECK, NEW YORK 10543
PHONE: (914) 698-9332
TOLL FREE
(Outside N.Y.)
800/431-2625

Cutler-Hammer
DIVISION OF EATON
MILITARY SPECIFICATION
INDUSTRIAL AND COMMERCIAL
FULL LINE
AUTHORIZED DISTRIBUTOR
E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

CW INDUSTRIES
FULL LINE
AUTHORIZED DISTRIBUTOR
E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

CYTEC CORP., 107 N. Washington St., E. Rochester, NY 14445, Tel: 716-381-4740; *Sls. Mgr.:* Harry Turner ..... **D•1207**

Local Sales Offices & Reps

MA Burlington, Tritek 617-272-4550
NY Frankfort, Kapital Sls. 315-896-4225

DABURN ELCTRNS. & CABLE, 70 Oak St., Norwood, NJ 07648, Tel: 201-768-5400, TWX: 710-991-9856; FSC No.: 25706; *Sls. Mgr.:* Randy Hibshman ...**C•1828-1837**

Local Sales Offices & Reps

CA Anaheim, Galaxie Sls. 714-752-1580
CA Palo Alto, Reliable 415-494-3266
CO Aurora, Sage Sls. 303-750-3501
FL Casselberry, H A, Inc. 305-695-8592
FL Coral Springs, H A, Inc. 305-752-7520
GA Atlanta, Eff Mktg. Force 404-948-6023
IL Elgin, Markar Sls. 312-888-2207
IN Carmel, STB & Assocs. 317-844-9227
LA Kenner, Assoc. Mktg. Grp. 504-443-5072
MA No. Scituate, W. A. Hendrickson 617-545-0652
MI Grand Rapids, Carl Orwant Assocs. ... 616-241-4927
MN Minneapolis, R. K. Sls. 612-786-5713
MO Raytown, Marty Taraski 816-358-1442
NY N.Y.C., Robt. Smith Assocs. 212-541-4885
NY Plainview, Robt. Smith Assocs. 516-681-3155
OH Cincinnati, John Olsen Co. 513-574-7711
OH Goshen, John Olsen Co. 513-722-1497
OR Hillsboro, Rhodes Sls. 503-640-6666
PA King of Prussia, Freedman-Malta 215-337-9211
PA Pittsburgh, John Olsen Co. 412-279-2550
TX Dallas, Assoc. Mktg. Grp. 214-241-7190
VA Arlington, Howard Golonpaul & Assocs. 703-525-5898
Can Montreal, Que., Avotronics 514-697-2135

DADEN ASSOCS., 23011 Moulton Pkwy., Ste. A12, Laguna Hills, CA 92653, Tel: 714-770-1522, TWX: 910-596-1324; FSC No.: 57032; Empl.: 26; *Sls. Mgr.:* Dennis Hook

Local Sales Offices & Reps

CA Los Angeles, McDougall-McLaughlin .. 213-477-8556
CA Saratoga, E. Reid Miller Corp. 408-257-6927
FL Winter Park, Microwave Mktg. 305-678-2141
MA Chelmsford, BBC 617-256-6593
TX Dallas, Southwest Microwave Elctrns. 214-669-1195

DAICO INDUSTRIES, INC.

DAICO INDS., INC., Box 5225, Compton, CA 90224, Tel: 213-631-1143, TWX: 910-346-6741; FSC No.: 28983; Empl.: 170; *Sls. Mgr.:* James Adamson ... **A•1708-1709**

Local Sales Offices & Reps

AZ Phoenix, Faser Tech. Sls. 602-948-4404
CA Los Altos, Cain-White & Co. 415-948-6533
CA Los Angeles, Midwin & Olifson 213-838-3455
CA San Diego, Midwin & Olifson, Inc. 619-571-0177
FL Palm Bay, Spartech Assocs. 305-727-8045
GA Smyrna, Spartech Assocs. 404-446-7300
IL Mt. Prospect, Cain-Forlaw Co. 312-253-3578
ME Ogunquit, Micronic Assocs. 617-933-2121
MD Burtonsville, Eastern Instrmn. 301-384-8500
NJ Hackensack, Technical Mktg. Assocs. 201-342-4008
OH Lancaster, Cain-Forlaw Co. 614-654-4800
PA Newtown Square, SWR Assocs. 215-353-6711
TX Dallas, McDonald Assocs. 214-238-1858

DAI-ICHI SHOJI OF AMER., INC., 150 Fifth Ave., New York, NY 10011, Tel: 212-691-9050, Telex: 429120 DSANY; Empl.: 3; *Sls. Mgr.:* A. Takayama ..... **A•1071; B•1548-1549; C•1179**

DALE ELECTRONICS, INC., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, Tel: 402-564-3131; FSC No.: 91637; Empl.: 2800; *Sls. Mgr.:* Darrel Smejkal; *Dist. Mgr.:* Jerry Jilek ..... **B•1025-1027**

Local Sales Offices & Reps

AL Huntsville, JWL Assocs. 205-883-1712
AZ Tempe, Dale Elctrns. Sls. 602-966-0291
CA Los Alamitos, Reed Elctrn. Mktg. 213-598-6676
CA Redwood City, J. S. Heaton Co. 415-367-9000
CA San Diego, Reed Elctrn. Mktg. 619-452-1456
CO Loveland, Dale Elctrns. Sls. 303-667-7500
FL Lake Park, Graham Assocs. 305-622-4049
FL Melbourne, Graham Assocs. 305-773-6631
FL Winter Garden, Graham Assocs. 305-656-9369
GA Marietta, JWL Assocs. 404-429-8010
ID Boise, LD Elctrns. 208-343-2741
IL Chicago, Indl. Reps. 312-647-7755
IN Fort Wayne, Scott Elctrns. 219-484-7865
IN Indianapolis, Scott Elctrns. 317-897-9976
KS Shawnee Mission, Dale Sls. 913-432-9140
MD Glen Burnie, Tri-Mark 301-761-6000
MA Wakefield, Howard C. Jappe Co. 617-245-9359
MI Plymouth, Jay Mktg. Assocs. 313-459-1200
MN Bloomington, Merrill Franklin Co. 612-854-9446
MO St. Louis, Industrial Reps., Inc. 314-227-7401
NJ Fairlawn, Kaelber & Mack 201-797-7782
NY Commack, Kaelber & Mack 516-499-2924
NY Ithaca, Dale Elctrns. Sls. 607-272-6212
NC Pineville, JWL Assocs. 704-541-5750
NC Raleigh, JWL Assocs. 919-787-4826
OH Cincinnati, Scott Elctrns. 513-791-2513
OH Cleveland, Scott Elctrns. 216-473-5050
OH Dayton, Scott Elctrns., Inc. 513-294-0539
OH Reynoldsburg, Scott Elctrns. 614-863-1281
OR Beaverton, LD Elctrns. 503-649-6177
PA Horsham, TMI 215-441-4300
PA Pittsburgh, Scott Elctrns. 412-963-6116
TX Dallas, E. F. Aymond Co. 214-826-7620
TX Houston, E. F. Aymond Co. 713-880-8229
TX San Antonio, E. F. Aymond Co. 512-366-1526
WA Snohomish, LD Elctrns. 206-568-0511
WA Spokane, LD Elctrns. 509-922-4883
WI Milwaukee, Indl. Reps. 414-259-0965

Local Distributors

AL Huntsville, Hamilton/Avnet 205-837-7210
AZ Phoenix, T.T.I., Inc. 602-861-0222
AZ Tempe, Acacia Sls., Inc. 602-894-2874
AZ Tempe, Hamilton/Avnet 602-231-5100
AZ Tempe, Shelley Elctrns. 602-894-2058
CA Chatsworth, Avnet Elctrns. 818-700-6264
CA Chatsworth, Hamilton/Avnet 818-700-6536
CA Chatsworth, Shelly Elctrns. 818-998-3333
CA Chatsworth, T.T.I., West 818-709-1010
CA Costa Mesa, Avnet Elctrns. 714-754-6021
CA Costa Mesa, Hamilton Electro Sls. 714-641-4100
CA Culver City, Hamilton Electro Sls. 213-558-2883
CA Culver City, Hamilton/Avnet 213-558-2662
CA Huntington beach, Inductor Supp., Inc. 714-891-4524
CA Irvine, Acacia Sls. 213-971-2428
CA Ontario, Hamilton/Avnet 714-989-8816
CA Sacramento, Hamilton/Avnet 916-920-3150
CA San Diego, Anacia Sls., Inc. 619-565-4365
CA San Diego, Hamilton/Avnet 619-571-7536
CA San Diego, Shelley Elctrns. 619-453-7133
CA San Jose, Shelley Elctrns. 408-942-9111
CA San Jose, T.T.I., Inc. 408-943-9155
CA Sunnyvale, Acacia Sls. 408-745-7200
CA Sunnyvale, Hamilton/Avnet 408-734-3358
CO Boulder, Shelley Elctrns. 303-442-2718
CO Commerce City, Waco Elctrns. 303-289-4743
CO Denver, Newark Elctrns. 303-757-3351
CO Englewood, Hamilton/Avnet 303-740-1020
CO Lakewood, Acacia Sls., Inc. 303-232-2882
CT Danbury, Hamilton/Avnet 203-797-2802
CT Stratford, Electro/Comp. 203-375-5811
FL Ft. Lauderdale, Hamilton/Avnet 305-979-5211
FL Orlando, T.T.I., II 305-859-1000
FL Palm Beach Gardens, Legri S. Resistor 305-845-7101
FL St. Petersburg, Hamilton/Avnet 813-576-3930
FL Tampa, Shelley Elctrns., Inc. 813-884-0946
FL Winter Park, Hamilton/Avnet 305-628-3888
GA Atlanta, Specialty Distr. Co., Inc. 404-873-2521
GA Norcross, Hamilton/Avnet 404-447-7504
GA Norcross, T.T.I., Inc. 404-662-0911
IL Bensenville, Hamilton/Avnet 312-860-8558
IL Chicago, Bell Ind. 312-982-9210
IL Chicago, Newark Elctrns. 312-638-4411
IL Crystal Lake, Sub-Sem 815-459-4139
IL Palatine, Ohm Elctrns. 312-359-5500
IN Carmel, Hamilton/Avnet 317-844-9333
IN Ft. Wayne, Graham Elctrns. 219-423-3422
IN Indianapolis, Graham Elec. 317-634-8202
IA Cedar Rapids, Deeco, Inc. 319-365-7551
IA Cedar Rapids, Hamilton/Avnet 319-362-4757
KS Overland Park, Hamilton/Avnet 913-541-7922
MD Beltsville, RESCO 301-937-9100
MD Columbia, Hamilton/Avnet 301-995-3525
MD White Marsh, RESCO 301-529-0500
MA Billerica, A. W. Mayer Co. 617-229-2255
MA Waltham, Sterling Elctrns. 617-894-6200
MA Woburn, Hamilton/Avnet 617-273-7562
MA Woburn, T.T.I. 617-938-8800
MI Grand Rapids, Hamilton/Avnet 616-243-8805
MI Grand Rapids, S-F Elctrn. Supp. 616-459-0216
MI Livonia, Hamilton/Avnet 313-522-4700
MI Livonia, R-S Elctrns. 313-525-1155
MI Livonia, Reptron Elctrns. 313-525-2700
MI Oak Park, Newark Elec. 313-967-0600
MN Minneapolis, Stark Elctrns. 612-332-1325
MN Minnetonka, Hamilton/Avnet 612-932-0674
MO Earth City, Hamilton/Avnet 314-344-1254
NH Manchester, Hamilton/Avnet 603-524-9400
NJ Cherry Hill, Hamilton/Avnet 609-424-0117
NJ Cranford, G.S.I. Elec. 201-272-6400
NJ Fairfield, Hamilton/Avnet 201-575-3490
NJ Kenilworth, Federated Purchaser 201-272-0505
NM Albuquerque, Hamilton/Avnet 505-765-1500
NY Bohemia, Shelley Elctrns., Inc. 516-567-7751
NY Bohemia, L.I., T.T.I., New York 516-567-1500
NY Buffalo, Summit Distr. 716-884-3450
NY E. Syracuse, Hamilton/Avnet 315-437-2641
NY Endwell, A.S.I. Elctrns. 607-754-3823
NY Farmingdale, Command Elctrns. 516-293-1212
NY Hauppauge, Fairmont 516-231-3313
NY Hauppauge, Hamilton/Avnet 516-231-9800
NY Rochester, Hamilton/Avnet 716-475-9130
NY Rochester, Simcona Elctrns. 716-328-3230
NY Rome, Rome Elctrns. 315-337-5400
NY Valley Stream, L&S Elctrns. 516-561-2474
NY W. Hempstead, March Elctrns. 516-486-6511
NC Raleigh, Hamilton/Avnet 919-878-0819
NC Raleigh, RESCO 919-781-5700
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
OH Cleveland, Hamilton/Avnet 216-831-3500
OH Cleveland, Pioneer Standard 216-587-3600
OH Dayton, Hamilton/Avnet 513-439-6700
OH Dayton, Pioneer Standard 513-236-9900
OH Dayton, Stotts-Friedman Co. 513-298-5555
OH Westerville, Hamilton/Avnet 614-882-7004
OK Tulsa, Radio, Inc. 918-587-9123
OR Beaverton, Acacia Sls. 503-646-3377
OR Lake Oswego, Hamilton/Avnet 503-635-8831
OR Portland, Radar Elec. 503-232-3404
PA McKean, Advacom 814-476-7774
PA Philadelphia, Herbach & Rademan 215-426-1700
PA Pittsburgh, CAM/RPC 412-782-3770
PA Pittsburgh, Hamilton/Avnet 412-281-4150
PA York, E.C.I., Inc. 717-846-5334
TX Austin, Hamilton/Avnet 512-837-8911
TX Dallas, Sterling Elctrns. 214-243-1600
TX Ft. Worth, T.T.I., Inc. 817-831-0441
TX Houston, Hamilton/Avnet 713-975-3516
TX Houston, Lenert Co. 713-225-1465
TX Houston, Sterling Elctrns. 713-627-9800
TX Irving, Hamilton/Avnet 214-659-4111
UT Salt Lake City, Hamilton/Avnet 801-972-2800
WA Bellevue, Hamilton/Avnet 206-453-5842
WA Seattle, Radar Elec. 206-282-2511
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI New Berlin, Hamilton/Avnet 414-784-4510

DALE ELECTRONICS, INC., El Paso Div., P.O. Box 26728, El Paso, TX 79926, Tel: 915-592-3253; FSC No.: 91637; Empl.: 272; *Sls. Mgr.:* Douglas Wagenknecht; *Dist. Mgr.:* Jerry Jilek ..... **A•1845-1863**

Refer to Dale Electronics, Inc., Columbus, NE for sales office and distributor information.

DALE ELECTRONICS, INC., Norfolk Div., 2300 Riverside Blvd., Norfolk, NE 68701, Tel: 402-371-0080; FSC No.: 91637; Empl.: 1200; *Sls. Mgr.:* Jim Filips; *Dist. Mgr.:* Jerry Jilek ..... **B•1748-1749**

Refer to Dale Electronics, Inc., Columbus, NE for sales office and distributor information.

DALE ELECTRONICS, INC., Tempe Div., 1155 W. 23rd St., Tempe, AZ 85282, Tel: 602-967-7874; FSC No.: 22929; Empl.: 139; *Sls. Mgr.:* Mike Brown; *Dist. Mgr.:* Jerry Jilek ..... **A•1358-1359**

Refer to Dale Electronics, Inc., Columbus, NE for sales office and distributor information.

DALE ELECTRONICS, INC., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078, Tel: 605-665-9301; FSC No.: 09969; Empl.: 400; *Sls. Mgr.:* John Elliot; *Dist. Mgr.:* Jerry Jilek .... **A•1231-1237, 2125-2132; C•1180-1183**

Refer to Dale Electronics, Inc., Columbus, NE for sales office and distributor information.

DALE WESTERN THERMISTOR DIVISION, See Dale Norfolk Division

DAMON/ELCTRNS. DIV., 80 Wilson Way, Westwood, MA 02090, Tel: 617-329-2460, TWX: 710-348-6722; Empl.: 90; *Sls. Mgr.:* Edward J. Doherty ..... **A•1360**

Local Sales Offices & Reps

AZ Phoenix, Sanford Sls. Assocs. 602-957-3570

CA N. Hollywood, Jewett Co. 213-789-8103
CA Palo Alto, Waldman Assocs. 415-961-4100
DC Washington, Stemler Assocs. 301-944-8262
FL Melbourne, Repcom 305-254-1877
MD Baltimore, Stemler Assocs. 301-944-8262
MA Waltham, Del Tech Sls. 617-890-1020
NJ Cherry Hill, Stemler Assocs. 609-966-4070
NJ Hackensack, T.M.A. Assoc. 201-342-4008
NY Cazenovia, S. T. Wollard Co. 315-655-8145
TX Ft. Worth, El-Tec Sls. 817-268-2896

D & B POWER, INC.

D & B POWER, INC., 204 N. Fehr Way, P.O. Box 40M, Bayshore, NY 11706, Tel: 516-586-5955; FSC No.: 54337; Empl.: 25; *Sls. Mgr.:* Gordon Best; *Dist. Mgr.:* Dan Hall ..... **D•1610-1611**

Local Sales Offices & Reps
CA Pasadena, Electro Mecha. Instrs. 818-795-7193
CA Sunnyvale, Schwerin & Merrill 408-735-7900
MD Randallstown, Beacon North, Inc. 301-655-2265
NY Cortland, Net Sls. Co. 607-756-6592
NY DeRuyter, Net Sls. Co. 315-662-7996
NY East Setauket, Edgerton Elctrn. 516-751-7089
NY Fairport, Net Sls. Co. 716-467-4538
NY Troy, Net Sls. Co. 518-274-4758
VA Fairfax, Beacon North, Inc. 703-591-1300

Local Distributors
MA Shannon, Adcour, Inc. 617-784-8123

D & L SALES CO. INC., 296 Preakness Ave., Paterson, NJ 07502, Tel: 201-684-8223/8224; Empl.: 10

DMC DANIELS MANUFACTURING CORPORATION

DANIELS MFG. CORP., 6103 Anno Ave., Orlando, FL 32809, Tel: 305-855-6161, Telex: 564321; FSC No.: 5935; Empl.: 150; *Sls. Mgr.:* John Jago-Ford; *Dist. Mgr.:* Tina Holder ..... **C•1741**

Local Sales Offices & Reps
AZ Scottsdale, Nelligan Co. 602-990-1415
CA Irvine, DMC Western Sls. Off. 714-660-1901
CO Englewood, Nelligan 303-761-2121
CT Orange, DMC Northeastern Sls. Off. .. 203-799-2343
FL Zephyrhills, Tool Tronics & Hydrospace 813-782-7177
TX Fort Worth, Wadco 817-284-4445
UT Salt Lake City, Nelligan Co. 801-261-1121
WA Redmond, Pan Pacific Electronics 206-881-7252

Local Distributors
CA Burbank, Stratos, Inc. 213-245-8914
CO Englewood, Columbine Fabricators ... 303-761-2121
CT Hamden, Connector Company 203-288-0044
FL Zephyrhills, Tool Tronics & Hydrospace 813-782-7177
NJ South River, Da-Green Electronics 201-254-2735
TX Fort Worth, Wadco 817-284-4445
WA Redmond, Pan Pacific Electronics 206-881-7252
Can Ontario, Patlon Aircraft 416-624-5572

DAN-L INC., 229 Laurel Rd., E. Northport, NY 11731, Tel: 516-757-8000; FSC No.: 28327; Empl.: 22

DANMAR INDS., 9705 Lurline Ave., Chatsworth, CA 91311, Tel: 818-882-7979/5280; FSC No.: 31690; Empl.: 6; *Sls. Mgr.:* Mukund Patel

DANTEL, 2991 N. Argyle Ave., Fresno, CA 93727, Tel: 209-292-1111, Telex: 35-5457; FSC No.: 56960; Empl.: 110; *Sls. Mgr.:* Peter Normandin

DANTRONICS, INC., 3175 Hafner Ct., St. Paul, MN 55112, Tel: 612-484-2108; Empl.: 22

DASH, STRAUS & GOODHUE, INC., 593 Massachusetts Ave., Boxboro, MA 01719, Tel: 617-263-2662; Empl.: 7; *Sls. Mgr.:* Ira Barry

DASOFT DESIGN SYSTEMS, INC., 2550 9th St. # 113, Berkeley, CA 94710, Tel: 415-486-0822; Empl.: 8

DATABASE DESIGN INC., 2020 Hogback Rd., Ann Arbor, MI 48104, Tel: 313-971-5363, TWX: 810-223-2412; FSC No.: 7030-0003; Empl.: 35; *Sls. Mgr.:* Terry R. McGown

DATA, INC., 7702 Emerald Ave., Box 2071, Ft. Collins, CO 80525, Tel: 303-493-1222; Empl.: 3; *Sls. Mgr.:* Sharon Shilling; *Dist. Mgr.:* Sharon Shilling

D.A.T.A., INC., Cordura Co., P.O. Box 26875, San Diego, CA 92126, Tel: 619-578-7600, TWX: 910-322-1340; Empl.: 39

DATA CAPTURE TECHNOLOGY, Hathaway Instruments, 5436-F South Mingo Rd., Tulsa, OK 74146, Tel: 918-627-7521, Telex: 796355; FSC No.: 7E812; Empl.: 50; *Sls. Mgr.:* Gary DeShazer; *Dist. Mgr.:* Gary DeShazer

DATA CHECK CORP., 10070 Willow Creek Rd., San Diego, CA 92131, Tel: 619-578-0101, TWX: 910-335-1596; FSC No.: 55792; *Sls. Mgr.:* Al Agent

DATACHRON INC., 3186 J Airway Ave., Costa Mesa, CA 92626, Tel: 714-751-2211, Telex: 678401; FSC No.: 56259; Empl.: 16; *Sls. Mgr.:* Clyde Davis

DATACOM, INC., Box 278, Ft. Walton Beach, FL 32548, Tel: 904-244-6121, TWX: 510-730-7693; Empl.: 50

dataCon

DATACON, INC., 60 Blanchard Rd., Burlington, MA 01803, Tel: 617-273-5800, Telex: 951651; FSC No.: 617 273 4809; Empl.: 400; *Sls. Mgr.:* Stephen J. Day .... **C•1705**

Local Sales Offices & Reps
AZ Phoenix, Cristee - Meade Co. 602-867-6000
CA Chatsworth, DataCon 818-700-0600
CA Mountain View, DataCon 415-967-5700
CA Santa Clara, DC Elctrns. 408-980-1199
CO Lakewood, Christee - Meade Co. 303-232-0287
FL Orlando, Mackay Smith & Assocs. 305-423-4353
GA Decatur, DataCon 404-373-1212
GA Norcross, Mackay Smith 404-449-7444
IL Lisle, W. G. Controls 312-963-5954
IL Schaumburg, DataCon 312-529-7690
IN Indianapolis, CC Elctrns., Inc. 317-255-1508
MA Burlington, DataCon 617-273-5800
MN St. Paul, Countryman Assocs. 612-645-9151
NY Bohemia, DataCon 516-589-1100
NC Cary, Mackay Smith 919-467-5400
PA Newton Square, Hagy Assocs. 215-459-0504
TN Chattanooga, Mackay Smith 615-899-6951
TX Carrollton, DataCon 214-245-6161
TX Richardson, Lear Assocs. 214-231-5388
WA Seattle, Gompf & Assocs. 206-575-6999

DATA-CONTROL SYS., Commerce Dr., Box 860, Danbury, CT 06810, Tel: 203-743-9241, TWX: 710-456-0376; FSC No.: 08539; Empl.: 87

DATA CONVERSION, See Analogic Corp., Data Conversion Prods. Grp.

DATACOPY CORP., 1215 Terra Bella Ave., Mountain View, CA 94043, Tel: 415-965-7900, Telex: 701994 DATACOPY UO; Empl.: 75; *Sls. Mgr.:* Charles Joseph

data delay devices, inc.®

DATA DELAY DEVICES, 385 Lakeview Ave., Clifton, NJ 07011, Tel: 201-772-1106 ..... **A•1489-1501**

Local Sales Offices & Reps
AZ Phoenix, Tech Sls., Inc. 602-246-1614
CA El Toro, Martronix 714-858-0632
CA Mountain View, Weseloh/Swanson & Assocs. 415-961-0565
GA Stone Mountain, Mountain Electro Prods., Inc. 404-448-5594
MA Woburn, Radian Assocs., Inc. 617-933-7386
TX Irving, IMPAQ Sales Co. 214-257-3677

Local Distributors
CA Sunnyvale, Target Elctrns. 415-961-1170

DATA-DESIGN LABS., P.O. Box 711, 7925 Center Ave., Cucamonga, CA 91730, Tel: 714-987-2511; Empl.: 1300; *Sls. Mgr.:* M. L. Sneller

DATA DEVICE CORP., See ILC Data Device Corp.

DATA DISPLAY PRODUCTS, Box 91072, Los Angeles, CA 90009, Tel: 213-640-0442, Telex: 664690; FSC No.: 15513; Empl.: 20; *Sls. Mgr.:* William F. Million

DATADYNE, Box 247, King of Prussia, PA 19406, Tel: 215-666-5751; FSC No.: 53032; Empl.: 23; *Sls. Mgr.:* James Riggs

DATA ENGINEERING, INC., 2515 N. State Rd. 7 Ste. 207, Margate, FL 33063, Tel: 974-7861

DATA GENERAL, 4400 Computer Dr., Westboro, MA 01581, Tel: 617-366-8911, Telex: 920-329, TWX: 710-390-1217; Empl.: 18,000; *Sls. Mgr.:* Frank Keaney

DATA INSTRUMENTS, INC., 4 Hartwell Pl., Lexington, MA 02173, Tel: 617-861-7450, TWX: 200081; Empl.: 250; *Sls. Mgr.:* Ernest C. Lutfy ..... **B•1790**

Local Sales Offices & Reps
CA Riverside, Jim Mitchell 714-684-6404
CA San Carlos, Elctrn. Engrg. Assocs. 415-593-2189
CO Boulder, Herb Bass Assocs. 303-530-7509
GA Decatur, Bandy & Co. 404-296-1027
HI Kihei, Aloha Assocs. 808-879-5296
MO Kansas City, Delltron Co. 816-436-6445
MO St. Louis, Delltron Co. 314-869-4779
NY Buffalo, The Robert F. Lamb Co.
OH Mansfield, Bob Young 419-522-3738
PA Broomall, Robert Snyder 215-356-1418
TX Dallas, Griffin Sls. 214-234-5013
UT Bountiful, Herb Bass Assocs. 801-295-7100
WA Redmond, S.E.A. Sls. 206-883-4999
WA Vancouver, S.E.A. Sls. 206-573-5161
Can Don Mills, Ontario, Intertechnology 416-445-5500

DATA I/O CORP., 10525 Willows Rd. N.E., Redmond, WA 98073-9746, Tel: 206-881-6444, Telex: 15-2167; Empl.: 550

Local Sales Offices & Reps
CA Costa Mesa, Data I/O 714-662-1182
CA Santa Clara, Data I/O 408-727-0641
NH Nashua, Data I/O 603-889-8511

DATAK CORP., 65 Seventy-First St., Guttenberg, NJ 07093, Tel: 201-869-2200; *Sls. Mgr.:* Theresa Pflueger ..... **C•1100, 1590, 1838**

Local Sales Offices & Reps
CA Burlingame, Polach & Bensinger 415-697-2525
CA West Covina, Don Forth Assocs. 213-919-2322
CO Broomfield, Conners Co. 303-466-9628
FL Bradenton, T. G. & Assocs. 813-753-5632
GA Roswell, Henry W. Phillips Co. 404-992-3070
IL Wheaton, Archie Joyner Assocs. 312-665-6662
IN Indianapolis, Elmarcon, Inc. 317-846-0221
MI Grand Blanc, Inter-Comm, Inc. 313-695-0666
MN Minneapolis, Kodo Assocs. 612-881-1255
MO Raytown, Marty Taraski Sls. 816-358-1442
NJ Teaneck, Steve Fisher Sls. 201-837-1200
NY Rochester, Warren Kaufman & Assocs. 716-266-2728
NC Matthews, Henry W. Phillips Co. 704-882-2878
OH Cuyahoga Falls, Buckeye Mktg. Grp. .. 216-929-6536
PA Library, Buckeye Mktg. Grp. 412-854-5727
RI Coventry, Adams-McGregor 401-821-1320
RI Lincoln, Adams-McGregor 401-726-1300
TX Dallas, J & J Sls. Co. 214-328-9739
WA Woodenville, McLaughlin Long, Inc. ... 206-743-1161

Local Distributors
AL Birmingham, Forbes Distrbg. 205-251-4104
AK Anchorage, Alaska Elctrns. Supp. 907-563-3774
AZ Phoenix, Tri-Tek 602-995-9352
AZ Tucson, Inland Elctrns. 602-889-5301
CA Berkeley, Al Lasher's Elec. 415-843-5915
CA Canoga Park, Sandy's Elec. 213-346-8353
CA Chatsworth, Priority One Elctrns. 818-709-5464
CA El Cerrito, Trumbull Co. 415-525-7242
CA Palo Alto, Zack Elctrns. 415-326-5432
CA San Francisco, Zack Elctrns. 415-626-1444
CA San Jose, Quement Elctrns. 408-998-5900
CO Boulder, Boulder Whls. Elctrns. 303-530-1666
CT Greenwich, Wise Comps. 203-531-4880
CT Hartford, Hatry Elec. 203-527-1881
CT Wallingford, Tron Town U.S.A. 203-237-5598
FL Miami, Elctrn. Equip. 305-871-3500
FL Orlando, Sun Elctrns. 305-841-4650
FL St. Petersburg, Knapp of Florida 813-392-0406
GA Atlanta, Ack Elctrn. Supp. 404-351-6340
GA Atlanta, Specialty Distrb. Co. 404-873-2521

HI	Honolulu, Honolulu Elec.	808-949-5564
IL	Berwyn, B-B & W, Inc.	312-749-1710
IL	Mt. Prospect, Tri-State Elec.	312-255-0600
IL	Niles, Joseph Elec.	312-297-4200
IL	Northbrook, Reproduction Specialists	312-564-0404
IN	Evansville, Hutch & Son	812-425-7201
IN	Indianapolis, Graham Elec.	317-634-8202
IA	Cedar Rapids, Deeco, Inc.	319-365-7551
KS	Wichita, RSC	316-267-5213
KY	Louisville, Peerless Elec.	502-637-7674
LA	Lafayette, Ralph's	318-233-0105
LA	New Orleans, Southern Radio Supp.	504-524-2343
MD	Baltimore, A S I Elec.	301-265-5100
MD	Rockville, Capitol Radio Whlsrs.	301-881-2270
MA	Hingham, Sager Elctrl. Supp.	617-749-6700
MA	Lynn, Land Elctrns. Supp.	617-592-2220
MA	Norwood, Gerber Elec.	617-769-6000
MI	Flint, Shand Elctrns.	313-743-8940
MI	Livonia, Norwest Elec.	313-261-4551
MN	Minneapolis, Acme Elctrns.	612-338-4754
MO	Kansas City, Elctrn. Supp.	816-931-0250
MO	St. Louis, Gateway Elec.	314-427-6116
MO	St. Louis, Van Sickle	314-621-5000
NE	Lincoln, Scott Elec. Supp.	402-466-8221
NV	Las Vegas, Hurley Elec.	702-384-5666
NV	Reno, Elect. Distr. Co.	702-323-2766
NH	Dover, American Radio	603-742-6800
NH	Hudson, C & H Elec.	603-882-1133
NJ	Raritan, Masters Elctrn.	201-725-3533
NJ	Ringoes, Scientific Inst. Svcs.	201-788-5550
NY	Buffalo, Summit Distr.	716-887-2800
NY	Hauppauge, Broadline Elctrns.	516-231-4100
NY	Long Island City, H. L. Dalis, Inc.	212-361-1100
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Cincinnati, URI Elec.	513-761-4030
OH	Columbus, Whitehead Elctrns.	614-224-1186
OK	Oklahoma City, Trice Wholesale	405-524-4411
OR	Beaverton, Norvac Elec.	503-644-1025
OR	Portland, Portland Radio Supp.	503-228-8647
PA	Braddock, Leff Elctrns.	412-351-5000
PA	Philadelphia, A.C. Radio	215-462-9379
PA	Reading, Barbey Elctrns.	215-376-6116
PA	Willow Grove, Resco	215-659-4575
RI	Providence, W. Dandreta & Co.	401-861-2800
SC	Charleston, Wholesale Inds. Elctrns.	803-722-2634
TN	Memphis, Bluff City Distr.	901-345-9500
TX	Dallas, Electrotex Elect. Corp. of TX	214-234-0433
TX	El Paso, Ideal Indl. Elec. Supp.	915-779-6647
TX	Houston, Gateway Elctrns.	713-978-6575
UT	Salt Lake City, Kimball Elec.	801-328-2075
VA	Arlington, Arlington Elec. Whlse.	703-524-2412
VA	Norfolk, Priest Elctrns.	804-855-0105
WA	Seattle, Radar Elec. Co.	206-282-2511
WV	Charleston, Elctrn. Materials Corp.	304-344-3577
WI	Milwaukee, Indl. Elctrns.	414-276-1212

DATA-MATCH CORP., 3810 Oakcliff Ind. Ct., Doraville, GA 30340, Tel: 404-441-0408; *Sls. Mgr.:* Charles L. Frazier III

DATAMAX
ELECTRONICS INC.
(formerly Datatronics Ltd. US)

DATAMAX ELECTRONICS, INC., P. O. Box 2839, Blue Jay, CA 92631, Tel: 714-336-3561, 714-951-5646, TWX: 910-595-1578 DATAN US LKARW ..... **A•1502-1507**

Local Sales Offices & Reps

AZ	Glendale, Adtek, Inc.	602-931-9289
CA	Santa Ana, California Elctrn. Mktg.	714-835-2702
CA	Santa Clara, Fischer Assocs.	408-733-7350
IL	Rosemont, Synmark Sls. Co.	312-825-3455
MI	Troy, C. B. Jensen & Assocs.	313-643-0506
MN	Minneapolis, Johnson Co.	612-941-4825
NH	Nashua, Access Sys. Corp.	603-888-8160
NJ	Kenilworth, Ventronics, Inc.	201-272-9262
OR	Portland, Abacus Sls., Inc.	503-777-8111
TX	Plano, Texas Sls. Co.	214-867-0644

Local Distributors

AL	Huntsville, RM Elctrns.	205-852-1550
CA	Chatsworth, Diplomat Elctrns.	213-700-8700
CA	Costa Mesa, Diplomat Elctrns.	714-549-8401
CA	San Diego, Diplomat Elctrns.	619-292-5693
CA	Santa Clara, RM Elctrns./I.S.C.	408-496-0411
CA	Sunnyvale, Diplomat Elctrns.	408-734-1900
CO	Wheat Ridge, Diplomat Elctrns.	303-422-9229
CT	Danbury, Diplomat Elctrns.	203-797-9674
FL	Clearwater, Diplomat Elctrns.	813-443-4514
GA	Norcross, Diplomat Elctrns.	404-449-4133
IL	Bensenville, Diplomat Elctrns.	312-595-1000
IL	Elk Grove Village, RM Elctrns.	312-364-6622
IN	Indianapolis, RM Elctrns.	317-291-7110
MD	Columbia, Diplomat Elctrns.	301-995-1226
MA	Woburn, A.C.I.	617-935-7230
MA	Woburn, Diplomat Elctrns.	617-935-6611
MI	Grand Rapids, RM Elctrns.	616-531-9300, 800-443-2957
MN	Minneapolis, Glenmark, Inc.	612-941-4825
NH	Manchester, Components North	603-624-4661
NJ	Cherry Hill, Diplomat Elctrns.	609-751-0518
NJ	Totowa, Diplomat Elctrns.	201-785-1830
NY	Liverpool, Diplomat Elctrns.	315-652-5000
NY	Melville, Diplomat Elctrns.	516-454-6400
PA	Horsham, RM Elctrns.	215-674-1181
TX	Austin, A.C.T./Diplomat	512-452-5254
TX	Dallas, A.C.T./Diplomat	214-980-1888
TX	Dallas, RM Elctrns.	214-869-2080
TX	Houston, A.C.T./Diplomat	713-975-8447
UT	Salt Lake City, Diplomat Elctrns.	801-486-4134
WI	New Berlin, RM Elctrns.	414-784-4420

DATAMETRICS CORP., Defense Products Div., 7630 Gloria Ave., Van Nuys, CA 91406, Tel: 818-989-3840, TWX: 910-495-2009; FSC No.: 19059; Empl.: 150; *Sls. Mgr.:* Jim Foti

datametrics DRESSER

DATAMETRICS • DRESSER INDS., INC., 340 Fordham Road, Wilmington, MA 01887, Tel: 617-658-5410, TWX: 710-347-7672; Empl.: 175; *Sls. Mgr.:* A. W. Siff ..... **B•1791**

Local Sales Offices & Reps

AZ	Phoenix, Motion Technology	602-991-1782
CA	Anaheim, Motion Technology	714-777-4259
CA	Chatsworth, Motion Technology	818-993-3762
CA	San Jose, Motion Technology	408-923-0990
CA	San Raphael, Motion Technlg.	415-459-2171
CO	Englewood, Integrated Motion Sys.	303-762-1817
CT	Guilford, Gem Sls.	203-453-5424
IL	Rolling Meadows, KMA Sls.	312-398-5300
MI	Lamont, Xanthus	616-677-3103
MI	Troy, Xanthus	313-528-2000
MN	Minneapolis, Trask Engrg.	612-537-2434
NH	Salem, Gem Sls.	603-893-0009
NJ	Williamstown, Precision Motion Sls.	609-629-4757
NY	Clark Mills, KLM-Garner	315-853-6126
NY	Glen Cove, Precision Motion Sls.	516-676-1645
NY	N. Syracuse, KLM-Garner	315-458-6214
NY	Pittsford, KLM-Garner	716-381-8350
NC	Cary, Scott Maxfield	919-851-5000
NC	Charlotte, MacKay, Smith & Assocs.	704-372-1188
OH	Chagrin Falls, K. F. Nauerz	216-338-8450
OH	West Chester, Fehrco	513-777-4248
TX	Dallas, Automated Motion Control	214-340-4192
TX	Denton, Automated Motion Control	817-382-4159
WA	Bellevue, Al Smith Co.	206-746-6770
WA	Vancouver, Al Smith Co.	206-892-9912
WI	Milwaukee, KMA Sls.	414-259-1771

DATA PLUS, INC., 7205E Lockport Pl., Lorton, VA 22079, Tel: 800-368-3747; Empl.: 20; *Sls. Mgr.:* George E. Pritz

DATAPOINT CORP., Peripheral Operations Division, 686 West Maude Avenue, Sunnyvale, CA 94086, Tel: 408-732-7330, TWX: 910-339-9244; Empl.: 500

DATAPOWER, INC., 3328 West First St., Santa Ana, CA 92703, Tel: 714-775-2000, Telex: 683323, TWX: 910-595-1560; Empl.: 300; *Sls. Mgr.:* Richard F. Tassone

DATA POWER, See Beaver Labs

DATA PRECISION CORP., Electronics Ave., Danvers, MA 01923, Tel: 617-246-1600, Telex: 921819; FSC No.: 51692; Empl.: 260; *Sls. Mgr.:* John P. Kelly, William Sapankevych; *Dist. Mgr.:* John Kelly

DATAPRINTER CORP., Printronix, 99 Middlesex St., Malden, MA 02148, Tel: 617-321-2400; *Sls. Mgr.:* Jack Garrity

DATAPROBE, 110 Palisades' Blvd., Palisades Park, NJ 07650, Tel: 201-947-9500, Telex: 642-165; Empl.: 20

DATA PROCESSING DESIGN, 1400 N. Brasher St., Anaheim, CA 92807, Tel: 714-970-2373, Telex: 182-278; Empl.: 50

DATAPRODUCTS, 6200 Canoga Ave., Woodland Hills, CA 91365, Tel: 213-887-8000, Telex: 67-4734; Empl.: 5700; *Sls. Mgr.:* Keith Bauserman; *Dist. Mgr.:* L. Bowne

DATA PRODS. NEW ENGLAND, Barnes Park N. Caller Box 30, Wallingford, CT 06492, Tel: 203-265-7151, TWX: 710-476-3427

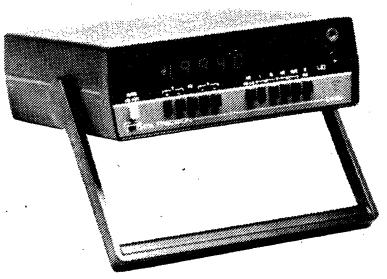
DATAPROFITS CORP., 2260 Distributors Dr., Indianapolis, IN 46241; Empl.: 5

DATARAM CORP., Princeton Road, Cranbury, NJ 08512, Tel: 609-799-0071, TWX: 510-685-2542; Empl.: 145; *Sls. Mgr.:* Bernard J. Mikula

Local Sales Offices & Reps

AZ	Phoenix, RML Assocs.	602-246-0321
CA	Los Alamitos, Gemini Assocs.	213-594-9618
CA	Mountain View, Thorson West	415-964-9300
CA	Newport Bch., Dataram Corp.	714-955-0851
CA	San Diego, Gemini Assocs.	619-268-1181
CO	Denver, RML Assocs.	303-757-6654
CT	Bloomfield, J & J Assocs., Inc.	203-242-4940
FL	Orlando, Col-Ins-Co.	800-432-4480
GA	Atlanta, Col-Ins-Co.	800-327-6600
IL	Oak Brook, Dataram Corp.	312-789-3710
IL	Skokie, Mar-Con Assocs., Inc.	312-675-6450
MD	Rockville, Technical Sls. Assocs.	301-340-0600
MA	Sterling, Dataram Corp.	617-422-6090
MA	Winchester, J & J Assocs., Inc.	617-729-5770
MN	Eden Prairie, First Rep Co. of Minnesota	612-944-2097
MO	St. Louis, Engineering Serv.	314-997-1515
NJ	Haddonfield, G. L. Williams Assocs.	609-428-6060
NJ	Ridgewood, Hansen & Hughes	201-652-7055
NM	Rio Rancho, RML Assocs.	505-892-2385
NY	Green Lawn, Hansen & Hughes	516-754-3608
NY	New York, Hansen & Hughes	800-526-5114
NY	Rochester, RG Engrg.	716-442-5631
OH	Columbus, SelTech Mktg.	614-451-3865
OR	Beaverton, Meritech Sls. Corp.	503-644-0304
RI	Johnston, J & J Assocs., Inc.	401-231-3488
TX	Austin, Thorson Southwest	512-451-7527
TX	Dallas, Thorson Southwest	214-233-5744
TX	Houston, Thorson Southwest	713-771-3504
WA	Bellevue, Meritech Sls. Corp.	206-454-4600

DATA RAY CORP., 452 Burbank Street, Broomfield, CO 80020, Tel: 303-469-5173, Telex: 887356; FSC No.: 303-466-9524; Empl.: 85; *Sls. Mgr.:* Jerry Garrett

DATA PRECISION
A DIVISION OF ANALOGIC CORPORATION
Digital Multimeters
Authorized Distributors
RAG ELECTRONICS, INC.
New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing
21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500
CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225

Model 2480

DATA RENTALS/SLS., INC, P. O. Box 3257, Culver City, CA 90230, Tel: 213-559-3822; Empl.: 51; *Sls. Mgr.:* Steven Beaver

DATAROYAL, 235 Main Dunstable Rd., Nashua, NH 03061, Tel: 603-883-4157, TWX: 710-228-1077; *Sls. Mgr.:* George Bouchard

DATA SET CABLE CO., INC., 722 Danbury Rd., Ridgefield, CT 06877, Tel: 203-438-9684, TWX: 710-467-0168; *Sls. Mgr.:* T. Brusch

DATA SIGNAL CORP., 149 California St, Newton, MA 02158, Tel: 617-926-5080

DATASOUTH COMPUTER CORP., 4216 Stuart Andrew, P.O. Box 240947, Charlotte, NC 28224, Tel: 704-523-8500, Telex: 6843018; Empl.: 225; *Dist. Mgr.:* Ann Vetas

DATA SPECIALTIES, INC., 3455 Commercial Ave., Northbrook, IL 60062, Tel: 312-564-1800, Telex: 206230; Empl.: 110; *Sls. Mgr.:* John H. Kindsvater, Jr.

DATA TECH MEASUREMENT AND CONTROL PRODUCTS
A PENRIL COMPANY

DATA TECH, DIV. OF PENRIL CORP., 3110 W. Segerstrom, Santa Ana, CA 92704, Tel: 714-546-7160, TWX: 910-595-1570; Empl.: 125; *Sls. Mgr.:* Don Gardner; *Dist. Mgr.:* Don Gardner ..... **D•1328, 1334-1345**

Local Sales Offices & Reps

AL	Birmingham, Systematx	205-979-2070
AZ	Mesa, David C. Donath	602-833-8612
CA	Burlingame, Thomas J. Campbell	415-342-7007
CA	Mission Viejo, Dea Company	714-770-0188
CA	Santa Ana, Data Tech	714-546-7160
FL	Eustis, Systematx	904-357-5100
GA	Jonesboro, Systematx	404-474-3661
HI	Honolulu, TS & D	808-955-4542
IL	Elk Grove Village, Memeco Sls. & Svc.	312-228-9555
IA	Bettendorf, Miller Mech. Spec.	319-355-4485
IA	Des Moines, Miller Mech. Spec., Inc.	515-243-4287
LA	Baton Rouge, Analytical Control	504-928-2292
MA	Peabody, JSR Assocs.	617-532-0348
MI	Troy, R. H. Jackson Co.	1-800-421-4367
MN	Cedar, Bican Co.	612-434-7733
MO	Kansas City, Economy Power & Instr.	816-523-1010
NJ	Middlesex, Buck Sales	201-560-0700
NY	Albany, Robert F. Lamb Co.	518-869-3355
NY	Buffalo, Robert F. Lamb Co.	716-874-4900
NY	Rochester, Robert F. Lamb Co.	714-323-1250
NY	Syracuse, Robert F. Lamb Co.	315-455-2469
NC	Concord, FLW Southeast	704-782-6615
OH	Cincinnati, Merrifield Co.	513-821-8620
OH	Cuyahoga Falls, Baker Industrial Equip.	216-928-1615
OK	Tulsa, Automatic Eng.	918-585-5703
OR	Portland, Branom Instr.	503-283-2555
PA	Coraopolis, Baker Process Equip.	412-264-8271
PA	Warminster, Multi-Measurements, Inc.	215-675-3082
TN	Memphis, FLW Southeast, Inc.	901-345-3563
TX	Dallas, JO Instr.	214-263-2025
TX	Houston, JO Instr.	713-468-8087
WA	Seattle, Branom Instr.	206-762-6050
Can	Calgary, Alberta, Instrument Service Labs	403-255-3448
Can	Toronto, Ontario, Willer Engr.	416-499-4421

Local Distributors

CA	Costa Mesa, FLW, Inc.	714-751-7512
IL	Park Ridge, E.I.A., Inc.	312-298-2290
MA	Waltham, Calibron Instrs.	617-894-6440
MN	Royal Oak, George Instrs.	313-280-1111
NY	Rochester, EIC Elctrns.	716-544-4392
OH	Dayton, National Inst. Dist.	513-435-4503
Can	Richmond, BC, Instrument Svc. Labs	604-278-4511

DATA TECHNOLOGY, INC., 4 Gill St, Woburn, MA 01811, Tel: 617-935-8820, Telex: 95-1351; Empl.: 85; *Sls. Mgr.:* D. Skenderian

DATA TERMINALS & COMMUNICATIONS, 590 Division St, Campbell, CA 95008, Tel: 408-378-1112, TWX: 910-590-2436; *Dist. Mgr.:* Michael R. Wood

DATATEX CORP., 10935 S. Wilcrest Dr., Houston, TX 77099, Tel: 713-495-3100; Empl.: 100; *Sls. Mgr.:* Glenn Messerschmitt; *Dist. Mgr.:* K. Pelletier

DATATRAN CORP., 1195 South Huron St, Denver, CO 80223, Tel: 303-778-0870; Empl.: 2; *Sls. Mgr.:* Cindi L. Kemper; *Dist. Mgr.:* Cindi L. Kemper

DATATRAN LABS, P.O. Box 384, Sussex, NJ 07461, Tel: 914-856-4313; Empl.: 18; *Sls. Mgr.:* Richard E. Johnson

DATA TRANSLATION, 100 Locke Dr., Marlboro, MA 01752, Tel: 617-481-3700, Telex: 4430109; FSC No.: 61867; Empl.: 145; *Sls. Mgr.:* Ellen Wirka

DATATRON, INC., 2942 Dow Ave., Tustin, CA 92680, Tel: 714-544-9970, TWX: 910-595-1589; Empl.: 125

"Refer to Shelly Assocs. Datatron Inc. for Sales Office and distributor information"

DATATRONIC SYSTEMS CORP., Computer Sciences Div., P.O. Box 44128, Panorama City, CA 91412, Tel: 818-988-5290; Empl.: 150

DATAVOICE CORP., 180 N. La Salle St. Ste 700, Chicago, IL 60601, Tel: 312-831-4488; Empl.: 8; *Sls. Mgr.:* J. Seifert

DATAWARE SYS. LEASE, INC., 30 Bay St., Staten Island, NY 10301, Tel: 212-447-4911, Telex: 421394, TWX: 710-588-6738; *Sls. Mgr.:* Ben Welwart

DATAWEST, 7333 E. Helm Dr., Scottsdale, AZ 85260, Tel: 602-948-3280, TWX: 910-950-1289

DATAWRAP inc.

DATAWRAP, INC., 13 Henshaw St., Woburn, MA 01801, Tel: 617-938-8911; Empl.: 16; *Sls. Mgr.:* Tony Lockwood ..... **D•1979**

DATEC, INC., 200 Eastowne Dr., Ste. 116, Chapel Hill, NC 27514, Tel: 919-929-2135; Empl.: 75; *Sls. Mgr.:* Walt Lovett ..... **D•1049**

Local Distributors

AZ	Phoenix, Sunwest Data Sys.	602-271-0500
CA	Los Angeles, Mark Assocs.	213-641-1840
CA	San Diego, Western Scientific	619-744-7117
FL	Orlando, Currie, Peak & Frazier	305-855-0843
FL	Plantation, Jetronics	305-472-0900
GA	Alpharetta, Terminals Plus, Inc.	404-475-6686
GA	Atlanta, Infotec, Inc.	404-458-1400
IA	Cedar Rapids, Norand Corp.	319-369-3100
LA	Matairie, T. L. Data (American Teledata)	504-456-1400
MA	Framingham, Data Comm. Sys. Inc.	617-620-1800
MI	Ann Arbor, Complete Technology	313-996-9600
NJ	Cherry Hill, The Datastore, Inc.	609-779-0200
NJ	Northvale, Glasgal Comms.	201-768-8082
NJ	Union, Transnet Corp.	201-688-7800
NM	Albuquerque, Sunbelt Data	505-266-7731
NY	Hauppauge, Manchester Equip. Co.	516-435-1199
NY	Islip, The Technology Consortium	516-293-6898
NC	Durham, Microglyphics	919-493-8444
OH	Brecksville, Electronic Engrg. Co.	216-526-4350
OH	Cleveland, Delta Products Co., Inc.	216-731-3537
OR	Beaverton, Data Dvcs.	503-641-5500

DA-TECH CORP., 92 Steamwhistle Dr., Ivyland, PA 18974, Tel: 215-322-9410; Empl.: 75; *Sls. Mgr.:* Bradford W. Bentz

GE DATEL

DATEL, General Electric Co., 11 Cabot Blvd., Mansfield, MA 02048, Tel: 617-339-9341, Telex: 95-1340, TWX: 710-346-1953; Empl.: 650; *Sls. Mgr.:* H. Batchelder ..... **D•1083, 1147, 1346**

Local Sales Offices & Reps
Tech. Mktg., Inc.

AL	Hunstville, Electronic Mfrs' Agts.	205-830-4030
AZ	Phoenix, Tech. Sls.	602-246-1614
CA	Santa Ana, Datel	714-835-2751
CA	Sunnyvale, Datel	408-733-2424
CO	Denver, Cleveland Entprs. of Colo.	303-751-3252
CT	Hamden, JBL Assocs.	203-281-3161
FL	Coral Springs, H. A., Inc.	305-752-7520
GA	Atlanta, Electronic Mfrs' Agts.	404-329-0530
HI	Honolulu, Adtech.	808-941-0708
IL	Elmhurst, Sector Engrg. Sls., Inc.	312-530-7850
IN	Indianapolis, Sector Engrg. Sls., Inc.	317-842-1120
IA	Davenport, Ensco-Rep, Inc.	319-386-6600
KS	Overland Park, Ensco-Rep, Inc.	913-381-7557
KS	Wichita, Ensco-Rep Inc.	316-683-1070
MA	Mansfield, Datel	617-339-9341
MI	Livonia, Electro Sls. Assocs.	313-474-7320
MI	Portage, Electro Sls. Assocs.	616-323-2416
MN	Minneapolis, Electro Sls. Assocs.	612-546-4110
MN	Minneapolis, J. R. Assocs.	612-546-4110
MO	Maryland Heights, Ensco-Rep, Inc.	314-423-3935
NJ	Perth Amboy, Astrorep, Inc.	201-826-8050
NM	Albuquerque, Cleveland Entprs.	505-265-7893
NY	Babylon, Astrorep	516-422-2500
NY	Liverpool, R & D Assocs.	315-457-0100
NC	Winston-Salem, Comp. Concepts	919-765-3484
OH	Cleveland, Instrmn Sys., Inc.	216-845-8800
OH	Dayton, Instrmn Sys., Inc.	513-294-2838
OR	Portland, TASCO, Inc.	503-245-8168
PA	Glenside, Wyncote Instrmn.	215-572-6500
PA	Pittsburgh, Instrmn Sys., Inc.	412-243-1111
PA	Pittsburgh, Instrmn. Sys., Inc.	412-823-7005
TX	Austin, Technical Mktg., Inc.	512-835-0064
TX	Carrollton, Tech. Mktg., Inc.	214-387-3601
TX	Houston, Tech. Mktg.	713-777-9228
TX	Houston, Technical Mktg., Inc.	713-783-4497
UT	Salt Lake City, Cleveland Entprs. of Colo.	801-355-8424
VA	Arlington, H. J. Hefferman	703-522-6666
WA	Bellevue, TASCO, Inc.	206-453-1414
WI	Milwaukee, Sector Engrg. Sls., Inc.	414-352-8280

DATOTEK, INC., 13740 Midway Rd., Dallas, TX 75234, Tel: 214-233-1030, Telex: 73-0558; Empl.: 130; *Sls. Mgr.:* T. Peddicord

DATRON INSTRS., INC., 3401 SW 42nd Ave., Stuart, FL 33497, Tel: 305-283-0935, Telex: 525724; FSC No.: 66-15b,66-23F,66 Part II SECT H, J; Empl.: 120; *Sls. Mgr.:* Irene Bugno

DATRON SYSTEMS, INC., 200 West Los Angeles Ave., Simi Valley, CA 93065-1650, Tel: 805-584-1717, TWX: 910-494-2787; FSC No.: 32255; Empl.: 169

Advertisement

DATRON: Designs and manufactures antenna systems used in satellite communications, radar and telemetry tracking. Principle components are antennas, feeds, positioners, servo-mechanisms and controllers.

DATTILO ELECTRONICS, 11621 Electron Dr., Louisville, KY 40299, Tel: 502-267-4446; Empl.: 32

DATUM, STORAGE PRODS. DIV., 1363 State College Blvd., Anaheim, CA 92806, Tel: 714-533-6333, TWX: 910-592-1289; FSC No.: 31160; Empl.: 350; *Sls. Mgr.:* Roger Evans

datum inc

DATUM INC., Timing/Aacom Divisions, 1363 S. State College Blvd., Anaheim, CA 92806, Tel: 714-533-6333, Telex: 4722045 (intl.), TWX: 910-592-1289; FSC No.: 31160; Empl.: 280; *Sls. Mgr.:* Charles Neumann ..... **D•1050, 1148**

Local Sales Offices & Reps

AL	Huntsville, Lee Assocs.	205-533-5896
AZ	Scottsdale, BFA Corp.	602-994-5400
CA	Anaheim, Datum	714-533-6333
CA	San Diego, M. Ficken	619-292-9392
CA	Santa Clara, Ward/Davis Assocs.	408-245-3700
CO	Denver, BFA Corp.	303-777-8070
CT	Mt. Carmel, Scientific Dvcs.- Connecticut	203-248-9361
FL	Fort Walton Beach, RAM-Z	904-862-2700
FL	S. Palm Beach, RAM-Z	305-388-0784
FL	Sarasota, RAM-Z	813-957-4900
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-293-5437

IA Cedar Rapids, Marsland Assocs. 319-396-8030
MA Waltham, Scientific Devices-New England 617-890-2252
MA Wayland, Daner-Hayes 617-655-0888
WI New Berlin, Marsland 414-786-6611
MN Minneapolis, Marsland Assocs. 612-545-4481
MO St. Louis, Marsland Assocs. 314-991-1399
NJ Haddonfield, G. L. Williams Assocs. ... 609-428-6060
NM Albuquerque, BFA Corp. 505-292-1212
NM Las Cruces, BFA Corp. 505-524-9693
OH Centerville, Micro Sls. Corp. 513-433-8171
OH No. Olmsted, Micro Sls. Corp. 216-734-3080
OK Tulsa, Data Mktg. Assocs. 918-299-4818
TX Austin, Data Mktg. Assocs. 512-451-5174
TX Dallas, Data Mktg. Assocs. 214-661-0300
TX El Paso, BFA Corp. 915-542-1762
TX Houston, Data Mktg. Assocs. 713-780-2511
TX San Antonio, Data Mktg. Assocs. 512-342-3031
UT Salt Lake City, BFA Corp. 801-265-1771
VA McLean, Creative Mktg. Assocs. 703-442-9100
WA Seattle, Comptronics 206-284-4842

DAVEN COMPONENTS GRP., See Armtec Inds., Inc., Daven Comps. Grp.

DAVIDGE CORP., 1951 Colony St., Mountain View, CA 94043, Tel: 805-688-7707; *Sls. Mgr.:* Don French

THE DAVID HAFLER CO., 5910 Crescent Blvd., Pennsauken, NJ 08109, Tel: 609-662-6355, Telex: 710-892-1475; Empl.: 38

DAVIDSON ELCTRN. DEV. CO., 113 E. 13th St., Erie, PA 16512, Tel: 814-453-7547, Telex: 914-529; Empl.: 27

DAVIES, HARRY, MOLDING CO., 4920 Bloomingdale Ave., Chicago, IL 60639, Tel: 312-622-8966; FSC No.: 72512; Empl.: 140; *Sls. Mgr.:* Leo A. Sera; *Dist. Mgr.:* Leo A. Sera

DAVIS, J. W., & CO., P.O. Box 26177, Dallas, TX 75226, Tel: 214-651-7341; Empl.: 42

DAVIS ELEC. CO., Box 38, Cape Girardeau, MO 63701, Tel: 314-335-5547; Empl.: 40

DAVONG SYSTEMS, INC., 217 Humboldt Ct., Sunnyvale, CA 94089, Tel: 408-734-4900, Telex: 176386; Empl.: 110; *Sls. Mgr.:* John Houghton; *Dist. Mgr.:* Michael Redmond

DAYCO CORP., 333 W. First St., Dayton, OH 45402, Tel: 513-226-5927, Telex: 288219, TWX: 810-459-1822; Empl.: 10000

DAYTRONIC CORP., 2589 Corporate Pl., Miamisburg, OH 45342, Tel: 513-866-3300, TWX: 810-473-2978; Empl.: 130; *Sls. Mgr.:* John A. Perkins

D-B-DEVELOPMENTS, 7709 Kilbourne Rd., Rome, NY 13440, Tel: 315-339-1265; Empl.: 3

D-CEMCO, INC., 3200 N. San Fernando Blvd., Burbank, CA 91504, Tel: 213-849-6341, TWX: 910-498-2228; Empl.: 30

D-CEMCO, 3200 N. San Fernando Blvd., Burbank, CA 91504, Tel: 213-849-6341, TWX: 970-498-2228; Empl.: 50; *Sls. Mgr.:* Cliff Crowder

DCI INC., 14812 W. 117th Street, P.O. Box 215, Olathe, KS 66061, Tel: 913-782-5672; FSC No.: 58677; Empl.: 9; *Sls. Mgr.:* William D. Cook ..... **D•1347**

Local Sales Offices & Reps
AZ Phoenix, J. Smith & Assoc. 602-267-0981
CA Redwood City, N-S Assocs. 415-851-2703
CA San Diego, Mesa Engrg. 619-278-8037
CA Torrance, Cutlass Elctrns. Inc. 714-549-9358
CA Woodside, N-S Assoc. 415-854-4870
CO Colorado Springs, J. Smith & Assoc. .. 303-597-5343
CT Tolland, R. G. Assoc. 203-875-4201
FL Melbourne, Saber Assocs. 305-724-0920
IL Chicago, Commodore I 312-394-5441
IN Indianapolis, Commodore I 317-636-3318
KS Shawnee Mission, Vertec 913-677-3200
MA Danvers, R. G. Assocs. 617-777-3199
MI Detroit, Michigan Valve & Fitting 313-884-9415
MN Minneapolis, Trask Engrg. 612-537-2434
MO St. Louis, Vertec 314-394-6242
NJ Cherry Hill, Analectro, Inc. 609-424-2883
NJ Wayne, Ramapo 201-839-6767
NM Albuquerque, J. Smith & Assoc. 505-265-3406
NY Latham, L-Tron 518-785-5032
OH Columbus, R. D. Cloon Assoc. 614-459-2890
PA Pittsburg, Wainwright Tech. Sls. Inc. ... 412-487-5055
TX Richardson, Meas. Sys. & Sls. 214-644-4954

DEAK TECHNOLOGY, INC., Sainte Claire Plaza, 1121 Boyce Rd., Pittsburgh, PA 15241, Tel: 412-941-9520; *Sls. Mgr.:* Dr. David Deak ..... **D•1208-1210**

DEARBORN WIRE & CABLE CO., 9299 Evenhouse Ave., Rosemont, IL 60018, Tel: 312-696-1000, TWX: 910-253-0343; Empl.: 80 ..... **C•1839**

Local Sales Offices & Reps
CA Chino, Dearborn West 714-591-9393
CA San Diego, OHM Spun Elctrns. 619-695-8102
CA Santa Clara, Ferreria Entprs. 408-988-8323
CO Denver, Kastler Cable & Equip., Inc. ... 303-571-4455
FL Orlando, Admiral Sls. 305-352-0046
GA Atlanta, Southwest Elctrl., Inc. 404-691-0648
IL Chicago, LGS Sls. 312-456-9616
IL Wilmette, Joel Wasserman Assocs. 312-256-3566
IN Indianapolis, Elctrn. Reps. 317-894-1414
MD Baltimore, Market Line, Ltd. 301-944-2111
MA Norwood, Mac Innis Co. 617-762-8090
MI Farmington Hills, R.C. Merchant & Co., Inc. 313-476-4600
MI St. Joseph, R. C. Merchant & Co. 616-983-7378
MN Golden Valley, Ambassador Indl. Mktg. 612-542-8437
MS Jackson, Doby Assocs. 601-981-1138
MO St. Charles, Buckman & Assocs. 314-946-6201
NJ Medford, Jack McCoy, Inc. 609-953-0770
NJ New Brunswick, Synergy Sls. 201-828-5090
NY Fairport, Net Sls. 716-467-4538
NC Kernersville, Heritage Sls. Assocs., Inc. 919-996-4374
OH Cleveland, Depco, K.T. 216-442-6200
OH Cleveland, Hawkins-Burwell Co. 216-888-1533
WA Renton, Carlyle Tech. Sls. 206-226-5951

Local Distributors
AL Madison, Sea Wire & Cable 205-772-9619
CA Chatsworth, Sonic Wire 213-701-0565
FL Altamonte Springs, Royce Elctrns. 305-869-4700
FL Ft. Lauderdale, Pacer Elctrns. 305-462-0902
IL Chicago, Newark Elctrns. 312-784-5100
IL Elk Grove Village, GBL/Goold Elctrns. 312-593-3220
IL Northbrook, Classic Comps. 312-272-9650
IL Palatine, Ohm Elctrns. 312-359-5500
IN Carmel, Altex 317-848-1323
IN Evansville, Hutch & Sons 812-425-7201
IN Indianapolis, Graham 317-634-8202
IN Indianapolis, PEI Genesis 317-637-5571
IA Cedar Rapids, Deeco 319-365-6205
LA New Orleans, Radio Parts 504-581-5959
MI Grand Rapids, R. M. Electrns. 616-531-9300
MI Livonia, RS Elctrns. 313-525-1155
MN Bloomington, Berquist Corp. 612-835-2322
MN Bloomington, NWR Elctrns. 612-854-7329
MN Cambridge, RSI 612-689-4870
MN Fridley, Voyager 612-571-7766
MN New Brighton, Chris 612-631-2647
MO St. Charles, Finnigan Elctrns. 314-946-6201
NJ Dover, Electro Spec 201-361-6300
NJ E. Brunswick, Brothers Elec. 201-238-2200
NJ East Hanover, Delburn 201-884-0800
NY Elmira, CAC Elec. Supp. 607-734-1696
NY Johnson City, Help Elctrns. 607-729-3528
NY Rochester, Simcona Elctrns. 716-328-3230
NC Raleigh, Wholesale 919-782-8500
OH Akron, Akron Elctrn. Supp. 216-762-8818
OH Mansfield, National Elec. Supp. 419-524-1042
PA Harrisburg, Pyttronics 717-236-8001
PA McKean, Advacom 814-476-7774
TN Nashville, Carlton Bates 615-244-3562
TX Dallas, Shearson Elec. 214-340-3094
TX Odessa, Superior Elect. 915-332-0276
UT Salt Lake City, RA-ELCO 801-487-0571
WA Seattle, Carlyle Tech. Sls. 206-575-6750
WI Oconomowoc, G.W. Elctrns. 414-367-6003

DECC DIV., See Helionetics, Inc., DECC Div.

DECISION DATA COMPUTER CORP., 100 Witmar Rd., Horsham, PA 19044

DECISION GRAPHICS, 11 Main St., P.O. Box 306, Southboro, MA 01772, Tel: 617-481-4119, TWX: 710-390-1890

DECOM SYS., 340 Rancheros Dr., San Marcos, CA 92069, Tel: 619-744-1002, TWX: 910-322-1758; FSC No.: 55744; Empl.: 44; *Sls. Mgr.:* G. F. Tremain

Local Sales Offices & Reps
AL Lake Guntersville, Kelley Sys. Corp. ... 205-582-8677
CA Los Angeles, L. L. Stoakes, Inc. 213-640-2178
CA Palo Alto, Egbert Engrg. 415-326-1387
CA San Diego, L. L. Stoakes, Inc. 619-452-1600
CO Boulder, Grady Moore Assocs. 303-494-3351
FL Sarasota, S. Bass Assocs. 813-922-9538
IN Indianapolis, Loren Green Associates 317-293-9827
KS Shawnee Mission, Techn. Sls. Assocs. 913-888-3330
MD Severna Park, Delmarva, Ltd. 301-647-8007
MA Bedford, Claflin Assocs. 617-275-7428
MO St. Louis, Techn. Sls. Assocs. 314-725-5361
NM Albuquerque, Grady Moore Assocs. ... 505-262-1416
PA Huntingdon, Rabal Assocs. 215-947-4825
EXP CA, San Marcos, Decom Sys. 619-744-1002

DE COURSEY ENGRG. LAB., 11828 W. Jefferson, Culver City, CA 90230, Tel: 213-EX7-9668; Empl.: 7

DEGUSSA CORP., 104 New Era Drive, So. Plainfield, NJ 07080, Tel: 201-757-6500, Telex: 4754247; FSC No.: 630673043; *Sls. Mgr.:* Stacey A. Mack

DEK, INC., 3480 Swenson Ave., St. Charles, IL 60174, Tel: 312-377-2575, Telex: 297284 DEK UR; FSC No.: 312-377-0372; Empl.: 115; *Sls. Mgr.:* L. R. Pappone

DELBERT BLINN CO., Box 2007, Pomona, CA 91766, Tel: 714-629-3900; Empl.: 10

DELCO WIRE & CABLE, INC., 257 Rittenhouse Cir., Bristol, PA 19007, Tel: 215-785-0511, Telex: 06-964523, TWX: 510-667-0968; *Sls. Mgr.:* T. Blick

DEL ELCTRNS. CORP., 250 E. Sandford Blvd., Mt. Vernon, NY 10550, Tel: 914-699-2000, TWX: 710-562-0130; FSC No.: 01378; Empl.: 180 ..... **A•2133; D•1614-1615**

Local Sales Offices & Reps
AZ Tempe, Trembly Assocs. 602-967-2058
CA Mountain View, Leddy Assocs., Inc. ... 415-969-6313
CA Pasadena, A-F Sales Engrg. 213-681-5631
CO Lakewood, Trembly Assocs. 303-233-9544
IL Elmhurst, Scott Assocs. 312-279-5681
MA Burlington, TriTek 617-272-4550
MI Dearborn, Pitcher-Poulin 313-582-5450
NV Las Vegas, Trembly Assocs. 702-739-9770
NM Albuquerque, Trembly Assocs. 505-266-8616
NY Smithtown, T & K Sls. 516-724-3456
PA Ardmore, Martin Assocs. 215-649-6332
UT Salt Lake City, Trembly Assocs. 801-486-5292

DELEVAN DIV., American Precision Inds. Inc., 270 Quaker Rd., E. Aurora, NY 14052, Tel: 716-652-3600, Telex: 91-293; FSC No.: 99800; Empl.: 400; *Sls. Mgr.:* R. Nareau ..... **A•1238**

Local Sales Offices & Reps
AL Huntsville, Conley & Assocs. 205-882-0316
AZ Phoenix, Toward Engrg. 602-955-3193
CA Culver City, Bestronics 213-870-9191
CA El Toro, Delevan 714-768-5522
CA Freemont, Advanced Technlg. Sls. 415-651-0123
CA Irvine, Bestronics 714-261-7233
CA San Diego, Bestronics 619-693-1111
CA Woodland Hills, Bestronics 213-704-5616
CO Aurora, High Tech Assocs. 303-695-1990
FL Deerfield Beach, Conley & Assocs. ... 305-421-7180
FL Oviedo, Conley & Assocs. 305-365-3283
FL Tampa, Conley & Assocs. 813-885-7658
GA Doraville, Conley & Assocs. 404-447-6992
IL Downers Grove, Momak Sls. 312-963-6400
IN Fort Wayne, Walter W. Bieberich 219-432-2537
IN New Albany, Walter W. Bieberich 812-945-3187
IA Cedar Rapids, Lorenz Sls. 319-377-4666

KS Parker, S. W. Wollard 913-898-6552
MD Lutherville, D. A. Dougherty Sls. Co. ... 301-321-7890
MA Boston, P. J. Engrg. Sls. Co. 617-924-5950
MN Mendota Hgts., G-II Sls. 612-454-3086
NJ Bellmawr, TAI 609-933-2600
NJ Parlin, Martech Assocs. 201-721-2200
NY Endicott, Tech-Mark 607-748-7473
NY Manhassett, Martech Assocs. 516-627-1151
NY Mendon, Tech-Mark 716-624-3840
NY Utica, Tech-Mark 315-733-0575
NC Raleigh, Conley & Assoc. 919-876-9862
OH Beachwood, Electronic Salesmasters 216-831-9555
TX Irving, Kite Elctrn. Sls. Co. 214-438-9336
Can Mississauga, J. G. Weiss Co. Ltd. 416-673-0011
Can Nepean, J. G. Weiss Co. Ltd. 613-726-1436
Can North Vancouver, J. G. Weiss Co. Ltd. 604-987-3833
Can St. Laurent, J. G. Weiss Co. Ltd. 514-337-5022
Can Winnipeg, J. G. Weiss Co. Ltd. 204-783-4387

Local Distributors

CA Chatsworth, IEC 213-998-2200
CA Glendale, R. V. Weatherford 213-849-3451
CA Santa Clara, WDG/Santa Clara 408-727-2500
FL West Palm Beach, Nurmi Elctrn. Supp. Co. 305-686-8553
MD Savage, Pyttronics Inds. Inc. 301-792-0780
MA Boston, P. J. Engrg. Supp. 617-783-0510
NJ New Brunswick, Brothers Elctrns. 201-238-2200
NY Bohemia, Car-Lac 516-567-4200
NY Buffalo, Summit Distrs. 716-884-3450
NY Farmingdale, Milgray/New York 516-420-9800
PA Norristown, Century Elctrn. Comp. 215-631-5400
TX Dallas, R. V. Weatherford Co. 214-931-7333
TX Fort Worth, Patco Supply 817-429-8596
Can Burnaby B.C., R-A-E Indl. Elctrns. Ltd. 604-291-8866
Can Don Mills, Ontario, Saynor Elctrns. Ltd. 416-445-2347
Can Montreal, Quebec, Prelco Elctrns. Ltd. 514-389-8051
Can Pointe-Claire Quebec, Future Elctrn. .. 514-694-7710

DELTA DATA SYSTEMS CORP., 2595 Metropolitan Dr., Trevose, PA 19047, Tel: 215-322-5400, Telex: 510-667-1650; Empl.: 280; *Sls. Mgr.:* Gene Mitchell

DELTA DESIGN, 5775 Kearny Villa Rd., San Diego, CA 92123, Tel: 619-292-5000, TWX: 910-335-1215; Empl.: 159; *Sls. Mgr.:* Bob Williams

DELTA ELECTRONIC CONTROLS CORP. (DECC), See Helionetics, Inc., DECC Div.

DELTA ELECTRONIC IND. USA, Delta Elctrn. Ind. Co. Ltd., 3401 Investment Blvd., Ste. 5, Hayward, CA 94545, Tel: 415-785-5231, 415-785-5235, Telex: 4992342 DELTAITTHY; Empl.: 1207; *Sls. Mgr.:* Elson Chang; *Dist. Mgr.:* Bruce Cheng ..... **A•1600-1601; D•1616-1617**

Local Sales Offices & Reps

AL Huntsville, Technlg. Mktg. Assocs. Inc. 205-883-7893
CA Burbank, Tri-Electro Sls., Inc. 818-954-9955
CO Aurora, Mountain View Mktg. Ltd. 303-699-1665
CT Wallingford, Midstate Elctrns. 203-265-9900
GA Atlanta, Technlg. Mktg. Assocs., Inc. ... 404-257-0374
FL Melbourne, Technlg. Mktg. Assocs., Inc. 305-676-3776
FL Pompano Beach, Technlg. Mktg. Assocs., Inc. 305-942-0774
IL Chicago, United Prods. Co. 312-631-1122
IN Indianapolis, Electronic Sls. & Engrg., Inc. 317-849-4260
IA Cedar Rapids, Palatine Engrg. & Sls. Inc. 319-365-8071
KS Mission, Palatine Engrg. & Sls. Inc. 913-831-0555
MA Woburn, Mascon Inc. 617-938-8950
MI Ypsilanti, Tamco, Inc. 313-572-1950
MN Edina, Monroe Hanna 612-925-5700
MO Hazelwood, Palatine Engrg & Sls. 314-839-0800
NJ Kenilworth, Ventronics 201-272-9262
NY Penfield, Tech. Assocs., Inc. 716-385-4240
NC Charlotte, Robert W. Chapman & Co. 704-525-2421
OH Centerville, Omega Sls., Inc. 513-434-5507
OH University Hgts., Omega Sls., Inc. 216-381-1404
OK Tulsa, Advance Tech. Sls., Inc. 918-664-0482
OR Portland, Jas. J. Backer & Co. 503-297-8744
PA McKean, Ecco Elctrns. Sls. 814-476-1376
SC W. Columbia, Robert W. Chapman & Co. 803-256-0072
TX Austin, Advance Tech. Sls., Inc. 512-440-7677
TX Dallas, Advance Tech. Sls., Inc. 214-860-5455
TX Houston, Advance Tech. Sls., Inc. 713-440-3888
VA Lynchburg, Burgin-Kreh Assocs., Inc. .. 804-239-2626
WA Seattle, Jas. J. Backer Co. 206-285-1300
Can Astec Comps. Ltd. 416-630-8463

Local Distributors

CA Irvine, Retel Elctrns. 714-768-0855
CA Mission Viego, Tri-Electro Sls., Inc. 714-643-9486
CA Mountain View, Cornett Elctrns. 415-969-5420
CA San Jose, Capacitors Unlimited 408-946-7676
CA San Jose, Cypress Elctrns. 408-945-8400
CA San Jose, K-Lectron 408-942-9177
CA Torrance, Cypress Elctrns. 213-533-6005
CO Englewood, Industrial Elctrns. 303-694-9444
CT Wallingford, Midstate Elctrns. 203-265-9900
IL Chicago, Upco Distrs., Ltd. 312-631-1122
IA Cedar Rapids, Berquist Co. 319-366-8733
MA Westford, Electronics Specialties Intl, Inc. 617-486-8495
MN Minneapolis, Berquist Co. 612-835-2322
PA McKean, Advacom, Inc. 814-476-7774
TX Allen, Prime Distrbg. Co. 800-442-4008, 800-526-7478

DELTA ELCTRNS., 145 Fayette St., Winston-Salem, NC 27101, Tel: 919-725-4122; Empl.: 45; *Sls. Mgr.:* L. E. Hancock

DELTA ELECTRONICS MFG. CORP., 416 Cabot St, Beverly, MA 01915, Tel: 617-927-1060; FSC No.: 00795; Empl.: 170; *Sls. Mgr.:* S. J. Somerset; *Dist. Mgr.:* C. F. Lassiter

DELTA PRODS., Box 1147, Grand Junction, CO 81501, Tel: 303-242-9000; Empl.: 35; *Sls. Mgr.:* K. D. Braa

DELTA WIRE & CABLE CO., P.O. Box 833, 1900 Marquette, North Chicago, IL 60064, Tel: 312-473-4990; Empl.: 12; *Sls. Mgr.:* Mike Golden; *Dist. Mgr.:* Matt Coleman

DEL-TELEPRODUCTS, 230 N. Market Pl., Escondido, CA 92025, Tel: 619-743-8344; Empl.: 30; *Sls. Mgr.:* Genrik Sirvis

DELTROL CONTROLS, 2745 S. 19th St., Milwaukee, WI 53215, Tel: 414-671-6800; Empl.: 300 ..... **B•1320-1321, 1464-1465**

Local Sales Offices & Reps

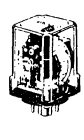
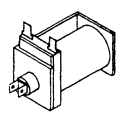
AL Huntsville, JWL Assocs. 205-883-1712
CA Canoga Park, Cummings & Assocs. ... 818-340-6035
CT Marion, Sands Co., Inc. 203-628-4363
FL Lighthouse Point, Jack Krutek & Assocs. 305-931-6544
GA Marietta, JWL Assocs. 404-429-8010
IL Glenview, E. J. McCaffrey & Assocs. .. 312-272-2820
IN Carmel, Nationwide Comps. 317-872-7207
MI Farmington Hills, W. R. Hummon & Assocs. 313-474-0661
MN St. Paul, Kencotronics, Inc. 612-645-7717
MO Ballwin, Weisler & Assocs. 314-394-4543
NJ Perth Amboy, Astrorep, Inc. 201-826-8050
NY Babylon, Astrorep., Inc. 516-422-2500
NY Rochester, Omni Sls. 716-342-5270
NC Pineville, JWL Assocs. 704-541-5750
OH Willoughby, Nationwide Comps. 216-946-3226
OR Portland, Control Dvcs. N.W. 503-230-7171
TX Garland, R. May Assocs. 214-276-5214
TX Houston, Weisler & Assocs. 713-467-1862
UT Salt Lake City, Cummings & Assocs. .. 801-261-4836
WI Milwaukee, Werking Ind. Sls. 414-964-2225
Can Pointe Claire, Que., Elcom GBM, Inc. .. 514-697-4556

Local Distributors

AL Birmingham, American Elctrn. Supp. .. 205-942-4656
AL Montgomery, Southern Controls 205-277-5030
AZ Phoenix, Elctrns. Parts Co. 602-277-7281
AR Little Rock, Carlton-Bates Co. 501-562-9100
CA Anaheim, Electro Comps. Distrs. 714-634-0222
CA Buena Park, Control Design 714-521-5040
CA Canoga Park, C & A Elctrns. 213-340-6022
CA City of Commerce, Electro Comps. Distrs. 213-727-0200
CA Los Angeles, Electric Switches 213-664-2125
CA Mt. View, Cornett Elctrns. 415-969-5420
CA Pasadena, Dow Radio Co. 213-793-1195
CA San Jose, Consolidated Parts 408-263-9521
CA Tustin, Western Switches 714-731-4333
CO Colorado Springs, Centennial Elctrns. 303-633-4666
CO Denver, Fistell's Elctrn. Supp. 303-629-1312
CO Denver, Integrated Elctrns. 303-534-6121
CT Danbury, Pilgrim Elctrns. 203-792-7274
CT New Haven, Hatry Elctrns. 203-787-5921
CT Shelton, Century Elec. 203-736-2684
FL Altamore Springs, Control Des. 305-788-3220
FL Ft. Lauderdale, Peerless Radio Corp. .. 305-566-5966
FL Ft. Lauderdale, SE Elctrns. 305-563-4131
FL Jacksonville, Mitchell Elctrns. 904-356-8427
FL Lakeland, Switch Controls 813-644-7564
FL Orlando, Hammond Elctrns. 305-849-6060
GA Atlanta, A-C Equip. 404-451-2747
GA Atlanta, Georgia Control Ctr. 404-876-8833
GA Stone Mountain, Control Des. 404-979-3502
ID Boise, Kimball Elctrns. 208-342-3559
IL Chicago, Otto Frankenbush 312-647-0755
IL Elk Grove Village, GBL 312-593-3222
IL Genoa, Control Design 815-784-6515
IL Kankakee, Blitz Elctrl. Supp. 815-933-5536
IN Gary, G. W. Berkheimer 219-887-0141
IN Indianapolis, Control Design 317-788-4559
IN Lafayette, CWY Elctrns. 317-447-4617
IA Cedar Rapids, Iowa Radio Supp. 319-364-6154
IA Davenport, Warren Radio 319-322-5301
IA Marion, Control Des. 319-373-2923
IA West Des Moines, Ramco Co. 515-225-6933
KS Kansas City, Kornfield Thorp Elec. 913-321-7070
KS Topeka, Carroll Radio 913-234-6677
KY Ashland, Ashland Elec. Co. 606-324-4107
KY Bowling Green, Randolph, Hale & Meredith 502-781-1460
KY Louisville, Peerless Elctrn. Equip. 502-637-7677
LA Shreveport, Indl. Elec. Supp. 318-222-9459
MD Aberdeen, Harco Elctrns. 301-838-7990
MA Boston, Ralph Pill Elec. Supp. 617-269-8200
MA Brighton, Interstate Elctrns. Equip. 617-782-9000
MA Burlington, QPL Elctrns. 617-229-2424
MA Newton Upper Falls, Instock Prods. ... 617-964-6200
MI Augusta, Great Lakes Elec. 616-731-4156
MI Farmington Hills, Advent Elctrns. 313-477-1650
MI Flint, Roth Elec. Supp. 313-234-8661
MN Minneapolis, Control Design 612-721-6555
MO Kansas City, Western Extralite 816-421-8404
MO St. Louis, Control Design 314-426-3150
MO St. Louis, Van Sickle Radio Elctrns. ... 314-621-5000
NE Omaha, West Dodge Elec. 402-393-8071
NJ Edison, William Elctrns. Supp. 201-985-3700
NJ Fairlawn, Relay Specialties 201-797-3313
NJ Paterson, Feldman Brothers 201-742-7329
NJ Raritan, Masters Elctrn. 201-725-3533
NY Hempstead, Elctrn. Equip. Co. 516-895-5757
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY Rochester, Masline Elctrns. 716-546-5373
NC Charlotte, Control Des. 704-588-4410
NC Raleigh, Southeastern Radio Supp. ... 919-828-2311
ND Grand Forks, Border States 701-772-3477
OH Columbus, McJunkin Corp. 614-294-3711
OH Medina, Wolff Bros. Supp. 215-725-3451

DELTROL
controls
FULL LINE
AUTHORIZED DISTRIBUTOR

E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

OH Toledo, Warren Radio Supp. 419-248-3364
OH Wickliffe, Gateway Elctrns. 216-944-8565
OK Tulsa, Radio, Inc. 918-587-9123
OR Portland, Dunn Elec. 503-285-0214
PA Erie, REM Elctrns. 814-453-5626
PA Malvern, Control Design 215-296-0150
PA Philadelphia, Lindley Elec. 215-329-7005
SC Greenville, Hammond Elec. 803-233-4421
SD Aberdeen, Plainco 605-225-7100
TN Chattanooga, Curle Elctrns. 615-266-4728
TN Knoxville, CED 651-521-6262
TN Memphis, Warren Radio 901-274-2460
TX Dallas, Control Design 214-358-1441
TX Dallas, Watson Elec. Supp. 214-742-8441
TX Garland, J & S Elec. 214-487-8808
TX Lubbock, R & R Elec. Co. 806-765-7727
TX San Antonio, Blackburn Drives Controls 512-349-2621
UT Salt Lake City, Kimball Elctrns. 801-328-2075
VA Ashland, Hermitage Distrs. 801-328-2075
VA Staunton, Southern Elec. 703-886-6218
WI Manitowoc, Englewood Elec. 414-684-6653
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI New Berlin, Control Design 414-784-1015

DELTRON, INC., P.O. Box 1369, Wissahickon Ave., N. Wales, PA 19454-9990, Tel: 215-699-9261, TWX: 510-661-8061; Empl.: 175-180; *Sls. Mgr.:* Jack Phillips

DELTRONIC CRYSTAL INDS., 215 Rt. 10, Bldg. 3, Sec. 5, Randolph, NJ 07869, Tel: 201-361-2222, Telex: 13-6170; Empl.: 8

DENNIS CHEMICAL, 2700 Papin St., St. Louis, MO 63103, Tel: 314-771-1800; Empl.: 70; *Sls. Mgr.:* Charles F. Seger III; *Dist. Mgr.:* Charles F. Seger III

DENNISON KUBE, Div. Dennison Computer Supplies Inc., 132 Calvary St., Waltham, MA 02254-0472, Tel: 617-899-0012, Telex: 94-0179; FSC No.: 17691; Empl.: 150; *Sls. Mgr.:* Alfred J. Black

DENNISON MFG. CO., 300 Howard St., Framingham, MA 01701, Tel: 617-879-0511, Telex: 948-478; FSC No.: 5975;2310; Empl.: 8000; *Sls. Mgr.:* Dan Shearn; *Dist. Mgr.:* Marlene Hajduk

DENSITRON CORPORATION

DENSITRON CORP., 20775 Western Ave., Torrance, CA 90501, Tel: 213-618-9647, TWX: 910-349-6200; FSC No.: 62483; Empl.: 65; *Sls. Mgr.:* Robert Turner; *Dist. Mgr.:* Robert Turner ..... **B•1029-1031**

Local Sales Offices & Reps

AL Huntsville, Elctrn. Mktg., Inc. 205-837-7363
AZ Phoenix, Chaparral Elctrn., Inc. 602-252-0897
CA Laguna Hills, Comp. Mktg. Assocs. 714-951-6046
CA Lomita, Comp. Mktg. Assocs. 213-326-1460
CA San Mateo, Comp. Mktg. Assocs. 415-345-7373
CA Simi Valley, (CMA) Repco 805-583-5710
CO Arvada, Delconec 303-422-7023
FL Coral Springs, E.P.M. Corp. 305-755-5387
FL Orlando, E.P.M. Corp. 305-425-6149
GA Atlanta, Elctrn. Mktg. Assoc., Inc. 404-448-1215
IL Park Ridge, Bob Burns & Assocs., Inc. 312-775-1233
IA Davenport, Ensco-Rep, Inc. 319-386-6600
KS Overland Park, Ensco-Rep, Inc. 913-381-7557
KS Wichita, Ensco-Rep, Inc. 316-683-1071
MA Braintree, Nova Assocs. 617-848-9330
MI Southfield, R. C. Nordstrom & Co. 313-559-7373
MN Minneapolis, Electro-Serv 612-338-3475
MO Maryland Heights, Ensco-Rep, Inc. 314-423-3935
NY Mastic, Optimum Sls. Co. 516-589-4664
NY Rochester, J. G. Welch Assocs. 716-244-1100
NY Utica, J. G. Welch Assocs. 315-736-7821
NC Raleigh, Elctrn. Mktg. Assoc., Inc. 919-847-8800
OH Dayton, Dynel Co. 513-434-6467
PA Wynnewood, Metz-Benham Assocs., Inc. 215-896-7300
SC Greenville, Elctrn. Mktg. Assoc., Inc. 803-233-4637
TX Austin, Delta Comp., Inc. 512-458-4288
TX Seagoville, Delta Comp., Inc. 214-287-6333
UT Salt Lake City, Delconec, Inc. 801-531-6177
WA Seattle, J. J. Assocs., Inc. 206-246-6619
WI Milwaukee, Taylor Mktg. & Sls. 414-332-1211

DESIGNATRONICS, INC., See Automatic Coil Corp., Sub. Designatronics, Inc.

DESIGN AUTOMATION, INC., 809 Massachusetts Ave., Lexington, MA 02173-3992, Tel: 617-862-8998, Telex: 951833 SBSB WOR; Empl.: 5

DESIGN TECHNOLOGY, 7760 Vickers St., San Diego, CA 92111-1871, Tel: 619-268-8194; *Sls. Mgr.:* Pam Hamilton; *Dist. Mgr.:* Sherry Kuzara

DESPATCH INDS., P.O. Box 1320, Minneapolis, MN 55440, Tel: 612-331-1873, Telex: 29-0704; Empl.: 475; *Sls. Mgr.:* T. Hostad

DEST CORP., 2380 Bering Dr., San Jose, CA 95131, Tel: 408-946-7100; Empl.: 50; *Sls. Mgr.:* Richard Dixon

DETORONICS CORPORATION, 10660 E. Rush St., S. El Monte, CA 91733, Tel: 818-579-7130, TWX: 910-587-3436; FSC No.: 29867; Empl.: 45

DEUTSCH CO., Deutsch Fiber Optics Div., 7001 W. Imperial Hwy., Los Angeles, CA 90045, Tel: 213-649-1400; *Sls. Mgr.:* Ken Ahmad

DEUTSCH FASTENER, 1315 East Grand Ave., El Segundo, CA 90245, Tel: 213-322-8840, Telex: 66-4453, TWX: 910-348-6676; Empl.: 300; *Sls. Mgr.:* Ian J. Skone-Rees

DEUTSCH RELAYS, INC., 65 Daly Road, East Northport, NY 11731, Tel: 516-499-6000

DEVCO ENGRG., Control Sys. Div., 36 Pier Lane West, Fairfield, NJ 07006, Tel: 201-CA8-0321, Telex: 139-340; Empl.: 36

DEVELCO, INC., 404 Tasman Dr., Sunnyvale, CA 94089-1797, Tel: 408-734-5700, TWX: 910-339-9295; Empl.: 50; *Sls. Mgr.:* W. J. Baker

DEVELOPMENT ASSOCIATES, 1520 S. Lyon, Santa Ana, CA 92705, Tel: 714-835-9512; Empl.: 6

DEXCEL, Div. of Gould, 2285C Martin Ave., Santa Clara, CA 95050, Tel: 408-727-9833, TWX: 910-338-0180; Empl.: 210; *Sls. Mgr.:* Art Kawai

DEXTER RESEARCH CTR., INC., 7300 Huron River Dr., Dexter, MI 48130, Tel: 313-426-3921, Telex: 757075 DEXTER RES UD; Empl.: 22; *Sls. Mgr.:* D. M. Szeles

DGS ASSOCS., 1353 Sarita Way, Santa Clara, CA 95051, Tel: 408-554-1469, Telex: 6502163796

DIALIGHT CORP., 203 Harrison Pl., Brooklyn, NY 11237-1587, Tel: 718-497-7600, TWX: 710-584-5487; Empl.: 400; *Sls. Mgr.:* I. Jaffe ..... **B•1032-1038, 1550-1551**

Local Sales Offices & Reps

AL Huntsville, Cartwright & Bean 205-830-1540
AZ Phoenix, Ralph Stitzer Co. 602-997-7415
CA Anaheim, Westrep 213-404-3881
CA Pleasanton, Moulthrop Sls. 415-463-0450
CA San Diego, Westrep 619-566-6580
CO Boulder, Comp. Prods. Sls. 303-530-2800
FL Deerfield Bch., Cartwright & Bean 305-429-3400
FL Orlando, Cartwright & Bean 305-422-4531
GA Atlanta, Cartwright & Bean 404-233-2939
IL Chicago, D. Dolin Sls. 312-498-6770
IN Indianapolis, Elctrn. Reps. 317-894-1414
KS Overland Park, Advanced Tech. Sales 913-642-6675
LA Covington, Cartwright & Bean 504-892-1780
MI Ferndale, Hilltronics 313-398-5556
MN Minneapolis, Professional Sales For Ind. 612-944-8545
MS Jackson, Cartwright & Bean 601-981-1170
NY Liverpool, Gen-Tech 315-451-3480
NC Charlotte, Cartwright & Bean 704-377-5673
NC Raleigh, Cartwright & Bean 919-876-4130
OH Dayton, K.W. Elctrn. Sls. 513-890-2150
OH Shaker Hgts., K.W. Elctrn. Sls. 216-491-9177
OH Worthington, K.W. Elctrn. Sls. 614-888-0483
OR Tigard, Elctrn. Sources 503-684-0040
PA Allison Park, K.W. Elctrn. Sls. 412-487-4300
PA Broomall, L.D. Lowery 215-528-5170
TN Knoxville, Cartwright & Bean 615-693-7450
TN Memphis, Cartwright & Bean 901-276-4442
TX Austin, Tesco 512-834-8374
TX Garland, Tesco 214-681-1376
UT Woodscross, Comp. Prods. Sls. 801-292-8882
WA Bellevue, Elctrn. Sources 206-451-3500
WI Milwaukee, D. Dolin Sls. 414-482-1111

Local Distributors

AZ Tempe, Richey Western Elctrns. 602-894-9251
CA Alhambra, Fisher/Brownell 213-289-0255
CA Chatsworth, Diplomat Westates Elctrns. 213-341-4411
CA Costa Mesa, Diplomat Westates 714-549-8401
CA Gardena, Bell Indus. 213-515-1800
CA Inglewood, Newark Elctrns. 213-671-7387
CA Los Angeles, Richey Western Elctrns. 213-820-3777
CA Sacramento, Sacramento Elctrns. 916-441-4821
CA San Diego, Fisher/Brownell 714-560-8545
CA San Diego, Richey Western Elctrns. 714-565-4444
CA Santa Clara, Fisher/Brownell 408-988-6041
CA Santa Clara, Richey Western Elctrns. 408-727-7411
CA Sun Valley, Richey Western Elctrns. 213-768-3800
CA Sunnyvale, Bell Indus. 408-734-8570
CA Sunnyvale, Time Elect. 408-734-9888
CO Denver, CSID Inc. 303-292-9594
CO Denver, Newark Denver Elctrns. 303-757-3351
CT Wallingford, Sager Elctrl. Supply 203-265-4600
FL Ft. Lauderdale, Peerless Radio 305-973-4141
FL Orlando, Hammond Elctrns. 305-849-6060
GA Atlanta, Specialty Dist. 404-873-2521
IL Chicago, Newark Elctrns. 312-638-4411
IL Northbrook, Classic Comps. Supp. 312-272-9650
IL Palatine, OHM Elctrns. 312-359-5500
IL Peoria, Klaus Radio & Elect. 309-691-4840
IN Ft. Wayne, Graham Elctrn. 219-423-3422
IN Indianapolis, Graham Elctrn. 317-634-8202
IN South Bend, Genesis Elctrn. 219-287-2911
KY Louisville, P.I. Burks 502-589-3960
LA Lafayette, Ralph's of Lafayette 318-234-4507
LA New Orleans, Southern Radio Supp. 504-524-2343
MD Baltimore, Resco/Baltimore 301-529-0600
MD Gaithersburg, Pioneer Wash. Elect. 301-948-0710
MD Rockville, Capitol Radio Whlsrs. 301-881-2270
MA Hingham, Sager Elec. Supp. 617-749-6700
MA Norwood, Gerber Elctrns. 617-769-6000
MA Springfield, T.F. Cushing 413-788-7341
MA Wilbraham, Ind'l. Comps. 413-596-3854
MI Ann Arbor, Wedemeyer Elctrn. Supp. 313-665-8611
MI Livonia, RS Elctrns. 313-525-1155
MI Oak Park, Newark Elctrn. 313-967-0600
MN St. Paul, Gopher Elctrns. 612-483-3322
MO Kansas City, LCOMP 816-221-2400
MO Kansas City, Walters Radio Supp. 816-531-7015
MO Maryland Hgts., LCOMP 314-291-6200
NE Lincoln, Scott Elctrn. Supp. 402-466-8221
NJ Hanover, State Elctrns. 201-887-2550
NJ Kenilworth, Federated Purchaser 201-272-0505
NJ Pennsauken, Resco Elctrns. 609-662-4000
NY Buffalo, Summit Dists. 716-887-2800
NY Elmsford, Ancar Elctrns. Supp. 914-592-7100
NY Endwell, ASI Elect. 607-754-3823
NY Farmingdale, Arrow Elctrns. 516-694-6800
NY Hauppauge, Broadline Elec. Dists. 516-231-4100
NY Long Island City, Dalis Indl. Elect. 212-361-1100
NY Lynbrook, Peerless Radio 516-593-2121
NY Rochester, Summit Elctrns. 716-334-8110
NY Rome, Rome Elctrns. 315-337-5400
NY Woodbury, Pioneer/Harvey 516-921-8700
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Raleigh, Southeastern Elctrns. 919-828-2311
OH Akron, Akron Elctrn. Supp. 216-762-8818
OH Akron, Sun Radio 216-434-2171
OH Cincinnati, Hughes-Peters 513-351-2000
OH Cincinnati, URI Elctrns. 513-761-4030
OH Cleveland, Pioneer-Cleveland 216-587-3600
OH Columbus, Hughes-Peters 614-294-5351
OH Dayton, Pioneer/Dayton 513-236-9900
OH Dayton, Stotts-Friedman 513-298-5555
OH Solon, REPCO Elctrn. 216-248-8900
OK Tulsa, Radio, Inc. 918-587-9123
OR Beaverton, Almac Elctrns. 503-641-9070
PA McKean, Advacom 814-476-7774
PA Montgomeryville, Pyttronic Indus. 215-643-2850
PA Philadelphia, Almo Elctrns. 215-698-4000
PA Philadelphia, Philadelphia Elctrns. 215-568-7400
PA Pittsburgh, Cam RPC Elect. 412-782-3770
PA Reading, Barbey Elctrns. 215-376-6116
RI Providence, Wm. Dandreta 401-861-2800
SC Greenville, Hammond Elctrns. 803-233-4121
TN Kingsport, Radio Elec. Supp. 615-247-8111
TN Nashville, Carlton-Bates Co. 615-244-3562
TN Nashville, Electra Dist. 615-329-3971
TX Dallas, Norvell Elctrns. 214-233-0020
TX Garland, Newark Elctrns. 214-494-5911
TX Houston, Newark Elctrns. 713-782-4800
TX Stafford, Harrison Equip. 713-879-2600
UT Salt Lake City, Standard Supp. 801-486-3371
VA Norfolk, Priest Elctrns. 804-855-0105
VA Richmond, Sterling Elctrns. 804-226-2190
WA Bellevue, Almac Elctrns. 206-643-9992
WI Milwaukee, Elctrn. Expeditors 414-228-8100
WI Milwaukee, Indl. Elect. 414-276-1212
WI Milwaukee, Marsh Elctrns. 414-475-6000

DIAL PRODS. CO., 19-21 Cottage St., Bayonne, NJ 07002, Tel: 201-HE7-0720; Empl.: 100; *Sls. Mgr.:* Beverly Malen

DIAMOND MAGNETICS, P.O. Box 4736, San Luis Obispo, CA 93403, Tel: 805-544-4019; Empl.: 10; *Sls. Mgr.:* Lyle Nighswonger

DIAMOND SHAMROCK CORP, 1100 Superior Ave, Cleveland, OH 44114, Tel: 216-694-5000

DIANACHART INC., 129 Hibernia Ave., Rockaway, NJ 07866, Tel: 201-625-2299; Empl.: 10; *Sls. Mgr.:* D. Brodie

DI/AN CONTROLS, INC., 944 Dorchester Ave., Boston, MA 02125, Tel: 617-288-7700, TWX: 710-333-1732; FSC No.: 06900; Empl.: 135; *Sls. Mgr.:* C. S. Aspinwall, Jr.; *Dist. Mgr.:* C. S. Aspinwall, Jr.

DIA-NETICS, INC., 18823 Napa St, Northridge, CA 91324, Tel: 818-886-2616; Empl.: 35

DIEGO POWER, 5350 Eastgate Mall, San Diego, CA 92121, Tel: 587-1925; Empl.: 12; *Sls. Mgr.:* Jack Jaquay ..... **D•1916**

Local Sales Offices & Reps

CA	Campbell, Elcor Assocs.	408-866-5505
CA	Garden Grove, Elcor Assocs.	714-895-3422
CT	Hamden, AMI, Inc.	203-288-5288
IL	Rolling Meadows, Commodore I	312-394-5441
MA	Acton, AMI, Inc.	617-263-2766
MN	Burnsville, Commodore I	612-894-5488
NJ	Lodi, SDM Reps., Inc.	201-368-0123
NY	Rochester, SDM Reps., Inc.	716-247-8770
OH	Miamisburg, Swenson Assocs.	513-866-3233
WA	Seattle, Datacom Assocs.	206-285-2525

DIELECTRIC COMMUNICATIONS, General Signal, Tower Hill Rd., Raymond, ME 04071, Tel: 207-655-4555, 800-341-9678, Telex: 710-229-6890; FSC No.: 08441; Empl.: 250; *Sls. Mgr.:* Rolf Olsen

DIELECTRIC INSTR. CORP., 761 Franklin Ave., Pittsburgh, PA 15221, Tel: 412-731-6566; Empl.: 7

DIELECTRIC LABS., 69 Albany St, Cazenovia, NY 13035, Tel: 315-655-8710, TWX: 710-541-1530; FSC No.: 55153; Empl.: 65; *Sls. Mgr.:* David Carter

DIETZ DESIGN, INC., 100 Electronics Pkwy., Belton, MO 64012, Tel: 816-331-4911; Empl.: 75

DIETZGEN CORP., 250 Wille Rd., Des Plaines, IL 60018, Tel: 312-635-5200; Empl.: 200

DIGELEC, INC., Affil. Wavetek Corp., 586 Weddell Drive, Suite 1, Sunnyvale, CA 94089, Tel: 408-745-0722, Telex: 821877; *Sls. Mgr.:* Karl Sturz

DIGIAC CORP., 175 Engineers Rd., Hauppauge, NY 11788, Tel: 516-273-8600, TWX: 510-227-9879; Empl.: 25; *Sls. Mgr.:* L. Keckeisen; *Dist. Mgr.:* S. Opperer

DIGI-DATA CORP., 8580 Dorsey Run Rd., Jessup, MD 20794, Tel: 301-498-0200, Telex: 87-580; Empl.: 75; *Sls. Mgr.:* Allen Grams

DIGIMAX INSTRS. CORP., 5625 Kearny Villa Rd., San Diego, CA 92123, Tel: 619-569-6582, Telex: 697120-DATAMAX; FSC No.: 5T492; *Sls. Mgr.:* Dan Burton; *Dist. Mgr.:* Dan Burton

DIGITAL COMMUNICATIONS ASSOCS., INC., 303 Technology Pk., Norcross, GA 30092, Tel: 404-448-1400, Telex: 261333 DCAATL; Empl.: 500; *Dist. Mgr.:* Jerry Buran

DIGITAL DATA SYS., 1551 N.W. 65 Ave., Plantation, FL 33313, Tel: 305-792-3290, Telex: 9109974751 (DIGITAL); Empl.: 20; *Sls. Mgr.:* Floyd Simon; *Dist. Mgr.:* A. Gomez

DIGITAL DEV. CORP., 8650 Balboa Ave., San Diego, CA 92123, Tel: 619-278-9920, Telex: 69-54-30; Empl.: 430; *Sls. Mgr.:* Charles Theodore

DIGITAL DYNAMICS, INC., 108 Water St., Watertown, MA 02172, Tel: 617-923-4315, Telex: 9580076; Empl.: 26; *Sls. Mgr.:* Eric Kapust

DIGITAL ELCTRNS., 26142 Eden Landing Rd., Ste. 2, Hayward, CA 94545, Tel: 415-786-0520, Telex: 334422; *Sls. Mgr.:* Bob Christensen

DIGITAL EQUIP., One Iron Way, Marlborough, MA 01752

digital

DIGITAL EQUIPMENT CORP., 33 Cabot Rd., Woburn, MA 01801, Tel: 800-225-5385 ..... **D•1063-1065**

DIGITAL GRAPHIC SYS., 2629 Terminal Blvd., Mountain View, CA 94043, Tel: 415-962-0200; *Sls. Mgr.:* Radcliffe Goddard

DIGITAL MICROSYSTEMS, 1755 Embarcadera, Oakland, CA 94606, Tel: 415-532-3686, TWX: 910-366-7310; Empl.: 200; *Sls. Mgr.:* Terry Forde

DIGITAL MEDIA, 3178 Gibraltar Ave., Costa Mesa, CA 92626, Tel: 714-751-1373; *Sls. Mgr.:* David Scott

DIGITAL PATHWAYS, INC., 1060 E. Meadow Cir., Palo Alto, CA 94303, Tel: 415-493-5544, TWX: 910-379-5034; *Sls. Mgr.:* Jan Legassick

DIGITAL POWER CORP., 686 East Gish Rd., San Jose, CA 95112, Tel: 408-288-5600, TWX: 910-338-0579; *Sls. Mgr.:* Claude Adkins

DIGITAL PRODUCTS, INC., 600 Pleasant St., Watertown, MA 02172, Tel: 617-924-1680; Empl.: 25; *Sls. Mgr.:* William M. Kahn

DIGITAL RADIO CORP., 8901 La Cienega Blvd., Inglewood, CA 90301, Tel: 213-670-8611; *Sls. Mgr.:* Arvin L. Perry

DIGITAL TRANSMISSION TECHNIQUES, INC., P.O. Box 1847, Wayne, NJ 07470, Tel: 201-831-1615; Empl.: 3; *Sls. Mgr.:* Charles Herbst

DIGITEC CORP., 918 Woodley Rd., P.O. Box 458, Dayton, OH 45401, Tel: 513-254-6251, Telex: 6874219 W.U.I.; FSC No.: 16152; Empl.: 135; *Sls. Mgr.:* Jerry Rozek; *Dist. Mgr.:* Jerry Rozek ..... **D•1066, 1149, 1348**

Local Sales Offices & Reps

AL	Huntsville, W. A. Brown	205-883-8660
CA	Huntington Beach, AWC	714-969-2468
CA	Santa Clara, Johnson Assocs.	408-984-4626
CT	New Canaan, R. J. Sickles Assoc.	203-966-4630
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-924-3568
IA	Cedar Rapids, Marsland Assocs.	319-396-8030
KS	Shawnee, Marsland Assocs.	913-631-5400
MI	Southfield, Comtel-Instr.	313-358-2505
MN	Minneapolis, Marsland Assocs.	612-545-4481
MO	St. Louis, Marsland Assocs.	314-878-2402
NJ	Cedar Grove, KLS	201-785-4450
NJ	Cherry Hill, Sci. Reps.	609-482-0059
NM	Albuquerque, Fry-Gates	505-262-1525
NY	Glens Falls, Glen Instrs.	518-798-1993
NY	Rochester, Glen Instrs.	716-338-7148
OH	Cleveland, Comtel-Instr.	216-442-8080
OH	Dayton, Comtel-Instr.	513-298-7573
PA	Pittsburgh, Comtel-Instr.	412-922-5720
TX	Houston, Adaptive Controls	713-995-9791
UT	Salt Lake City, Meas. Conslts.	801-364-3174
VA	Fairfax, Scientific Reps.	703-385-0600
VA	Richmond, Cavalier	804-794-4033

DIGITECH INDUSTRIES, INC., 66 Grove St., Ridgefield, CT 06877, Tel: 203-438-3731, Telex: 969-623; Empl.: 70

DIGITEK INC., P.O. Box 468, Kenmore, WA 98028, Tel: 206-485-6571; *Sls. Mgr.:* Paul J. McManus; *Dist. Mgr.:* Paul J. McManus

DIGITRAN CO., Becton Dickinson & Co., 3100 New York Dr., Pasadena, CA 91107, Tel: 818-791-5600, Telex: 67-5485, TWX: 910-588-3794; Empl.: 300

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns. Assoc.	205-881-5031
AZ	Scottsdale, Arcom Sls.	602-947-5745
AR	Little Rock, Beacon Elctrn. Assoc.	501-224-5449
CA	Anaheim, Westrep 213-404-3881,	714-527-2822
CA	San Diego, Westrep	619-276-0751
CA	Santa Clara, Westrep	408-988-8833
CO	Littleton, Omega, Ltd.	303-798-7040
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Clearwater, Beacon Elec. Assoc.	813-796-2378
FL	Ft. Lauderdale, Beacon Elec. Assocs.	305-491-1054
FL	Maitland, Beacon Elec. Assocs.	305-647-3498
FL	Melbourne, Beacon Elec. Assoc.	305-724-8010
GA	Atlanta, Beacon Elctrns. Assoc.	404-256-9640
IL	Elk Grove Village, Carlson Elctrn. Sls.	312-956-8240
IN	Ft. Wayne, R. O. Whitesell & Assoc.	219-432-5591
IN	Indianapolis, R. O. Whitesell & Assoc.	317-359-9283
IN	Kokomo, R. O. Whitesell & Assoc.	317-457-9127
IA	Des Moines, The Beams Co.	515-255-1148
KS	Shawnee Mission, The Beams Co.	913-631-0300
KY	Louisville, R. O. Whitesell & Assoc.	502-426-7696
MD	Silver Spring, Marktron	301-460-6100
MD	Timonium, Marktron	301-252-7111
MA	Burlington, Kitchen & Kutchin	617-229-2660
MI	Grand Rapids, R. O. Whitesell & Assoc.	616-942-5420
MI	Southfield, R. O. Whitesell & Assoc.	313-559-5454
MI	St. Joseph, R. O. Whitesell & Assoc.	616-983-7337
MO	St. Louis, The Beams Co.	314-569-1060
NJ	Haddonfield, Sunday-O'Brien	609-429-4013
NJ	Hasbrouck Hgts., Comp-Tech Sls.	201-288-7400
NY	New York, Comp-Tech Sls.	516-593-2628
NY	Rochester, Ossmann Comp. Sls.	716-424-4460
NY	Syracuse, Ossmann Comp. Sls.	315-455-6611
NC	Greensboro, Beacon Elctrns. Assoc.	919-275-9997
NC	Raleigh, Beacon Elec. Assoc.	919-787-0330
OH	Cincinnati, R. O. Whitesell & Assoc.	513-521-2290
OH	Cleveland, R. O. Whitesell & Assoc.	216-447-9020
OH	Columbus, R. O. Whitesell & Assoc.	614-888-9396
OH	Dayton, R. O. Whitesell & Assoc.	513-298-9546
PA	Pittsburgh, R. O. Whitesell & Assoc.	412-963-6161
TX	Dallas, Allied Comps.	214-238-0408
TX	Houston, Allied Comps.	713-988-1600
TX	Hurst, Allied Comps.	817-589-0456
TX	Round Rock, Allied Comps.	512-244-1166
UT	Riverton, Omega, Ltd.	801-254-6723
VA	Charlottesville, Marktron	301-460-6100
WA	Bellevue, Underwood Hanify	206-451-8223
WA	Vancouver, Underwood Hanify	503-641-4463
WI	Milwaukee, Carlson Elctrn. Sls.	414-476-2790

Local Distributors

AL	Huntsville, Comp. Distrs.	205-883-7501
AL	Huntsville, Powell Elec.	205-539-2731
AZ	Tempe, Powell Elctrns.	602-967-7538
AR	Little Rock, Comp. Distrs.	501-227-6278
CA	Cerritos, El-Com	213-404-2961
CA	Fullerton, Pyramid 714-773-0781,	213-691-0561
CA	San Diego, El-Com	619-578-0900
CA	San Jose, Powell Elctrns.	408-943-9020
CA	Santa Clara, Pyramid Elec.	408-727-9810
CO	Denver, CSID, Inc.	303-292-9594
CT	Hamden, Impact Elctrns.	203-281-1331
FL	Ft. Lauderdale, Comp. Distrs.	305-971-4950
FL	Ft. Lauderdale, Powell Electr./Fla.	305-972-4300
GA	Norcross, Comp. Distrs.	404-441-3320
IL	Mt. Prospect, Magnuson Elctrns.	312-956-0700
IN	Indianapolis, Graham Elec.	317-634-8202
MD	Columbia, Powell Electr.	301-621-4070
MA	Canton, Impact Sls. Co.	617-821-1500
MA	West Borough, Powell Electrns.	617-336-6100
MI	Livonia, Pioneer/Michigan	313-525-1800
MI	St. Clair Shores, Specialties Mfg.	313-771-2700
MN	St. Paul, Magnuson Elec.	612-227-8495
NJ	Hasbrouck Hgts., Tory Sls.	201-288-5656
NY	Rochester, Modutex Corp.	716-647-9700
NC	Cary, Powell Elec.	919-467-1212
NC	Raleigh, Comp. Distrs.	919-834-9465
OH	Cleveland, Pioneer-Cleveland	216-587-3600
OH	Columbus, Elctrns. Mktg. Corp.	614-299-4161
OH	Dayton, Pioneer/Dayton	513-236-9900
OK	Tulsa, Norvell Elctrns.	918-663-1247
OR	Beaverton, Shannon, Ltd. 503-644-8077,	800-426-4615
PA	Philadelphia, Powell Electr.	215-365-1900
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
WA	Kent, Shannon, Ltd.	206-763-0545

DIGITUS CORPORATION, 22 West 25th Street, Baltimore, MD 21218, Tel: 301-467-3223, TWX: 908248 SVCETCY; Empl.: 12; *Sls. Mgr.:* Mr. Henry Mo; *Dist. Mgr.:* Mr. Henry Mo

DILLON, W. C., & CO., National Controls, Inc., 2320 Airport Blvd., Santa Rosa, CA 95401, Tel: 707-527-5555, TWX: 510-744-2076; Empl.: 500

DIMCO-GRAY, 8200 S. Suburban Rd., Dayton, OH 45459, Tel: 513-433-7600, Telex: 288-367; Empl.: 150; *Sls. Mgr.:* R. Cramer

DIMENSIONS UNLIMITED, INC., 1636 Gervais Ave., St. Paul, MN 55109, Tel: 612-770-5630; *Sls. Mgr.:* Dennis Getter

DIODES INC., 9957 Canoga Ave., Chatsworth, CA 91311, Tel: 818-882-4920, 800-821-1178; Empl.: 30; *Sls. Mgr.:* Tim Regan; *Dist. Mgr.:* Tim Regan

DIONICS, 65 Rushmore St., Westbury, NY 11590, Tel: 516-997-7474, TWX: 510-222-0974; Empl.: 85; *Sls. Mgr.:* Mel Geffner

DIO-REY, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, Tel: 201-941-4455; FSC No.: FSCM 52116; Empl.: 13; *Sls. Mgr.:* Joseph M. Cartelli; *Dist. Mgr.:* Joseph M. Cartelli ..... **B•1040-1046**

Local Sales Offices & Reps

CA No. Hollywood, Crown Elctrns. 213-877-3550
CA Redwood City, Caltronic Assocs. 415-365-2545
CT Weston, CJA Assoc. 203-226-4317
FL St. Petersburg, R. L. Matus & Assocs. 813-896-4133
GA Buford, R. L. Matus & Assocs. 404-945-2946
IL Lake Zurich, L & B Assocs. 312-438-7917
MI Brighton, Michigan Mktg. & Sls. 313-229-6218
NJ Wayne, GT Assocs. 201-694-6040
NY Syracuse, Lenard Co. 315-479-9191
OH Cleveland, A.S.A. 216-662-6080
OH Dayton, Mohawk Intronics 513-434-8873
TX Dallas, Glidden Electro Equip. 214-341-0610
TX Houston, Glidden Electro Equip. 713-681-1415

DISC INSTRUMENTS, Honeywell, 102 E. Baker St, Costa Mesa, CA 92626, Tel: 714-979-5300, TWX: 910-595-1987; Empl.: 175; *Sls. Mgr.:* Don Risk

DISPLAY DEVICES, Box 667, Encinitas, CA 92024, Tel: 619-753-0113; FSC No.: 26107

DISPLAY INTERFACE CORP., 525 Boston Post Rd., P.O. Box 250, Milford, CT 06460, Tel: 203-877-7661; *Sls. Mgr.:* Leigh H. Hickcox

DISPLAYS, INC., Mifflin Countey Indl. Pk., Rte. 4, Box 6AAA, Lewistown, PA 17044, Tel: 717-242-2541, Telex: 842540; Empl.: 50

Local Sales Offices & Reps

IL Des Plaines, Esco Assocs. 312-298-5310
MA Framingham, Bay Colony Reps. 617-620-0607

DISPLEX, INC., Alexander Place, Glen Cove, NY 11542, Tel: 516-671-4400, Telex: 46-6886 NOHILL CI; Empl.: 12; *Sls. Mgr.:* Alan Kushner; *Dist. Mgr.:* Alan Kushner ..... **D•1619, 1917**

Local Sales Offices & Reps

CA Gardena, Bidwell Sls. 213-532-7305
CA Westlake Village, WEW Entprs. 213-707-1551
IL Elmhurst, First Rep Co. 312-530-2450
MD Wheaton, Brimberg Sls. 301-946-2670
MA Needham, Addelco Corp. 617-444-4754
NY Great Neck, F & F Metro 516-482-4080
OH Cleveland Heights, Seltech 614-451-3868
OH Columbus, Seltech 614-451-3865
OR Portland, Belusko & Co. 503-222-4279
TN Nashville, Computer Power Corp. 615-366-1703
PR Casuas, Micro-Tech Sys & Controls. .. 809-783-0100

DISTRIBUTED COMPUTER SYS., 223 Crescent St, Waltham, MA 02154, Tel: 617-899-6619, TWX: 710-324-6476; Empl.: 32; *Sls. Mgr.:* Garry Stephens

DISTRIBUTED LOGIC CORP. (DILOG), 12800-G Garden Grove Blvd., Garden Grove, CA 92643, Tel: 714-534-8950, Telex: 681399; FSC No.: 95-3205555; Empl.: 105; *Sls. Mgr.:* Dennis Edwards; *Dist. Mgr.:* Dennis Edwards

Distributor

DISTRIBUTOR SPECIALISTS, 632 Santa Monica Blvd., Santa Monica, CA 90401, Tel: 213-393-9666 ..... pgs. **708, 775**

DIVERSIFIED CASE CO., Ellis Ave., Off. 2, Whitesboro, NY 13492, Tel: 315-736-3028; Empl.: 75; *Sls. Mgr.:* John Fitzsimmons

DIVERSIFIED ELECTRONICS, INC.

DIVERSIFIED ELCTRNS., INC., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711, Tel: 812-426-2806; Empl.: 55; *Sls. Mgr.:* Ken Qualls ..... **B•1322**

Local Sales Offices & Reps

CA Danville, Stuart Assocs. 415-837-8197
CA Signal Hill, California Electro Sls. Co. .. 213-595-7427
CO Denver, Empire Elctrl. Sls. 303-744-1776
FL Leesburg, Diversified Elctrns. 800-874-0619
GA Atlanta, Grady Duckett 404-451-3529
IL Des Plaines, Antek/Lincoln, Hodges & Assocs. 312-297-0885
IN Seymour, Diversified Elctrns. Inc. 812-522-1481
IA Bettendorf, Weisler & Assocs. 319-344-0566
MD Fulton, S. Jefferies 301-792-7452
MO Ellisville, Weisler & Assocs. 314-394-4543
MO Kansas City, Weisler & Assocs. 816-421-1679
NY Great Neck, Frank Tylinski Co. 516-466-9070
NC Charlotte, Sentry Power 704-535-1774
NC Wake Forrest, Sentry Power Controls 704-535-1774
OH Cleveland, Arthur Baier 216-461-6161
OH Cleveland, Syntron, Inc. 216-572-2848
OH Dayton, Arthur Baier 513-276-4128
OR Forest Grove, Doran Sls. Assocs., Inc. 503-357-3333
PA Narberth, S. A. Jefferies 215-664-8500
TX Houston, Weisler & Assocs. 713-467-1847
UT Salt Lake City, Conely Engrg. Co. 801-972-5923
WA Green Acres, Doran Sls. Assocs., Inc. 509-922-2317
WA Redmond, Doran Sls. Assocs., Inc. 206-855-1885
WI Janesville, Antek Mktg. Assocs. 608-754-4214
EXP MO, St. Louis, Brauner Export Co. 314-426-2600
Can Mississauga, Ont., Knox Elctrl. Specialities, Inc. 416-646-6080

Local Distributors

AL Birmingham, MG Elctrns. & Equip., Co., Inc. 205-328-4525
AL Mobile, Specialty Distrg. Co. 205-344-0450
AR Rogers, Evans Elec. Motor Centers ... 501-636-0721
CA Cathedral City, Consolidated Elec. 714-328-1131
CA Danville, Cal-West Supp. 415-837-8245
CA Fresno, Electric Motor & Supp. 209-233-1155
CA Long Beach, Mag-Trol/Long Beach, Inc. 213-435-3451
CA Palm Springs, Lake Service 619-320-2727
CA Palo Alto, Elctrl. Matls., Inc. 415-494-0400
CA Redondo Beach, Elctrl. Power & Controls, Inc. 213-772-8890
CA South El Monte, Walton Electrical Controls, Inc. 213-442-4610
CO Denver, Control Comps, Inc. 303-371-2727
CO Golden, Utility Control & Equip. Co. ... 303-425-1990
DC Washington, Wesco 202-833-5250
FL Crystal River, Crems Indl. Sls. 813-795-2230
FL Ft. Lauderdale, Graybar Elec. 305-467-1453
FL Ft. Myers, Con. Elec. Supp. Co. 813-332-1515
FL Jacksonville, Graybar Elec. 904-356-7611
FL Lakeland, A-A Elc. 813-665-6941
FL Largo, Graybar Elec. 813-535-6460
FL New Port Richey, Pasco Elec. Sup. ... 813-842-8405
FL Orlando, Consolidated Elec. 305-849-6532
FL Tallahassee, Graybar Elec. 904-222-5332
FL Tampa, Electric Supp. of Tampa 813-872-1894
FL W. Palm Beach, Nurmi Elctrn. Supp., Inc. 305-686-8553
GA Albany, Specialty Distrbg. Co., Inc. 912-435-1711
GA Athens, Specialty Distrbg. Co., Inc. 404-548-1334
GA Atlanta, Dapco, Inc. 404-458-6341
GA Atlanta, Specialty Distrbg. Co., Inc. 404-873-2521
GA Augusta, Speciality Distrbg. Co., Inc. .. 404-722-1526
GA Brunswick, Specialty Distrbg. Co., Inc. 912-265-1927
GA College Park, Specialty Distrbg. Co., Inc. 404-763-3828
GA Columbus, Specialty Distrbg. Co., Inc. 404-327-7414
GA Macon, Specialty Distrbg. Co., Inc. 912-743-5421
GA Marietta, Specialty Distrbg. Co., Inc. ... 404-422-4333
GA Norcross, A-A Electric 404-449-8670
GA Savannah, Graybar Elec. 912-232-1121
GA Savannah, Specialty Distrbg. Co., Inc. 912-234-1684
GA Valdosta, Specialty Distrbg. Co., Inc. .. 912-242-4910
ID Coeur d'Alene, R. C. Worst & Co., Inc. 208-664-2133
ID Idaho Falls, Electrical Supp. 208-523-2800
ID Pocatello, Electrical Supp. 208-233-1362
ID Rexburg, Electrical Supp. 208-356-7282
IL Bloomingdale, Seversen Engrg. 312-529-0501
IL Fairfield, Precision Elec. Co. 618-842-7000
IL Mt. Prospect, Legend Elctrl. Sls. 312-952-0090
IN Evansville, Hutch & Son, Inc. 812-425-7201
IN Indianapolis, Genesis Elec. 317-637-5571
IN Indianapolis, Jackson Controls Co., Inc. 317-887-3111
IN Vincennes, Valley Elec. 812-882-7860
KS Salina, American Elec. 913-823-2248
KY Louisville, CDE/E & H Elec. Supp. Co. 502-587-0991
KY Louisville, Peerless Elec. 502-637-7677
KY Louisville, Peterson Elec. Supp. Co., Inc. 502-491-5010
ME Auburn, Gilman Elec. Supp. 207-784-6906
MD Baltimore, Infinity Sys., Inc. 301-358-8500
MD Baltimore, Wesco 301-327-4300
MD Salisbury, Wesco 301-742-2193
MN Minneapolis, Texa Minn Prods. 612-861-2900
MO St. Louis, United Elec. Supp. 314-771-5555
NE Omaha, West Dodge Elec. 402-393-8071
NH Manchester, Graybar Elec. 603-624-4341
NJ Audubon, Universal Elctrns. Supp. Co. 609-547-3430
NJ E. Rutherford, A-A Elec. 201-777-5477
NJ Fairlawn, Relay Specialties 201-797-3313
NY Long Island, Graybar Elec. 212-392-2000
NY Maybrook, Air Power House 914-457-3113
NY Whitestone, Power Electro Supp. Co., Inc. 212-767-1447
NC Charlotte, Southern Elec. Svc. Co. 704-372-4832
NC Huntersville, Scott Equip. 704-875-1611
OH Cincinnati, Wesco 513-542-4300
OH Cleveland, Milner Elec. 216-361-0300
OK Oklahoma City, Evans Elec. Motor Centers 405-631-1344
OK Tulsa, Cooper Supp. Co. 918-628-1500
OK Tulsa, Evans Elec. Motor Centers 918-587-1566
OR Bend, North Coast Elec. Co., Inc. 503-382-6211
OR Coos Bay, North Coast Elec. Co., Inc. 503-267-2145
OR Eugene, North Coast Elec. Co., Inc. ... 503-343-7701
OR Klamath Falls, North Coast Elec. Co., Inc. 503-884-4171
OR Medford, North Coast Elec. Co., Inc. ... 503-772-7131
OR Portland, North Coast Elec. Co., Inc. ... 503-228-5111
OR Portland, Reed Elec. Sls. & Supp., Inc. 503-223-8191
OR Tualatin, North Coast Elec. Co., Inc. ... 503-620-3910
PA Bala-Cyn-Wyd, Wesco 215-581-9314
PA Erie, Wesco 814-454-8191
PA Johnstown, Wesco 814-536-8761
PA Monroeville, Wesco 412-325-1300
PA Philadelphia, Mechanical Specialties, Inc. 215-331-5555
PA Pittsburgh, Wesco 412-255-4290
PA York, Wesco 717-843-0891
SC Columbia, J. W. Vaughn Co. 803-779-2690
SC Greenville, Shealy Elctrl. Whlsrs. 803-242-6880
TN Chattanooga, Specialty Distrbg. Co., Inc. 615-267-9531
TX Ft. Worth, Swieco, Inc. 817-335-6521
TX Houston, Commercial Equip. 713-237-8682
TX Houston, Hedco 713-224-4771
TX Midland, Energy Sys., Inc. 915-694-9657
TX San Antonio, Summers Elec. 512-824-1451
TX Waco, Smith Pump Co. 817-776-0377
TX Wichita Falls, Evans Elec. Motor Ctrs. 817-723-7466
UT S. Salt Lake, Engineered Control Sys., Inc. 801-487-6226
VA Alexandria, Calvert-Jones Co., Inc. 703-370-5850
VA Chantilly, Engineered Svcs., Inc. 703-471-6310
VA Danville, Wesco 804-792-2274
VA Hampton, Wesco 804-826-6730
VA Lynchburg, Wesco 804-845-0948
VA Norfolk, Wesco 804-625-7451
VA Petersburg, Wesco 804-732-1222
VA Richmond, Wesco 804-353-7353
VA Roanoke, Wesco 703-344-3271
WA Longview, North Coast Elec. Co., Inc. 206-423-1550
WA Moses Lake, Inland Elctrl. Supp. Co. .. 509-765-1251
WA Renton, Debenham 206-251-5055
WA Richland, Wesco 509-783-1397
WA Spokane, North Coast Elec. Co., Inc. .. 509-922-1317
WA Spokane, Power Pump & Elec. Supp. 509-534-5616
WV Beckley, Wesco 304-252-8633
WV Bluefield, Wesco 304-325-6151
WV Bridgeport, Wesco 304-624-6311
WV Parkersburg, Wesco 304-485-6541
WI Cedarburg, A-A Elec. 414-377-7500
WI Green Bay, Climatic Control Co., Inc. .. 414-336-4060
WI Madison, Climatic Control Co., Inc. 608-273-1717
WI Milwaukee, Climatic Control Co., Inc. .. 414-259-9070
WI Monroe, Precision Drive & Control, Inc. 608-328-5600
WY Casper, Crum Elec. Supp. Co. 307-266-1278
WY Casper, Wesco 307-266-3740
WY Gillette, Wesco 307-687-0014
EXP Jamaica, Kingston, Calcon Exporters 809-926-3320
Intl St. Thomas, Power Sys., Inc. 809-776-0217
PR Bayamon, Jenson Protective Dvcs. ... 809-798-3264

DIVERSIFIED TECHNLG., P.O. Box 748, Ridgeland, MS 39157, Tel: 601-856-4121, Telex: 585326, TWX: 810-966-2626; Empl.: 65; *Sls. Mgr.:* Bill Long; *Dist. Mgr.:* Bill Long

DIXON INDS., 386 Metacom Ave., Bristol, RI 02809, Tel: 401-253-2000, Telex: 927706

DIXSON INSTRUMENTS

DIXSON, INC., INSTRUMENT DIV., Box 1449, Grand Junction, CO 81502, Tel: 303-242-8863, TWX: 910-929-6991; Empl.: 250; *Sls. Mgr.:* Ray Carlson ..... **D•1349**

Local Sales Offices & Reps

AL	Birmingham, Sesco-Birmingham	205-988-8304
AZ	Phoenix, Finn-Pat Co. Inc.	602-954-0301
CA	Arcadia, Van Gott & Assocs.	818-445-9728
CA	Newark, Jacobson & Assocs.	415-791-2336
CO	Lakewood, Loritz Controls	303-232-7803
CT	Hamden, Pond Tech. Sls.	203-281-0005
FL	North Palm Beach, Sesco-Miami	305-832-0770
GA	Atlanta, Sesco-Atlanta	404-458-6423
IL	Bartlett, JJS Mktg. Svcs.	312-830-1670
LA	Baton Rouge, Sesco-Baton Rouge	504-928-4951
ME	W. Buxton, Pond Tech. Sls.	207-637-2200
MA	Waltham, Pond Tech. Sls.	617-890-5535
MI	Swartz Creek, JJS Mktg. Svcs.	313-635-7305
MN	Chanhassen, Elctrn. Instr. Cnslts.	612-445-7056
MO	Manchester. Control Sys. Des.	314-227-4212
NY	Mt. Vernon, Sonkin Assocs.	914-668-9809
NY	North Syracuse, Naco Elctrns.	315-699-2651
NC	Cary, Sesco-Raleigh	918-467-7482
OK	Tulsa, Sesco-Tulsa	918-622-3868
OR	Portland, Instr. Rep. Assocs.	503-245-6103
PA	King of Prussia, FLW of PA, Inc.	215-337-4343
TN	Knoxville, Sesco-Knoxville	615-588-5455
TX	Austin, Sesco-Austin	512-892-2490
TX	Dallas, Sesco-Dallas	214-231-9364
TX	Houston, Sesco-Houston	713-999-3510
WA	Seattle, Instr. Rep. Assocs.	206-762-0707
EXP	Toronto, Ontario, Versatile Meas. Instr.	416-239-8161

DMA SYS., 601 Pine St., Goleta, CA 93117, Tel: 805-683-3811; *Sls. Mgr.:* Don M. Minami

DOCUMATION, Box 1240, Melbourne, FL 32901, Tel: 305-725-5500, TWX: 510-959-6286; Empl.: 2800; *Sls. Mgr.:* K. Nelson; *Dist. Mgr.:* D. Carson

DODGE-MASTER-REEVES, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199, Tel: 800-245-4501, in OH 800-245-4497

D. O. INDUSTRIES, 317 E. Chestnut St., E. Rochester, NY 14445, Tel: 716-385-4920, Telex: 200802; FSC No.: 716-381-7032; *Sls. Mgr.:* Jeremy Goldstein

DOLAN-JENNER INDS., Box 1020, Woburn, MA 01801, Tel: 617-935-7444, Telex: 94-8161; Empl.: 120; *Sls. Mgr.:* S. Futran; *Dist. Mgr.:* S. Futran

Local Sales Offices & Reps

CA	Hollywood, Duncan Engrg.	213-462-5880
CA	Mountain View, C/G Assocs.	415-968-6062
CO	Denver, Gribble Sls.	303-279-4545
IL	Buffalo Grove, Jim Laganowski Assoc.	312-520-0130
MA	Hingham, R. J. Wilson	617-749-7575
MI	Walled Lake, Static Controls Corp.	313-363-4500
MN	Minneapolis, Gribble Sls.	612-788-7028
MO	Independence, Gribble Sls.	816-796-4333
NJ	Mt. Laurel, Speck Indl. Controls	609-778-8924
NJ	Rivervale, Budd-Tronics	201-666-5030
NY	Frankfort, Kapital Instr. Sls.	315-894-4245
NC	Greensboro, Ron Ingle	919-273-4042
OH	Novelty, Rogers Sls.	216-338-8500
TN	Knoxville, Stephenson Controls & Sys.	615-588-7473
TX	Lewisville, Gribble Sls.	214-221-5109
WI	Cedarburg, TFL Assocs.	414-377-7030

DOLCH LOGIC INSTRS., 2029 O'Toole Avenue, San Jose, CA 95131, Tel: 408-945-1881, TWX: 910-338-2023; *Sls. Mgr.:* Terry Larson

DOLPH, JOHN C., CO., New Rd., Monmouth Junction, NJ 08852, Tel: 201-329-2333; *Sls. Mgr.:* J. E. Rooze

DONGAN ELECTRIC MFG. CO., 2987 Franklin St., Detroit, MI 48207, Tel: 313-964-3500

DONTECH INC., 601-606 Airport Indl. Blvd., Doylestown, PA 18901, Tel: 215-348-5010, Telex: 685 1155 DONTK; *Sls. Mgr.:* Bernard Sherer

DORAN MFG. CO., 2851 Massachusetts Ave., Cincinnati, OH 45225, Tel: 513-681-5424; Empl.: 40; *Sls. Mgr.:* Russ DeMar

DORMAN BOGDONOFF CORP., Corp. Center, Willow Pond, Andover, MA 01810, Tel: 617-470-0001, Telex: 710-347-0333; *Sls. Mgr.:* Charles P. Centore

DORMEYER INDS., 3418 N. Milwaukee, Chicago, IL 60641, Tel: 312-283-4000, TWX: 910-221-3831; Empl.: 400; *Sls. Mgr.:* Richard Henry

DOTRONIX, 160 First St. SE, New Brighton, MN 55112, Tel: 612-633-1742, TWX: 910-563-3541; Empl.: 130; *Sls. Mgr.:* L. R. Lemke

Local Sales Offices & Reps

GA	Atlanta, E. G. Holmes & Assocs.	404-451-6161
ME	Newton, Gerber Sls. Corp.	617-969-2620
MN	New Brighton, Dotronix	612-633-1742
TX	Dallas, MGR	214-238-5246

DOUGLAS ELCTRNS., 718 Marina Blvd., San Leandro, CA 94577, Tel: 415-483-8770

DOUGLAS RANDALL, 6 Pawcatuck Ave., Pawcatuck, CT 06379, Tel: 203-599-2075, Telex: 6814060; Empl.: 125; *Sls. Mgr.:* N. Paulson ..... **B•1323-1331**

Local Sales Offices & Reps

AZ	Tempe, Trembly Assoc.	602-967-2058
CA	Anaheim, Galaxie Sls. Int'l.	714-937-5622
CA	Oakland, Powermatic Assoc.	415-635-6825
CA	San Diego, Qualtronics	619-695-0118
CO	Wheat Ridge, Trembly Assoc.	303-421-8900
CT	Yalesville, JMG-Glynn Connecticut	203-265-9452/2498
FL	Maitland, Ellis & Assoc.	305-645-1101
GA	Lilburn, W. A. Stancil	404-962-5643
IL	Chicago, Ropek-Cahill-Vogt	312-631-0070
MA	Norwood, JMG, Inc.	617-762-5333
MI	Southfield, Fred H. Gehrke & Assoc.	313-559-5363
MN	Osseo, Gaffney Sls. Co.	612-425-5484
MO	Kansas City, Delltron Co. Inc.	816-436-6445
MO	St. Louis, Delltron Co.	314-869-4779
NV	Las Vegas, Trembly Assoc.	702-739-9770
NJ	Morristown, Andrews & Andrews	201-569-8800
NM	Albuquerque, Trembly Assoc.	505-266-8616
NY	Fayetteville, C. W. Floring & Assocs.	315-637-4552
NY	Glen Head, Andrews & Andrews	516-692-8686
NY	Rochester, J. G. Welch Assoc.	716-244-1100
NY	Syracuse, C. W. Floring & Assoc.	315-478-2149
NC	Raleigh, Leigh Sls.	919-872-1484
OH	Cleveland, Geotronix Mktg. Assoc.	216-526-2535
OH	Trotwood, Geotronix, Inc.	513-252-6700
OR	Beaverton, Caruso & Northcutt	503-646-4973
PA	Glenside, Elcom	215-885-1715
TX	Dallas, Paramount Controls	214-341-4561
WA	Bellevue, Caruso & Northcutt	206-454-9699
Can	Mont., Que., Solid State Engrg. Co.	514-481-3313

Local Distributors

CA	Chatsworth, Mil-Comm Dist.	213-998-3111
CA	S. San Francisco, Steven Engrg.	415-588-9200
MA	Middleboro, Glynn Elect.	617-947-4262
OH	Cleveland, Alpha Corp.	216-526-3716
TX	Houston, Alpha Distr. Corp.	713-464-4662
EXP	Jerusalem, Efraim Ben Yakir	
Intl	London, England, Kynmore Eng.	01-839-2371

DOW CHEMICAL CO., 2020 Dow Center, Midland, MI 48640, Tel: 517-636-1000, Telex: 227455, TWX: 810-266-9490; Empl.: 53,300

DOW CORNING CORP., Box 0994, Midland, MI 48686-0994, Tel: 517-496-4000, Telex: 227450, TWX: 810-266-9006; Empl.: 5800

DowKey®
Division of Kilovac Corporation

DOW-KEY MICROWAVE CORPORATION, 1110 Mark Ave., Carpenteria, CA 93013-2918, Tel: 805-684-4560, TWX: 910-336-1141; FSC No.: 00471; Empl.: 130; *Dist. Mgr.:* Jack Dysart ..... **A•1710**

Local Sales Offices & Reps

AZ	Tempe, Gassner & Clark	602-968-9037
CA	Mountain View, Peninsula Tech. Sls.	415-965-3636
CA	Torrance, Detomasi & Grupp, Inc.	213-327-1775
CO	Englewood, Sierra Tech. Grp., Inc.	303-790-1700
FL	Melbourne, Saber Assocs., Inc.	305-724-0920
FL	Melbourne, Saber Assocs., Inc.	305-742-0920
IL	Schaumburg, Gassner & Clark	312-882-8608
IA	Cedar Rapids, H. R. Brown Sls. Co.	319-366-0635
MD	Beltsville, Applied Engrg. Conslts.	301-792-2211
MA	Lowell, Matrix Sls., Inc.	617-458-2096
MN	Minneapolis, De Beck-Hays Assocs., Inc.	612-835-4649
MN	St. Paul, De Beck	612-635-4649
MO	St. Louis, Abrams & Assocs.	314-569-0447
NM	Albuquerque, Data Handling	505-884-0284
NY	Casenovia, S. T. Woolard Co.	315-655-8145
NY	Melville, Metro-Mics	516-271-6677
NY	Rochester, Lamb Comps., Inc.	716-323-1250
OH	Cincinnati, Delta Sls.	513-271-5444
OR	Tigard, Components West, Inc.	503-684-6171
PA	Paoli, Tyler Griffin Co.	215-647-1550
TX	Houston, Lear Assocs., Inc.	713-488-7893
TX	Richardson, Lear Assocs., Inc.	214-231-5388
WA	Redmond, Components West, Inc.	206-885-5880
Can	Mississauga, Ont., Vitel Elctrns.	416-676-9720

Local Distributors

TX	Ft. Worth, Allied Elctrns.	817-336-5041

DRACON DIV., See Harris Corp., Dracon Div.

DRAKE, R. L., CO., 540 Richard St., Miamisburg, OH 45342, Tel: 513-866-2421, Telex: 28-8017; *Sls. Mgr.:* Richard Renken; *Dist. Mgr.:* Richard Renken

DRANETZ TECHNOLOGIES, INC, Computer Products Division, 1000 New Durham Rd., P.O. Box 4019, Edison, NJ 08818-4019, Tel: 201-287-3680, Telex: 499-7808, TWX: 710-997-9553; FSC No.: 23207; Empl.: 230; *Sls. Mgr.:* A. Orlacchio ..... **D•1167**

Local Sales Offices & Reps

AL	Huntsville, Kemp Instrs., Inc.	205-837-4304
AZ	Scottsdale, Barnhill Assocs., Inc.	602-947-7841
CA	Redondo Beach, Ward/Davis Assocs., Inc.	213-643-6977
CA	Santa Clara, Ward/Davis Assocs., Inc.	408-245-3700
CO	Englewood, Barnhill Assocs., Inc.	303-779-3600
CT	Mount Carmel, Scientific Dvcs. - Conn.	203-248-9361
FL	Melbourne, Datarep, Inc.	305-259-8924
FL	Orlando, Datarep, Inc.	305-843-5224

DORMEYER
CONVERTER CHARGERS
SOLENOIDS
TRANSFORMERS

IN STOCK • IN STOCK

Franchised
Distributor

LOGICOMP
ELECTRONICS, INC.

1009 W. BOSTON POST ROAD
MAMARONECK, NEW YORK 10543
PHONE: (914) 698-9332

TOLL FREE
(Outside N.Y.)
800/431-2625

GA Atlanta, Kemp Instrs., Inc. 404-452-8050
IL Elk Grove Village, Loren Green Assocs. Central, Inc. 312-593-0282
IN Indianapolis, Loren Green Assocs. Central, Inc. 317-293-9827
KS Shawnee, Atech, Inc. 913-268-9644
LA Lafayette, Kemp Instrs., Inc. 318-269-9452
MI Brighton, Stress Anls. Svcs. 313-632-6110
MI Farmington, Carter, McCormic & Peirce, Inc. 313-477-7700
MN Edina, Carvel Engrg. & Sls. Co. 612-835-7929
MN Minneapolis, Loren Green Assocs., Inc. 612-571-6666
MO St. Louis, Atech, Inc. 314-576-2884
NE Lincoln, Harry Ferris Co. 402-464-6148
NJ Lodi, SDM Reps., Inc. 201-368-0123
NM Albuquerque, Barnhill Assocs., Inc. 505-299-7658
NY Rochester, SDM Reps., Inc. 716-247-8770
NC Charlotte, Baesel & Assocs., Inc. 704-375-1044
OH Cleveland, Carter, McCormic & Peirce, Inc. 216-779-5100
OH Englewood, Carter, McCormic & Peirce, Inc. 513-836-0951
OR Portland, Topp Engrg. Sls. Corp. 503-244-7265
PA Monroeville, Carter, McCormic & Peirce, Inc. 412-372-4415
PA Plymouth Meeting, Elctrn. Mktg. Assocs., Inc. 215-828-7400
TX Austin, Barnhill Assocs., Inc. 512-451-0217
TX Houston, Barnhill Assocs., Inc. 713-688-9971
TX Richardson, Barnhill Assocs., Inc. 214-231-2573
UT Murray, Barnhill Assocs., Inc. 801-262-3000
WA Bellevue, Topp Engrg. Sls. Corp. 206-747-5400
Can Toronto, Ont., Atelco, Inc. 416-497-2208

DRANETZ TECHNOLOGIES, INC., General Instrument Division, 1000 New Durham Rd., P.O. Box 4019, Edison, NJ 08818-4019, Tel: 201-287-3680, Telex: 4997808, TWX: 710-997-9553; FSC No.: 23207; Empl.: 230; *Sls. Mgr.:* A. Orlacchio

Local Sales Offices & Reps

AL Huntsville, Kemp Instrs., Inc. 205-837-4304
CA Costa Mesa, Ward/Davis Assocs., Inc. 714-556-0955
CA Redondo Beach, Ward/Davis Assocs., Inc. 213-643-6977
CA Santa Clara, Ward/Davis Assocs., Inc. 208-245-3700
GA Atlanta, Kemp Instrs., Inc. 404-452-8050
IL Elk Grove Village, Loren Green Assocs., Central, Inc. 312-593-0282
IN Indianapolis, Loren Green Assocs., Central, Inc. 317-293-9827
KS Shawnee, Atech, Inc. 913-268-9644
LA Lafayette, Kemp Instrs., Inc. 318-269-9452
MI Southfield, Comtel Instrs. Co. 313-358-2505
MN Minneapolis, Loren Green Assocs., Inc. 612-571-6666
MO St. Louis, Atech, Inc. 314-576-2884
NY Rochester, Harmony Labs 716-458-3376
NC Charlotte, Baesel & Assocs., Inc. 704-375-1044
OH Cleveland, Comtel Instrs. Co. 216-442-8080
OH Dayton, Comtel Instrs. Co. 513-298-7573
OH Hilliard, Comtel Instrs. Co. 614-876-8305
OR Portland, Topp Engrg. Sls. Corp. 503-244-7265
PA Pittsburgh, Comtel Instrs. Co. 412-922-5720
PA Plymouth Meeting, Electronic Mktg. Assocs., Inc. 215-828-7400
WA Bellevue, Topp Engrg. Sls. Corp. 206-747-5400-1
Can Toronto, Ont., Atelco, Inc. 416-497-2208

DRANETZ TECHNOLOGIES, INC., Industrial Products Division, 1000 New Durham Rd., P.O. Box 4019, Edison, NJ 08818-4019, Tel: 201-287-3680, Telex: 499-7808, TWX: 710-997-9553; FSC No.: 23207; Empl.: 230; *Sls. Mgr.:* A. Orlacchio

Local Sales Offices & Reps

AL Huntsville, Kemp Instrs., Inc. 205-837-4304
CA Orange, Sterling West 714-997-1862
CA Pasadena, Jim Robins & Assocs. 818-795-9118
CA San Jose, D.P. Assocs., Inc. 408-296-1492
CO Wheatridge, MC2 303-431-2262
FL Melbourne, Datarep, Inc. 305-259-8924
FL Orlando, Datarep, Inc. 305-843-5224
GA Atlanta, Kemp Instrs., Inc. 404-462-8050
IL Elk Grove Village, MEMECO Sls. & Svc. Corp. 312-228-9555
LA Lafayette, Kemp Instrs., Inc. 318-269-9452
MI Brighton, Stress Analysis Svcs. 313-632-6110
MN Bloomington, Arjay Sls. 612-854-4972
MO Raytown, Power Spec., Inc. 816-353-6550
MO St. Charles, Gramlich Elec. Power 314-928-1075
NE Lincoln, Harry Ferris Co. 402-464-6148
NJ Bayonne, Long, Poveromo & Assocs., Inc. 201-858-3745
NM Albuquerque, MC2 505-293-9090
NY Syracuse, O. R. Lawrence Co. 315-455-5587
NC Charlotte, Baesel & Assocs., Inc. 704-375-1044
OH Medina, Stress Analysis Svcs. 216-725-7733
OH Middletown, Stress Analysis Svcs. 513-422-7900
OK Stillwater, Acudata, Inc. 405-743-1886
OR Portland, Topp Engrg. Sls. Corp. 503-244-7265
PA Carnegie, Stress Analysis Svcs. 412-344-5555
PA Plymouth Meeting, Electronic Mktg. Assocs., Inc. 215-828-7400
TX Austin, Acudata, Inc. 512-478-1018
TX Houston, Acudata, Inc. 713-580-2451
TX Houston, Payne Assocs./EMS Engrg. 713-537-0056
TX Plano, Acudata, Inc. 214-424-3567
TX Rockdale, K & K Elctrns. 512-446-3773
UT Salt Lake City, MC2 801-364-3174
WA Bellevue, Topp Engrg. Sls. Corp. 206-747-5400-1
Can Toronto, Ont., Atelco, Inc. 416-497-2208

DRAWN METAL PRODUCTS, 6143 W. Howard St., Niles, IL 60648, Tel: 312-647-8941; Empl.: 60; *Sls. Mgr.:* Tom Amundson

Dreefs

DREEFS SWITCH, INC., 3782 Hawthorn Ct., Waukegan, IL 60087, Tel: 312-662-7667, 800-323-9605, Telex: 703784; Empl.: 63; *Sls. Mgr.:* Ed Magiera; *Dist. Mgr.:* Ed Magiera ..... **B•1553-1555**

Local Sales Offices & Reps

AZ Tempe, Trembly Assocs., Inc. 602-967-2058
CA Anaheim, Spectrum Assocs., Inc. 714-630-6977
CA Sunnyvale, Schwerin Merrill,Inc. 408-735-7900, 312-662-7667
CO Wheat Ridge, Trembly Assocs., Inc. 303-421-8900
CT Madison, Reptron Sls. 203-245-2242
IL Roselle, MSL & Assocs. 312-893-9555
IL Waukegan, Dreefs Switch, Inc. 800-323-9605
MA Newton Highlands, WM. Valle Assocs., Inc. 617-965-0002
MO Raytown, Centech, Inc. 816-358-8100
NJ Ocean, P. Saftler Assocs.,Inc./Gordon 201-922-3014
NM Albuquerque, Trembly Assocs., Inc. 505-266-8616
NY Fulton, P. Saftler Assocs. 315-592-7184
NY Lynbrook, P. Saftler Assocs. 516-593-7880
OH Cleveland, Goory Sls. Co. 216-777-2011
OH Toledo, Jim Finnegan Co. 419-865-5306
OR Portland, Controltek Sls., Ltd. 503-641-0877
OR Portland, Controltek, Sls. 503-641-0877
PA Malvern, Stitzer Assocs. 215-644-5500
TX Dallas, Blackburn Assocs., Inc. 214-692-8885
TX Houston, Blackburn Assocs., Inc. 713-463-1354
UT Salt Lake City, Trembly Assocs., Inc. 801-486-5292
WA Seattle, Controltek Sls., Ltd. 206-467-0622
WI Mequon, Badgerep, Inc. 414-241-9200
Can Concord, Astec Comps. 416-669-4022

Local Distributors

CA San Jose, Cypress Elctrns. 408-945-8400, 800-538-5112
CA Torrance, Cypress Elctrns. 213-530-1900
CO Wheat Ridge, Cypress Elctrns., Inc. 303-431-2622
IL Wheeling, Hawk Elctrns. 213-459-4030, 800-843-4295
TX Dallas, Cypress Elctrns., Inc. 214-869-1435
TX McKinney, Sunbelt Elctrns. 214-542-1432
Can Mississauga, Ont., Prelco Elctrns., Ltd. 416-745-9370,800-387-3874

DRESSEN-BARNES ELCTRNS., 1600 E. Valencia Dr., Fullerton, CA 92631, Tel: 714-871-3020, TWX: 910-592-1256; FSC No.: 89321; Empl.: 220; *Sls. Mgr.:* B. Guy

DRESSER INDS., 1505 Elm St., Dallas, TX 75201, Tel: 214-746-6000, Telex: 73-2489, TWX: 910-861-4136; Empl.: 55,000

DUKANE CORP., Communications Sys. Div., 2900 Dukane Dr., St. Charles, IL 60174, Tel: 312-584-2300, Telex: 720426; Empl.: 700; *Sls. Mgr.:* Jack Hollis; *Dist. Mgr.:* Jack Hollis

DUMONT ELCTRNS., See Thomson-CSF Comps. Corp., DuMont Div.

DUMONT INSTRUMENTATION, INC., 75 Mall Dr., Commack, NY 11725, Tel: 516-864-8500, TWX: 510-226-3739; Empl.: 15,000; *Sls. Mgr.:* H. Poschmann

DUMONT OSCILLOSCOPE LABS., 40 Fairfield Pl., W. Caldwell, NJ 07006, Tel: 201-575-8666, Telex: 219236 DOLI-UR; FSC No.: 30669; Empl.: 30; *Sls. Mgr.:* John Carter, Jr.

SYSTRON DONNER DUNCAN ELECTRONICS DIVISION
A THORN EMI company

DUNCAN ELECTRONICS, INC., 2865 Fairview Rd., Costa Mesa, CA 92626, Tel: 714-545-8261, TWX: 910-595-1128; FSC No.: 5905;Multiple; Empl.: 160; *Sls. Mgr.:* J. Colligan; *Dist. Mgr.:* J. Colligan ..... **A•2012-2013**

Local Sales Offices & Reps

AL Huntsville, L & D., Inc. 205-837-1469
AZ Tempe, Southwest E/M Engrg. 602-941-2828
AR El Dorado, Kemp Engrg. Co., Inc. 501-862-5869
CA Irvine, Comar Co. 714-540-1219
CA Mountain View, Caltron Comps. 415-964-3244
CA San Diego, Comar Co. 619-565-6097
CO Denver, Elcom 303-337-2300
CT Guilford, A & M Elctrn. 203-453-1612
FL Ft. Lauderdale, ElectroComp Assocs. 305-491-4141
FL Melbourne, ElectroComp Assocs. 305-242-0621
FL St. Petersburg, ElectroComp Assocs. 813-822-9677
GA Atlanta, L. & D., Inc. 404-455-3483
IL Rolling Meadows, KMA Sales Co. 312-398-5300
KS Shawnee Mission, Florence & Meyer 913-722-5210
LA Lafayette, Kemp Engrg. Co. 318-269-9452
MA Needham, A & M Elctrn. 617-444-8170
MI Farmington Hills, Elcon Michigan Sls. 313-855-3240
MN St. Paul, J. J. Exon Co. 612-636-5533
NY Clinton, Advanced Comps. 315-853-6438
NY Copiague, Sencor 516-842-7676
NY Endicott, Advanced Comps. 607-785-3191
NY N. Syracuse, Advanced Comps. 315-699-2671
NY Scottsville, Advanced Comps. 716-889-1429
NC Greensboro, L. & D., Inc. 919-292-3201
NC Raleigh, L. & D., Inc. 919-876-5301
OH Dayton, Rockford Controls Ohio 513-898-5452
OH Euclid, Rockford Controls Ohio 216-731-5250
OH Reynoldsberg, Rockford Controls Ohio 614-868-5577
OK Tulsa, Kemp Engrg. Co. 918-663-4501
OR Portland, Dussault & Assocs. 503-641-8540
PA Philadelphia, Sencor 215-698-9660
TN Seymour, Tennessee 615-573-6511
TX Addison, Kemp Engrg. Co. 214-931-7100
TX Houston, Kemp Engrg. Co. 713-466-1465
UT Salt Lake City, Elcom 801-532-7940
VA Richmond, L & D, Inc. 804-257-7717
WA Seattle, Dussault & Assocs. 206-527-5454
WI Milwaukee, KMA Sales Co. 414-259-1771

Local Distributors

AZ Phoenix, Aero-Space SW, Inc. 602-861-1785
CA Hollywood, Yale Radio Elec. Co. 213-465-3186
CA Sun Valley, Richey Elctrns. 213-875-2862
CO Englewood, Industrial Elctrns. 303-694-9444
IL Elk Grove, RM Co. 312-364-6622
IL Elk Grove Village, GBL Elctrns. 312-593-3220
LA Baton Rouge, Industrial Elctrn. Supp. 504-926-0513
LA Shreveport, Industrial Elctrn. Supp. 318-222-9459
MA Waltham, Sterling Elctrns. 617-894-6200
MN Minneapolis, The Bergquist Co. 612-835-2322
NY Hauppauge, Broadline Elctrns. 516-231-4100
NY Mt. Vernon, Kin-Tronics 914-668-9885
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
OH Akron, Akron Elctrns. Supp. 216-762-8818
OK Tulsa, Southwest Elctrns. 918-583-7776
OR Portland, Radar Elec. 503-232-3404
PA Erie, REM Elctrns. Supp. 814-453-5626
PA McKeesport, Barno Radio 412-664-9394
TX Austin, Southwest Elctrns. 512-837-8971
TX Richardson, Southwest Elctrns. 214-234-3050
TX Stafford, Southwest Elctrns. 713-491-4900
UT Salt Lake City, Standard Supp. Co. 801-486-3371
WA Seattle, Radar Elec. 206-282-2511
WI Hartland, GW Elctrns. 414-276-1212

DUNEGAN CORPORATION, P.O. Box 3238, Mission Viejo, CA 92690, Tel: 714-831-9131, Telex: 68-3430; FSC No.: 66; Empl.: 70; *Sls. Mgr.:* Mike Kelly

DUOTONE, 6875 S.W. 81st St., S. Miami, FL 33143, Tel: 305-665-1121; Empl.: 20; *Sls. Mgr.:* S. Nester; *Dist. Mgr.:* S. G. Nester

DU PONT CONNECTOR SYSTEMS, 30 Hunter La., Camp Hill, PA 17011, Tel: 800-237-2374, TWX: 510-650-3538; *Sls. Mgr.:* J. McAluney; *Dist. Mgr.:* E. Abbott

DUPONT DE NEMOURS, E. I., & CO., 1007 Market St., Wilmington, DE 19898, Tel: 302-773-3218; Empl.: 130,000

DUPREE, INC., 9835 Dupree St., So. El Monte, CA 91733, Tel: 818-442-4700; Empl.: 60; *Sls. Mgr.:* Beverly Bowdry

DURACELL INTL., S. Broadway, Tarrytown, NY 10591, Tel: 914-591-7000, Telex: 131548, TWX: 710-564-0810; Empl.: 4000

DURAKOOL, 1010 N. Main St., Elkhart, IN 46514, Tel: 219-264-1116, Telex: 25-8482; Empl.: 200; *Sls. Mgr.:* Stan Kalin; *Dist. Mgr.:* Larry Hedeen/Dave Deuel

DURALITH, 525 Orange St., Millville, NJ 08332, Tel: 609-825-6900, TWX: 510-687-7520; Empl.: 500; *Sls. Mgr.:* James Potter

DURGIN & BROWNE, 80 Allen Rd., So. Burlington, VT 05401, Tel: 802-863-6873; Empl.: 35; *Sls. Mgr.:* Chris Riggs

DVE/CALTRONIC CO., LTD., A Sub. of Dee Van Entrp. Co., Ltd., 407 S. Palm Ave., Alhambra, CA 91803, Tel: 818-289-0310 ..... **D•1613**

DY-4 SYSTEMS INC., 888 Lady Ellen Pl., Ottawa, ON, Canada K1Z 5M1, Tel: 613-728-3711, Telex: 053-4969; Empl.: 90; *Sls. Mgr.:* Terry Black

DYLON DATA CORP., 9561 Ridgehaven Ct., San Diego, CA 92123, Tel: 619-292-5584, TWX: 910-335-1524; Empl.: 20; *Sls. Mgr.:* R. A. Comstock; *Dist. Mgr.:* Steve Komarek

DYMA ENGRG., Box 1535, Los Lunas, NM 87031, Tel: 505-865-6700; Empl.: 14; *Sls. Mgr.:* Wiley R. Cunningham; *Dist. Mgr.:* Patrick Cating

DYMEC, 8 Lowell Ave., Winchester, MA 01890, Tel: 617-729-7870, TWX: 710-348-6596; Empl.: 80; *Sls. Mgr.:* Bill Schromm

DYMEK CORP., 1851 Zanker Road, San Jose, CA 95070, Tel: 408-947-8700, Telex: 910-338-2174; Empl.: 65; *Sls. Mgr.:* Dan Cribbs; *Dist. Mgr.:* Dan Cribbs

DYNACIRCUITS INC., 11230 W. Addison, Franklin Park, IL 60131, Tel: 312-451-1700; *Sls. Mgr.:* Fred Stein

DYNAGE/CONTROLS, INC., 2 Willowbrook Rd., Cromwell, CT 06416, Tel: 203-635-6257, Telex: 753243 (OAKLEAFINC); Empl.: 9; *Sls. Mgr.:* Helen S. Mendello

Local Sales Offices & Reps

AZ	Scottsdale, Williams Assocs.	602-947-4297
CA	Mountain View, Claypool Controls Corp.	415-968-7488
CO	Commerce City, Williams Assocs.	303-289-5647
CT	Hamden, Applied Meas., Inc.	203-288-5288
FL	Deland, Dell-Tech Control Co.	904-734-4200
IL	Palatine, Delta Instrmn.	312-934-8328
IN	Indianapolis, R. R. Harden Assocs., Inc.	317-849-1708
LA	Metairie, Slaton & Assocs., Inc.	504-455-3855
MD	Gaithersburg, Powell-Pendergraph, Inc.	301-921-4200
MA	Acton, Applied Meas., Inc.	617-263-2766
MI	Lathrop Village, Electro-Assocs. of Mich., Inc.	313-533-8797
MN	Minneapolis, Busch-Elctrns., Inc.	612-835-2044
MO	Ellisville, Advanced Ind. Sys.	314-458-2034
NJ	Plainfield, Cosine, Inc.	201-654-3551
NM	Albuquerque, Williams Assocs.	505-255-1638
NY	Buffalo, Seelbach & Schmitt, Inc.	716-839-2300
OH	Cleveland, Fox & Dole, Inc.	216-476-2625
OH	Dayton, Mohawk Itronics	513-434-8873
OK	Tulsa, Electronic Pneumatic Instrmn.	918-834-8400
OR	Portland, Topp Engrg. Sls. Corp.	503-244-7265
PA	Ingomar, Greye Glass Assocs.	412-366-6664
PA	Pittsburgh, Greye Glass Assocs.	412-366-6664
PA	Thornton, Sentech Co.	215-459-4260
TN	Concord, Technical Automation, Inc.	615-966-5107
TX	Corpus Christi, Collinsystems/Pro-Quip	512-887-9711
TX	Houston, Collinsystems/Pro-Quip	713-464-9428
TX	Weatherford, Collinsystems/Pro-Quip	817-599-8252
UT	Salt Lake City, Applied Engrg. Prods.	801-532-5343
VA	Richmond, Powell-Pendergraph, Inc.	804-270-1400
WA	Bellevue, Topp Engrg. Sls. Corp.	206-747-5400
WI	Milwaukee, Star Engrg. Sls. Corp.	414-645-3680

DYNAGE/POWER & MAGNETICS, Division Of Oakleaf, Inc., 2 Willowbrook Road, Cromwell, CT 06416, Tel: 203-635-3510, Telex: 753243 (OAKLEAFINC); Empl.: 9; *Sls. Mgr.:* Helen S. Mendello

Local Sales Offices & Reps

CT	Cromwell, Oakleaf Engrg. Sls.	203-635-5213
NJ	East Rutherford, L & L Comp. Sls.	201-933-8542
SD	Hartford, Oakleaf Engrg. Sls.	605-528-6701

DYNALOY, INC., 7 Great Meadow La., Hanover, NJ 07936, Tel: 201-887-9270, Telex: 642-033; FSC No.: 27908; Empl.: 19

Local Sales Offices & Reps

CA	Westminster, Contronic Devices	714-897-2266
FL	Ft. Lauderdale, Etchomatic	305-563-5060
MA	Waltham, Etchomatic	617-893-2020
MN	Minneapolis, International Sls.	612-831-8423

DYNAMIC AIR ENGRG, INC., EMC Filter Div., 620 E. Dyer Rd., Santa Ana, CA 92705, Tel: 714-540-2081, TWX: 910-595-2588

DYNAMICS, Div. of Waugh Controls Corp., 9001 Fullbright Ave., Chatsworth, CA 91311, Tel: 818-998-8281, Telex: 69-6171; Empl.: 100; *Sls. Mgr.:* Tony Mastroianni

DYNAMICS RESEARCH CORP., Encoder Division, 60 Concord St., Wilmington, MA 01887, Tel: 617-658-6100; *Sls. Mgr.:* Dave Silva ..... **B•1793**

Local Sales Offices & Reps

AZ	Phoenix, Thor Engrg.	602-437-1463
CA	Laguna Beach, Comar Co.	714-240-0140
CA	San Diego, Comar Co.	619-565-6097
CA	San Jose, Motion Sys.	408-246-0641
CO	Aurora, HI Tech.	303-696-7403
CT	Ansonia, Sturdy Corp.	203-734-2186
FL	Tampa, Brawley Tech. Sls.	813-251-6816
MD	Columbia, Tyler Griffen	301-995-1215
MA	Wellesley Hills, Sturdy Corp.	617-235-2330
MI	Southfield, Fred H. Gehrke & Assocs.	313-559-5363
MN	Newport, Applied Motion Technlg.	612-459-0600
MO	St. Louis, Delltron Co.	314-869-4779
NJ	Sparta, E.S. Williams Co.	201-729-4049
NY	Pittsford, Controlled Motion Prods. Co.	714-381-1933
NC	Charlotte, Jake Rudisill Assocs.	704-377-6901
OH	Cincinnati, Kenneth C. Hoffman	513-931-1686
PA	Paoli, Tyler Griffen	215-647-1550
TX	Fort Worth, El-Tech Sls.	817-268-2896
TX	Houston, C.R. Colvin Assocs.	713-961-1262
WI	Colgate, Rep 1 & Assocs.	414-628-4016
Can	Lachine, Que., Electro Design	514-636-4838

DYNAMIC TIME SYSTEMS, INC., 150 West 1230 North, Ste. 2, Provo, UT 84604, Tel: 801-377-9154; *Sls. Mgr.:* Graham Hawkins; *Dist. Mgr.:* Graham Hawkins

DYNAPAR, 1675 Delany Rd., Gurnee, IL 60031, Tel: 312-662-2666, TWX: 910-235-1865; Empl.: 100

DYNAPLEX INC., Interplex, 120-12 28th Ave., Flushing, NY 11354, Tel: 212-961-6750, TWX: 710-582-3048; *Sls. Mgr.:* Lester Zimmerman; *Dist. Mgr.:* Lester Zimmerman

DYNATECH CORP., 1225 E. Wakeham Ave., P.O. Box 1019, Dept. E, Santa Ana, CA 92702, Tel: 714-558-8755, TWX: 910-595-1951; Empl.: 340; *Sls. Mgr.:* Rick Burbank

DYNATEC INTERNATIONAL, 3594 West 1820 South, Salt Lake City, UT 84104, Tel: 801-973-9500, 800-722-7425; *Sls. Mgr.:* Robert Checketts; *Dist. Mgr.:* Robert Checketts

DYNATRONIX, INC., 105 Power St., Amery, WI 54001, Tel: 715-268-8118, 800-826-7172, TWX: 297861 DYTX UR; Empl.: 25; *Sls. Mgr.:* R. W. Kappler; *Dist. Mgr.:* R. W. Kappler, Natl. Sls. Mgr.

DYNISCO, 10 Oceana Way, Norwood, MA 02062, Tel: 617-769-6600, Telex: 092-4347; Empl.: 153

DYSAN CORP., 5201 Patrick Henry Dr., P.O. Box 58053, Santa Clara, CA 95050, Tel: 408-988-3472, Telex: 171551 DYSAN SNTA

Local Sales Offices & Reps

CA	Culver City, Dysan Corp.	213-215-1754
CA	Fair Oaks, Dysan Corp.	916-966-8039
CA	Santa Clara, Dysan Corp.	408-727-9552
CA	Santa Clara, Dysan Corp.	408-988-3472
CO	Denver, Dysan Corp.	303-452-8487
GA	Atlanta, Dysan Corp.	404-952-0919
IL	Rolling Meadows, Dysan Corp.	312-577-2572
MA	Chelmsford, Dysan Corp.	617-256-1900
MI	Livonia, Dysan Corp.	313-525-8240
MN	Bloomington, Dysan Corp.	612-854-4500
MO	St. Louis, Dysan Corp.	314-434-4011
NJ	Marlton, Dysan Corp.	609-596-8210
NY	Forest Hills, Dysan Corp.	718-268-7656
OH	Rocky River, Dysan Corp.	216-333-3725
TX	Dallas, Dysan Corp.	214-256-7446
TX	Houston, Dysan Corp.	713-961-1461
VA	Springfield, Dysan Corp.	703-941-0566
WA	Bellevue, Dysan Corp.	206-455-4724

DYTRONICS CO., See Ryan Intl. Corp.

DZUS FASTENER, 425 Union Blvd., W. Islip, NY 11795, Tel: 516-669-6000, Telex: 96-1454; FSC No.: 72794; Empl.: 100; *Sls. Mgr.:* George R. Davis

EAGLE ELECTRIC MFG. CO., INC., 45-31 Court Sq., L.I.C., NY 11101, Tel: 212-937-8000, Telex: ITTEAGLE 426774; *Sls. Mgr.:* Joseph Mannarino; *Dist. Mgr.:* John Chambers

EAGLE MAGNETIC COMPANY, INC., P.O. Box 24283, Indianapolis, IN 46224, Tel: 317-297-1030, TWX: 810-341-3386; Empl.: 44; *Sls. Mgr.:* Robert Jackson ..... **C•1723**

EAGLE-PICHER INDS., INC., Elctrns. Div., Box 47, Joplin, MO 64801, Tel: 417-623-8000, TWX: 910-774-4508; Empl.: 700

EAGLE SIGNAL CONTROLS, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761, Tel: 512-837-8300; Empl.: 600

EALING OPTICS CO., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760, Tel: 617-655-7000, Telex: 948339; *Sls. Mgr.:* Peter Andreas

E & L INSTRUMENTS, INC., 61 First St., Derby, CT 06418, Tel: 203-735-8774, Telex: 963536; Empl.: 46

EAO SWITCH CORP., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, Tel: 203-877-4577, Telex: 96-4347; FSC No.: 61706; Empl.: 19; *Sls. Mgr.:* George T. Bracci ..... **B•1557**

Local Sales Offices & Reps

AL	Huntsville, Conley and Assocs.	205-882-0316
AZ	Scottsdale, Luscombe Engrg. Co. of AZ	602-949-9333
CA	Campbell, Luscombe Engrg. Co. of S.F.	408-370-2020
CA	Pasadena, Luscombe Engrg. Co. of L.A.	213-684-2000
CA	San Diego, Luscombe Engrg. Co. of L.A.	619-295-4300
CO	Boulder, Luscombe Engrg. Co. of CO	303-772-3342
CT	Farmington, Ray Perron & Co., Inc.	203-673-4825
FL	Boca Raton, Conley and Assocs.	305-395-6108
FL	Deerfield Beach, Conley & Assocs.	305-421-7180, 305-358-3735
FL	Oviedo, Conley and Assocs.	305-365-3283
GA	Atlanta, Conley and Assocs.	404-447-6992
FL	Tampa, Conley and Assocs.	813-885-7658
IL	Arlington Hgts., Brainard-Wilson Mktg., Inc.	312-437-2700
IN	Ft. Wayne, M/S Sls. & Assocs.	219-436-3023
IN	Indianapolis, M/S Sls. & Assocs.	317-257-8915
KS	Mission, Mertens Co.	918-432-9323
MD	Columbia, Delta III Assocs., Inc.	301-730-4700
MA	Needham, Ray Perron & Co., Inc.	800-225-4280, 617-449-6162
MI	Plymouth, Jay Mktg. Assocs., Inc.	313-459-1200
MN	Golden Valley, Highland Elctrn. Sls.	612-546-2123
MO	St. Louis, Mertens Co.	314-993-6600
NH	Dover, Ray Perron & Co., Inc.	603-742-2321, 800-225-4280
NJ	Englewood, Sprung/Nussbaum	201-569-5666
NY	Rochester, Apex Assocs., Inc.	716-254-6050
NC	Raleigh, Conley and Assocs.	919-876-9862
OH	Mentor, Jay Mktg. Assocs., Inc.	216-257-5244
OR	Lake Oswego, Luscombe Engrg. Northwest	503-636-6664
PA	Hatboro, Jacobsen Assocs.	215-674-2937
PA	Pittsburgh, R. W. Kneip	412-823-0169
TX	Dallas, Glidden Electro Equip. Co	214-341-0610
TX	Houston, Glidden Electro Equip. Co.	713-681-1415
WI	Milwaukee, Badgerep	414-258-6630

Local Distributors

AL	Huntsville, R.M. Alabama	205-852-1550
AZ	Phoenix, Minarik Elec.	602-233-3000

AZ Tempe, Fisher Brownell 602-967-1464
CA Alhambra, Fisher Brownell 714-739-2201
CA Burlingame, Electric Control Dvcs. 415-348-0791
CA Gardena, California Switch & Sig. 213-770-2330
CA Los Angeles, Minarik Elec. Co. 213-624-3161
CA San Diego, Fisher Brownell 619-560-8545
CA San Diego, Minarik Elec. Co. 619-560-6632
CA Santa Clara, Fisher Brownell 408-988-6041
CA Santa Clara, Minarik Elec. Co. 408-727-0575
CA Van Nuys, Patane Avionics, Inc. 818-988-4455
CO Denver, CSID, Inc. 303-292-9594
CT New Canaan, Impact Sls. Co. 203-972-1458
CT Shelton, Century Elec. Supp. 203-736-2684
FL Oviedo, Dixie Sls. 305-365-5211
GA Norcross, Marshall Elctrn. Grp. 404-923-5750
IL Elk Grove, Martec Assoc. 312-956-8090
IL Lombard, R.M. Illinois ... 312-364-6622,800-325-1433
IL Rosemont, Advent Elctrns., Inc. 312-297-6200
IN Indianapolis, R.M. Indiana 317-291-7110
KY Louisville, Peerless Elctrns. 502-637-7674
LA Baton Rouge, Menard Elctrns. 504-355-0323
LA Jefferson, Gulfside Co., Inc. 504-733-4481
ME Scarborough, Nelson & Wright 207-883-4388
MD Gaithersburg, Axis Elctrns. 301-840-9640, 800-492-3190
MA Canton, Impact Sls. Co. 617-821-1500
MI Grand Rapids, R. M. Elctrns. Co. 616-531-9300
MI St. Claire Shores, SPEMCO Switches 313-771-2700
MN Minneapolis, Electronic Ctr., Inc. 612-371-5200
NJ Cranford, Garden State Indl. Elctrns., Inc. 201-272-6400
NY Bohemia, Key Comps., Inc. 516-567-7500
NY Buffalo, Summit Distrs., Inc. 716-887-2800
NY New York, Martin-Audio/Video 212-541-5900
NY Rochester, Modutex Corp. 716-647-7900
NY Rochester, Summit Elctrns., Inc. 716-334-8110
NY Woodside, Switches Unlimited 718-478-5000
NC Charlotte, Elctrns. Mktg. Corp. 704-394-6195
NC Winston-Salem, Kirkman Elctrns., Inc. 919-722-9131,800-334-8688
OH Columbus, Electronics Mktg. Corp. 614-299-4161
OH Highland Hgts., Electronics Mktg. Corp. 216-442-3441
OK Tulsa, Radio, Inc. 918-587-9123
OR Portland, Minarik Elc. Co. 503-253-3402
PA Horsham, R. M. Philadelphia 215-674-1181
PA Lancaster, Advacom 717-299-5615
PA McKean, Advacom 814-476-7774
PA Norristown, Kimberly-James Co. 215-666-7286
PA Pittsburgh, Grant Indl. Controls, Inc. ... 412-787-9770
TX Dallas, R.M. Dallas 214-263-8361
TX Garland, Indl. Equip. Co. of Dallas 214-271-5494
TX Richardson, Fisher Brownell 214-235-3177
TX San Antonio, Minarik Elec. Co. 512-822-7097
WA Bellevue, Integrated Elctrns., Inc. 206-455-2727
WI Milwaukee, Marsh Elctrns. Corp. 414-475-6000

E-A-R DIV., Cabot Corp., 7911 Zionsville Rd., Indianapolis, IN 46268, Tel: 317-872-1111, TWX: 810-341-3412; *Sls. Mgr.:* Lawrence K. Landers ..... **C•1695**

EASCO/K-D TOOLS, 3575 Hempland Rd., Lancaster, PA 17604, Tel: 717-665-4557, Telex: 848429; *Sls. Mgr.:* Mark Lax

EASTERN AIR DEVICES MOTOR DIV., 1 Progress Dr., Dover, NH 03820, Tel: 603-742-3330, TWX: 510-297-4454; Empl.: 200; *Sls. Mgr.:* H. Dumas ..... **B•1146**

Local Sales Offices & Reps

AL Huntsville, Montgomery Mktg. 205-830-0498
CA Los Altos, Servo Data 415-964-1325
CA Tustin, Schoenbachler-Dobson Co. ... 714-544-1888
CO Boulder, R. G. Entprs. 303-447-9211
FL Orlando, Perrott Assoc. 305-275-1132
GA Norcross, Montgomery Mktg. 404-447-6124
IL Chicago, Berndt Assocs. 312-283-0713
IN Carmel, Berndt Assocs. 317-844-0114
IA Cedar Rapids, REPCO, South 319-373-0525
MA Framingham, Gerald Rosen Co. 617-879-5505
MN St. Paul, REPCO 612-488-0201
MO Independence, REPCO, South 816-254-3410
NJ Ridgefield, Rical Assocs. 201-945-5250
NY Rochester, Elcom Sls. 716-385-1400
NY Syracuse, ELCOM Sls. 315-685-8245
NC Cary, Montgomery Mktg. 919-467-6319
OH Cleveland, Jim Finnegan & Co. 216-238-5905
PA Paoli, ETC Sales 215-296-3527
TX Austin, Oeler & Menelaides Inc. 512-453-0275
TX Dallas, Oeler & Menelaides Inc. 214-361-8876
WA Seattle, Eltech 206-767-4330
WI Milwaukee, Berndt Assocs. 414-545-8400

EASTERN DELTA CORP., 29-09 S. Broadway, Fair Lawn, NJ 07410, Tel: 201-797-4200; FSC No.: 18105; Empl.: 35

EASTERN ELCTRNS. MFG. CORP., 180 Roberts St., East Hartford, CT 06108, Tel: 203-528-9821; Empl.: 100; *Sls. Mgr.:* M. Bengala

EASTERN MARKING MACHINES, 422 S Franklin St., Hempstead, NY 11550, Tel: 516-483-7070, Telex: 968095; Empl.: 8; *Sls. Mgr.:* P. Coburn; *Dist. Mgr.:* L. Sherman

EASTERN MICROWAVE, 4 Gill St., Woburn, MA 01801, Tel: 617-935-8600; FSC No.: 30616; Empl.: 45; *Sls. Mgr.:* Maximilian J. Fuchs

EASTERN SMELTING & REFINING CORP., 37-39 Bubier St., Lynn, MA 01901, Tel: 617-599-9000, Telex: 940108; *Sls. Mgr.:* Donald Decareau

EAST PENN. MFG. CO., INC., Main Office, Lyon Station, PA 19536, Tel: 215-682-6361; Empl.: 1200; *Sls. Mgr.:* John Rickolt/Stanley Glass

EASY HEAT-WIREKRAFT, 555 North Michigan St., Lakeville, IN 46536, Tel: 219-784-3011, Telex: 233159; *Sls. Mgr.:* Russell W. Riddle

EATON CORP., Aerospace Controls/Systems Div., 2074 Whitfield Ave., East, Sarasota, FL 33578, Tel: 813-758-7726

EATON CORP., Microwave Components Div., 680 W. Maude Ave., Sunnyvale, CA 94086, Tel: 408-733-3883, TWX: 910-339-9252; FSC No.: 54987; Empl.: 30

Local Sales Offices & Reps

AZ Tempe, Sierra Technl. Grp. 602-894-2335
CA Costa Mesa, EBA Microwave 714-857-6079
CA Sunnyvale, Loeswicks 408-745-6751
FL Winter Park, Microwave Mktg. 305-678-2141
IA Cedar Rapids, S & O Sls. 319-393-1845
KS Merriam, Midwest Tech. Sls. 913-236-8555
ME Ogunquit, Micronic Assocs. 617-933-2121
MD Silver Spring, Youth-Nelson Assocs. .. 301-598-5740
NY Fayetteville, R. D. Sherman & Co. 315-637-9861
PA Huntingdon Valley, Rabal Assoc., Inc. 215-947-4825
TX Dallas, Stevens Sls. Co. 214-350-2476
WA Seattle, Ecco Mktg. 206-364-0200

EATON CORP., A.I.L. Div., Comac Rd., Deer Park, NY 11729, Tel: 516-595-3094, TWX: 510-227-6073; FSC No.: 00752; Empl.: 2250; *Sls. Mgr.:* H. N. Kreisberg

EATON CORP., Microwave Products Division, 955 Benicia Avenue, Sunnyvale, CA 94086, Tel: 408-730-6300, TWX: 910-339-9556; FSC No.: 27338; Empl.: 400; *Sls. Mgr.:* J. R. Campbell

EATON CORP, Durant Products, 901 S. 12th St., Watertown, WI 53094, Tel: 414-261-4070, TWX: 910-260-3713; Empl.: 400; *Sls. Mgr.:* H. L. Sisson; *Dist. Mgr.:* Dennis G. Walz

EATON CORP., Elctrn. Instrmn. Div., 5340 Alla Rd., Los Angeles, CA 90066; Empl.: 400

EATON CORP., Printer Prods Oper., Technical Research Park, Riverton, WY 82501, Tel: 307-856-4821, Telex: 910 949 4864; Empl.: 185; *Sls. Mgr.:* Rich Phillips; *Dist. Mgr.:* Rich Phillips

EATON CORP., TEST SYS. DIV., Discrete Test, Precision Rd., Danbury, CT 06810, Tel: 203-797-1281, TWX: 710-456-5030; *Sls. Mgr.:* Dennis Riccio

EATON CORP., TEST SYS. DIV., Memory Test Sys., 21135 Erwin St., Woodland Hills, CA 91365, Tel: 213-887-5550, Telex: 69-8489; Empl.: 200+; *Sls. Mgr.:* Chuck Winick

EATON CORP, Yig-Tek Prods., 785 Palomar Ave., Sunnyvale, CA 94086, Tel: 408-737-7300, TWX: 910-339-9395; Empl.: 100

EATON CORP./CUTLER-HAMMER PRODS, Aerospace & Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, Tel: 414-449-7487, Telex: 26-716; FSC No.: 81640; *Sls. Mgr.:* J. R. McDonough; *Dist. Mgr.:* E. G. Caporellie

EBERHARD MFG. CO., DIV., Eastern Co., 21944 Drake Rd., Strongsville, OH 44136, Tel: 216-238-9720, Telex: 98-5301; FSC No.: 19220; *Sls. Mgr.:* Edward Hongosh

EBM INDS., INC., 525 New Britain Ave., Unionville, CT 06085, Tel: 203-674-1515, TWX: 710-423-8723; FSC No.: 62292; *Sls. Mgr.:* Robert Sobolewski ..... **C•1626-1628**

Local Sales Offices & Reps

AL Huntsville, Raycom 205-859-2017
AZ Scottsdale, Harris And Croy 602-951-9121
AZ Tucson, Harris and Croy 602-293-5393
CA Chatsworth, WCV-Raltech, Inc. 818-700-0933
CA Los Angeles, Wiley Co. 213-666-1611
CA Palo Alto, Abbott Engrg. 415-968-2265
CA San Diego, Cerco 619-450-1754
CA San Diego, Wiley Co. 619-571-2881
CA Santa Clara, Ross Mktg. Assocs. 408-988-8111
CO Littleton, Simpson Assocs. 303-794-8381
CT Clinton, Selmark Assocs. 203-573-9088
FL Melbourne, Raycom, Inc. 305-259-7988
FL Orlando, Raycom, Inc. 305-859-5504
FL Plantation, Raycom, Inc. 305-741-6690
FL Wellborn, Raycom, Inc. 904-963-5023
GA Fayetteville, Raycom 406-446-9015
IL Schaumburg, Micro-Tex, Inc. 312-885-1131
IN Columbus, Technical Reps. 812-376-9226
IN Indianapolis, Technical Reps. 317-882-4407
KS Overland Park, Web Elctrns. 913-381-7986
MD Columbia, Delta III 301-730-4700
MA Millis, Selmark Assocs. 617-376-2914
MI Warren, Burcaw Co. 313-573-4605
MI Wyoming, Burcaw 616-532-2756
MN St. Paul, Arkco Sls. 612-777-7454
MO Florissant, Web Elctrns. 314-921-5720
NH Hopkinton, Selmark Assocs. 603-746-3299
NJ Marlton, b.g.r. Assocs. 609-983-1020
NJ Palmyra, RD Indl. Sls. 609-829-4441
NJ Perth Amboy, Astrorep, Inc. 201-826-8050
NY Babylon, Astrorep, Inc. 516-422-2500
NY Buffalo, Rudell-Merrifield Assocs. 716-634-4300
NY Skaneateles, ADN/Rudell-Merrifield .. 315-685-8991
NC Raleigh, Raycom 919-847-8276
OH Cleveland, DT/Depco 216-442-6200
OH West Chester, KT/Depco 513-874-0236
OK Tulsa, Bonser-Philhower Sls. 918-744-9964
OR Portland, Earl & Brown Co. 503-245-2283
PA Harrison City, Rudell-Merrifield Assocs. 412-327-0858
TX Austin, Bonser-Philhower Sls. 512-346-9186
TX Dallas, Bonser-Philhower Sls. 214-234-8438
TX Houston, Bonser-Philhower Sls. 713-531-4144
UT Midvale, Simpson Assocs. 801-566-3691
WA Seattle, Earl & Brown Co. 206-284-1121
WA Seattle, Earl & Brown Co., Inc. 206-284-1121
WI Waukesha, Mirco-Tex, Inc. 414-542-5352

Local Distributors

AL Huntsville, Powell Elec. 205-539-2731
AZ Scottsdale, Hall Elctrns. 602-946-9977
AZ Tempe, Powell 602-967-7538
CA Anaheim, Deco Elec. 714-630-8252
CA Chatsworth, Integrated 213-998-2200
CA Costa Mesa, Powell 714-754-1717
CA Fullerton, Pyramid/Fullerton 714-773-0781
CA Fullerton, Young Sls. Co. 714-871-5355
CA Hollywood, Yale Elctrns. 213-465-3186
CA San Diego, Deco Elctrns. 619-693-1595
CA San Jose, Integrated 408-263-1100
CA San Jose, Powell Elec. 408-943-9020
CA Santa Clara, Pyramid Elctrns. 408-727-9810
CA Sunnyvale, Target Elctrns., Inc. 408-734-5611
CO Denver, Integrated Elctrns. 303-292-6121
CO Englewood, Indl. Elctrns. 303-694-9444
CT Danbury, Pilgrim Elctrns. 203-792-7274
CT New Canaan, Impact 203-972-1458
CT Wallingford, Cronin Elec. 203-265-3134
FL Ft. Lauderdale, Powell Elec. 305-979-5606
FL Melbourne, Eurick 305-254-8718
FL Melbourne, Raycom, Inc. 305-259-7988
FL Pompano Beach, Peerless Radio 305-973-4141
FL Tampa, Reptron 813-855-4656
GA Atlanta, ACK Radio Supp. 404-351-6340
GA Fayetteville, Frankland 404-461-4026
IL Chicago, NEP Elctrns. 312-625-8400
IL Hoffman Estates, I.E.C. Intercomp 312-843-2040
IL Rosemont, Advent Elctrns. 312-297-6200
IN Indianapolis, Advent Elctrns. 317-872-4910
IA Cedar Rapids, Advent Elctrns. 319-363-0221
IA Cedar Rapids, Bergouist 319-366-8733
MD Beltsville, Resco/D.C. 301-937-9100
MD Columbia, Powell 301-621-4070
MD White Marsh, Resco/Baltimore 301-529-0500
MA Canton, Impact Sls. Co. 617-821-1500
MA Middleboro, Glynn Elctrns. 617-947-4262
MA Needham, Cronin 617-449-5000
MA Westborough, Powell 617-366-6100
MA Wilmington, J.V. Elctrns. 617-273-4300
MI Bloomington, NWR Elctrns. 612-854-7329
MI Farmington Hills, Advent Elctrns. 313-477-1650
MI Grand Rapids, S.F. Elctrns. 616-459-0216
MI Grand Rapids, T & W Elctrns. 616-241-3645
MI Lansing, Fulton Radio Supp. Co. 517-394-5020/2
MI Livonia, Reptron 313-525-2700

MN Minneapolis, Bergquist 612-835-2322
MN Minneapolis, Control Des. Supp. 612-721-1628
MO Kansas City, L Comp 816-221-2400
NH Salem, Glynn Elctrns. 603-893-8313
NJ Berlin, General Comps. 609-768-6767
NJ Englewood, Powell Elec. 201-894-0800
NJ Rockaway, Tonar Indus. 201-586-9000
NY Central Islip, Domino Comps. 516-582-3050
NY Farmingdale, Addem Sls. 201-882-0993
NY Hauppauge, Broadline Elec. Distr. 516-231-4100
NY Lynbrook, Peerless Radio 516-593-2121
NY Poughkeepsie, Kabelton, Inc. 914-473-1222
NY Rochester, Simcona 716-328-3230
NY Suffern, Nobel Elctrns. 914-357-4500
NC Cary, Powell Elec. 919-467-1212
NC Raleigh, Century 919-872-2203
OH Akron, Akron Elctrns. 216-762-8818
OH Dayton, Related Comps. 513-253-6116
OH North Royalton, Related Comp. 216-237-7271
OH Worthington, Reptron Ohio 614-436-6675
OR Beaverton, Norvac Elctrns. 503-644-1025
OR Tigard, Integrated Elctrns. 503-639-9661
PA Harrisburg, Advacom 717-545-5674
PA McKean, Advacom/Erie 814-476-7774
PA Norristown, Century Elctrn. Comp. Co. 215-631-5400
PA Phildelphia, Powell 215-365-1900
RI Warwick, Cal-Greg 401-738-6170
TN Hixson, Techni-Tronics 615-842-0514
WA Bellevue, Integrated Elctrns./Jaco 206-455-2727
WA Bellevue, Powell Elec. 206-641-4446
WI Mequon, Taylor Elec. Co. 414-241-4321
WI New Berlin, Nep Electrns. 414-785-9100

EBY CO., 2751 Southampton Rd., Philadelphia, PA 19154, Tel: 215-969-4200, TWX: 710-670-0452; FSC No.: 72825; Empl.: 150; *Sls. Mgr.:* C. R. Dedera ..... **C•1184-1185**

Local Sales Offices & Reps
AZ Tempe, Gassner & Clark 602-968-9037
CA Anaheim, Galaxie Sls. Intl. 714-752-1580
CA Los Altos, J. W. Wilhoit Co. 415-961-3660
CO Boulder, R. F. Mayo Assocs. 303-499-2155
FL Coral Springs, EPM Corp. 305-755-5387
GA Atlanta, Effective Mktg. Force 404-948-6023
IL Chicago, Rendell Sls. Co. 312-528-9025
IN Ft. Wayne, Given Corp. 219-432-5585
IA Cedar Rapids, Gassner & Clark 319-393-5763
MD Glen Burnie, Macrotech Assocs. 301-437-5588
MA Newton Upper Falls, Anchor Engrg. 617-964-6205
MI Brighton, Electronic Sources, Inc. 313-227-3598
MN Edina, Grayden & Flemmer 612-941-1120
NY Fairport, Bastian Sls. Agy., Inc. 716-223-0237
NY Melville, Comtronic Assocs. 516-249-0505
NY Syracuse, Bastian Sls. Agency, Inc. 325-437-1482
OH Dayton, J. N. Bailey & Assocs. 513-226-0512
OR Beaverton, Caruso & Northcutt, Inc. 503-646-4973
PA Springhouse, Deltatronics, Inc. 215-542-0250
TX Austin, Stevens Sls. Co. 512-250-5104
TX Dallas, Stevens Sls. Co. 214-350-2476
VA Gladys, Ralley Entprs., Inc. 804-283-5656
WA Bellevue, Caruso & Northcutt, Inc. 206-454-9699

Local Distributors
AL Birmingham, American Elec. Supp. Co. 205-254-3280
AL Huntsville, Contact Elctrns. 205-881-9321
AL Mobile, Electronic Supp. Co. 205-478-0455
AZ Phoenix, Lion Elctrn. Distrs. 602-869-9611
CA City of Industry, Ital Elctrn. Sls. 213-968-8515
CA Irvine, AMC Milliken 714-549-9811
CA San Carlos, Logan Elctrns. 415-594-0700
CA San Jose, Afcom 408-263-0660
CA Santa Ana, Amcotec Elec. Comp. Sls. 714-957-3003
FL Miami, Alpeco Intl. 305-592-2985
FL W. Palm Beach, Nurmi Elctrn. Supp. 305-686-8553
GA Atlanta, Accu-Tech Cable, Inc. 404-455-6422
GA Atlanta, ACK Radio Supp. 404-351-6340
GA Atlanta, Prehler Elctrns. 404-447-5540
GA Atlanta, Specialty Dist. Co., Inc. 404-873-2521
IL Chicago, Prehler Elctrns. 312-384-6100
IN Indianapolis, Prehler Elctrns. 317-841-0018
KY Bowling Green, Randolph, Hale & Meredith 502-781-1460
KY Hopkinsville, Randolph & Hale 502-885-5357
KY Louisville, P.I. Burkes Co. 502-589-3960
MD Columbia, Aztech Elctrns., Inc. 301-995-1760
MI Farmington Hills, Prehler Elctrns. 313-473-7200
MI Grand Rapids, S-F Elctrn. Supp. Co. 616-459-0216
MN Bloomington, Prehler Elctrns. 612-854-4106
NJ Union, Cougar Elctrns. 201-687-7722
NY Albany, E.E. Taylor 518-438-7811
NY Jamaica, Eby Sls. Co. of NY 212-291-3232
NY Long Island City, Hardware Specialty Co. 212-361-9393
NY Rome, Rome Elctrns. 315-337-5400
NC Raleigh, Carolina Cable & Conn. 919-876-9100
NC Raleigh, Prehler Elctrns. 919-876-9111
NC Raleigh, Southeastern Elctrns. 919-828-2311
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
OH Dayton, Televox, Inc. 513-294-4499
OH Middleburg Heights, Prehler Elctrns. 216-243-5510
PA Allentown, Lehigh Elctrns. 215-433-3045
PA Philadelphia, Spectrum Elctrns., Inc. 215-748-3010
PA York, Electronic Comps. for Ind. 717-843-8971
SC Columbia, Dixie Elec. 803-779-5332
TN Chattanooga, Curle Elctrns. 615-266-4727
TN Chattanooga, Indl. Elec. Dist., Inc. 615-698-3413
TN Clarksville, Randolph, Hale & Matthews 615-647-2325
TN Cookville, Randolph & Parks 615-526-6184
TN Memphis, Bluff City Distrs. 901-345-9500
TN Nashville, Randolph & Rice 615-255-5602
TN Tullahoma, Randolph, Rice & Williams 615-455-4531
TX El Paso, Midland Specialty Co. 915-533-9555
VA Roanoke, Peoples Elctrn. Supp. 703-342-8933

ECD CORP., 196 Broadway, Cambridge, MA 02139, Tel: 617-661-4400, TWX: 710-320-6965; Empl.: 40

ECI COMPANY, Box 1565, Terra Haute, IN 47808, Tel: 812-232-4442; Empl.: 3

ECO INSTRS. DIV., Sea Data Corp., 1 Bridge St., Newton, MA 02158, Tel: 617-964-8360, Telex: 951107; Empl.: 40; *Sls. Mgr.:* Jill Shipman

ECOSOFT, INC., 6413 N. College Ave., Indianapolis, IN 46220, Tel: 317-255-6476; Empl.: 6; *Sls. Mgr.:* Emma Alkire

ECTRON CORP., 8159 Engineer Rd., San Diego, CA 92111, Tel: 619-278-0600, TWX: 910-335-1259; FSC No.: 24856; Empl.: 50; *Sls. Mgr.:* W. W. Hanford ..... **D•1007**

Local Sales Offices & Reps
AZ Phoenix, Aztec Entprs. 602-944-9185
CA Costa Mesa, FLW Inc. 714-751-7512
CA Hayward, FLW Inc. 415-487-2222
CA San Diego, FLW Inc. 619-277-0993
CA Van Nuys, FLW Inc. 818-989-5238
CO Denver, Aztec Entprs. 303-779-5285
FL Melbourne, Saber Assocs. 305-724-0920
GA Griffin, Saber Assoc. Inc. 800-327-0853
IL Elmhurst, Sector Engrg. Sls. 312-530-7850
IN Indianapolis, Sector Engrg. Sls. 317-842-1120
KS Overland Park, Ramsey Assocs. 913-649-6996
LA Baton Rouge, Sesco 504-928-4951
MD Rockville, Elctrn. Mktg. Assoc. 301-744-7700
MA Needham, Addelco Corp. 617-444-4754
MI Royal Oak, Satullo 313-549-3910
MN Minneapolis, Sector Eng. Sls. Inc. 612-593-1809
MO Maryland Hgts., Ramsey Assocs. 314-878-5042
NM Albuquerque, Aztec Entprs. 505-262-1688
NY East Syracuse, Ossmann Instrs. 315-437-7052
NY Plainview, Eastern-Metro Assoc. 516-931-1414
NY Rochester, Ossmann Instrs. 716-424-4460
NY Saratoga Springs, Ossmann Instrs. 518-377-8604
NC Clayton, Saber Assocs. 800-327-0853
OH Cleveland, Instrmn. Sys. 216-845-8800
OH Dayton, Instrmn. Sys. 513-294-2838
OK Tulsa, Sesco 918-622-3868
PA Pittsburgh, Instrmn. Sys. 412-243-1111
PA Plymouth Meeting, Elctrn. Mktg. Assoc. 215-828-7400
SC Columbia, Saber Assoc. Inc. 800-327-0853
TX Dallas, Sesco 214-231-9364
TX Houston, Sesco 713-999-3510
UT Ogden, Aztec Entprs. 801-621-1655
VA Chesapeake, Elctrn. Mktg. Assoc. 804-482-3318
WA Seattle, Datacom Assoc. Inc. 206-285-2525
WI Milwaukee, Sector Eng. Sls. Inc. 414-352-8280

EDAC INC., 20 Railside Rd., Toronto, ON, Canada M3A 1A4, Tel: 416-445-2292, TWX: 610-492-1398; FSC No.: 31781; Empl.: 120; *Sls. Mgr.:* Alan Little; *Dist. Mgr.:* Alan Little

EDA INSTRUMENTS, INC., 4 Thorncliffe Park Dr., Toronto, ON, Canada M4HIHI, Tel: 416-425-7800, Telex: 06 23222; Empl.: 50; *Sls. Mgr.:* Scott Hepburn

EDEN EQUIPMENT CO., 17649 Jacquelyn Lane, Huntington Beach, CA 92647, Tel: 714-842-8181

EDL, INC., 385 Oser Ave., Hauppauge, NY 11788, Tel: 516-435-2808, 1-800-DIAL EDL; Empl.: 50; *Sls. Mgr.:* Donna Oliveri

EDMAN CORP., Subsidiary of Rospatch, 7500 Main St., P.O. Box 750, Fishers, NY 14453-0750, Tel: 716-924-4000, TWX: 510-254-2896; Empl.: 170; *Sls. Mgr.:* Howard Potter

EDO CORP./ELINCO DIV., 272 Main Ave., Norwalk, CT 06851, Tel: 203-847-5861, Telex: 96-5945; FSC No.: 73693; Empl.: 87

EDO WESTERN CORP., EDO Corp., 2645 South 300 W., Salt Lake City, UT 84115, Tel: 801-486-7481/3846, Telex: 388-315; Empl.: 360; *Sls. Mgr.:* Doug Moore

EDWARDS CO., Signaling Prods. Div., P.O. Box 1188, Farmington, CT 06034, Tel: 203-678-0410; *Sls. Mgr.:* Al Canevari; *Dist. Mgr.:* Al Canevari

EECO INCORPORATED, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, Tel: 714-835-6000, Telex: 67-8420, TWX: 910-595-1550; Empl.: 625; *Sls. Mgr.:* Frank Bruder; *Dist. Mgr.:* Ken Plount ..... **B•1558-1561**

Local Sales Offices & Reps
CA El Monte, Cook Entprs. 213-686-2120
AL Huntsville, Montgomery Mktg. 205-830-0498
AZ Scottsdale, Thom Luke Sls. 602-941-1901
AR Fort Smith, Electra Reps. 501-452-4030
CA Fountain Valley, Bager Elctrns. 714-957-3367
CA Los Altos, Recht Assocs. 415-964-6321
CA San Diego, Harvey King Inc. 619-566-5252
CO Denver, Delltron Co. 303-373-0300
CT Danbury, Ray Perron & Co. 203-798-6392
CT Farmington, Ray Perron & Co. 203-673-4825
FL Pompano Beach, Ema, Inc. 305-943-3732
FL Winter Park, EMA, Inc. 305-671-6800
GA Norcross, Montgomery Mktg. 404-447-6124
IL Elk Grove Village, John G. Twist Co. 312-593-0200
IN Fort Wayne, M/S Sls. & Assoc. 219-484-1904
IN Indianapolis, M/S Sls. & Assocs. 317-257-8915
IA Cedar Rapids, Palatine Sls. 319-365-8071
KS Mission, Palatine Sls. 913-831-0555
MD Rockville, EMA (Elctrn. Mktg. Assts.) 301-881-5300
MA Needham, Ray Perron & Co. 617-449-6162
MI Livonia, Lowell Wendt Mktg. 313-464-2722
MN Bloomington, Elctrn. Sls. Agecy. 612-884-8291
MO Hazelwood, Palatine Sls. 314-839-0800
NJ Englewood, Tecnimat 201-569-4200
NY Endicott, Tech-Mark, Inc. 607-748-7473
NY Mendon, Techmark, Inc. 716-624-3840
NY Utica, Techmark, Inc. 315-733-0575
NC Cary, Montgomery Mktg. 919-467-6319
OH Aurora, EMA, Inc. 216-562-6104
OH Centerville, EMA, Inc. (Engr. Mktg. Assts.) 513-433-2800
OR Beaverton, Blair Hirsh Co. 503-641-1875
PA Plymouth Meeting, EMA (Elctrn. Mktg. Assts.) 215-828-7400
TX Austin, Electra Reps. Inc. 512-339-1163
TX Dallas, Electra Reps. Inc. 214-248-3852
UT Salt Lake City, Delltron Co. 800-692-2069
WA Lynnwood, Blair Hirsh Co. 206-774-8151
WI Brookfield, John G. Twist Co. 414-782-2670

Local Distributors
CA San Diego, Fisher Brownell 619-560-8545
AL Huntsville, Hall-Mark Elctrns. 205-837-8700
AL Huntsville, Marshall Inds. 205-881-9235
AZ Phoenix, Hall-Mark Elctrns. 602-437-1200
AZ Tempe, Fisher-Brownell 602-967-1464
AZ Tempe, Marshall Inds. 602-968-6181
CA Alhambra, Fisher Brownell 818-289-0255
CA Canoga Park, Hall-Mark Elctrns. 818-716-7300
CA Canoga Park, Marshall Inds. 818-999-5001
CA El Monte, Marshall Inds. 818-442-7204
CA Irvine, Marshall Inds. 714-660-0952
CA San Diego, Fisher Brownell 714-560-8545
CA San Diego, Hall-Mark Elctrns. 619-268-1201
CA San Diego, Marshall Inds. 619-578-9600
CA San Jose, Hall-Mark Elctrns. 408-946-0900
CA Santa Clara, Fisher Brownell 408-988-6041
CA Sunnyvale, Marshall Inds. 408-732-1100
CA Sunnyvale, Time Electronics 408-734-9888
CA Tustin, Hall-Mark Elctrns. 714-669-4700
CO Denver, Marshall Inds. 303-427-1818
CO Englewood, Hall-Mark Elctrns. 303-790-1662
CT Wallingford, Hall-Mark Elctrns. 203-269-0100
CT Wallingford, Marshall Inds. 203-265-3822
CT Wallingford, Sager Electrical Supply Co. 203-265-4600
FL Clearwater, Hall-Mark Elctrns. 813-530-4543
FL Orlando, Hall-Mark Elctrns. 305-855-4020
FL Orlando, Marshall Inds. 305-841-1878
FL Pompano Beach, Hall-Mark Elctrns. 305-971-9280

GA Atlanta, Marshall Inds. 404-923-5750
GA Norcross, Hall-Mark Elctrns. 404-447-8000
IL Bensenville, Hall-Mark Elctrns. 312-860-3800
IL Schaumburg, Marshall Inds. 312-490-0155
IN Indianapolis, Mar Elctrns., Inc. 317-875-4510
KS Lenexa, Hall-Mark Elctrns. 913-888-4747
MD Baltimore, Hall-Mark Elctrns. 301-988-9800
MD Gaithersburg, Marshall Inds. 301-840-9450
MA Billerica, Hall-Mark Elctrns. 617-667-0902
MA Burlington, Marshall Inds. 617-272-8200
MA Hingham, Sager Elctrn. Supp. Co. 617-749-6700
MI Livonia, LWC Distrs. 313-464-7700
MN Bloomington, Hall-Mark Elctrns. 612-854-3223
MN Plymouth, Marshall Inds. 612-559-2211
MO Earth City, Hall-Mark Elctrn. 314-291-5350
MO St. Louis, Olive Elctrns. 314-426-4500
NJ Cherry Hill, Hall-Mark Elctrns. 609-355-7300
NJ Cherry Hill, Hall-Mark Elctrns. 609-424-7300
NJ Fairfield, Hall-Mark Elctrns. 201-575-4415
NJ Fairfield, Marshall Inds. 201-882-0320
NJ Mt. Laurel, Marshall Inds. 215-627-1920
NM Albuquerque, International Elctrns. 505-345-8127
NY Endwell, Marshall Inds. 607-754-1570
NY Hauppauge, Marshall Inds. 516-273-2424
NY Lynbrook, L.I., Peerless Radio Corp. 516-593-2121
NY Rochester, Marshall Inds. 716-235-7620
NY Ronkonkoma, Hall-Mark Elctrns. 516-737-0600
NC Raleigh, Hall-Mark Elctrns. 919-872-0712
OH Cincinatti, Hall-Mark Elctrns. 513-563-5980
OH Dayton, Marshall Ind. 513-236-8088
OH Solon, Hall-Mark Elctrns. 216-349-4632
OH Solon, Marshall Inds. 214-248-1788
OH Westerville, Hall-Mark Elctrns. 614-891-4555
OK Tulsa, Hall-Mark Elctrns. 918-665-3200
OR Beaverton, Almac/Stroum 503-641-9070
OR Beaverton, Marshall Inds. 503-644-5050
TX Austin, Hall-Mark Elctrns. 512-258-8848
TX Dallas, Hall-Mark Elctrns. 214-341-1147
TX Dallas, Marshall Inds. 214-233-5200
TX El Paso, International Elctrns. 915-598-3406
TX Houston, Hall-Mark Elctrns. 713-781-6100
TX Houston, Marshall Inds. 713-789-6600
TX Richardson, Fisher Brownell 214-235-3177
UT Murray, Hall-Mark Elctrns. 801-268-3779
WA Bellevue, Almac Elctrns. 206-643-9992
WA Bellevue, Marshall Inds. 206-747-9100
WA Spokane, Almac Elctrns. 509-924-9500
WI Oak Creek, Hall-Mark Elctrns. 414-797-7844
Can Burnaby, BC, RAE Indl. Elec. Ltd. 604-291-8866
Can Calgary, Alb., Cardinal Ind. Elec. Ltd. .. 403-259-6817
Can Edmonton, Alb., Cardinal Ind. Elec. Ltd. 403-483-6266
Can Ottawa, Ont., Carsten Elctrns., Ltd. 613-729-5138
Can Scarborough, Ont., Carsten Elctrns., Ltd. 416-495-9999
Can St. Laurent, Que., Carsten Elctrns., Ltd. 514-334-8321

EEMCO DIV., 4585 Electronics Pl., Los Angeles, CA 90039, Tel: 213-247-7060, TWX: 910-497-2269; FSC No.: 72121; Empl.: 350; *Sls. Mgr.:* D. Haymond; *Dist. Mgr.:* D. Haymond

EEV INC., 7 Westchester Plaza, Elmsford, NY 10523, Tel: 914-592-6050, Telex: 6818096; Empl.: 36; *Sls. Mgr.:* Tom Soldano

EFECTOR, INC., 201 So. Gulph Rd., King of Prussia, PA 19406, Tel: 215-337-5500, 800-441-8245, Telex: 84-6437; Empl.: 300; *Sls. Mgr.:* J. Kelly

EFI CORPORATION, 350 West 2700 South, Salt Lake City, UT 84115, Tel: 801-486-5871; Empl.: 35; *Sls. Mgr.:* George O. Stewart

EFRATOM, a division of Ball Corp., 18851 Bardeen Ave, Irvine, CA 92715, Tel: 714-752-2891, Telex: 68-5635; Empl.: 105 ..... **A•1361**

Local Sales Offices & Reps
CA Los Altos, Kolm Mktg. Assoc. 415-948-2635
CA Los Angeles, Cain Technlg. 213-477-9054
FL Sarasota, Bass Assocs. 813-922-9538
MA Natick, Wayland Engrg. Sls. 617-655-6080
NJ Pennsauken, Sci. Reps. 609-662-5222
NY Huntington, CDB Entprs. 516-692-5200
TX Houston, Sci. Devices 713-864-1711
TX Richardson, Sci. Devices 214-231-8106
VA Fairfax, Scientific Assocs. 703-385-0600

EG&G, INC., Electro-Optics Div., 35 Congress St., Salem, MA 01970, Tel: 617-745-3200, Telex: 681-7405 EGGSA; FSC No.: 25506; Empl.: 500; *Sls. Mgr.:* J. Murachver

EG & G ALMOND INSTRUMENTS, 1330 E. Cypress St., Covina, CA 91724, Tel: 818-967-9521, TWX: 910-584-1320; Empl.: 260; *Sls. Mgr.:* Dave Adams ..... **D•1620-1621**

Local Sales Offices & Reps
FL Orlando, Truex Assocs. 305-859-2160
MA Lexington, Circuit Sls. Co. 617-861-0567
NY Yonkers, Sonkin Assocs. 914-968-8282

EG&G BIRTCHER INDUSTRIAL PRODUCTS

EG & G BIRTCHER, 4505 N. Arden Dr., El Monte, CA 91731, Tel: 818-442-2572, Telex: 247345 EGGUR; *Sls. Mgr.:* H. Robert Sproul ..... **C•1051-1053**

Local Sales Offices & Reps
AL Huntsville, Mar-Tec, Inc. 205-883-5910
AZ Phoenix, Mercury Engrg. Sls. 602-244-0123
CA Brea, Masco 714-529-0866
CA San Diego, Masco 619-234-6905
CA Santa Clara, Nova-Tronix, Inc. 408-727-9530
CO Broomfield, Connors Co. 303-466-9628
FL Clearwater, Hutto, Hawkins, Peregory, Inc. 813-797-4447
FL Maitland, Hutto, Hawkins, Peregory, Inc. 305-831-2474
FL Pompano Beach, Hutto, Hawkins, Peregoy, Inc. 305-971-5750
GA Roswell, Mar-Tec, Inc. 404-992-0040
IL Rollings Meadows, Heartland Technlg. Mktg., Inc. 312-577-9222
KS Shawnee Mission, Midland Engrg. Sls. Assocs. 913-262-5500
MD Baltimore, Burgin Kreh Assocs., Inc. ... 301-265-8500
MA Burlington, Conti-Younger Assocs., Inc. 617-273-1582
MN Minneapolis, Hei-Lite Sls., Inc. 612-861-6051
NY Great Neck, Frank Tylinski Co., Inc. ... 516-466-9070
NY Syracuse, IA Hotze Assocs. 315-479-6641
NC Raleigh, Tingen Technlg. Sls., Inc. 919-878-4440
OH Cleveland, Jim Finnegan & Co. 216-238-5905
OH Dayton, Jim Finnegan & Co. 513-890-8322
OR Beaverton, Eclipse Mktg. Grp. 503-642-1661
TX Dallas, El-Com Mktg., Inc. 214-241-2166
VA Lynchburg, Burgin Kreh Assocs., Inc. .. 804-239-2626
WA Redmond, Eclipse Mktg. Grp. 206-885-6991
WI Milwaukee, Heartland Technlg. Mktg., Inc. 414-931-0606

Local Distributors
CA Cerritos, El-Com, Inc. 213-404-2961
CA Manhattan Beach, Prime Electro Prods. 213-379-1724
CA San Diego, El-Com 619-578-0900
CA Santa Jose, Bisco Inds. 408-946-8980
CA Santa Clara, Pyramid Elctrns. 408-727-9810
CO Aurora, Jet Elctrns. Supp. Co., Inc. 303-364-5487
FL Pompano Beach, Peerless Radio Corp. of FL 305-973-4141
IL Franklin Park, Bisco Inds.
MA Winchester, Rush Inds., Inc. 617-729-5800
MN Minneapolis, Stark Elctrns., Inc. 612-322-1325
NH Hudson, C & H Elctrns., Inc. 603-882-1133
NY Bohemia, Car Lac Inds. Sls., Inc. 516-567-4200
NY Buffalo, Summit Distrs. 716-884-3450
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY Rochester, Summit Distrs. 716-334-8110
OH Englewood, Argent Inds. 513-836-8633
TX Ft. Worth, Industrial Elctrns. 817-731-7321
TX Houston, Force Elctrns. 713-561-8644
TX Irving, Force Elctrns. 214-438-5700
WA Redmond, Murphy Elctrns. 206-881-1234

EG&G GAMMA SCIENTIFIC, Div. of EG&G Inc., 3777 Ruffin Rd., San Diego, CA 92123, Tel: 619-279-8034, Telex: 697938; Empl.: 75; *Sls. Mgr.:* Robert Ruff

EG&G GEOMETRICS, Div. of EG&G Inc., 395 Java Dr., Sunnyvale, CA 94089, Tel: 408-734-4616, Telex: 357435; FSC No.: 34314; *Sls. Mgr.:* Ross Johnson; *Dist. Mgr.:* Fritz Faber

EG&G RETICON, Div. of EG&G, 345 Potrero Ave., Sunnyvale, CA 94086-4197, Tel: 408-738-4266, Telex: 910-339-9343; *Sls. Mgr.:* John Skurla

EG&G ROTRON

EG & G ROTRON, Commercial Div., Saugerties, NY 12477, Tel: 914-246-3615, Telex: 551496; *Sls. Mgr.:* Michael Keating; *Dist. Mgr.:* Ralph Stevens ..... **C•1630-1636**

Local Sales Offices & Reps
AL Huntsville, Over & Over 205-837-7105
AZ Phoenix, Westrep 602-997-8899
CA Anaheim, Westrep 213-404-3881
CA Chatsworth, EG & G Rotron 818-709-2133
CA San Diego, Hadden Assoc. 619-565-9444
CA Santa Clara, Westrep 408-988-8833
CO Littleton, Lange Sls. 303-795-3600
CT Stamford, Circuit Sls. 203-322-0240
FL Apopka, G. Bohman 305-886-1882
GA Norcross, Over & Over, Inc. 404-449-6205
HI Honolulu, R. Clark 808-531-5897
IL Rolling Meadows, Sumer 312-991-8500
IN Indianapolis, F. J. Campisano 317-253-7651
IA Cedar Rapids, S & O Sls. 319-393-1845
KS Raytown, CenTech 816-358-8100
MD Columbia, L. D. Lowery 301-964-0225
MA Lexington, Circuit Sls. 617-861-0567
MI Detroit, Rathsburg Assocs. 313-882-1717
MN Mendota Heights, G-11 Sales 612-454-3086
MO Bridgeton, CenTech 314-291-4230
MO Raytown, CenTech 816-358-8100
NJ Springfield, F. Sylvester 201-376-3324
NY Saugerties, Rotron (Commercial Div.) 914-246-3615
NC Charlotte, Over & Over 704-527-3070
OH Cincinnati, F. J. Campisano 513-574-7111
OH Cleveland, Comp., Inc. 216-243-9200
OK Tulsa, Ammon & Rizos 918-663-8788
PA Broomall, L. D. Lowery 215-356-5300
TX Dallas, Ammon & Rizos 214-644-5591
TX Houston, Ammon & Rizos 713-781-6240
UT Salt Lake City, Lange Sls. 801-487-0843
WA Lynnwood, Blum & Assocs. 206-775-6656
WI Brookfield, Sumer, Inc. 414-784-6641
EXP NY, Great Neck, A. Auriema 516-487-0700

Local Distributors
Chatsworth, Arrow Elctrns. 818-701-7500
AL Huntsville, Arrow Elctrns. 205-882-2730
AL Huntsville, Hall-Mark Elctrns. 205-837-8700
AL Huntsville, Schweber Elctrns. 205-882-2200
AZ Phoenix, Cetec Elctrns. 602-272-7951
AZ Phoenix, Hall-Mark Elctrns. 602-243-6601
AZ Phoenix, Schweber Elctrns. 602-997-4874
AZ Tempe, Arrow Elctrns. 602-968-4800
CA Canoga Park, Hall-Mark Elctrns. 818-716-7300
CA Canoga Park, Schweber Elctrns. 818-999-4702
CA El Segundo, Hall Mark Elctrns. 213-643-9101
CA Gardena, Schweber Elctrns. 213-327-8409
CA Glendale, R. V. Weatherford 213-849-3451
CA Hayward, Arrow Elctrns. 415-487-4600
CA Irvine, Cetec Elctrns. 714-521-7412
CA Irvine, Schweber Elctrns. 714-863-0200
CA Los Angeles, Richey/Western 214-820-3777
CA Sacramento, Arrow Elctrns. 916-925-7456
CA Sacramento, Schweber Elctrns. 916-929-9732
CA San Diego, Arrow Elctrns. 619-565-4800
CA San Diego, Cetec Elctrns. 619-278-5020
CA San Diego, Hall-Mark Elctrns. 619-268-1201
CA San Diego, Schweber Elctrns. 619-450-0454
CA San Jose, Cetec Elctrns. 408-263-7373
CA San Jose, Hall-Mark Elctrns. 408-773-9990
CA San Jose, Schweber Elctrns. 408-946-7171
CA South Gate, Cetec Elctrns. 213-773-6521
CA Sunnyvale, Arrow Elctrns. 408-745-6600
CA Tustin, Arrow Elctrns. 714-838-5422
CA Tustin, Hall Mark Elctrns. 714-669-0681
CO Aurora, Hall-Mark Elctrns. 303-696-1111
CO Denver, R. V. Weatherford 303-428-6900
CO Englewood, Schweber Elctrns. 303-799-0258
CT Danbury, Schweber Elctrns. 203-748-7080
CT Wallingford, Arrow Elctrns. 203-265-7741
FL Altamonte Springs, Schweber Elctrns. 305-331-7555
FL Clearwater, Arrow Elctrns. 813-576-8995
FL Clearwater, Hall-Mark Elctrns. 813-530-4543
FL Deerfield Beach, Arrow Elctrns. 305-429-8200
FL Hollywood, Schweber Elctrns. 305-927-0511
FL Orlando, Hall-Mark Elctrns. 305-855-4020
FL Palm Bay, Arrow Elctrns. 305-725-1480
FL Pompono Beach, Hall-Mark Elctrns. ... 305-971-9280
GA Atlanta, Schweber Elctrns. 404-449-9170
GA Norcross, Arrow Elctrns. 404-449-8252
GA Norcross, Hall-Mark Elctrns. 404-447-8000
IL Bensenville, Hall-Mark Elctrns. 312-860-3800
IL Elk Grove, Schweber Elctrns. 312-364-3750
IL Schaumburg, Arrow Elctrns. 312-397-3440
IN Indianapolis, Arrow Elctrns. 317-243-9353
IA Cedar Rapids, Arrow Elctrns. 319-395-7230
IA Cedar Rapids, Schweber Elctrns. 319-373-1417
KS Kansas City, Schweber Elctrns. 913-492-2922
KS Lenexa, Hall-Mark Elctrns. 913-888-4747

KS Overland Park, Arrow Elctrns. 913-642-0592
MD Columbia, Arrow Elctrns. 301-995-0003
MD Columbia, Hall-Mark Elctrns. 301-796-9300
MD Gaithersburg, Schweber Elctrns. 301-840-5900
MA Bedford, Schweber Elctrns. 617-275-5100
MA Billerica, Hall Mark Elctrns. 617-935-9777
MA Woburn, Arrow Elctrns. 617-933-8130
MI Ann Arbor, Arrow Elctrns. 313-971-8220
MI Grand Rapids, Arrow Elctrns. 616-243-0912
MI Livonia, RS Elctrns. 313-525-1155
MI Livonia, Schweber Elctrns. 313-525-8100
MN Bloomington, Hall-Mark Elctrns. 612-854-3223
MN Edina, Arrow Elctrns. 612-830-1800
MN Edina, Schweber Elctrns. 612-941-5280
MN Minneapolis, I.C.I. 612-831-2666
MO Maryland Hts., Hall-Mark Elctrns. 314-291-5350
MO St. Louis, Arrow Elctrns. 314-567-6888
MO St. Louis, Schweber Elctrns. 314-739-0562
NH Manchester, Arrow Elctrns. 603-668-6968
NH Manchester, Schweber Elctrns. 603-625-2250
NJ Cherry Hill, Hall-Mark Elctrns. 609-424-7300
NJ Fairfield, Arrow Elctrns. 201-575-5300
NJ Fairfield, Hall-Mark Elctrns. 201-575-4415
NJ Fairfield, Schweber Elctrns. 201-227-7880
NJ Marlton, Arrow Elctrns. 609-596-8000
NM Albuquerque, Arrow Elctrns. 505-243-4566
NY Buffalo, Summit Elctrns. 716-884-3450
NY Buffalo, Summit Elctrns. 607-748-8211
NY Hauppauge, Arrow Elctrns. 516-231-1000
NY Liverpool, Arrow Elctrns. 315-652-1000
NY Rochester, Arrow Elctrns. 716-427-0300
NY Rochester, Schweber Elctrns. 716-424-2222
NY Ronkonkoma, Hall Mark Elctrns. 516-737-0600
NY Westbury, Schweber Elctrns. 516-334-7474
NC Raleigh, Hall-Mark Elctrns. 919-832-4465
NC Raleigh, Schweber Elctrns. 919-876-0000
NC Winston-Salem, Arrow Elctrns. 919-725-8711
OH Beachwood, Schweber Elctrns. 216-464-2970
OH Centerville, Arrow Elctrns. 513-435-5563
OH Cincinnati, Hall-Mark Elctrns. 513-563-5980
OH Cleveland, Hall-Mark Elctrns. 216-349-4632
OH Columbus, Arrow Elctrns. 614-885-8362
OH Dayton, Schweber Elctrns. 513-439-1800
OH Solon, Arrow Elctrns. 216-248-3990
OK Tulsa, Arrow Elctrns. 918-665-7700
OK Tulsa, Hall-Mark Elctrns. 918-665-3200
OK Tulsa, Schweber Elctrns. 918-622-8000
OR Beaverton, Almac Elctrns. 503-641-9070
OR Tigard, Arrow Elctrns. 503-684-1690
PA Horsham, Schweber Elctrns. 215-441-0600
PA Philadelphia, Almo Elctrns. 215-698-4000
PA Pittsburgh, Schweber Elctrns. 412-782-1600
TX Austin, Schweber Elctrns. 512-458-8253
TX Carrollton, Arrow Elctrns. 214-380-6464
TX Dallas, Hall-Mark Elctrns. 214-553-4300
TX Dallas, Schweber Elctrns. 214-661-5010
TX Houston, Arrow Elctrns. 713-530-4700
TX Houston, Hall-Mark Elctrns. 713-781-6100
TX Houston, Schweber Elctrns. 713-784-3600
UT Salt Lake City, Arrow Elctrns. 801-972-0404
UT Salt Lake City, Hall-Mark Elctrns. 801-268-3779
VA Richmond, Arrow Elctrns. 804-282-0413
WA Bellevue, Almac Elctrns. 206-643-9992
WA Bellevue, Arrow Elctrns. 206-643-4800
WI Brookfield, Schweber Elctrns. 414-784-9020
WI Oak Creek, Arrow Elctrns. 414-764-6600
WI Oak Creek, Hall-Mark Elctrns. 414-761-3000

EG & G ROTRON, Custom Div., Hasbrouck La., Woodstock, NY 12498, Tel: 914-679-5201, TWX: 510-247-9033; FSC No.: 82877; *Sls. Mgr.:* Mike Lyon; *Dist. Mgr.:* Mary Fellows ..... **B•1210**

EG & G TORQUE SYSTEMS, 36 Arlington St., Watertown, MA 02172, Tel: 617-924-6000, Telex: 95-1736; Empl.: 200; *Sls. Mgr.:* W. F. O'Leary; *Dist. Mgr.:* H. D. Waddell

EG & G VACTEC, 10900 Page Blvd., St. Louis, MO 63132, Tel: 314-423-4900, TWX: 910-764-0811; Empl.: 250; *Sls. Mgr.:* D. Hartley; *Dist. Mgr.:* D. Hartley ..... **B•1210**

Local Sales Offices & Reps

CA Encino, King-Way Assocs. 818-788-4124
CA Redwood City, Ault Assocs. 415-367-1710
CO Arvada, Arrowhead Sls. Corp. 303-423-5556
CT Gilford, A & M Elctrn. Reps. 203-453-1612
FL Orlando, EAB Assocs. 305-898-7444
IL Highland Park, T. B. Hunter Assocs. 312-433-7000
IN Fort Wayne, Scott Elctrns. 219-484-7865
IN Indianapolis, Scott Elctrns. 317-897-9976
MA Needham, A & M Elctrn. Reps. 617-444-8170
MI Southfield, O.E.M. Technical Sls. 313-444-1680
MI Troy, Scott Elctrns. 313-585-7690
MN Eden Prairie, Rockmore Sls. 612-941-1390
MO Independence, Engrg. Svcs. Co. 816-254-3600
MO St. Louis, Engrg. Svcs. Co. 314-997-1515
NJ Marlton, B.G.R. Assocs. 609-428-2440
NY Pittsford, C. W. Beach Co. 716-586-3200
NY Syracuse, C. W. Beach Co. 315-446-9587
OH Cincinnati, Scott Elctrns. 513-791-2513
OH Cleveland, Scott Elctrns. 216-473-5050
OH Kettering, Scott Elctrns. 513-294-0539
OH Reynoldsburg, Scott Elctrns. 614-863-1281
PA Pittsburgh, Scott Elctrns. 412-828-1073
TX Dallas, S. W. Mktg. Assocs. 214-341-8631
WA Bellevue, N. R. Schultz Co. 206-454-0300

Local Distributors

AZ Scottsdale, Instate Mktg. 602-244-9050
CA Encino, King Way West 818-788-4124
CA Palo Alto, Zack Elctrns. 415-326-5432
CA Santa Clara, Allied Elctrns. 408-727-1690
CO Denver, Integrated Elctrns. Co. 303-534-6121
FL Orlando, EAB, Inc. 305-898-7444
ID Boise, N. R. Schultz 208-377-8686
IL Chicago, Newark Elctrns. 312-638-4411
IL Elgin, Allied Elctrns. 312-697-8200
MO St. Louis, Olive Indl. Elec. 314-426-4500
OH Dayton, Televox, Inc. 513-294-4499
OR Beaverton, N. R. Schultz 503-643-1644
TX Fort Worth, Allied Elctrns. 817-336-5401
Intl Reading, Berkshire U.K., Norbain Opto Elctrns. Div. 0734-864411

EG&G WAKEFIELD ENGRG., 60 Audubon Rd, Wakefield, MA 01880, Tel: 617-245-5900, TWX: 710-348-6713; Empl.: 240; *Sls. Mgr.:* Ray A. Radford; *Dist. Mgr.:* Carl Swanson

EH ELECTRONICS, INC., Sub. EH Intl., Inc., 48507 Milmont Drive, Fremont, CA 94538, Tel: 415-651-2340, TWX: 910-366-7258; FSC No.: 13488; Empl.: 67; *Sls. Mgr.:* Donald F. Smith

EHRHORN TECHNOLOGICAL OPERS., INC., P.O. Box 888, Canon City, CO 81212, Tel: 303-275-1613; Empl.: 50; *Sls. Mgr.:* Terry Dillahunty

EIGEN VIDEO, P.O. Box 848, Nevada City, CA 95959, Tel: 916-272-3461, Telex: 298788 EIG UR; FSC No.: 59535; Empl.: 50

EIKONIX CORP., 23 Crosby Dr., Bedford, MA 01730, Tel: 617-275-5070

EI NORTH AMERICA, 15 W. 53rd St. Suite 47E, New York, NY 10019, Tel: 212-315-3099, Telex: 803347 'EINA'

EIP MICROWAVE, INC., 2731 North First St., San Jose, CA 95134, Tel: 408-946-5700, TWX: 910-338-0155; FSC No.: 34257; Empl.: 250; *Sls. Mgr.:* Robert Loft/Bill Dentinger

EITEL MFG., 2835 Laguna Canyon Rd., Laguna Beach, CA 92652, Tel: 714-494-2012; Empl.: 6; *Sls. Mgr.:* H. Mengel

ELANTEC, INC., 1996 Tarob Ct., Milpitas, CA 95035, Tel: 408-945-1323, 800-821-7429, TWX: 910-997-0649; FSC No.: 64762; Empl.: 90; *Sls. Mgr.:* Jerry Zis

ELCO CORP., Electronic Connector Div., Huntingdon Ind'l. Park, Huntingdon, PA 16652, Tel: 814-643-0700, TWX: 510-691-3117; Empl.: 500; *Sls. Mgr.:* J. J. Smith; *Dist. Mgr.:* John J. Galiney, Jr.

ELCO CORP., Interconnect Systems Div., 2250 Park Pl., El Segundo, CA 90245, Tel: 213-675-3311; *Sls. Mgr.:* T. Tuttle

ELCOM INDUSTRIES, INC., 10268 Bach Blvd., St. Louis, MO 63132, Tel: 314-429-3100

Local Sales Offices & Reps

CA Anaheim, Magna-Code, Inc. 714-821-7500
MA Newton Highlands, Butler Assocs., Inc. 617-965-1080

ELCOM SYSTEMS, INC., 932 Clint Moore Rd., Boca Raton, FL 33431, Tel: 305-994-1774; FSC No.: 32424; Empl.: 5; *Sls. Mgr.:* D. Pollachek ..... **A•1711**

Local Sales Offices & Reps

EXP MA, Mattapoisett, Clark Export-Import Co. 617-758-6448

ELCON PRODUCTS INTERNATIONAL COMPANY, 44036 Grimmer Blvd., Fremont, CA 94538, Tel: 415-490-4200, Telex: 910-381-7026; FSC No.: 85901; Empl.: 25; *Sls. Mgr.:* Shirley Gendreau; *Dist. Mgr.:* Shirley Gendreau

ELDEC CORP., Monitor & Control Div., 16700 13th Ave. W., P.O. Box 100, Lynnwood, WA 98046-0100, Tel: 206-743-1313, Telex: 32-8959, TWX: 910-449-2855

ELDEC CORP., Power Conversion Div., 16700 13th Ave. W., P.O. Box 100, Lynnwood, WA 98036, Tel: 206-743-1313, Telex: 32-8959, TWX: 910-449-2855

ELDEC CORPORATION, Sensing Systems Div., 16700 13th Ave. West, P.O. Box 100, Lynnwood, WA 98046-0100, Tel: 206-487-4000, Telex: 32-8959, TWX: 910-449-0873

ELDORADO INSTRS., 7303 Edgewater Dr., Oakland, CA 94621, Tel: 415-638-5656, TWX: 910-366-7258; FSC No.: 54495; *Sls. Mgr.:* Paul Magnusson

ELDRE CORPORATION, 1500 Jefferson Rd., Rochester, NY 14623, Tel: 716-427-7280, TWX: 510-253-4347; FSC No.: 19648; Empl.: 220; *Sls. Mgr.:* Harvey Erdle

Local Sales Offices & Reps

AL Huntsville, Elctrns. Mktg. Assocs. 205-837-7363
AZ Tucson, W.J.M. Sls. Co. 602-888-4847
CA Beverly Hills, ELDRE West 213-271-4485
CA Palo Alto, ELDRE West 415-325-0838
CO Denver, Spectrum Sls. 303-480-9991
FL Altamonte Springs, V. G. Sls. Co., Inc. 305-831-8688
FL Pompano Bch., V. G. Sls. Co., Inc. 305-971-0900
GA Atlanta, Electronic Mktg. Assocs. 404-448-1215
GA Norcross, Elctrns. Mktg. Assocs. 404-448-1215
IL Oak Park, ELDRE Midwest 312-383-1414
MD Ellicott City, Arbotek Assocs. 301-461-1323
MA Brookline, Harman Assocs. 617-232-6687
MO St. Louis, Cadon Techn. Sls. 314-645-8670
NJ Haddonfield, Tritek Sls. 609-429-1551
NM Albuquerque, W.J.M. Sls. Co. 505-898-5917
NY Rochester, ELDRE Corp. 716-427-7280
NC Raleigh, Electronic Mktg. Assocs. 919-847-8800
NC Winston-Salem, Ictrns. Mktg. Assocs. 919-722-5151
OH Cleveland, Marlow Assocs., Inc. 216-991-6500
OH Columbus, Marlow Assocs., Inc. 614-885-7643
OR Portland, Electronic Mktg. Grp. 503-252-0610
PA Pittsburgh, Marlow Assocs., Inc. 412-367-8886
SC Greenville, Elctrns. Mktg. Assocs. 803-233-4673
UT Ogden, Spectrum Sls. 801-972-8552
WA Redmond, Electronic Mktg. Grp. 206-882-0962

ELEC-TEK, INC., 10280 Alliance Rd., Cincinnati, OH 45242, Tel: 513-793-7937; FSC No.: 5U373; Empl.: 10; *Sls. Mgr.:* Rick Groth

ELECTRAC, INC., 1614 Orangethrope Way, Anaheim, CA 92801, Tel: 714-879-6021, Telex: 692433; FSC No.: 016154; Empl.: 21

ELECTRICAL INDS., 691 Central Ave., Murray Hill, NJ 07974, Tel: 201-464-3200, TWX: 710-984-7979; FSC No.: 20093; *Sls. Mgr.:* D.V. Wilson

ELECTRICAL INSTR. SVC., 25 Dock St., Mt. Vernon, NY 10550, Tel: 914-699-9717; FSC No.: 32590;16034A; Empl.: 35

ELECTRICAL PLASTICS CORP., 500 Long Branch Ave., Long Branch, NJ 07740, Tel: 201-870-9500; Empl.: 50

ELECTRICAL STANDARDS DIV., E.S.R.S., Inc., 7337 Greenbush, N. Hollywood, CA 91605, Tel: 818-765-4224; Empl.: 6

ELECTRIC DEVICE, PO Box 337, Canfield, OH 44406, Tel: 216-533-3060

ELECTRIC FIELD MEASUREMENTS, Box 326, W. Stockbridge, MA 01266, Tel: 413-637-1929; Empl.: 3; *Sls. Mgr.:* L. Hegl

Distributor

ELECTRIC SWITCHES, INC., 2478 Fletcher Dr., Los Angeles, CA 90039, Tel: 213-660-1310, TWX: 910-321-2971; Empl.: 42; *Sls. Mgr.:* Louis Lim ..... **B•1516,1517, pgs. 605, 614, 616, 632, 635, 637, 638, 639, 651, 657, 669, 672, 675, 676, 688, 689, 701, 709, 711, 719, 724, 726, 731, 736, 747, 751, 753, 766, 767, 768, 781, 786, 789, 794, 801, 803, 816.**

ELECTRIC TACHOMETER, 68th & Upland Sts., Philadelphia, PA 19142, Tel: 215-SA6-7723, Telex: 83-1475; FSC No.: 20049; Empl.: 50; *Sls. Mgr.:* F. M. Porter

ELECTRIC TIME COMPANY, INC., P.O. Box 298, Natick, MA 01760, Tel: 617-653-1341; FSC No.: 6645; Empl.: 10

ELECTRO ASSEMBLIES, 425 Huehl Rd. Bldg. 17, Northbrook, IL 60062, Tel: 312-498-6520

ELECTROCHEM INDS., Wilson Greatbatch Ltd., 10000 Wehrle, Clarence, NY 14031, Tel: 716-759-6901, Telex: 91-386; FSC No.: 6U589; *Sls. Mgr.:* R. Carey; *Dist. Mgr.:* L. Hanitz, M. Brookman

ELECTROCOM INDS., 1105 N. Ironwood Dr., S. Bend, IN 46615, Tel: 219-232-2743; FSC No.: 27114; *Sls. Mgr.:* B. Jaffe

ELECTRO COMP., INC., 2415 Main St., Stratford, CT 06497, Tel: 203-375-5811 ..... **A•1864-1865**

ELECTRO-CRAFT CORPORATION

ELECTRO-CRAFT, 1600 2nd St. S., Hopkins, MN 55343, Tel: 612-931-2700 ..... **B•1147-1149**

Local Sales Offices & Reps

CA	Westlake Village, Electro-Craft	818-889-3631
CO	Denver, Electro-Craft	303-839-5565
GA	Marietta, Electro-Craft	404-971-2669
IL	Palatine, Electro-Craft Corp.	312-991-4570
MA	Salem, Electro-Craft	603-893-5552
MN	Hopkins, Electro-Craft	612-931-2700
NH	Salem, Electro-Craft	603-893-5552
NJ	Cherry Hill, Electro-Craft	609-662-0555
OH	Cincinnati, Electro-Craft	513-474-4171

Local Distributors

Can	Edmonton, Alb., H.M. Mott Mktg., Ltd.	403-468-1292
Intl	England, Crewe, Electro-Craft, Ltd.	0270-584416
Intl	Finland, Helsinki, Stig Wahlstrom OY	90-5577 x51
Intl	France, Tekelec Airtronic	1-534-7535
Intl	Holland, Rotterdam, Van Gelder Compagnie B.V.	010-156622
Intl	India, Hyderabad, Kashinath & Co.	36942
Intl	Israel, Tel-Aviv, Abiry Agencies (1979), Ltd.	03-254106-253337
Intl	Italy, Milano, Pamoco S.r.l.	02-3452531/5
Intl	Japan, Tokyo 104, Midoriya Electric Co.	03-561-8851
Intl	Sweden, Johanneshov, L. Ostergren El.	08-815013
Intl	W. Germany, Darmstadt, Eduard Bautz G.m.b.H.	06151/82973
Intl	Hong Kong, Kowloon, Nanco Elctrns. Supp. Ltd.	3-335121-10
Intl	Japan, Toshima-Ku Tokyo, Sanyo Denki Co., Ltd.	03-917-5151
Intl	Korea, Seoul, Lucky-Gold Star Intl.	778-247315
Intl	Rep. of China, Taiwan, Sertek	02-7134022-7134027-7135435
Intl	Switzerland, Lohwisst Rasse, EME AG Zurich	019801111

ELECTROCUBE, 1710 So. Del Mar Ave., San Gabriel, CA 91776, Tel: 818-573-3300, TWX: 910-589-1609; FSC No.: 14752; Empl.: 175; *Sls. Mgr.:* E. F. Bryant; *Dist. Mgr.:* E. F. Bryant

ELECTRODATA, INC., 23020 Miles Rd., Bedford Heights, OH 44128, Tel: 216-663-3333, TWX: 810-427-2280; FSC No.: 34-1173465; Empl.: 15; *Sls. Mgr.:* Philip Ardire; *Dist. Mgr.:* Philip Ardire

ELECTRO DESIGN SYS., 100 W. 35th St., Ste. S, National City, CA 92050, Tel: 619-420-2351, Telex: 182827; Empl.: 35

ELECTRODYNAMICS

ELECTRODYNAMICS, INC., A Talley Inds. Co., 1200 Hicks Rd., Rolling Meadows, IL 60008, Tel: 312-259-0740, Telex: 28-1070; FSC No.: 10236; Empl.: 250; *Sls. Mgr.:* Frank Rafferty ..... **D•1119**

Local Sales Offices & Reps

CA	Alhambra, M. W. Riedel & Co.	213-283-7694
CA	Hayward, Avionics, Inc.	415-783-1131
CO	Denver, West, Inc.	303-773-8180
CT	Old Saybrook, FJS Assocs.	203-388-5374
FL	Clearwater, Delmac Sls.	813-447-5192
FL	Orlando, Delmac Sls.	305-898-4688
FL	Tamarac, Delmac Sls.	305-726-1330
IA	Cedar Rapids, J.R. Sales Engrg.	319-393-2232
MD	Severna Park, Delmarva Engrg. Assocs., Ltd.	301-647-8007
MA	Winchester, FJS Assocs.	617-729-3135
MN	New Brighton, TWC Sls.	612-636-1770
MO	Maryland Hgts., Midwest Meridian Corp.	314-878-4441
NJ	Clinton, Churchill Assocs.	201-735-8971
NY	Endicott, Noeth Honsinger Assocs.	607-754-3214
NY	Larchmont, Hingston Walsh Assocs., Inc.	914-834-5781
NY	Pittsford, Noeth Honsinger Assocs.	716-586-9002
OR	Portland, Caruso & Northcutt	503-646-4973
PA	Norristown, Rivco January Inc.	215-631-1414
TX	Hurst, Midwest Meridian	817-654-2132
UT	Salt Lake City, Meridian West	801-466-5739
WA	Bothwell, Caruso & Northcutt	206-454-9699

ELECTRO-DYNAMICS DEV. CO., 475 Mt. Hood Dr. S.W., Issaquah, WA 98027, Tel: 206-392-2493; *Sls. Mgr.:* W. A. Pommer

ELECTROFILM, 27727 Avenue Scott, Valencia, CA 91355, Tel: 805-257-2240, Telex: 65-1438; FSC No.: 85932; Empl.: 250; *Sls. Mgr.:* George Hulett

ELECTRO-FILMS, INC., 111 Gilbane St., Warwick Central Indl. Pk., Warwick, RI 02886, Tel: 401-738-9150, TWX: 710-382-0405; Empl.: 100; *Sls. Mgr.:* Frank Urrico ..... **A•1866-1867**

Local Sales Offices & Reps

CA	Santa Ana, Weatherman Assocs.	714-544-1304
CA	Sunnyvale, NES Assocs.	408-738-3259
GA	Doraville, BCI, Inc.	404-455-0405
IL	Hinsdale, Willtech Corp.	312-655-4850
IN	Indianapolis, CC Electronics	317-255-1508
MA	Allston, Vector Sls.	617-787-2790
MA	Boston, Vector Assocs.	617-787-2790
MI	Livonia, Electro Sls. Assocs.	313-474-7320
MN	Minneapolis, Comprehensive Tech. Sls.	612-888-7011
NM	Albuquerque, Grady Moore Assocs.	505-262-1416
NY	Kew Gardens, Robert Smith Assocs.	212-780-0097
NY	New York, Robert Smith Assocs.	212-541-4885
NY	Plainview, Robert Smith Assocs.	516-681-3155
NY	Syracuse, Labtronics	315-455-7314
NC	Charlotte, BCI, Inc.	704-567-0473
NC	Raleigh, BCI, Inc.	919-781-9426
OH	Cleveland, Electro Sls. Assocs.	216-261-5440
OH	Dayton, Electro Sls. Assocs.	513-426-5551
PA	Allison Park, Electro Sls. Assocs.	412-487-3801
PA	Colman, EL Assocs.	215-822-2510
PA	Oreland, EFW Tech. Sls.	215-887-5300
TX	Austin, J. Clay Co.	512-346-7340
TX	Dallas, J. Clay Co.	214-350-1281
TX	Houston, Elctrn. Mktg. Assocs.	713-498-8120
WA	Seattle, MARS	206-747-3292
EXP	MA, Plainville, Teknis, Inc.	617-695-3591

ELECTRO IMPULSE, Box 870, Red Bank, NJ 07701-0870, Tel: 201-741-0404, TWX: 710-722-5717; FSC No.: 91161; Empl.: 99; *Sls. Mgr.:* Mark Rubin ..... **C•1637; D•1211**

Local Sales Offices & Reps

CA	Los Angeles, RDH Assocs.	213-396-4100
MA	Reading, Geder Assocs.	617-944-3105
NY	Greenvale, B. D. Aaron & Co.	516-621-0630
TX	Richardson, Spectra Sls. Corp.	214-234-3600
EXP	NJ, Oradell, Sylvan Ginsbury Ltd.	201-261-3200

Local Distributors

CA	Los Angeles, RDH Assocs.	213-396-4100
MA	Reading, Geder Assocs.	617-944-3105
NJ	Oradell, Sylvan Ginsbury	201-261-3200
NY	Greenvale, Bertram D. Aaron & Co.	516-621-0630
TX	Richardson, Spectra Sls.	214-234-3600

ELECTRO INDUSTRIES, Div. E.I. Elctrns., Inc., 1800 Shames Drive, Westbury, NY 11590, Tel: 516-334-0870; Empl.: 20; *Sls. Mgr.:* S. Kagan ..... **D•1350-1351**

For further information call toll free: 800-645-6342

ELECTRO KINETICS CO., Sub. HTL Inds., Inc., 402 E. Gutierrez St., Santa Barbara, CA 93102, Tel: 805-963-2055, TWX: 910-334-1177; FSC No.: 02101; Empl.: 260; *Sls. Mgr.:* N.G. Otis

ELECTROL

ELEC-TROL, INC., 26477 N. Golden Valley Rd., Saugus, CA 91350, Tel: 805-252-8330, Telex: 310-372-0331; FSC No.: 15636; Empl.: 650; *Sls. Mgr.:* Frank Cooper; *Dist. Mgr.:* Barbara J. Owens ..... **B•1332-1342**

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrn. Assocs.	205-881-5031
AZ	Scottsdale, TC Electronics	602-944-5153
AR	Little Rock, Beacon Elctrn. Assocs.	501-224-5449
CA	Garden Grove, Elsco	714-891-4621
CA	San Jose, Jeff Mallman	408-972-9072
CO	Denver, Elcom	303-337-2300
FL	Boca Raton, Beacon Elctrn. Assocs.	305-392-3500
FL	Clearwater, Beacon Elctrn. Assocs.	813-796-2378
FL	Maitland, Beacon Elctrn. Assocs.	305-647-3498
FL	Melbourne, Beacon Elctrn. Assocs.	305-724-8010
GA	Atlanta, Beacon Elctrn. Assocs.	404-256-9640
IL	Des Plaines, Lincoln, Hodges & Assocs.	312-297-3810
IN	Granger, Gregory Sls.	219-272-9626
KS	Overland Park, John F. Guernsey Co.	913-381-2225
MA	Framingham, Stone Comps.	617-875-3266
MN	Minneapolis, Westlund & Assoc.	612-866-5002
MO	Florissant, John F. Guernsey Co.	314-921-5720
NY	Clark Mills, KLM-Garner Co.	315-853-6126
NY	Mt. Vernon, Sonkin Assocs.	914-968-8282
NY	North Syracuse, KLM-Garner Co.	315-458-6214
NY	Pittsford, KLM-Garner Co.	716-381-8350
NC	Greensboro, Beacon Elctrn. Assocs.	919-275-9997
OH	Columbus, Mulligan & Assoc.	614-457-2242
OR	Portland, Earl & Brown Co.	503-245-2283
PA	Birchrunville, Jadelectronics	215-296-3800
TX	Houston, Aid Elctrns.	713-955-6204
TX	Irving, Aid Elctrns.	214-790-4761
UT	Salt Lake City, Elcom	801-485-7415
WA	Seattle, Earl & Brown Co.	206-284-1121
WI	Waukesha, Lincoln, Hodges & Assocs.	414-542-3087

Local Distributors

AL	Huntsville, Component Distrs.	205-883-7501
AZ	Tempe, Acacia Sls.	602-894-2874
CA	Anaheim, Arrow Elctrns.	714-774-5290
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Irvine, Acacia Sls.	714-549-0954
CA	San Carlos, Control Design	415-592-4806
CA	San Diego, Acacia Sls.	619-565-4365
CA	San Diego, Arrow Elctrns.	619-565-4800
CA	Santa Clara, Patane/Selectronics	408-496-6151
CA	Santa Monica, Master Distrs.	213-452-1229
CA	Sunnyvale, Acacia Sls.	408-745-7200
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CA	Van Nuys, Patane Avionics	213-988-4455
CO	Denver, Arrow Elctrns.	303-758-2100
CO	Lakewood, Acacia Sls.	303-232-2882
CT	Wallingford, Arrow Elctrns.	203-265-7741
FL	Clearwater, Diplomat Elctrns.	813-443-4514
FL	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
FL	Ft. Lauderdale, Component Distrs.	305-971-4950
FL	Palm Bay, Arrow Elctrns.	305-725-1480
IL	Bensenville, Diplomat Elctrns.	312-595-1000
IL	Itasca, Voyager Elctrns.	312-773-4900
IN	Indianapolis, Arrow Elctrns.	317-243-9353
MA	Framingham, Jaks Elctrns.	617-875-3266
MA	Woburn, Arrow Elctrns.	617-933-8130
MA	Woburn, Diplomat Elctrns.	617-935-6611
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MN	Edina, Arrow Elctrns.	612-830-1800
MN	Fridley, Voyager Elctrns.	612-571-7766
MO	St. Louis, Arrow Elctrns.	314-567-6888
NH	Manchester, Arrow Elctrns.	603-668-6968
NJ	Fairlawn, Relay Specialties	201-797-3313
NJ	Moorestown, Arrow Elctrns.	609-235-1900
NJ	Saddle Brook, Arrow Elctrns.	201-797-5800
NY	Farmingdale, Arrow Elctrns.	516-694-6800
NY	Farmingdale, Arrow Elctrns.	516-293-6363
NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Liverpool, Arrow Elctrns.	315-652-1000
NY	Rochester, Arrow Elctrns.	716-275-0300
NY	Rochester, Simcona Elctrns. Corp.	716-328-3230
NY	Yonkers, Kin-Tronics	914-968-7736
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Winston Salem, Arrow Elctrns.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Dayton, Bell Inds.	513-435-8660
OH	Solon, Repco	216-248-8900
OR	Beaverton, Acacia Sls.	503-646-3377
PA	Monroeville, Arrow Elctrns.	412-856-7000
PA	Philadelphia, Shap Elctrns.	215-969-3300
TX	Dallas, Arrow Elctrns.	214-386-7500
TX	Houston, Force Elctrns. Co. of TX	713-772-8510
TX	Irving, Force Elctrns. Co. of TX	214-438-5700
TX	Stafford, Arrow Elctrns.	713-491-4100
UT	Salt Lake City, Diplomat Elctrns.	801-486-4134
WA	Bellevue, Arrow Elctrns.	206-643-4800
WI	Oak Creek, Arrow Elctrns.	414-764-6600

ELECTROL CO., 321 Dewey St., P.O. Box 29, York, PA 17405, Tel: 717-848-1722; Empl.: 30; *Sls. Mgr.:* Debra Dudley; *Dist. Mgr.:* Debra Dudley

ELECTROLOGIC, INC., 1359 28th St., Signal Hill, CA 90806, Tel: 213-595-0551; FSC No.: 213-595-0554; Empl.: 8; *Sls. Mgr.:* Don Masadao

ELECTROMAGNETIC INDUSTRIES, INC., Box 6440, Clearwater, FL 33518, Tel: 813-447-2511

ELECTRO-MAGNETIC PROCESSES, INC., 9616 Owensmouth Ave., Chatsworth, CA 91311, Tel: 818-882-6333, Telex: 499 2240 EMP UI; FSC No.: 51290; Empl.: 70; *Sls.-Mgr.:* Arthur Sullivan

ELECTRO MATERIALS CORP. AMER., See EMCA, Sub. Rohm & Haas Advanced Matls. Co.

ELECTROMATIC CONTROLS CORP., 2495 Pembroke Road, Hoffman Estates, IL 60195-2010, Tel: 312-882-5757, TWX: 910-222-3452; FSC No.: 75203; Empl.: 400; *Sls. Mgr.:* Robert Martin

ELECTROMECH, INC., 528 Elm Street, Kearny, NJ 07032, Tel: 201-997-0950; Empl.: 40; *Sls. Mgr.:* Solomon Ezraseneh ..... **A•2134**

ELECTRO MECHANICAL DESIGN SERVICES, INC., 16698 Oakmont Ave., Gaithersburg, MD 20877, Tel: 301-840-5710; *Sls. Mgr.:* Patrick E. Roney

ELECTRO-MECHANICS CO., Box 1546, Austin, TX 78767, Tel: 512-835-4684, Telex: 767178

electro-mechanisms INCORPORATED

ELECTRO-MECHANISMS, 2745 E. Huntington Dr., Duarte, CA 91010, Tel: 818-359-2535; FSC No.: 52592; Empl.: 27 ..... **B•1466-1467**

Local Sales Offices & Reps

CA	Arcadia, Van Gott & Assoc.	818-445-9729
CA	Redwood City, Hickey Indl. Sls.	415-368-3849
CA	San Diego, Van Gott & Assocs.	619-280-1041
CO	Lakewood, Cristee-Meade Co.	303-232-0287
FL	Ft. Meyers, Rainbow Sls., Inc.	813-332-2210
IL	Addison, Engrd. Sls. Co.	312-832-8425
MD	Baltimore, R. P. Luce	301-752-8200
MN	St. Paul, Vikeland Sls., Inc.	612-645-4647
NJ	Piscataway, R. P. Luce	201-752-8750
NY	Buffalo, Good Comps.	716-634-4400
NY	New Hyde Park, R. P. Luce	516-437-4550
NC	Raleigh, G. P. O'Malley & Assoc., Ltd.	919-848-9865
OH	Dayton, Harvey Teplitz	513-898-4330
PA	Philadelphia, R. P. Luce & Co.	215-233-0999
TX	Dallas, Marcom	214-351-4532
WA	Vancouver, Ray Over Sls.	206-695-6179

ELECTRO-MECH COMPS., 1826 N. Floradale Ave., So. El Monte, CA 91733, Tel: 818-442-7180; FSC No.: 07150; Empl.: 75; *Sls. Mgr.:* Walter H. Trumbull; *Dist. Mgr.:* Margaret W. Ambrose ..... **B•1562-1563**

Local Sales Offices & Reps

CA	Los Angeles, Universal Comps. Co.	213-641-4255
CA	San Diego, Qualtronics	619-560-8955
CA	Santa Clara, Engrg. Assocs.	408-988-5001
CO	Englewood, Franklin Sls.	303-789-2526
CT	Milford, Todino Engrg.	203-874-6643
FL	Orlando, Publicover	305-898-9361
IL	Chicago, Indl. Rep.	312-647-7755
IN	Fort Wayne, Scott Elctrns.	219-484-7865
IN	Indianapolis, Scott Elctrns.	317-897-9976
MA	Needham Hgts., Todino Engrg.	617-444-7925
MI	Brighton, Michigan Mktg. & Sls.	313-229-6218
MN	Minneapolis, D. A. Case Assocs.	612-869-3700
NJ	Medford, Comp. Conslts.	609-654-5300
NY	Camillus, SHR	315-487-3232
NY	Mamaroneck, Bassin Tech.	914-698-9332
OH	Cincinnati, Scott Elctrns.	513-791-2513
OH	Cleveland, Scott Elctrns.	216-473-5050
OH	Dayton, Scott Elctrns.	513-294-0539
OH	Reynoldsburg, Scott Elctrns.	614-863-1281
OR	Forest Grove, Doran Sls.	503-357-3333
PA	Pittsburgh, Scott Elctrns.	412-963-6116
TX	Leander, McCoy Assocs.	512-259-1109
TX	Richardson, McCoy Assocs.	214-238-1017
VA	Front Royal, Eltron	703-635-7201
WA	Redmond, Doran Sls.	206-885-1885
WI	Milwaukee, Indl. Rep.	414-259-0965

Local Distributors

AZ	Phoenix, Parts Elctrn.	602-258-6476
CA	Los Angeles, Elec. Distr.	213-660-1310
CA	Los Angeles, Master Distrs.	213-452-1229
FL	Pompano Beach, Components South	305-971-0350
NY	Buffalo, Genesee Radio & Parts	716-873-9661
NY	Mamaroneck, Logi Comp Elctrns.	914-698-9332
Intl	England, Kensington, London, G.E. Elctrns.	01-727 0711/3
Intl	Israel, Holon, M.S.R. Engrg. & Dev.	847686
Intl	Switzerland, Oberengstringen, G & P Elctrns.	(01)643231/644555

ELECTRO-METRICS, Penril Corp., 100 Church St., Amsterdam, NY 12010, Tel: 518-843-2600, TWX: 710-446-4798; FSC No.: 18581; Empl.: 105; *Sls. Mgr.:* David Cook

ELECTRO NATL., Matthews Ave., Canton, MS 39046, Tel: 601-859-5511, TWX: 810-990-0938; FSC No.: M-54208; Empl.: 40

ELECTRONETICS, INC., Paine Field Bldg 335, Everett, WA 98204, Tel: 206-355-1855; Empl.: 10

ELECTRON, INC., P.O. Box 28640, San Diego, CA 92128, Tel: 216-681-4700, Telex: 98-0240; Empl.: 85

ELECTRONIC COIL CORP., Farmington Industrial Park, Farmington, CT 06032, Tel: 203-677-6731; Empl.: 127; *Sls. Mgr.:* Raymond Gorski, Jr.

ELECTRONIC COMPONENT ASSEMBLY, INC., 9500 Alto Drive, La Mesa, CA 92041, Tel: 619-464-0910; Empl.: 70; *Sls. Mgr.:* Daniel J. McGillicuddy

ELECTRONIC COMPONENTS GROUPE

ELECTRONIC COMPONENTS GROUPE, Stein Industries, Inc., 14143 21st Ave. No., Minneapolis, MN 55441, Tel: 612-559-0720, TWX: 910-576-1725; *Sls. Mgr.:* Ehrhard Goebel; *Dist. Mgr.:* Tom Coey ..... **B•1566**

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Scottsdale, SMS & Assocs.	602-998-0831
AR	Little Rock, Beacon Elctrns.	501-224-5449
CA	Cupertino, F & F Assocs.	408-446-2349
CA	Marina Del Ray, Spec-Rep, Inc.	213-827-7767
CO	Englewood, Electronic Comp. Sls.	303-781-5904
FL	Clearwater, Beacon Elctrns.	813-796-2378
FL	Ft. Lauderdale, Beacon Elec.	305-491-1054
GA	Atlanta, Beacon Elctrns.	404-256-9640
IL	Downers Grove, Richmar Elec.	312-968-0118
IN	Indianapolis, Insul-Reps	317-842-5203
IA	Cedar Rapids, Palatine	319-365-8071
KS	Mission, Palatine	913-831-0555
MA	Plainville, Enterprise Tech., Inc.	617-695-4700
MN	Minneapolis, Comps. Representative Groupe	612-894-8055
MO	Hazelwood, Palatine	314-839-0800
NJ	Ho-Ho-Kus, D. J. Fisher Co., Inc.	201-652-0090
NM	Albequerque, Syntech	505-266-7951
NY	Fairport, TAC Sls., Inc.	716-425-1070
NC	Raleigh, Beacon Elctrns.	919-787-0330
OH	Cleveland, Components, Inc.	216-243-9200
OK	Tulsa, Southern States Mktg.	918-369-3233
TX	Austin, Southern States Mktg.	512-473-2741
TX	Houston, Southern States Mktg.	713-558-4900
TX	Richardson, Southern States Mktg.	214-238-7500
UT	Salt Lake City, Quality Comp. Sls.	801-268-8000
VA	Fairfax, Beacon North, Inc.	703-591-1300
WA	Kirkland, A/D Elctrns.	206-821-3205
WI	Butler, Richmar Elctrns.	414-781-1730

Local Distributors

CA	Hollywood, Yale Radio	213-465-3186
CA	Manhattan Beach, Prime Electro	213-379-3642
CA	Mountain View, Target Elctrns.	415-961-1170
CA	San Carlos, Logan Elec.	415-594-0700
CO	Englewood, Industrial Elctrns.	303-694-9444
CT	Shelton, Century Elec. Supp.	203-736-2684
MD	Beltsville, PSI	301-937-4960
MD	Columbia, D. K. Elctrns.	301-995-1950
MN	Mpls., Glenmark, Inc.	612-941-4825
WA	Seattle, Radar Elec.	509-747-3053

ELECTRONIC CONCEPTS, INC., Box 627 E, Eatontown, NJ 07724, Tel: 201-542-7880, Telex: 7107226661; Empl.: 240; *Sls. Mgr.:* Philip N. Lepore ..... **A•1072-1077**

Local Sales Offices & Reps

AZ	Tempe, Piper Sls. Co.	612-949-0048
CA	Colton, Elctrn. Concepts, Inc.	714-824-2525
CA	La Mirada, Select Elctrns.	714-739-8891
CA	Los Gatos, Elctrn. Concepts, Inc.	408-395-4224
CA	San Jose, Landia Sls. Grp.	408-280-5695
CO	Aurora, Sage Sls.	303-750-3501
FL	Sunrise, Electronic Concepts, Inc.	305-748-4604
IL	Wheaton, Elctrn. Concepts, Inc.	312-668-8747
MA	Wakefield, Omni-Rep	617-245-4511
MN	Minneapolis, Components Grp.	612-374-1250
MO	Grandview, Harris-Hanson Co.	816-763-6200
NJ	Englewood Cliffs, Ed Glass Assocs.	201-592-0200, 212-586-8440
OR	Portland, Components West	503-684-1671
MO	St. Louis, Harris-Hanson Co.	314-432-3611
PA	Lansdale, Industrial Comps., Inc.	215-368-3382
TX	Austin, Milred Assocs., Inc.	512-459-8602
TX	Houston, Milred Assocs., Inc.	713-937-0127
TX	Richardson, Milred Assocs., Inc.	214-644-6731
UT	Salt Lake City, Sage Sls.	801-467-5451
WA	Seattle, Components West	206-885-5880

Local Distributors

IL	Chicago, Nep Elctrns.	312-625-8400
NJ	Teterboro, Elcon Sls.	201-288-8170
TX	Dallas, R. V. Weatherford	214-931-7333
TX	Houston, R. V. Weatherford	713-688-7406
WI	New Berlin, Nep Elctrns.	414-785-9100

ELECTRONIC CONNECTOR DIV., Midland-Ross Corp., One Alewife Pl., Cambridge, MA 02140, Tel: 617-491-5400; *Sls. Mgr.:* Jim Gomes; *Dist. Mgr.:* Karen McMillan

electro-mech

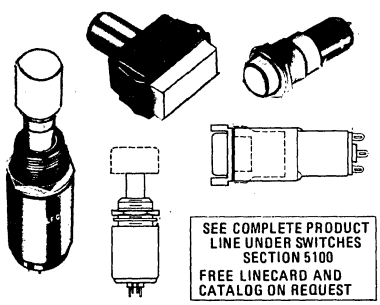
FULL LINE
AUTHORIZED DISTRIBUTOR

E S I

ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

ELECTRONIC CONTROLS, INC., 561 Tamarack Ave., Brea, CA 92621, Tel: 714-990-0850; Empl.: 9

ELECTRONIC CONTROLS DESIGN, 13626 S. Freeman Rd., Mulino, OR 97042, Tel: 503-829-9108, Telex: 703874 ECDINC UD; Empl.: 103; *Sls. Mgr.:* Rex Breunsbach

ELECTRONIC CONVENTIONS, INC., P.O. Box 92275, Worldway Postal Ctr., Los Angeles, CA 90009, Tel: 213-772-2965; *Sls. Mgr.:* William C. Weber, Gen. Mgr.

ELECTRONIC DEV. CORP., 11 Hamlin St., Boston, MA 02127-4198, Tel: 617-268-9696, Telex: 951596; FSC No.: 12619; *Sls. Mgr.:* R. B. Ross ..... **D•1213-1215**

Local Sales Offices & Reps

AL	Huntsville, MOCO	205-881-5968
AZ	Phoenix, R. A. Mayes Co.	602-279-5243
CA	Costa Mesa, Feeger, Lucas, Wolf	714-751-7512
CA	Hayward, Feeger, Lucas, Wolf	415-786-9070
CA	San Diego, Feeger, Lucas, Wolf	619-277-0993
CA	Van Nuys, Feeger, Lucas, Wolf	213-989-5237
CO	Englewood, R. A. Mayes Co.	303-761-9447
FL	Winter Haven, Lee Assocs.	813-294-5815
IL	Hoffman Estates, Carvel Engrg.	312-885-8800
IN	Carmel, Berndt Assocs.	317-844-0114
KS	Overland Park, Ramsey Assts.	913-649-6996
MD	Gaithersburg, Powell-Pendergraph	301-921-4200
MA	Hudson, Datarep	617-481-0333
MI	Hazel Park, Tiby Co.	313-547-3550
MN	Edina, Carvel Engrg. & Sls.	612-835-7929
MO	St. Louis, Ramsey Assocs.	314-878-5042
NM	Albuquerque, R. A. Mayes Co.	505-292-2330
NY	E. Syracuse, Ossmann Instrs.	315-437-7052
NY	Rochester, Ossmann Instrs.	716-442-6990
NY	White Plains, Cane Techn. Sls.	914-694-9240
NC	Raleigh, Lee Assocs.	919-848-8818
OH	Cleveland, Tiby Co.	216-371-5335
OH	Dayton, Tiby Co.	513-277-3822
OR	Portland, Topp Engrg. Sls.	503-244-7265
PA	Willow Grove, Powell-Pendergraph	215-657-0330
TX	Dallas, Tech Rep Mktg.	214-241-2434
TX	El Paso, R. A. Mayes Co.	Enterprise 750
TX	Kemah, Hi Tech Sys.	713-783-3856
UT	West Jordan, R. A. Mayes Co.	801-292-6781
VT	Burlington, Data Reps.	802-864-0933
VA	Richmond, Powell-Pendergraph	804-270-1400
WA	Bellevue, Topp Engrg. Sls.	206-747-5400
WI	New Berlin, Carvel Engrg.	414-784-7007

ELECTRONIC DEVELOPMENT LABS., See EDL Inc.

ELCTRN. DEVICES, 21 Gray Oaks Ave., Yonkers, NY 10710, Tel: 914-965-4400, TWX: 710-560-0021; Empl.: 200; *Sls. Mgr.:* Dennis Dean; *Dist. Mgr.:* Dennis Dean

ELECTRONIC ENCLOSURES, Div. Wyle Labs, 225 South Aviation Blvd., El Segundo, CA 90245, Tel: 213-643-8181, TWX: 910-348-6699; FSC No.: 09097; Empl.: 400; *Sls. Mgr.:* Hillard W. Sorey ..... **C•1056**

Local Sales Offices & Reps

AL	Huntsville, Macro Mktg. Assocs.	205-833-9630
CA	Campbell, Carlson, Bob	408-370-1284
CA	Los Angeles, Chris Allen Elec. Encl.	213-643-8181
CA	San Diego, De LaTorre & Assocs.	213-323-0922
CO	Denver, Odyssey 1	303-688-3555
FL	Palmetto, Southeast Tech. Sls., Inc.	813-729-3112
IL	Elmhurst, Scott Assocs.	312-279-5681
MD	Randallstown, Imagitron Sls. Co.	301-521-2020
MI	Jackson, Norwood Scroggs Co.	517-750-1170
MN	St. Paul, Charles E. Bohlig & Assocs.	612-944-8404
NJ	Pennsauken, Elctrn. Encls.	609-665-6810
NJ	Randolph, D. Despins Elctrn. Encls.	201-361-2864
NM	Albuquerque, Odyssey 1	505-265-6645
NY	Binghamton, Precision Sls.	607-648-8833
NY	Liverpool, Precision Sls.	315-451-3480
NY	Pittsford, Precision Sls.	716-381-2820
NY	Pleasant Valley, Precision Sls.	914-635-3233
NY	Syracuse, Precision Sls.	315-472-3010
OH	Dayton, Technical Dvcs. Co.	513-890-6811
OR	Portland, Jas. J. Backer Co.	503-297-3776
TX	Houston, Zonk Engrg. Co.	713-895-9131
TX	Richardson, Zonk Engrg. Co.	214-238-7651
WA	Seattle, Jas. J. Backer Co.	206-285-1300

ELECTRONIC ENGRG. CO. OF CAL., See EECO

ELECTRONIC HARDWARE, 320 Broad Hollow Rd., Farmingdale, NY 11735, Tel: 516-752-1950; Empl.: 100

E&S

ELECTRONIC INSTR. & SPECIALTY CORP., 42 Pleasant St., Stoneham, MA 02180, Tel: 617-438-5300, Telex: 948-025; FSC No.: 14908; Empl.: 180 ..... **B•1344-1345**

Local Sales Offices & Reps

AL	Huntsville, JWL Assocs.	205-881-0413
AL	Huntsville, REMCO (Rakes Engr. & Mktg. Corp.)	205-533-3763
AZ	Glendale, Southwest Elctrn. Mktg.	602-278-0500
CA	Escondido, Cirolia Elctrn. Sls. Inc.	619-489-2452
CA	Granada Hills, C & W Comps.	213-368-4032
CA	Hayward, Pacific Mktg. Inc.	415-887-1620
CA	San Diego, Cirolia Elctrn. Sls.	619-743-3015
CO	Golden, J. F. Hurlbut Co.	303-279-7796
FL	Lighthouse Point, Jack Krutek & Assocs.	305-941-6544
GA	Atlanta, REMCO (Rakes Engr. & Mktg. Corp.)	404-447-6937
IL	Lincolnwood, Saffro & Assocs., Inc.	312-677-9720
IN	Carmel, Brainard-Wilson Mktg.	317-844-2800
MD	Woodbine, Naudain Assocs.-Southern	301-442-2270
MA	Stoneham, E I & S	617-438-5300
MN	Minneapolis, Peterson Sls. & Assocs.	612-944-0030
NJ	Perth Amboy, Astrorep	201-826-8050/51
NY	Babylon, Astrorep	516-422-2500
NY	Buffalo, Lynn Assocs., Inc.	716-631-0054
NC	Raleigh, REMCO	919-847-5079
OH	Cleveland, Jim Finnegan & Co.	216-238-5905
OR	Portland, SPS Elctrns.	503-297-6919
PA	Norristown, Rivco-January Inc.	215-631-1414
PA	Willow Grove, Harry Nash Assoc.	215-657-2213
TX	Dallas, P. J. Scanlon Co. Inc.	214-231-4661
UT	Salt Lake City, J. F. Hurlbut Co.	801-973-4443
WA	Redmond, SPS Elctrns.	206-323-4140
WA	Seattle, SPS Elctrns.	206-323-4140
WI	Lake Mills, Saffro & Assocs.	414-648-2605

Local Distributors

CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Santa Clara, Cypress Elctrns.	408-727-7080
CA	Torrance, Cypress Elctrns.	215-530-1900
CT	New Haven, The Greene-Shaw Co.	203-397-0710
MD	Columbia, DK Elctrns.	301-995-1950
MA	Billerica, A. W. Mayer Co.	617-229-2255
MA	Newton, The Greene-Shaw Co.	617-969-8900
NJ	Fairlawn, Relay Specialties	201-797-3313
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NY	Troy, Trojan Elctrn. Supp. Co.	518-274-4481
OK	Tulsa, Radio, Inc.	918-587-9123
TX	Houston, Gaumer Co.	713-460-5200

ELCTRN. INSTR. & SPEC. CORP., MC DIV., See Millen Comps.

ELECTRONIC KITS INTL., INC., 791 Redrock Rd., St. George, UT 84770, Tel: 801-628-3627; *Sls. Mgr.:* Gary Gibson; *Dist. Mgr.:* Charles Meinkey

ELECTRONIC MEASUREMENTS, 405 Essex Rd., Neptune, NJ 07753, Tel: 201-922-9300, Telex: 132-424; Empl.: 250; *Sls. Mgr.:* Charles Lehmann ... **D•1622-1625**

Local Sales Offices & Reps

AL	Huntsville, Sci. Devices	205-536-1969
AZ	Phoenix, Sci. Devices	602-957-0401
CA	Huntington Beach, Sci. Devices	714-840-3501
CA	San Diego, Sci. Devices	619-573-0157
CA	San Jose, Sci. Devices	408-554-0455
CO	Broomfield, Sci. Devices	303-469-5145
FL	Orlando, Sci. Devices	305-841-8180
GA	Marietta, Sci. Devices	404-427-8660
IL	Chicago, Comtel	312-539-4838
IN	Indianapolis, Comtel	317-253-1681
IA	Cedar Rapids, Comtel	319-377-9434
MA	Winchester, FJS Assoc.	617-729-3135
MI	Southfield, Comtel	313-358-2510
MN	Wayzata, Comtel	612-476-1551
NM	Albuquerque, Sci. Devices	505-883-3668
NY	East Syracuse, Ossmann Insts.	315-437-7052
NJ	Ridgefield, Rical Assocs.	201-945-5250
NC	Winston-Salem, Sci. Devices	919-765-5776
OH	Dayton, WKM Assoc.	513-434-7500
PA	Pittsburgh, WKM Assoc.	412-892-2953
PA	Plymouth Meeting, Electronic Mktg. Assocs.	215-828-7400
TX	Austin, Alphatech	512-458-9179
WA	Bellevue, Al Smith Co.	206-746-6770
WA	Vancouver, Al Smith Co.	206-892-9912
WI	New Berlin, Comtel	414-544-6042

EMC

ELCTRN. MOLDING CORP., 96 Mill St., Woonsocket, RI 02895, Tel: 401-769-3800, TWX: 710-387-1350; FSC No.: 17117; Empl.: 350; *Sls. Mgr.:* Scott R. Tate; *Dist. Mgr.:* Irene S. Dulude ..... **C•1186-1188, 1698, 1706-1709**

Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean of GA	205-830-1540
AZ	Scottsdale, EDP & Assocs., Inc.	602-991-6119
CA	Huntington Beach, Pegasus	714-964-8731
CA	Mountain View, West Mark Assocs.	415-969-1700
CA	Torrance, EMC	213-325-5801
CO	Englewood, Delta Sls., Inc.	303-799-0646
FL	Deerfield Beach, Cartwright & Bean of FL	305-429-3400
FL	Orlando, Cartwright & Bean of FL	305-422-4531
GA	Atlanta, Cartwright & Bean of GA	404-233-2939
IL	Oak Brook, Winner Co.	312-655-3545
IN	Ft. Wayne, Denton Mktg.	219-627-5525
KS	Shawnee Mission, Lowell-Kangas & Assocs.	913-631-3515
LA	Kenner, Cartwright & Bean of TN	504-466-0020
MD	Pasadena, Macrotech Assocs.	301-437-5588
MA	Needham Heights, Todino Engrg. Sls.	617-444-7925
MI	Ferndale, Hilltronics, Inc.	313-398-5556
MN	Hopkins, The Kits Co.	612-933-1888
MS	Jackson, Cartwright & Bean of TN	601-981-1170
MO	St. Louis, Lowell-Kangas & Assocs.	314-821-4050
NJ	Englewood, Harold Gray Assocs.	201-894-0894
NJ	Sicklerville, Brown Assocs.	609-629-2240
NY	Binghamton, Empire Tech. Assocs.	607-772-0651
NC	Charlotte, Cartwright & Bean of GA	704-377-5673
NC	Raleigh, Cartwright & Bean of GA	919-781-6560
TN	Knoxville, Cartwright & Bean of TN	615-693-7450
TN	Memphis, Cartwright & Bean of TN	901-276-4442
TX	Austin, Mil-Rep Assocs.	512-459-8602
TX	Houston, Mil-Rep Assocs.	713-937-0127
TX	Richardson, Mil-Rep Assocs.	214-644-6731
UT	Salt Lake City, Delta Sls., Inc.	801-487-7571
Can	Brampton, Ont., Clark-Hurman Assocs.	416-453-1118
Can	Nepean, Ont., Clark-Hurman Assocs.	613-727-5626

Local Distributors

AL	Huntsville, Electro-Wise, Inc.	205-830-4764
AZ	Phoenix, Heilind Elctrns.	602-437-1060
CA	El Segundo, Force Elctrn.	714-522-1324
CA	San Jose, Force Elctrn.	408-943-1324
CO	Denver, C.S.I.D.	303-292-9594
CO	Wheat Ridge, ACT	303-422-9229
CT	Bethel, Heilind Elctrns.	203-797-8600
CT	Bridgeport, Millenium Elctrns.	203-372-2037
FL	Melbourne, Action Elctrns.	305-725-4920
FL	Orlando, Axtech Elctrns.	305-291-1681
IL	Elk Grove Village, Nu Way Elctrns.	312-437-7120
IA	Cedar Rapids, Bergquist	319-277-5155
MD	Columbia, Aztech Elctrns.	301-995-1760
MA	Boston, Vector Sls.	617-787-2790
MA	Burlington, Heilind Elctrns.	617-272-5610
MA	Woburn, EPC	617-935-0400
MI	Grand Rapids, Calder Elctrns	616-698-7400
MN	Minneapolis, Bergquist	612-835-2322
NJ	Pennsauken, RESCO Elctrns.	609-662-4000
NJ	Union, Meridian Supp. Co.	201-839-8665
NM	Albuquerque, Betatron	505-344-2381
NM	Albuquerque, International Elctrns.	505-345-8127
NY	Bohemia, L.I., Car-Lac Elctrns.	516-567-4200
NY	Lynbrook, L.I., Peerless Radio Corp.	516-593-2121
NY	Millbrook, Villarreal Elctrns.	914-677-3447
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Suffern, Nobel Elctrns.	914-357-4500
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Cincinnati, Schuster Elctrns.	513-489-1400
OH	Twinsburg, Schuster Elctrns.	216-425-8134
OK	Tulsa, Altair Co.	918-252-5781
OR	Beaverton, Norvac Elctrns.	503-644-1025
PA	Allentown, Lehigh Elctrns.	215-433-3045
TX	Austin, Altair Co.	512-837-4970
TX	Austin, Heilind Elctrns.	512-834-9711
TX	Dallas, Heilind Elctrns.	214-351-2050
TX	Dallas, International Elctrns.	214-233-9323
TX	El Paso, International Elctrns.	915-598-3406
TX	Houston, Altair Co.	713-462-3029
TX	Houston, Lenert Co.	713-225-1465
TX	Richadson, Altair Co.	214-231-5166

ELECTRONIC NAVIGATION INDS, Emerson Electric Co., 100 Highpower Road, Rochester, NY 14623, Tel: 716-427-8300, Telex: 671-1542 ENI UW; FSC No.: 10226; Empl.: 200; *Sls. Mgr.:* Leonard A. Benedict ..... **D•1008-1009**

Local Sales Offices & Reps

AL Huntsville, W. A. Brown Instrs. 205-883-8660
AZ Tempe, Trembly Assocs. 602-967-2058
CA Los Altos, Jay Stone Assocs. 415-948-4563
CA Los Angeles, McDougall/McLaughlin Co. 213-477-8556
CO Wheat Ridge, Trembly Assocs. 303-421-8900
FL Orlando, W. A. Brown Instrs. 305-425-5505
GA Norcross, W. A. Brown Instrs. 404-441-2980
IL Elmhurst, Sector Engrg. 312-530-7850
IN Indianapolis, Sector Engrg. 317-842-1120
KS Overland Park, Ramsey Assocs. 913-649-6996
LA Mandeville, W. A. Brown Instrs. 504-626-9701
MD Silver Spring, Gawler Knoop Co. 301-589-4406
MI Madison Heights, WKM Assocs. 313-588-2300
MN Minneapolis, Sector Engrg. 612-593-1809
MO Maryland Hgts., Ramsey Assocs. 314-878-5042
NV Las Vegas, Trembly Assocs. 702-739-9770
NH Nashua, JPR Elctrn. Sls. 603-889-8285
NM Albuquerque, Trembly Assocs. 505-266-8616
NY Great Neck, RTI, Inc. 516-829-3770
NC Durham, W. A. Brown Instrs. 919-479-5200
OH Dayton, WKM Assocs. 216-434-7500
OH Independence, WKM Assocs. 216-524-5930
PA Mechanicsville, John Bell Assocs. 215-794-7075
PA Pittsburgh, WKM Assocs. 412-892-2953
SC Columbia, W. A. Brown Instrs. 803-798-8070
TN Oakridge, W. A. Brown Instrs. 615-482-5761
TX Houston, Lear Assocs. 713-488-7893
TX Richardson, Lear Assocs. 214-231-5388
UT Salt Lake City, Trembly Assocs. 801-486-5292
WA Bellevue, Sci. Dvcs. Northwest 206-747-5169
WI Milwaukee, Sector Engrg. 414-352-8280
Can Toronto, Rayonics Scientific 416-736-1600

ELECT. PREC. COMP. CORP., 11 W. Sandford Blvd., Mt. Vernon, NY 10550, Tel: 914-664-2333; FSC No.: 75898; Empl.: 8; *Sls. Mgr.:* Don Edwards ..... **A•1603, 1868; D•1217**

Local Sales Offices & Reps

CA Granada Hills, W. H. Inds., Inc. 213-363-3910
CO Denver, Midwest Meridian Corp. 303-341-7550
IL Elk Grove Village, Midwest Meridian Corp. 312-640-9540
IA Cedar Rapids, Midwest Meridian Corp. 319-365-6561
MA Andover, William Crawford Assocs. 617-470-2122
MN Prior Lake, Midwest Meridian Corp. 612-447-8222
MO Marylan Heights, Midwest Meridian Corp. 314-878-4441
OH Fairborn, Midwest Meridian Corp. 513-879-7100
TX Fort Worth, Midwest Meridian Corp. 817-654-2132
WA Kirkland, W.H. Industries 206-827-1024

ELECTRONIC PRODS. CORP., Interstate Indl. Plaza, R. D. # 5, York, PA 17402, Tel: 717-767-6517; Empl.: 16; *Sls. Mgr.:* M. E. Lehman; *Dist. Mgr.:* M. E. Lehman

ELECTRONIC RELAYS, 30 Plaza Dr., Westmont, IL 60559, Tel: 312-789-8166, TWX: 910-991-3903; FSC No.: 53087; Empl.: 29; *Sls. Mgr.:* Barbara Breibach; *Dist. Mgr.:* Barbara Breibach

ELECTRONIC RESEARCH CO., 7618 Wedd St., Overland Park, KS 66204, Tel: 913-631-6700, TWX: 910-749-6477; FSC No.: 13571; Empl.: 60; *Sls. Mgr.:* Charles Ditzler ..... **A•1362**

Local Sales Offices & Reps

Frequency Product

NJ Riverdale, Comp-Tech Sls. 201-935-5454
NJ Union, Comp-Tech Sls. 201-687-2484
NY New Hyde Park, Comp-Tech Sls. 516-593-2628

ELECTRONIC SOLUTIONS, 9255 Chesapeake Drive, San Diego, CA 92123, Tel: 619-292-0242, 800-854-7086, TWX: 910-335-1169; FSC No.: 61081; Empl.: 90; *Sls. Mgr.:* R. J. Felker; *Dist. Mgr.:* Kim E. Mamer .... **D•1084-1086**

Local Sales Offices & Reps

AL Huntsville, Remco 205-533-3763
AZ Tempe, Mar Tech 602-968-4944
CA Anaheim, Qualtech South 714-639-9820
CA Brentwood, Qualtech South 408-732-4800
CA Los Angeles, Qualtech South 805-495-7100
CA San Diego, Mesa Engrg. 619-278-8021
CA Sunnyvale, Qualtech 408-732-4800
CT Canton, Bell Controls 603-882-6984
FL Melbourne, Southeastern First Rep 305-259-6373
GA Atlanta, Remco 404-447-6937
IL Chicago, Mar-Con Assocs. 312-675-6450
IA Des Moines, The Beams Co. 515-255-1148
KS Shawnee Mission, The Beams Co. 913-631-0300
MD Rockville, Spectro 301-294-9770
MA Nashua, Bell Controls 603-882-6984
MI Livonia, Lowell Wendt 313-464-2722
MN Minneapolis, Micro Res. 612-830-1454
MO St. Louis, The Beams Co. 314-434-8448
NH Nashua, Bell Controls 603-882-6984
NM Albuquerque, Mar Tech Assocs. 602-968-4944
NJ Springfield, Gebhardt Mktg. 201-376-4415
NC Raleigh, Remco 919-847-5079
OH Cleveland, Geotronix 216-526-2535
OH Trotwood, Geotronix 513-252-6700
OR Portland, Thorson Co., N.W. 503-644-5900
PA Jenkintown, Monument Tech. Assocs. 215-884-3737
TX Austin, Acudata 512-478-1018
TX Houston, Acudata 713-580-2451
TX Plano, Acudata 214-424-3567
WA Bellevue, Thorson Co., N.W. ..... &
WI Waukesha, Computer & Sys. Sls. 414-544-1141

Local Distributors

CA Mountain View, I/O Sls., Inc. 415-968-1080
CT Danbury, Pilgrim Elctrns. 203-792-7274
Can Mississauga, Ont., Allan Crawford Assocs. 416-678-1500

ELECTRONIC SPACE SYS. CORP., Old Powder Mill Rd., Concord, MA 01742, Tel: 617-369-7200, Telex: 923480 ESSCO WCRD; FSC No.: 15175; Empl.: 82; *Sls. Mgr.:* Susan M. Cuevas

ELECTRONIC SPECIALISTS, 171 South Main St., Natick, MA 01760, Tel: 617-655-1532, 800-225-4876, Telex: 955-329 ATTN: ESP; Empl.: 42; *Sls. Mgr.:* Alice Brown

ELECTRONIC SPECIALTY DIV., ElecSpec Corp., 14511 N.E. 13th Ave., Vancouver, WA 98668-3501, Tel: 206-574-5000, Telex: 360-453, TWX: 910-469-8782; FSC No.: 98927;Multiple; Empl.: 250; *Sls. Mgr.:* L. Fuller ..... **B•1346-1347**

Local Sales Offices & Reps

CA Anaheim, Gabriel & Assocs. 713-666-0660
CA San Jose, Ruppert Sls. & Engrg. 408-998-8717
CT Bethel, Livera-Polk Assocs. 203-744-1426
FL Lighthouse Point, Jack Krutek & Assocs. 305-941-6544
KS Wichita, BAKA Corp. 316-682-8411
MD Timonium, Eastern Comp. 301-561-5811
MN Hopkins, The Kits Co. 612-933-1888
NJ Madison, Livera-Polk Assocs. 201-377-3239
NY Glen Head, Livera-Polk Assocs. 516-759-9300
NC Raleigh, Eastern Comp. 919-787-3416
PA West Conshohocken, Eastern Comp. 215-825-8610
TX Dallas, MARCOM 214-351-4521
TX Houston, MARCOM 713-271-5635
VA Annandale, Eastern Comp. 703-354-0723

ELECTRONIC SYS. & PROGRAMMING, See Augat/ES)sP, Inc.

ELECTRONIC TRANSFORMER CORP., P.O. Box 188, Totowa, NJ 07511, Tel: 201-942-2222; FSC No.: 72149; Empl.: 130; *Sls. Mgr.:* Dan Rovine

ELECTRONIC TRANSISTORS, 112-15 Northern Blvd., Flushing, NY 11368, Tel: 212-651-7200, Telex: 96-0173; FSC No.: 12045; Empl.: 45; *Sls. Mgr.:* Mike Byrnes; *Dist. Mgr.:* Mike Byrnes

ELECTRONIC TREND PRODS., 10080 N. Wolfe Rd., Ste. 372, Cupertino, CA 95014, Tel: 408-996-7401, Telex: 345516; Empl.: 3; *Dist. Mgr.:* Gene Selven

ELECTRONIC WATTMETER CO., 2275 Sixth St., Sarasota, FL 33577, Tel: 813-953-5355; Empl.: 6

ELECTRONIZED CHEMICALS CO., Div. of High Voltage Engrg., 23 Industrial Way, Wilmington, MA 01887, Tel: 617-657-8030, Telex: 68-17284

ELECTRON-MACHINE CORP., Box M, Umatilla, FL 32784, Tel: 904-669-3101, Telex: 56-4300; Empl.: 55; *Sls. Mgr.:* S. K. Kemp V.P. Mktg

ELECTRON PRODUCTS, 2084 Central Ave., Duarte, CA 91010, Tel: 818-359-8281, Telex: 910-333-9810; FSC No.: 99515; Empl.: 65; *Sls. Mgr.:* Ann Meunier; *Dist. Mgr.:* Ann Meunier

ELECTRO-NUMERICS, 1811 Reynolds, Irvine, CA 92714, Tel: 714-250-1501, Telex: 68-5612; FSC No.: 51666; Empl.: 24

ELECTRO-OPTICAL INDS., Box 3770, Santa Barbara, CA 93130, Tel: 805-964-6701, Telex: 65-8427; Empl.: 130

ELECTRO-PACIFIC, 5782 Thornwood Dr., Goleta, CA 93017, Tel: 805-964-0751; FSC No.: 29853; Empl.: 60; *Sls. Mgr.:* Verne White

ELECTRO PHYSICS, 1910 West Birchwood Ave., Chicago, IL 60626, Tel: 312-274-9669; Empl.: 6; *Sls. Mgr.:* Abe Siegelman

ELECTROPHYSICS CORP., 48 Spruce St., Nutley, NJ 07110, Tel: 201-667-2262, Telex: 642277

ELECTRO-PREP, LTD., Rt 28A, P.O. Box 437, Cataumet, MA 02534, Tel: 617-563-5559; *Sls. Mgr.:* J. Anderson

ELECTRO-RACK PRODUCTS CO., 1742 S. Clementine St., Anaheim, CA 92802, Tel: 714-776-5420; FSC No.: 26073; Empl.: 25; *Sls. Mgr.:* Allen Benson

ELECTRO RENT CORP., 4209 Van Owen Place, Burbank, CA 91505, Tel: 818-843-1221, Telex: 314225, TWX: 910-498-2238; Empl.: 350; *Sls. Mgr.:* R. Tarullo

ELECTRO SCIENTIFIC INDS., 13900 N.W. Science Pk. Dr., Portland, OR 97229, Tel: 503-641-4141, Telex: 474-2064; FSC No.: 11837; Empl.: 1100; *Sls. Mgr.:* Dick Donaca

Local Sales Offices & Reps

Impedance Measuring Devices

CA Anaheim, Gary Ingbretson 714-995-2141
TX Austin, Pete Fugger 512-258-7362
PA Sewickley, Charles Molitor 412-255-1577
NC Cary, Gay Gasque 919-481-0058
OR Portland, Stan Gressel 503-641-4141

Laser Trimming & Processing Systems

IN Kokomo, Doug Goad 317-453-9293
CA San Jose, Tom White 408-243-8700
GA Rosewell, Jack Fedon 404-998-0545
MN Minneapolis, Tom Goodnow 612-870-9192
NH Nashua, Roy Johnson 603-888-7605
NJ Mt. Laurel, John Alpaugh 609-235-2474
OR Portland, Stan Gressel/Russ Schlager 503-641-4141
TX Plano, Doug Dickinson 214-867-4647

Electro-Space Fabricators, Inc.

ELECTRO SPACE FABRICATORS, 300 W. High St., P.O. BOX 67, Topton, PA 19562-0067, Tel: 215-682-7181; Empl.: 205; *Sls. Mgr.:* T. Roth ..... **C•1054-1055**

Local Sales Offices & Reps

AL Huntsville, Mackan, Smith & Assocs. .. 205-539-8000
CA Irvine, Vale Assocs. 714-551-4004, 4821
CA San Jose, Silicon Valley Sls. 408-286-7510
CA San Jose, Silicon Valley Sls. 408-371-8814
CO Boulder, Starsales 303-440-4193
CT Bridgeport, Betronic Assocs. 203-374-6404
FL Lighthouse Point, Jack Krutek & Assocs. 305-941-6544
FL Madeira Beach, MacKay, Smith & Assocs. 813-393-7144
FL Orlando, MacKay, Smith & Assocs. ... 305-277-1513
GA Norcross, MacKay, Smith & Assocs. .. 404-449-7444
IL Northbrook, Raines & Assocs. 312-498-0890
MD Pikesville, Imagitron Sls. 301-521-2020
MD Pikesville, Imagitron Sls. Co. 800-638-3592
MA Waltham, Betronic Assocs. 617-894-8400
MN Minneapolis, Jen-Ray Sys. 612-831-5060
NJ Boonton, Winter Assocs. 201-334-3434
NY Morrisville, Promark-Electrns. 315-662-3310
NY Morrisville, Promark Elctrns., Inc. 315-662-3310
NC Charlotte, MacKay, Smith & Assocs. .. 704-372-1188
OH Galion, James R. Bright 419-468-3787
OK Tulsa, Advance Techn. Sls. 918-664-0482
PA Doylestown, Monteiro Assocs. 215-345-5855
PA McKean, Ecco Electrns. Sls. 814-476-1376
PA McKean, ECCO 814-476-1376
TN Chattanooga, MacKay, Smith & Assocs. 615-899-6951
TX Austin, Advance Techn. Sls. 512-459-1351
TX Dallas, Advance Techn. Sls. 214-340-1300
TX Houston, Advance Techn. Sls. 713-440-3888
WA Auburn, Elctrn. Sls. Northwest 206-839-5808
WA Maple Valley, Electrn. Sls. Northwest .. 206-432-1002
Can Downsview, Ont., Designtronics 1-416-747-1171

ELECTROSPACE SYS., INC., P. O. Box 831359, Richardson, TX 75083-1359, Tel: 214-783-2004, TWX: 910-867-4768; FSC No.: 33875; Empl.: 1,269

ELECTRO STANDARDS LAB., INC., P.O. Box 9144, Providence, RI 02940, Tel: 401-943-1164, Telex: 697-2057 ESLAB; Empl.: 20; *Sls. Mgr.:* R. B. Sepe; *Dist. Mgr.:* R. B. Sepe

ELECTROSTATIC CONSLTG. ASSOCS., 556 Lowell Rd., Groton, MA 01450, Tel: 617-448-5485; Empl.: 5; *Sls. Mgr.:* Paul Malinaric

ELECTROSTATICS, 7718 Clairemont Mesa Blvd., San Diego, CA 92111, Tel: 619-279-1414; FSC No.: 34538; Empl.: 17

ELECTRO STYLUS, 31 Cheyenne Blvd., Colorado Springs, CO 80906, Tel: 303-633-5969; Empl.: 10; *Sls. Mgr.:* L. F. Murray; *Dist. Mgr.:* M. L. Murray

ELECTRO SWITCH, King Ave., Weymouth, MA 02188, Tel: 617-335-5200, TWX: 710-388-0377; FSC No.: 82121; Empl.: 260; *Sls. Mgr.:* H. F. Peters ..... **B•1564-1565**

Local Sales Offices & Reps

AZ	Phoenix, Howe & Howe Sls.	602-264-7971
CA	Los Angeles, Wiley	213-666-1611
CA	Moraga, W. Nott & Co.	415-376-1922
CA	San Diego, Wiley Co.	619-571-2881
CO	Boulder, Comp. Prods. Sls.	303-530-2800
FL	Winter Park, Floritronics	305-886-4818
GA	Atlanta, Holman-Gillespie	404-992-8820
IL	Elk Grove Village, Electro Switch	312-593-2225
IA	Bettendorf, H. J. Weisler & Assocs.	319-344-0566
MD	Gathersburg, Naudain Assocs.	301-258-5040
MI	Ferndale, Hilltronics	313-398-5556
MN	St. Paul, Kencotronics	612-645-7717
MO	Ellisville, H. J. Weisler & Assocs.	314-394-4543
MO	No. Kansas City, H.J. Weisler & Assocs.	816-421-1679
NJ	Fairfield, Electro Switch	201-227-6559
NJ	Marlton, Naudain Assocs.	609-983-5300
NY	Rochester, Sweetco Assocs.	716-225-2383
NY	Utica, Sweetco Assocs.	315-797-6721
NC	Winston-Salem, L. G. White Southern, Inc.	
NC	Winston-Salem, L.G. White Southern	919-725-3612
OH	Dayton, Rockford Controls	513-898-5452
OH	Euclid, Rockford Controls	216-731-5250
OH	Reynoldsburg, Rockford Controls	614-868-5577
PA	Pittsburgh, R. F. Clark	412-242-9500
SC	Greenville, L.G. White Southern	803-271-0630
TX	Bellaire, Brice Co.	713-666-1788
TX	Dallas, Brice Co.	214-233-9808
UT	Woodscross, Comp. Prods. Sls.	801-292-8882
VA	Richmond, L.G. White Southern	804-740-7093
WA	Seattle, C.B. Parsons & Co.	206-762-7373
WI	Wauwatosa, Larsen Assocs.	414-258-0529

Local Distributors

CA	Concord, Omega	415-671-7796
CA	Los Angeles, Electric Switches	213-660-1310
CO	Denver, Wesco	303-573-7550
FL	Ft. Lauderdale, Peerless Radio Corp. of Fla.	305-973-4141
GA	Atlanta, Georgia Control Ctr.	404-876-8833
IL	Bridgeview, Midco Comp. Sls.	312-599-7777
MD	Kensington, Marine Air Supp.	301-949-9560
MA	Sharon, Adcour	617-784-8123
MI	Grand Rapids, S-F Elctrn. Supp.	616-459-0216
MN	St. Paul, K. D. I.	612-645-7717
MO	St. Louis, Industrial Svc. Labs	314-535-5760
NY	Hempstead, Electronic Equip. Co.	516-538-5510
NC	Winston-Salem, General Prods. Co.	919-725-3612
OH	Euclid, Rockford Controls Ohio	216-731-5250
OK	Tulsa, Nelson Elec. Supp.	918-583-1212
PA	Conshohocken, I/O Elec. Supp. Corp.	215-825-4610
TX	Bellaire, Barclay Whls.	713-666-1788
WA	Seattle, C.B. Parsons Co.	206-762-7373
WI	Milwaukee, I/O Elec. Supp. Corp.	414-963-9050

ELECTRO-TECH SYS., INC., 115 E. Glenside Ave., Glenside, PA 19038, Tel: 215-887-2196, Telex: 831449; *Sls. Mgr.:* Sharon Sandy; *Dist. Mgr.:* Stanley Weitz

ELECTRO VECTOR, INC., 6555 Covey Rd., Forestville, CA 95436, Tel: 707-887-2292, TWX: 510-746-6024; *Sls. Mgr.:* Wayne Brigden

ELECTROVERT INC., 399 Executive Blvd., Elmsford, NY 10523, Tel: 914-592-7322, Telex: 646186; *Sls. Mgr.:* Steve Vineis

ELECTROVERT USA CORP., 10969 Shady Trail, #101, Dallas, TX 75220, Tel: 214-353-9950, Telex: 4630186; FSC No.: 1-214-350-4991; Empl.: 175; *Sls. Mgr.:* Tom Gill

Local Sales Offices & Reps

CA	Santa Ana	714-835-2033
CA	Santa Clara	408-739-6015
CO	Denver	303-423-5598
GA	Norcross	404-441-3644
IL	Rosemont	312-678-5557
NH	Manchester	603-625-5877
NY	Elmsford	914-592-7322
TX	Dallas	214-353-9950

ELECTRO WEAVE, 425 Shrewsbury St., Worcester, MA 01604, Tel: 617-752-8932, TWX: 710-340-0635; FSC No.: 54207; Empl.: 18; *Sls. Mgr.:* C. J. Nowasacki

ELFAB CORP., 1097 Yates Street, Lewisville, TX 75067, Tel: 214-221-8776, 214-233-3033, TWX: 910-860-5460; Empl.: 350; *Sls. Mgr.:* Kermit Dye; *Dist. Mgr.:* Bud Addington ..... **C•1190-1191**

Local Sales Offices & Reps

AL	Brownsboro, J.H.U. Assocs.	205-536-7455
AZ	Tempe, Delta Elec.	602-224-1601
CA	Escondido, Cirolia Elctrn. Sls.	619-743-3015
CA	Los Alamitos, Reed Elctrns. Sls.	714-821-9600
CA	Santa Clara, Elfab Corp.	408-988-1716
CA	Tustin, Elfab Corp.	714-731-2515
CO	Littleton, Lange Sls., Inc.	303-795-3600
FL	Goldenrod, Sunland Assocs.	305-365-9533
FL	Winter Park, Elfab Corp.	305-678-7759
GA	Atlanta, J.H.U. Assocs.	404-662-0792
IL	Arlington Heights, Brainard-Wilson Mktg.	312-437-2700
IL	Crystal Lake, E. S. Healy & Assocs.	815-459-4386
MD	Hunt Valley, Phoenix Elctrn. Sls.	301-628-2066
MA	Hopkinton, Marathon Sls., Ltd.	617-875-3566
MI	Grand Rapids, R. P. Urban Assocs.	616-245-0511
MN	Edina, Mel Foster Tech Sls.	612-941-9790
MO	St. Charles, Microtronics	314-946-8500
NJ	Cherry Hill, Elfab Corp.	609-795-6262
NY	N. Syracuse, Advanced Comps.	315-699-2671
NC	Raleigh, Rick Burns Assoc., Inc.	919-876-2224
OH	Dayton, Duane Thompson & Assocs.	513-237-9422
OK	Oklahoma City, Ammon & Rizos Co.	405-942-2552
TX	Austin, Ammon & Rizos Co.	512-454-5131
TX	Dallas, Ammon & Rizos Co.	214-644-5591
TX	Houston, Ammon & Rizos Co.	713-781-6240
UT	Salt Lake City, Lange Sls., Inc.	910-925-4006
WA	Seattle, Blum & Assocs.	206-285-2590
PR	Rio Piedras, D. K. Mktg.	809-765-5380

Local Distributors

CA	Santa Clara, Cetec Elctrns.	408-748-8550

ELFORM, INC., 521 Dunn Circle, Sparks, NV 89431, Tel: 702-356-1734, Telex: 170037; *Sls. Mgr.:* Roger R. Reinke

ELGAR

An Onan/McGraw-Edison Company

ELGAR CORP, An Onan McGraw Edison Co., 9250 Brown Deer Rd., San Diego, CA 92121, Tel: 619-450-0085, Telex: 211063 ELSD UR, TWX: 910-335-1246; FSC No.: 25965; Empl.: 375; *Dist. Mgr.:* Steve Larson ..... **D•1918-1922**

Local Sales Offices & Reps

AL	Huntsville, Pen-Tech Assocs.	205-881-9298
AZ	Tempe, Trembly Assoc.	602-967-2058
CA	Costa Mesa, Ward Davis Assocs.	714-556-0755
CA	Pasadena, A & F Sls.	213-681-5631
CA	Redondo Beach, Ward/Davis Assocs.	213-973-7772
CA	San Diego, Ward/Davis Assocs.	619-292-1000
CA	San Jose, D.P. Assocs.	408-296-1492
CA	Santa Clara, Ward Davis Assocs.	408-245-3700
CO	Wheat Ridge, Trembly Assocs.	303-421-8900
FL	Casselberry, Pen-Tech Assocs.	305-645-3444
FL	Deerfield Beach, Pen-Tech Assocs.	305-421-4989
GA	Marietta, Pen-Tech Assocs.	404-424-1931
IL	Arlington Heights, Dytec/Central	312-394-3380
IL	Hoffman Estates, Carvel Engrg.	312-885-8800
IN	Indianapolis, Dytec/Central	317-247-1316
KS	Lenexa, Dytec/South	913-888-0215
MD	Rockville, Elctrn. Mktg. Assocs.	301-881-5300
MA	Woburn, P. Jenks Assocs.	617-938-0488
MI	Madison Heights, WKM Assocs.	313-588-2300
MN	Edina, Carvel Engrg.	612-835-7929
MN	Minneapolis, Berndt Assocs.	612-546-2021
MO	Maryland Hgts., Dytec/South	314-569-2990
NV	Las Vegas, Trembly Assocs.	702-739-9770
NJ	Fairfield, G & A Sls.	201-575-8080
NM	Albuquerque, Trembly Assoc.	505-266-8616
NY	Fairport, NACO Elctrns. Corp.	716-223-4490
NY	Great Neck, RTI	516-829-3770
NY	North Syracuse, NACO Elctrns. Corp.	315-699-2651
NY	Utica, NACO Elctrns. Corp.	315-732-1801
NC	Greenboro, Pen Tech Assocs.	919-852-6000
OH	Dayton, WKM Assocs.	513-434-7500
OH	Independence, WKM Assocs.	216-524-5930
OK	Edmond, Data Aids Assocs.	405-478-5000
OR	Beaverton, Northwest Test & Meas.	503-646-9966
OR	Portland, Topp Engrg.	503-244-7265
PA	Pittsburgh, WKM Assocs.	412-892-2953
PA	Plymouth Meeting, Elctrn. Mktg. Assocs.	215-828-7400
TX	Austin, Data Aids Assocs.	512-327-8600
TX	Dallas, Data Aids Assocs.	214-620-1551
TX	Woodlands, Data Aids Assocs.	713-363-3838
UT	Salt Lake City, Trembly Assocs.	801-486-5292
WA	Bellevue, Topp Engrg.	206-747-5400
WA	Redmond, Northwest Test & Meas.	206-881-8857
WI	Elm Grove, Dytec Central Inc.	414-784-9686
WI	New Berlin, Carvel Engrg.	414-784-7007
EXP	CA, San Diego, Elgar Intl. Corp.	619-565-1155

Local Distributors

CA	Inglewood, Cal. Micro	213-671-6075
IL	Arlington Heights, Peak Distrs., Inc.	312-394-3380
MN	St. Paul, Dytec North, Inc.	612-645-5816
MO	Maryland Heights, Dytec Distrs.	314-569-2990
NJ	Hackensack, Logon, Inc.	201-646-9222
NY	North Syracuse, Naco Elctrns. Corp.	315-699-2651
NC	Greensboro, Pen-Tech Sls.	919-852-6000
OH	Dayton, National Distrs., Inc.	513-434-7500
PA	Penllyn, Promark Distrs., Inc.	215-643-3400
TX	Woodlands, Data Aids Assocs.	713-363-3838
WA	Bellevue, Topp Engrg. Sls. Corp.	206-747-5400

ELGENCO, INC., Box 460, Hurricane, UT 84737, Tel: 801-635-4954; FSC No.: 15455; *Sls. Mgr.:* Duane Beecher ..... **D•1218-1223**

Local Sales Offices & Reps

CA	Sherman Oaks, Windsor Dynamics	818-990-4173
CA	Woodside, N-S Assocs.	415-851-2703
CT	Hamden, Polytek Assoc.	203-288-5246
MA	Waban, Polytek Assoc.	617-881-4741

ELECTROSWITCH

MILITARY SPECIFICATION
INDUSTRIAL AND COMMERCIAL

FULL LINE
AUTHORIZED DISTRIBUTOR

E S I

ELECTRIC SWITCHES
INCORPORATED

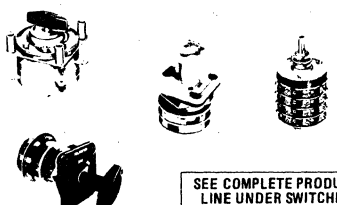
2478 Fletcher Dr, Los Angeles, California 90039

213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971

ROTARY SWITCHES FOR
INDUSTRIAL CONTROL APPLICATIONS



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

NJ Marmore, Holdsworth & Co. 609-398-4340
NM Albuquerque, Technology Mktg. Assoc. 505-345-8921
PA Newtown Square, Holdsworth & Co. .. 215-356-8550

ELGIN ELECTRONICS, Combustion Engineering, 5533 New Perry Hwy., Erie, PA 16509-3570, Tel: 814-864-4921, TWX: 510-699-6870; Empl.: 500; *Sls. Mgr.:* C. G. Searles

Local Sales Offices & Reps
CA Chatsworth, Elgin Elctrns. 818-700-0299
GA Atlanta, Elgin Elctrns. 404-925-2572
IN Redkey 317-369-2012
PA Wayne 215-687-6100
TX Fort Worth, Elgin Elctrns. 817-429-7331

ELIN DIV., California Instrs. Co., Div. of Norlin Ind., 5150 Convoy St, San Diego, CA 92111, Tel: 619-279-8620, Telex: 695-047; FSC No.: 16067; Empl.: 90; *Sls. Mgr.:* W.W. Hanford

ELITE ELECTRONICS, INC., 1408 Summit - Suite #5, Plano, TX 75074, Tel: 214-881-0026; Empl.: 3

ELITE SOFTWARE DEVELOPMENT, INC., P.O. Drawer 1194, Bryan, TX 77806, Tel: 409-846-2340, Telex: 910-997-6760; Empl.: 4; *Sls. Mgr.:* Terri J. King

ELMA ENGRG., 1066 E. Meadow Circle, Palo Alto, CA 94303, Tel: 415-494-7303, Telex: 345-560; FSC No.: 59810; Empl.: 50

ELMAG, 54 Clark St., Newark, NJ 07104, Tel: 201-481-1600; FSC No.: 23160; Empl.: 25

ELM SYSTEMS, 1101 Brown St., Wauconda, IL 60084, Tel: 312-526-5003; *Sls. Mgr.:* T. A. McCollum

Elmwood Sensors Inc.
Subsidiary of FASCO®

ELMWOOD SENSORS, 500 Narragansett Park Drive, Pawtucket, RI 02861, Tel: 401-727-1300, Telex: 6814066 ELMWOOD, TWX: 710-381-6413; Empl.: 700; *Sls. Mgr.:* Gary Polkow ..... **B•1750**

Local Sales Offices & Reps
AL Decatur, Tenn. Tech. Sls. 205-350-0630
AZ Phoenix, O'Donnell SW 602-944-9542
AR Hot Springs, Ion Assoc.-Arkla 918-664-018
CA San Diego, O'Donnell Assocs. 619-578-1645
CA San Jose, O'Donnell Assocs. 408-263-6500
CA Torrance, O'Donnell Assocs. 213-539-9664
CO Boulder, Front Range Mktg. 303-443-4780
FL Coral Springs, CBC Electronics 305-755-1111
GA Atlanta, Tenn. Tech. Sls. 404-622-5784
IL Arlington Heights, Thermek 312-577-6900
IN Fort Wayne, O. Bromberg 219-456-6010
KY Louisville, O. Bromberg 502-245-8916
MA Danvers, C. H. Burnham Assoc. 617-774-0111
MI Brooklyn, Engineered Comps. 517-592-3236
MN Minneapolis, C. Listug Sls. 612-537-6740
MO Creve Coeur, Hill & Co. 314-432-1136
MO St. Louis, Hill & Co. 314-432-1136
NH Durham, C. H. Burnham Assoc. 603-868-2282
NY Fairport, Bastian Sls. 716-223-0237
NY Larchmont, G. M. Moch Co. 914-834-3530
NY Syracuse, Canavan-Scanlon 315-437-1271
NC Charlotte, Tenn-Tech Sls. 704-525-6295
NC Raleigh, Tenn-Tech 919-226-3610
OH Cincinnati, O. Bromberg 513-771-9333
OH Cleveland, Allied Entprs. 216-779-0080
OK Tulsa, Ion Assoc. 918-664-0186
OR Hillsboro, Temco-Northwest 503-648-8171
PA Huntington Valley, Omega Elctrns. Sls. 215-947-4135
PA Murrysville, Allied Entprs. 412-325-3200
RI Johnston, C. H. Burnham Assoc. 401-231-7475
TX Austin, Ion Assocs. 512-331-7252
TX Grand Prairie, Ion Assocs. 214-647-8225
TX Houston, Ion Assocs. 713-977-4354
UT Salt Lake City, Front Range Mktg. 801-364-6481
VA Midlothian, Daniel E. Boehling Assocs. 804-794-5879
WA Bellevue, Lehr Assocs. 206-453-9993
WA Bothell, Temco Northwest 206-821-5434
WI Milwaukee, R. Zingler 414-351-5005
Can Mississauga, Ont., Andy Baumen Assocs. 416-828-2600

ELNA AMERICA, INC., 153 E. Savarona Way, Carson, CA 90746, Tel: 213-327-6090, Telex: 68-6427, TWX: 910-346-6730; *Sls. Mgr.:* Don L. Bilsing; *Dist. Mgr.:* Isao Kikuchi

ELNETIC ELCTRNS., 1730 21st St., Santa Monica, CA 90404, Tel: 213-828-9541; FSC No.: 98460; Empl.: 25; *Sls. Mgr.:* Ernest H. Carlson, Jr.

ELNIK INSTRS., 3 Edison Place, Fairfield, NJ 07006, Tel: 201-882-8033, Telex: 13-0567; Empl.: 8; *Sls. Mgr.:* Claus J. Joens

ELOGRAPHICS, 105 Randolph Rd., Oak Ridge, TN 37830, Tel: 615-482-4100; *Sls. Mgr.:* R. Highfill

ELPAC COMPS., 3131 S. Standard Ave., Santa Ana, CA 92705, Tel: 714-979-4440, TWX: 910-595-1513; Empl.: 130; *Sls. Mgr.:* Rod Bolton ..... **A•1078-1079**

Local Sales Offices & Reps
AZ Tempe, Sunwest Mktg. Assocs. 602-838-7586
CA San Diego, Wes-K Assocs. 619-578-2040
CA Santa Clara, Westrep 408-988-8833
CA Van Nuys, Wes-K Assocs. 213-989-3070
CO Arvada, Wescom Mktg. 303-422-7619
CT Milford, Todino Engr. Sls. 203-874-6643
FL Orlando, OEM Mktg. Corp. 305-299-1000
IL Highland Park, Bransky Sls. 312-433-2375
MA Needham Heights, Todino Engr. Sls. .. 617-444-7925
MN Bloomington, Smiley-Scott Assocs. ... 612-888-5551
NJ Englewood, Harold Gray Assocs. 201-894-0894
OH Dayton, J. C. Hofstetter Co. 513-296-1010
OH Medina, J. C. Hofstetter Co. 216-241-4880
OR Beaverton, Caruso & Northcutt. 503-646-4973
PA Hickord, J. C. Hofstetter Co. 412-356-2305
TX Richardson, Mech-Tron 214-437-4833
UT Salt Lake City, Wescom Mktg. 801-466-9594
WA Bellevue, Caruso & Northcutt. 206-454-9699
WI Cedarburg, Bransky Sls. 414-377-8507

Local Distributors
AZ Phoenix, T.T.I. 602-861-0222
CA Chatsworth, Mil-Comm 213-998-3111
CA Garden Grove, Megacap 714-891-5176
CA Irvine, Kelex 714-863-1230
CA San Jose, T.T.I. 408-943-9155
FL Orlando, T.T.I. Florida 305-859-1000
IL Northbrook, Classic Components 312-272-9650
IL Skokie, Kellner Elctrns. 312-677-1120
MA Wilmington, Aved Elctrns. 617-657-8311
MA Woburn, T.T.I., Inc. NE 617-938-8800
MO Maryland Heights, Ensco Distribg., Inc. 314-423-3935
NJ S. Hackensack, Waltech 201-641-7300
NY Bohemia, T.T.I. 516-567-1500
NY Elmsford, Ancar 914-592-7100
OK Tulsa, Altair Co. 918-252-5781
TX Austin, Captronics 512-459-4328
TX Dallas, Captronics 214-340-3592
TX Ft. Worth, T.T.I. 817-429-1440
TX Houston, Altair Co. 713-462-3029
WI Mequon, Taylor Elec. Dists. 800-558-8921
WI Racine, Badger Elctrns. 414-637-1256, 414-933-6685

ELPAC POWER SYS., 3131 S. Standard Ave., Santa Ana, CA 92705, Tel: 714-979-4440, TWX: 910-595-1513; Empl.: 270; *Sls. Mgr.:* Randy Bilsley; *Dist. Mgr.:* Randy Bilsley ..... **D•1626-1631**

Local Sales Offices & Reps
AL Huntsville, K&E Assoc. 205-883-9720
AZ Phoenix, Westrep 602-997-8899
CA Anaheim, Westrep 714-527-2822
CA San Diego, Westrep 619-276-0751
CA Santa Clara, Westrep 408-988-8833
CO Parker, A-5 Co. 303-841-3651
CT Yalesville, The Newscott Co. 203-269-2654
FL Casselberry, Semi 305-831-2822
GA Doraville, K&E Assoc. 404-448-7025
IL Highland Park, Bransky Sls. 312-433-2375
IN Ft. Wayne, F. J. Campisano 219-747-2633
IN Indianapolis, F. J. Campisano 317-253-7651
KS Overland Park, Electri-Rep 913-649-2168
MD Pikesville, Imagitron Sls. 301-521-2020
MA Needham Hgts., Newscott Co. 617-444-1923
MI Brighton, Michigan Mktg. 313-229-6218
NJ Cedar Knolls, TAM 201-285-9094
NY S. Hauppauge, TAM 516-348-0800
NC Greenboro, Imagitron Sls. 919-292-5474
OH Cincinnati, F. J. Campisano 513-574-7111
OH Cleveland, F. J. Campisano 216-749-5550
OK Tulsa, ION Assocs. 918-664-0186
OR Beaverton, Caruso & Northcutt 503-646-4973
PA Coraopolis, F. J. Campisano 412-264-5151
TX Austin, Ion Assocs 512-346-7160
TX Grand Prairie, ION Assocs. 214-647-8225
TX Houston, Ion Assocs. 713-977-4354
UT Murray, A-5 Co. 801-483-1034
WA Bellevue, Caruso & Northcutt 206-454-9699
WI Cedarburg, Bransky Sls. 414-377-6837

Local Distributors
AL Marshall Inds.
AL Birmingham, ACK Radio Supp. 205-322-0588
AL Huntsville, Powell Elec. 205-539-2731
AL Huntsville, RM Elctrns. 205-852-1550
AZ Phoenix, Heilind Elec. 602-437-1060
AZ Tempe, Marshall Inds. 602-968-6181
CA Costa Mesa, Powell Elec. 714-754-1717
CA El Monte, Marshall Inds. 213-442-7204
CA San Jose, Powell Elec. 408-943-9020
CO Denver, Marshall Inds. 303-427-1818
CT Bethel, Heilind Elec. 203-797-8600
CT Wallingford, Marshall Inds. 203-265-3822
CT Wallingford, Sager Elctrns. 203-265-4600
FL Ft. Lauderdale, Powell Elec. 305-979-5000
FL Orlando, Marshall Inds. 305-841-1878
GA Atlanta, ACK Radio Supp. 404-351-6340
GA Norcross, Marshall Inds. 404-923-5750
IL Chicago, Newark Elctrns. 312-638-5100
IL Northbrook, Classic Comps. 312-272-9650
IL Schaumburg, Marshall Inds. 312-490-0155
IN Indianapolis, RM Elctrns. 317-291-7110
MD Gaithersburg, Marshall Inds. 301-840-9450
MA Burlington, Marshall Inds. 617-272-8200
MA Burlington, QPL Elctrns. 617-229-2424
MA Hingham, Sager Elctrns. 617-749-6700
MI Grand Rapids, RM Elec. 616-531-9300
MI Livonia, Marshall Inds. 313-525-5850
MN Plymouth, Marshall Inds. 612-559-2211
MO St. Charles, Finnigan Elec. 314-946-6201
NH Hudson, Heilind Elec. 603-883-9536
NJ Cranford, Garden State Indl. 201-272-6400
NJ Fairfield, Marshall Inds. 201-882-0320
NJ Mt. Laurel, Marshall Inds. 609-234-9100
NY Hauppauge, Broadline Elctrns. 212-895-6232
NY Hauppauge, Marshall Inds. 516-273-2424
NY Johnson City, Marshall Inds. 607-798-1611
NY Rochester, Marshall Inds. 716-235-7620
NC Greensboro, Hammond 919-275-6391
OH Dayton, Marshall Inds. 513-236-8088
PA Philadelphia, Shap Elctrns. 215-969-3300
SC Greenville, Hammond Elctrns. 803-233-4121
TN Austin, Marshall Inds. 512-458-5654
TX Dallas, Heilind Elec. 214-351-2050
TX Dallas, Marshall Inds. 214-233-5200
TX Dallas, RM Elctrns. 214-235-3100
TX Houston, Heilind Elec. 713-988-2711
TX Houston, Marshall Inds. 713-789-6600
TX Houston, Newark Elctrns. 713-782-4800
WA Bellevue, Marshall Inds. 206-747-9100
WI New Berlin, Classic Comps. 414-786-5300
WI New Berlin, RM Elctrns. 414-784-4420

ELPA MARKETING IND., Thorens & Atlantic Ave., Garden City Park, NY 11040, Tel: 516-746-3002

Technacell™
by Elpower®

ELPOWER, 2117 S. Anne St., Santa Ana, CA 92704, Tel: 714-540-6155, Telex: 678354 ELPOWER SNA; Empl.: 200; *Sls. Mgr.:* D. Keil; *Dist. Mgr.:* Ronnie LeFevre ..... **D•1418-1420**

Local Sales Offices & Reps
AZ Phoenix, Shefler-Kahn 602-257-9015
CA Hayward, Pacific Mktg. 415-887-1620
CO Denver, Moss Mktg. 303-455-7205
CT Milford, Todino Engrg. Sls. Co. 203-874-6643
GA Norcross, Hollingsworth & Still 404-447-1700
IL Chicago, G. Mcl. Cole Co. 312-774-3535

IN Indianapolis, Elctrn. Mktg. Consits. 317-253-1668
KS Overland Park, Thomas L. Dowell & Assocs. 913-648-7373
MA Needham Heights, Todino Engrg. 617-444-7925
MI Livonia, Electronic Salesmasters 800-321-1848
MN Edina, Restronics 612-941-9135
MO St. Louis, Thomas L. Dowell & Assoc. 314-849-4234
NJ Englewood Cliffs, Masin Esco 201-569-8868
NJ Marlton, Twin Sls. 609-966-4070
NY Chappaqua, Masin Esco 914-238-8337
NY East Syracuse, Nycom, Inc. 315-437-8343
NY Hauppauge, Masin Esco 516-273-3500
OH Beachwood, Electronic Salesmasters 216-831-9555
PA Bensalem, Twin Sls. 215-638-4850
TX Dallas, R. E. Nesbitt Co. 214-357-4601
VA Herndon, Stinson Assocs. 703-620-0088
WA Seattle, Northmar 206-524-5170

Local Distributors

AL Huntsville, Components Distrs. 205-883-7501
CA Cerritos, El Com 213-404-2961
CA Fremont, Terminal Sls. 415-656-7722
CA Gardena, Culver Elctrn. Sls. 213-538-2811
CA Mountain View, Energy Sls. 415-969-0800
CO Denver, Hensley Battery 303-455-3643
CT Middletown, Mid-State Elctrns. 203-347-5638
FL Ft. Lauderdale, Component Dist. 305-971-4950
GA Atlanta, Custom Alarm Prods. 404-458-0990
IL Downers Grove, Telecommunication Dvcs. 312-971-3460
IL Palatine, Ohm Elctrns. 312-359-5500
IN Indianapolis, Graham Elctrns. 317-634-8202
LA New Orleans, Allen Supp. Corp. 504-525-8222
MD Savage, Pyttronic 301-792-0780
MI Livonia, Alarm Supp. Co. 313-591-9100
MN Burnsville, Power Trust Grp. 612-890-1360
MO St. Louis, Olive Elctrns. 314-426-4500
MO St. Louis, Van Sickle Radio 314-621-5000
NJ Hanover, State Elctrns Pts. 201-887-2550
NY Jackson Hgts., A-1 Alarmatic 212-639-8300
OR Portland, Radar Elec. 503-232-3404
PA Allentown, A. A. Peters 215-434-5237
UT Salt Lake City, Standard Supp. 801-486-3371
VA Richmond, AVCC Elctrns. 804-359-6071
WA Seattle, Radar Elec. 206-282-2511

EL-RAD MFG., 2800 W. Cullom Ave., Chicago, IL 60618, Tel: 312-478-7300, TWX: 910-221-0104; FSC No.: 11253; Empl.: 225; *Sls. Mgr.:* Marvin S. Christ

Local Sales Offices & Reps
J. J. Riley Assocs.

AZ Scottsdale, Memco Sls. 602-241-2254
AR Little Rock, Jaro Electro Sls. 214-231-6654
CA Huntington Beach, J. J. Riley Assoc. .. 714-841-1411
CA Mountain View, Westech Sls. 415-961-1422
FL Pompano Beach, Cole-Tek 305-781-8110
IL Elk Grove Village, I R O Co. 312-593-0644
MD Glen Burnie, Faion Lott & Co. 301-744-4611
MD St. Louis, Abrams & Assocs. 314-569-0447
MI Benton Harbor, Mc Nabb & Assocs. 616-925-2166
NJ Baltimore, Faion Lott & Co. 301-744-4611
NM Phoenix, Memco Sls. 602-952-2254
TX Richardson, Jaro Electro Sls. 214-231-6654

ELTEC INSTRUMENTS INC., P.O. Box 9610, Daytona Bch., FL 32020, Tel: 904-253-5328, TWX: 810-832-6294; Empl.: 120; *Sls. Mgr.:* Douglas S. Armstrong

EMCA, Sub. Rohm and Haas Advanced Matls. Co., 605 Center Ave., Mamaroneck, NY 10543, Tel: 914-698-8434, TWX: 710-566-1128; Empl.: 70; *Sls. Mgr.:* Dennis Hanley

EMCO HIGH VOLTAGE CO., 11126 Ridge Road, Sutter Creek, CA 95685, Tel: 209-223-3626; Empl.: 38 .... **D•1632**

EMCON INC., Sub. of Kyocera Intl., 11620 Sorrento Valley Rd., San Diego, CA 92138, Tel: 619-459-4355, TWX: 910-322-1130; Empl.: 500; *Sls. Mgr.:* Bob Goodman; *Dist. Mgr.:* George Maines

EMCOR PRODUCTS, Crenlo, Inc., 1600 Fourth Ave. NW, Rochester, MN 55901, Tel: 507-289-3371, TWX: 910-565-2374; *Sls. Mgr.:* John Horton .... **C•1057**

EMC TECHNOLOGY INC., 1971 Old Cuthbert Rd., Cherry Hill, NJ 08034, Tel: 609-429-7800, Telex: 710 896 0193; FSC No.: 24602; Empl.: 75; *Sls. Mgr.:* Peter Semitschew

Local Distributors

CA Los Altos, SIDCO, Inc. 415-949-0440
CA Malibu, RL Comp., Inc. 213-456-9021
NJ E. Windsor, Micro-Lambda, Inc. 609-443-3113

EMERGENCY BEACON CORP., 15 River St., New Rochelle, NY 10801, Tel: 914-235-9400; Empl.: 25; *Sls. Mgr.:* Judith L. Weber

EMERGENCY POWER ENGINEERING INC., 3580 Cadillac Ave., Costa Mesa, CA 92606, Tel: 714-557-1636, Telex: 183535; Empl.: 356; *Sls. Mgr.:* Warren Caves

EMERSON, INDL. CONTROLS DIV., 3300 Standard St., Santa Ana, CA 92702, Tel: 714-545-5581, Telex: 67-8460; Empl.: 800; *Sls. Mgr.:* R. L. Calvin

Please call factory for sales offices and nearest rep.

EMERSON & CUMING, W. R. Grace & Co., 59 Walpole St., Canton, MA 02021, Tel: 617-828-3300, TWX: 710-348-1324; Empl.: + 500

EMHART CANADA, LTD., See Mallory Components Div.

EMICO INC., Box 368, Dublin, PA 18917, Tel: 215-249-9330, TWX: 510-665-9583; FSC No.: 85925; Empl.: 170; *Sls. Mgr.:* R. Jones .... **D•1352-1353**

Local Sales Offices & Reps

AZ Scottsdale, Luscombe 602-949-9333
CA Campbell, Luscombe Engrg. 408-370-2020
CA Pasadena, Luscombe 213-684-2000
CO Arvada, Arrowhead Sls. Co. 303-423-5556
FL Semenole, Chaco Sls. 813-397-4843
IL Chicago, Ropek & Cahill 312-631-0070
IN Carmel, S T B & Assocs. 317-844-9227
KS Shawnee Mission, Robinson & Assocs. 913-262-1374
MD Silver Spring, H.R. Sieber Co. 301-681-3770
MA Braintree, Anderson Sls. Co. 617-848-9194
MN Minneapolis, H.M.R., Inc. 612-888-2122
NJ Marlton, B.G.R. Assocs. 609-428-2440
NY Syracuse, Nycom, Inc. 315-437-8343
NY Yonkers, Sonkin Assoc. 914-968-8282
NC Charlotte, Electro-Rep. Assocs. 704-527-2530
OH Rocky River, Loesch Assocs. 216-333-0077
TX Rowlett, Campion Sls. 214-475-8313
WA Redmond, Eclipse Mktg. 206-885-6991
WI Colgate, Rep I and Assocs. 414-628-4016

EMI GENCOM INC., See THORN EMI Gencom Inc.

EMI TECHNOLOGY INC., See THORN EMI Technology Inc.

E/M LUBRICANTS, INC., Div. of Great Lakes Chemical Corp., Highway 52 NW, W. Lafayette, IN 47906, Tel: 317-463-2511, Telex: 27-9428; FSC No.: 11770

Local Sales Offices & Reps

CA Mt. View 415-961-5865
CA North Hollywood 213-875-0101
CO Denver 303-371-6771
CT New Britain, E/M Lubricants, Inc. 203-224-9148
GA Atlanta 404-361-2550
IL Lombard 312-620-6808
MA Auburn 617-792-6919
MI Roseville 313-779-6460
MN New Brighton 612-780-3202
OH Dayton 513-254-8481
PA Sharon Hill 215-461-1015
TX Ft. Worth 817-834-8817

EMM SEMI, SUB OF EM & M, See GTE Microcircuits

EMM/SESCO, 20630 Plummer St., Chatsworth, CA 91311, Tel: 213-998-9090, Telex: 691404, TWX: 910-494-4990; *Sls. Mgr.:* Russ Summers

Empro SHUNTS ®

EMPRO MFG. CO., INC., P.O. Box 26060, Indianapolis, IN 46226, Tel: 317-823-4478; Empl.: 25 .... **D•1224**

Local Sales Offices & Reps

CA La Canada, Lew Brooks Co. 213-790-8358
CA Santa Ana, Lew Brooks Co. 714-544-8900
GA Atlanta, Brownell Electro Inc. 404-762-5181
IL Chicago, Best Rep Co. 312-992-1055
MA Burlington, E.I.L. Instr.-Mancib Div. 617-272-9450
NJ Belleville, D. F. Tobias & Co. 201-751-8680
OH Cleveland, Weschler Elec. Corp. 216-238-2550
PA Philadelphia, Sunshine Sci. Instr. Inc. .. 215-673-5600
TX Houston, Ev Smith Sls. 713-649-5756

EMR DATA SYSTEMS, DIV. SANGAMO- WESTON, Box 3041, Sarasota, FL 33578, Tel: 813-371-0811, Telex: 052-890, TWX: 810-864-0406; Empl.: 1100; *Sls. Mgr.:* F. V. Hinkel

E M S DEVELOPMENT CORP., 200 Allen Blvd., Farmingdale, NY 11735, Tel: 516-694-2886, TWX: 510-224-6480; FSC No.: 51435; Empl.: 115; *Sls. Mgr.:* Ed Simkovich

EMULOGIC, 3 Technology Way, Norwood, MA 02062, Tel: 617-329-1031; *Sls. Mgr.:* Robert Smith

ENCLOSURE CORP., 4529 Adams Circle, Cornwells Hts., PA 19020, Tel: 215-638-9550; FSC No.: 32360; Empl.: 106; *Sls. Mgr.:* Gene Goldner

ENCODER DIV., LITTON SYSTEMS, INC., See Litton Encoder Div.

ENCODER PRODS., 1601B Dover Rd., Sandpoint, ID 83864, Tel: 208-263-8541, TWX: 510-776-1595; Empl.: 70; *Sls. Mgr.:* Vance Conner

ENDEVCO, 30700 Rancho Viejo Rd., San Juan Capistrano, CA 92675, Tel: 714-493-8181, Telex: 68-5608, TWX: 910-596-1415; FSC No.: 95411; Empl.: 400; *Sls. Mgr.:* C. Bowes

Local Sales Offices & Reps

AL Huntsville, & 205-536-4454
CA Anaheim 714-831-9200
CA San Francisco, & 415-552-1763
CT West Mystic 203-572-0571
FL Orlando, & 305-855-4535
IL Chicago 312-754-3888
MD Annapolis, & 301-269-8800
NJ Lambertville, & 201-254-9600
TX Dallas 214-458-7720

Local Distributors

MI Charlotte, RDP Assocs. 517-543-6212
OH Cleveland, RDP Assocs. 216-659-3138
OH Dayton, RDP Assocs. 513-253-6175

ENDICOTT COIL, 22 E. Charlotte St., Binghamton, NY 13905, Tel: 607-797-1263, Telex: 932411; Empl.: 140; *Sls. Mgr.:* Norman Aprile .... **A•1239, 2135**

ERC™
Endicott Research Group, Inc.

ENDICOTT RESCH. GRP., INC., 2601 Wayne St., P.O. Box 269, Endicott, NY 13760, Tel: 607-754-9187, TWX: 510-252-0155; FSC No.: 63312; Empl.: 102 .... **B•1047-1049; D•1633**

Local Sales Offices & Reps

CA Laguna Hills, Component Mktg. Assocs. 714-951-6046
CA Lomita, Component Mktg. Assoc. 213-326-1460
CA Saratoga, Testco 408-253-1900
CO Denver, West Incorporated 303-773-5150
CT Bloomfield, SIR Assocs. 203-243-9343
FL Pompano Beach, Cole-Tek Assocs. 305-781-8110
GA Atlanta, Wallace Electronics 404-471-6297
IL Elk Grove Village, Carlson Elctrn. Sls. 312-956-8240
IN Indianapolis, J & W Sls. 317-842-3740
IA Cedar Rapids, Carlson Elctrn. Sls. 319-377-6341
KS Wichita, PMR, Inc. 316-684-4141
MA Bedford, SIR Assocs. 617-275-5550
MI West Bloomfield, Granneman & Assocs. 313-661-4891
MN Minneapolis, Jos-Col Melius 612-861-3343
MO Maryland Hts., PMR, Inc. 314-569-1220
NE Overland Park, PMR, Inc. 913-381-0004
NJ Livingston, Eagle Sls. Co. 201-992-2030
NY Albany, H. C. Johnson Agencies 716-632-7880
NY Buffalo, H. C. Johnson Agencies 716-632-7880
NY Jericho, Metro-Tech 516-935-3330
NY Rochester, H. C. Johnson Agencies 716-482-3000
NC Kernersville, Wallace Electronics 919-996-2742
OH Dayton, Dynel Co. 513-434-6467
PA Glenshaw, H. C. Johnson Agencies 412-487-1246
PA King of Prussia, Freedman-Malta Assocs. 215-337-9211
TX Austin, Mil-Rep Associates 512-258-2828
TX Houston, Mil-Rep Associates 713-937-0127
TX Richardson, Mil-Rep Associates 214-644-6731
UT Salt Lake City, West Inc. 303-773-8180
WA Bellevue, Testco 206-454-7422
WI Milwaukee, Carlson Elctrn. Sls. 414-476-2790

Can Toronto, Norgay Entprs., Ltd. 416-239-3025

ENERCO, INC., 9615 W. Marginal Way S., Seattle, WA 98108, Tel: 206-762-1422; Empl.: 5; *Sls. Mgr.:* Lee Rabie

ENERGETEC SYSTEMS, INC., 130 E. St. Charles Rd., Carol Stream, IL 60188, Tel: 312-653-1920, Telex: 910-380-8574; Empl.: 40

ENERGY CONCEPTS, PO Box 128, Carlsbad, CA 92008, Tel: 619-942-3144; FSC No.: 01830; Empl.: 6; *Sls. Mgr.:* Marilyn Decarlo

ENERGY, LTD., 4714 Upshur Street, Bladensburg, MD 20710, Tel: 301-699-1144; FSC No.: Easylink 62837736; Empl.: 6 ..... **D•1923**

ENGELHARD CORP., 70 Wood Ave. S., Iselin, NJ 08830, Tel: 201-321-5900, Telex: 83-3147; Empl.: 8500

ENGELMANN MICROWAVE CO., KDI Pyrofilm, 60 S. Jefferson Rd., Whippany, NJ 07981, Tel: 201-887-5700, TWX: 710-986-8220; *Sls. Mgr.:* Carl Schraufnagl

ENGINEERED COMPS. CO., P. O. Box 8121, San Luis Obispo, CA 93403-8121, Tel: 805-544-3800; FSC No.: 32440; Empl.: 250

ENGD. PROD., Div. of Acme Elec. Corp., 40 Water St., Cuba, NY 14727, Tel: 716-968-2400, Telex: 91-6451, TWX: 510-245-2700; Empl.: 850; *Sls. Mgr.:* Dick Milne

ENGINEERING & ELCTRN. DEVICES, 1024 N. McCadden Pl., Los Angeles, CA 90038, Tel: 213-463-4175; Empl.: 4; *Sls. Mgr.:* John H. Aulbach, Jr.; *Dist. Mgr.:* Henry C. Lerner

ENGINEERING DESIGN & SLS., Rt. 2, Box 305, Danville, VA 24540, Tel: 804-685-7073; Empl.: 50; *Sls. Mgr.:* Mark Gignac

ENGINEERING SOFTWARE CO., Infotech Mgmt, Inc., Three Northpark East, # 901, 8800 N. Central Expwy., Dallas, TX 75041, Tel: 214-361-2431

ENGLER INSTRUMENTS OPERATION, Stemco Truck Products Division, 250 Culver Ave., Jersey City, NJ 07305, Tel: 201-332-5353, TWX: 710-730-5236; FSC No.: 07446; Empl.: 1200; *Sls. Mgr.:* Bob Halpin

ENI, INC., See Electronic Navigation Inds., Inc.

ENI POWER SYS., 3000 Winton Rd. S., Rochester, NY 14623, Tel: 716-473-7330, Telex: 97-8283; FSC No.: 10226; Empl.: 200; *Sls. Mgr.:* L. A. Benedict

ENTECH SYSTEMS, INC., 15 Herman Dr., Simsbury, CT 06070, Tel: 203-651-9557; *Sls. Mgr.:* A. D. Jorczak

ENTER COMPUTER, INC., 6867 Nancy Ridge Drive, San Diego, CA 92121, Tel: 619-450-0601, Telex: 181740; *Sls. Mgr.:* Robert Curtis

ENTERPRISE SYS. CORP., P.O. Box 698, Dover, NH 03820, Tel: 603-742-7363; Empl.: 20; *Sls. Mgr.:* G. E. Perrine

Entran

ENTRAN DEVICES, 10 Washington Ave., Fairfield, NJ 07006, Tel: 201-227-1002, Telex: 130-361; *Sls. Mgr.:* John W. G. Budd ..... **B•1794-1795**

Local Sales Offices & Reps

AZ Phoenix, J. Smith & Assocs. 602-267-0981
CA Long Beach, Saber Entprs. 213-595-5646
CA Pleasanton, Secco Assocs. 415-484-1030
CA San Diego, Saber Entprs. 619-271-1523
CO Colorado Springs, J. Smith & Assoc. .. 303-597-5343
CT Hamden, Pond Tech. Sls. 203-281-0005
GA Atlanta, Quantum Meas. 404-351-3531
IN Plainfield, Stress Analysis Svcs. 317-839-8235
MI Brighton, Stress Analysis Svcs. 313-632-6110
NJ Hopatcong, Measurements, Inc. 201-770-1281
NM Albuquerque, J. Smith & Assocs. 505-265-3406
NY Clarence, Trott Electrns. 716-634-8500
NY Pittsford, Trott lectrnis. 716-586-8251
NC Chapel Hill, Quantum Meas. 919-933-7408
OH Dayton, Stress Analysis Svcs. 513-263-8036
OH Medina, Stress Analysis Svc. 216-725-7733
PA Frazer, Measurements, Inc. 215-644-7142
VA Fredericksburg, Measurements, Inc. ... 703-373-5520
Can Ontario, Intertechnology 416-445-5500

ENTRELEC DIV., See Cogenel, Inc./Entrelec Div.

ENVIRONMENTAL COMM., 3150 Pullman St., Costa Mesa, CA 92627, Tel: 714-557-7800, TWX: 910-595-1781; FSC No.: 16450; Empl.: 65; *Sls. Mgr.:* Joseph Hughes

ENVIRONMENTAL CONTAINER SYS., INC., 3560 Rogue River Hwy., Box 188, Grants Pass, OR 97526, Tel: 503-476-8871, TWX: 510-755-0777; FSC No.: 24995; Empl.: 135

Local Sales Offices & Reps

AR Little Rock, Advance Tech. Sls. 501-794-1618
CA Santa Clara, Ross Mktg. Assocs. 408-988-8111
CO Englewood, Electronic Comp. Sls., Inc. 303-781-5904
CT Wallingford, Apex Assocs. 203-269-8401
FL Clearwater, Brennan Assocs., Inc. 813-446-5006
GA Atlanta, Brennan Assocs., Inc. 404-395-7527
MA Westwood, Apex Assocs. 617-326-5042
NJ Teaneck, Noreast Tech. Sls. 201-833-2044
OK Tulsa, Advance Tech. Sls. 918-664-0482
TX Austin, Advance Tech. Sls. 512-459-1351
TX Dallas, Advance Tech. Sls. 214-340-1300
TX Houston, Advance Tech. Sls. 713-440-3888

EOTEC CORP., 420 Frontage Road, W. Haven, CT 06516, Tel: 203-934-7961, Telex: 358190; Empl.: 24; *Sls. Mgr.:* Robert L. Belard

EOTEC CORPORATION, Fiber Optic Interconnect Group, 420 Frontage Road, West Haven, CT 06516, Tel: 203-934-7961, Telex: 358190; Empl.: 24; *Sls. Mgr.:* Lou Maiolo

E.P.E. CORP., P.O. Box 5238, Manchester, NH 03108, Tel: 603-669-9181, Telex: 943536; Empl.: 65; *Sls. Mgr.:* James D. Bell; *Dist. Mgr.:* Thomas S. Bell

EPIC, INC., 150 Nassau St., New York, NY 10038, Tel: 212-349-2470, Telex: 12-6531; Empl.: 8; *Sls. Mgr.:* Peter Letica

EPICOM, INC., 411 Josiane Court, Altamonte Springs, FL 32701, Tel: 305-331-1640; Empl.: 15; *Sls. Mgr.:* W. R. Adams; *Dist. Mgr.:* W. R. Adams

EPOCH ENTERPRISES, LTD., 3541 N. Olive Rd., Tucson, AZ 85719, Tel: 602-887-1970, 888-5167, Telex: 4995542; Empl.: 2

EPOXYLITE CORP., 9400 Toledo Way, P.O. Box 19671, Irvine, CA 92713, Tel: 714-951-3231; Empl.: 60

EPOXY TECHNOLOGY, INC., 14 Fortune Dr., P.O. Box 567, Billerica, MA 01821, Tel: 800-227-2201, Telex: 94-7140; FSC No.: 33246; Empl.: 18

Local Sales Offices & Reps

AZ Phoenix, Wadsworth/Bryant 602-275-7366
CA Atherton, Wadsworth/Bryant 415-321-3619
CA Hacienda Heights, Wadsworth/Bryant 818-330-5592
CO Boulder, Specialty Sales Co. 303-444-0954
FL Fort Pierce, Hyber-Sem 305-464-0461
IL Chicago, E. Przechera Sls. Co. 312-725-1933
MA Newton, Normell Assoc. 617-969-5478
MI Royal Oak, Murray A. Percival Co. 313-548-1971
NJ Clinton, Price-Tech Inc. 201-735-9797
NY Fair Haven, Feikert Assoc. 315-652-5577
OH Dayton, Berberich Assoc. 513-433-0342
OR Beaverton, Demarest Assoc. 503-643-0141
TX Arlington, Whitehead & Assoc. 817-261-5794
UT West Jordan, Specialty Sales Co. 801-561-0222
WA Seattle, Demarest Assoc. 206-523-3210

EPSCO, 920 Westwood Ave., Addison, IL 60101, Tel: 312-543-0410; FSC No.: 53003; Empl.: 8 ..... **D•1634**

Local Distributors

AR Little Rock, Carlton-Bates Co. 501-562-9100
CA Garden Grove, Allied Elctrns. 714-554-0731
CA San Francisco, VWR Scientific Inc. 415-468-7150
CO Denver, Newark Elctrns. 303-757-3351
FL Marathon, Marathon Wholesale Electric Supply 305-743-2262
FL Miami, Aero Quality Sls. 305-592-5055
GA Warner Robbins, Omnia Supp. 912-929-2948
HI Honolulu, Honolulu Elctrn. 808-949-5564
IL Chicago, Newark Elctrns. 312-638-4411
IL Elgin, Allied Elctrns. 312-697-8200
IL Elmhurst, McMaster-Carr Supp. 312-834-9600
IL Skokie, Sargent-Welch Sci. 312-677-0600
IN Evansville, Hutch & Son 812-425-7201
IN Indianapolis, Electro Prods. 317-298-8255
LA New Orleans, Radio Parts 504-581-5959
MA Lynn, Land Elctrns. 617-592-2220
MI Flint, Shand Elctrns. 313-743-8940
MI Lansing, Fulton Radio 517-394-5020
MO Kansas City, Walters Radio Supp. 816-531-7015
NJ Bridgeport, VWR Scientific Corp. 609-467-2600
NM Albuquerque, Walker Radio 505-247-2288
NY New York, Colonial Hardware Corp. ... 212-741-8989
OH Dayton, The John A. Becker Co. 513-226-1341
OH Warren, Rem Elctrns. Supp. 216-373-1300
PA Pittsburgh, Fischer Scientific Co. 412-562-8300
SC Charleston, Wholesale Inds. Elec. 803-722-2634
TX Dallas, Wholesale Elctrns. 214-824-3001
TX Ft. Worth, Allied Elctrns. 817-336-5401
UT Salt Lake City, Newark Elctrns. 801-486-1048
VA Norfolk, Avec Elctrns. 804-627-3502
WI Milwaukee, Industrial Elctrns. Supp. ... 414-276-1212

EPSCO MICROWAVE, 411 Providence Hwy., Westwood, MA 02090, Tel: 617-329-1500, TWX: 710-348-0484; FSC No.: 15894; Empl.: 185; *Sls. Mgr.:* John M. Shalhoub

EPSILON-LAMBDA ELCTRNS. CORP., 427 Stevens St., Geneva, IL 60134, Tel: 312-232-9611, TWX: 910-237-1684; Empl.: 30; *Sls. Mgr.:* Robert Knox

EQUIPTO, 225 S. Highland Ave., Aurora, IL 60507, Tel: 312-859-1000, TWX: 910-232 0845; Empl.: 300; *Sls. Mgr.:* Ralph Zettinger

EQUIPTO ELCTRNS. CORP., 351 Woodlawn Ave., Aurora, IL 60507, Tel: 312-897-4691; FSC No.: 14002;Multiple; *Sls. Mgr.:* Larry Suggett ..... **C•1059**

Local Sales Offices & Reps

AL Mobile, Hollingsworth & Still 800-241-5712
AZ Tempe, Burland Assoc. 602-894-5564
CA Anaheim, Spectrum Assocs. 714-630-6977
CA Milpitas, Ward Elctrn. Packaging Sls. .. 408-945-0420
CO Littleton, Grifco 303-795-1989
CT Bridgeport, Technical Instrs. 203-368-4582
FL Ft. Lauderdale, Hollingsworth & Still ... 800-241-5712
FL Tampa, Hollingsworth & Still 800-241-5712
GA Norcross, Hollingsworth & Still 404-447-1700
IN Ft. Wayne, Scott Elctrns. 219-484-7865

entrelec®

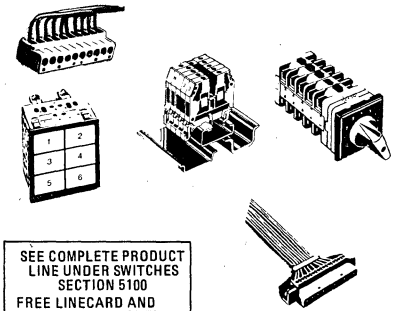
FULL LINE
AUTHORIZED DISTRIBUTOR

E S I

ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



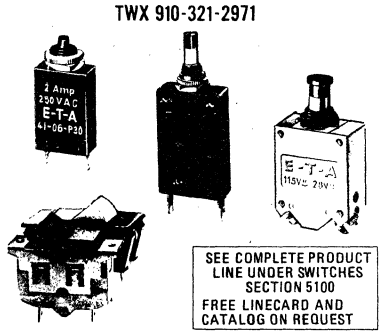
SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

IN Indianapolis, Scott Elctrns., Inc. 317-897-9976
KS Desoto, Midtec Assocs., Inc. 913-441-6565
MD Silver Spring, Sel-Tronics 301-589-3391
MA Wilmington, Technical Instrs. 617-944-3930
MO Florissant, Midtec Assocs., Inc. 314-837-5200
NJ Englewood, Tecnimat 201-569-4200
NM Albuquerque, R.L.S. Instr. 505-265-4187
NY Syracuse, Labtronics 315-455-7314
NC Charlotte, Hollingsworth & Still, Inc. ... 800-241-5712
NC Kernersville, Hollingsworth & Still, Inc. 800-241-5712
OH Cincinnati, Scott Elctrns. 513-791-2513
OH Cleveland, Scott Elctrns. 216-473-5050
OH Dayton, Scott Elctrns. 513-294-0539
OH Reynoldsburg, Scott Elctrns., Inc. 614-863-1281/1282
OK Tulsa, ION, Assocs., Inc. 918-664-0186
PA Pittsburg, Scott Elctrns., Inc. 412-963-6116
PA Valley Forge, J. E. Cuesta & Co. 215-265-5800
TX Austin, ION Assocs., Inc. 512-331-7251
TX Grand Prairie, ION Assocs., Inc. 214-647-5225
TX Houston, ION Assocs., Inc. 713-977-4354
WA Seattle, S.J.I. Corp. 206-763-8981

ERA POLY-PLANAR DIV., 311 E. Park St., Moonachie, NJ 07074, Tel: 201-641-3650, TWX: 710-990-5064; Empl.: 100; *Sls. Mgr.:* John Apelian

ERA TRANSPAC DIV., Sub. Elctrn. Research Assocs., 50 Graphic Place, Moonachie, NJ 07074, Tel: 201-641-3650, TWX: 710-990-5064; FSC No.: 96762; Empl.: 100; *Sls. Mgr.:* John Apelian ..... **D•1635-1637**

Local Sales Offices & Reps
CA Los Angeles, Astralonics 213-706-0488
CA Orange County, Astralonics 213-691-6123
CA San Diego, Astralonics 619-789-2256
CA Westlake Village, Astralonics 818-706-3936
CT Milford, Todino Engrg. Sls. 203-874-6643
GA Smyrna, B-C Elctrn. Sls., Inc. 404-436-5169
MA Needham Heights, Todino Engrg. Sls. 617-444-7925
NJ Perth Amboy, Astrorep, Inc. 201-826-8050
NY Babylon, Astrorep, Inc. 516-422-2500
PA Pittsburgh, Covert & Newman Co. 412-531-2002
TX Austin, Beacon 512-331-5115
TX Dallas, Beacon 214-437-1505
VA Front Royal, Eltron Sls., Ltd. 703-635-7201

E-T-A
CIRCUIT BREAKERS
FULL LINE
AUTHORIZED DISTRIBUTOR
E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971


SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

WA Seattle, Datacom Assocs., Inc. 206-285-2525
Can Pointe Claire, Que., Elcom GBM, Inc. 514-626-4039,514-697-4556

ERASER CO., Box 4961, Syracuse, NY 13221, Tel: 315-454-3237, Telex: 93-7442; Empl.: 45; *Sls. Mgr.:* Linda S. Cahill

ERBTEC ENGINEERING, INC., 5680 Valmont Rd., Boulder, CO 80301, Tel: 303-447-8750; Empl.: 16; *Sls. Mgr.:* Harvey Girard

ERC, See Electronic Research Co.

ERCONA, 125 Wilbur Pl., Bohemia, NY 11716, Tel: 516-567-3399, Telex: 961449; Empl.: 10; *Sls. Mgr.:* M. Kandell; *Dist. Mgr.:* J. Curley

EREM CORP., 3740 Skypark Dr., Torrance, CA 90505, Tel: 213-772-0751; Empl.: 25; *Sls. Mgr.:* G. Johnson; *Dist. Mgr.:* C. Johnson

ERGOTRON, INC., 1621 E. 79th Street, Minneapolis, MN 55420, Tel: 612-854-9116, 800-328-9839, Telex: 290766; Empl.: 8; *Sls. Mgr.:* Keith A. Jentoft

ERICSON MFG. CO., 4215 Hamann Pkwy., Willoughby, OH 44094, Tel: 216-951-8000, Telex: 98-5390; *Sls. Mgr.:* J. E. (Jay) Ericson, Jr.

ERIE TECHN. PRODS., See Murata Erie No. Amer., Inc.

ERIE TECHNOLOGICAL PRODUCTS, 645 West 11th St., Erie, PA 16512, Tel: 814-453-5611

ERM, 27 Water St., Wakefield, MA 01880, Tel: 617-246-3550

ERNI COMPS. CORP., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005, Tel: 312-577-8620, TWX: 910-687-0260; *Sls. Mgr.:* J. Garratt; *Dist. Mgr.:* G. F. Zib

ESC

ESC ELCTRNS. CORP., 534 Bergen Blvd., Palisades Pk., NJ 07650, Tel: 201-947-0400, TWX: 710-991-9780; Empl.: 120 ..... **A•1508-1521, 1604-1605**

Local Sales Offices & Reps
AL Huntsville, Interep Assocs. 205-533-1730
AZ Mesa, Sedco Sls. 602-835-6281
AZ Tucson, Sedco Sls., Inc. 602-298-1758
CA Culver City, Westaronics 213-641-4122
CA Santa Clara, Rodgers Assocs. 408-984-8110
CO Westminster, D/Z Assocs. 303-429-9369
CT Bridgeport, Betronic Assocs. 203-374-6404
FL St. Petersburg, QXI, Inc. 813-821-2281
FL Tamarac, QXI, Inc. 305-392-2626
GA Norcross, Interep Assocs., Inc. 404-449-8680
IL Elk Grove, Carlson Elctrn. Sls. Co. 312-956-8240
IN Indianapolis, J & W Sls. 317-842-3740
IA Cedar Rapids, Carlson Elctrn. Sls. Co. 319-377-6341
KS Merriam, Midwest Tech. Sls. 913-236-8555
MA Waltham, Betronic Assocs. 617-894-8400
MN Minneapolis, R-J, Inc. 612-866-3661
MO St. Charles, Midwest Tech. Sls. 314-441-1012
NY New York City, Robert Smith Assocs. 212-541-4885
NY Plainview, Robert Smith Assocs. 516-681-3155
OH Cincinnati, Makin Assocs. 513-871-2424
OR Beaverton, Ravencraft 503-646-9261
NJ Marlton, BGR Assocs. 609-983-1020
TN Greeneville, Interep Assocs., Inc. 615-639-3491
TX Plano, Zeus Engrg. 214-423-2027
UT Salt Lake City, D/Z Assocs. 801-268-2876
VA Reston, Tytronics Tech. Sls. 703-471-0440
WI Milwaukee, Carlson Elctrn. Sls. Co. 414-476-2790
EXP NJ, Palisades Pk., ESC Elctrns. Corp. 201-947-0400

ESE, 142 Sierra St., El Segundo, CA 90245, Tel: 213-322-2136; FSC No.: 58525; Empl.: 25; *Sls. Mgr.:* R. Mayers; *Dist. Mgr.:* R. Mayers

ESICO, INC., Box 247, Deep River, CT 06417, Tel: 203-526-5361; Empl.: 45; *Sls. Mgr.:* Robert W. Mead

ESNA DIV., 2330 Vauxhall Rd., Union, NJ 07083, Tel: 201-686-6000, Telex: 1-38243, TWX: 710-985-4677; Empl.: 700

ESNA DIV., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083, Tel: 201-686-6000, Telex: 1-38243, TWX: 710-985-4677; Empl.: 600; *Sls. Mgr.:* W. H. Riley; *Dist. Mgr.:* A. H. Wighton

ESPEY MFG. & ELECTRONICS CORP., 223-239 Ballston Ave., Saratoga Springs, NY 12866, Tel: 518-584-4100

E^2 TECHNOLOGY CORP., 4475 Dupont Ct # 9, Ventura, CA 93003, Tel: 805-644-9544, Telex: 887971 E Sq. Tech. UD; Empl.: 15; *Sls. Mgr.:* Larry D. Emery

ESSCO INDS., P.O. Box 515, Sierra Madre, CA 91024-0515, Tel: 818-355-8315; Empl.: 33

ESSEX CONTROLS, See Stancor Products

ESSEX CONTROLS DIV., ESSEX GRP., See Essex Controls, United Technologies

ESSEX GROUP, 9933 13th St., Ft. Wayne, IN. 46809, Tel: 219-478-1521; Empl.: 300-500; *Sls. Mgr.:* J. Scott

ESSEX GRP., ESSEX TERMINALS/CONNECTORS, See United Technologies, Comps. Div. Terminals

ESSEX GRP., Power Conductor Div., 2601 S. Adams, Marion, IN 46953, Tel: 317-664-6211, TWX: 317-667-6972; Empl.: 700; *Sls. Mgr.:* J. Burdick

ESTERLINE ANGUS INSTR. CORP., Box 24000, Indianapolis, IN 46224, Tel: 317-244-7611, Telex: 027-419; FSC No.: 72264; Empl.: 250 +; *Sls. Mgr.:* James Banks

ESTES ENGRG. CO., 930 Marine Dr., Port Angeles, WA 98362, Tel: 206-457-0904; FSC No.: 22590; Empl.: 28

E-SYSTEMS, Garland Div., Box 226118, Dallas, TX 75266, Tel: 214-272-0515, TWX: 910-860-5187; Empl.: 1927

E-SYSTEMS, Greenville Div., P.O. Box 1056, Greenville, TX 75401, Tel: 214-457-4694, Telex: 73-2392; *Sls. Mgr.:* C. L. Byrom

E-SYSTEMS, Melpar Div., 7700 Arlington Blvd., Falls Church, VA 22046

E-SYSTEMS, Memcor Div., 1320 Flaxmill Rd., Huntington, IN 46750, Tel: 219-356-4300, TWX: 810-333-1530; FSC No.: 24681; Empl.: 450; *Sls. Mgr.:* Ray Vanderspool ..... **A•1869, 2015**

Local Sales Offices & Reps
AL Huntsville, Murcota 205-539-8476
CA Santa Ana, Cal-Tronic Sls. 714-979-4863
CA Santa Clara, D.H. Ross 408-988-8111
CO Denver, West, Inc. 303-692-0131
FL Indialantic, Raycom 305-727-8860
GA Atlanta, Murcota 404-875-2525
IL Chicago, D. Dolin Sls. 312-286-6200
IN Ft. Wayne, Menze Sls. 219-747-5616
MI St. Clair Shores, J.M. Thorpe 313-779-6363
MO Blue Springs, Chesco 816-229-1404
MO St. Charles, Chesco 314-946-6677
NH Atkinson, Mark Rep Assoc. 603-362-4526
NJ Englewood Cliffs, Masin Esco 201-569-8868
NY Hauppauge, Masin Esco 516-273-3500
NY Pittsford, Noeth-Honsinger 315-586-9002
NC Burlington, Murcota 919-585-1577
NC Winston-Salem, Murcota 919-723-1001
OH Cleveland, Glover Sls. 216-842-4520
PA Newtown Square, G.M. Conneen 215-353-2241
TX Dallas, SW Elctrn. Ind. 214-233-9816
TX Houston, SW Elctrn. Ind. 713-729-1670
UT Salt Lake City, West, Inc. 801-966-0171
WA Redmond, Barrett-Squibb 206-885-6991

E-T-A CIRCUIT BREAKERS, 7400 N. Croname Rd., Chicago, IL 60648, Tel: 312-647-8303, Telex: 253780; Empl.: 20; *Sls. Mgr.:* John J. Palsir

Local Sales Offices & Reps
CA Pleasanton, Moulthrop Sls. 415-463-0450
CA Tustin, Sierra-Pacific Eng. 714-731-3411
CO Denver, Challenge Sls. 303-450-2402
CT East Haven, Eagle Assocs. 203-467-6542
FL Orlando, EAB Inc. 305-898-7444
IL Arlington Heights, Thermek 312-577-6900
IN Ft. Wayne, Needler Sls. Co. 219-447-2123
IN Indianapolis, Needler Sls. Co. 317-255-8056

MA Boston, Eagle Assocs. 617-444-3446
MI Detroit, Hilltronics 313-398-5556
MN Minneapolis, Chris & Assocs. 612-432-1823
MO Kansas City, Delltron Co. 816-436-6445
MO St. Louis, Delltron Co. 314-869-4779
NY New York, Schmitt Indl. Mktg. Corp. ... 516-486-3510
NY Rochester, Robert F. Lamb Co. 716-323-1250
NY Syracuse, Robert F. Lamb Co. 315-455-2469
OH Cincinnati, J. O. Olsen Co. 513-574-7711
OH Cleveland, J. O. Olsen Co. 216-662-3454
OR Portland, Temco Northwest 503-648-8171
PA Pittsburgh, J. O. Olsen Co. 412-279-2550
TN Hendersonville, Stark & Assoc. 615-822-1667
TX Austin, Delta Comps. 512-458-4288
TX Dallas, Delta Comps. 214-287-6333
UT Salt Lake City, Frank Merchant 801-277-3775
VA Fairfax, Beacon North 703-591-1300
WA Seattle, Temco Northwest 206-488-1254
WI Milwaukee, Star Engineering 414-645-3680

ETI ELECTRONICS, 5751 Miami Lakes Dr., Miami Lakes, FL 33014, Tel: 305-556-4000, Telex: 80-3347; *Sls. Mgr.:* R. Grossman; *Dist. Mgr.:* S. Zucker

ETI SYSTEMS, Polaris Indl. Entprs., 215 Via Del Norte, Oceanside, CA 92054, Tel: 619-757-7770, TWX: 910-322-1396; FSC No.: 952 762672; *Sls. Mgr.:* Bill Tice; *Dist. Mgr.:* Bill Tice ..... **A•2016-2017; B•1150-1152; D•1120-1121**

Local Sales Offices & Reps

CT Washington, Tri-Com Assocs. 203-563-2241
IL Arlington Heights, Brainard-Wilson Mktg. 312-437-2700
IN Carmel, Brainard-Wilson Mktg. 317-844-2800
LA Covington, HBT Assocs. 504-892-4045
MA Burlington, Tri-Com Assocs. 617-272-8163
MA Newburyport, Tri-Com Assocs. 617-465-3205
MI Livonia, Lowell Wenot 313-464-2722
MN Minneapolis, Intl. Elctrns. 612-571-0000
NJ Morristown, Andrews & Andrews 201-569-8800
NY Huntington, Andrews & Andrews 516-692-8686
OH Cleveland, Baehr Greenleaf & Assocs. 216-221-9030
OH Columbus, Baehr Greenleaf & Assocs. 614-486-4046
OH Dayton, Baehr Greenleaf & Assocs. ... 513-439-0724
OR Hillsboro, Rhodes Sls. Corp. 503-640-6666
PA Dowington, Homersmith, Inc. 215-269-3637
PA Evans City, Baehr Greenleaf 412-776-2151
PA Media, Homersmith, Inc. 215-543-2434
TX Dallas, Allied Comp., Inc. 214-238-0408
TX Houston, Allied Comp., Inc. 713-988-1600
TX Hurst, Allied Comp., Inc. 817-589-0456
TX Round Rock, Allied Comp., Inc. 512-244-1166
VA Roanoke, Homersmith, Inc. 703-774-7411
WA Kent, Rhode Sls. Corp. 206-251-5396
WI Waukesha, Brainard-Wilson 414-797-7940

Local Distributors

AZ Tempe, Anjon Enterprises 602-894-1332
CA Anaheim, A To Z Elctrns. 714-634-3620
CA Canoga Park, Tim-Co. Sls. 213-992-5040
CA Garden Grove, Allied Elctrns. 714-544-0731
CA Hayward, Allied Elctrns. 415-487-5250
CA Los Angeles, Allied Elctrns. 213-725-7111
CA San Jose, Allied Elctrns. 408-727-1690
CA San Jose, Vader Elec. 408-971-0288
CO Wheatridge, Allied Elctrns. 303-425-7144
CT Hamden, Allied Elctrns. 203-248-8900
FL Ft. Lauderdale, Allied Elctrns. 305-486-0500
FL Jupitor, Brosey Entprs. 305-746-2439
GA Atlanta, Allied Elctrns. 404-237-3366
IL Elgin, Allied Elctrns. 312-697-8200
IL Lisle, Components, Inc. 312-852-7707
MD Marlow Heights, Allied Elctrns. 301-423-0161
MA Holliston, Add Elctrns. 617-478-4200
MA Wilmington, Allied Elctrns. 617-942-0150
MA Woburn, Mac Bearing Co. 617-933-2110
NY Mineola, Allied Elctrns. 516-248-2360
NY Port Washington, Connector Concepts Corp. 516-883-3800
NC Raleigh, Allied Elctrns. 919-467-0720
OH Cleveland, Allied Elctrns.
OH Cleveland, Specialized Comp. Sls. 216-464-0405
OK Oklahoma City, Trice Wholesales Elec. 405-524-4411
OK Tulsa, Allied Elctrns. 918-663-7630
OR Beaverton, Shannon, Ltd. 503-644-8077
PA Bala Cynwyd, Allied Elctrns. 215-667-6940
TX Ft. Worth, Allied Elctrns. 817-336-5401
TX Houston, Lenert Co. 713-225-1465
TX Humble, Allied Elctrns. 713-852-3730
WA Kent, Shannon, Ltd. 206-763-0545
WA Seattle, Allied Elctrns. 206-767-5772
WI Milwaukee, Allied Elctrns. 414-355-8866
WI Oshkosh, Electronic Inds. 414-235-8930

ETM ELECTROMATIC, 470 San Antonio Ave., Palo Alto, CA 94306, Tel: 415-494-1505; *Sls. Mgr.:* Wes Henderson ..... **D•1226-1227, 1638**

ETRI, INC., 608 Broome St., P.O. Box 5006, Monroe, NC 28110, Tel: 704-289-5423, TWX: 810-649-1352; FSC No.: FAX 704-283-7170; *Sls. Mgr.:* G. Wolf ... **C•1638-1640**

Local Sales Offices & Reps

AL Huntsville, Montgomery Mktg. 205-830-0498
AZ Scottsdale, Luscombe Engrg. 602-949-9333
CA Los Gatos, Nor-West Elctrns. 408-395-1190
CA Pasadena, Luscombe Engrg. 213-684-2000
CA San Diego, Bestronics 619-693-1111
CO Boulder, Comp. Prods. Sls. 303-530-2800
FL Altamonte Springs, Semitronics Assocs. 305-831-8233
FL Clearwater, Semtronics Assocs. 813-461-4675
FL Ft. Lauderdale, Semtronics Assocs. ... 305-731-2484
GA Norcross, Montgomery Mktg. 404-447-6124
IL Des Plaines, Lincoln, Hodges & Assocs. 312-297-3810
IN Ft. Wayne, Advanced Comp. Sls. 219-484-0722
IN Indianapolis, Advanced Comp. Sls. 317-545-6441
IA Cedar Rapids, PMR, Inc. 319-362-9177
KS Overland Park, PMR, Inc. 913-381-0004
MA Lexington, John E. Boeing Co., Inc. 617-862-2500
MI Birmingham, Favco Techn. Reps. 313-644-0173
MN Minneapolis, Milt Westlund Assocs. ... 612-866-5002
MO Maryland Heights, PMR, Inc. 314-569-1220
NJ Cherry Hill, Trinkle Sls., Inc. 609-795-4200
NY Endicott, Noeth-Honsinger 607-754-3214
NY Manhasset, Win-Cor Elctrns. 516-627-9474
NY Pittsford, Noeth-Honsinger 716-586-9002
NC Cary, Montgomery Mktg. 919-467-6319
OH Cincinnati, Makin & Assocs., Inc. 513-871-2424
OR Wilsonville, RTS, Inc. 503-638-5670
TX Austin, Nova Mktg. 512-343-2321
TX Dallas, Nova Mktg. 214-750-6082
TX Houston, Nova Mktg. 713-988-6082
WA Vashon, RTS, Inc. 206-285-1363
WI Janesville, Antek/Lincoln Hodges & Assocs. 608-754-4214
WI Waukesha, Lincoln, Hodges & Assocs. 414-542-3087
PR Santurce, John E. Boeing Co., Inc. 809-722-6942
Can Monroe, NC, ETRI, Inc. 704-289-5423

Local Distributors

AL Huntsville, RM Elctrns. 205-852-1550
AZ Tempe, Acacia Sls., Inc. 602-894-2874
AZ Tempe, Fisher Brownell 602-967-1464
CA Alhambra, Fisher-Brownell 818-289-0255
CA Fountain Valley, Components Ctr. 714-979-0433
CA Irvine, Acacia Sls., Inc. 714-660-0834
CA San Diego, Acacia Sls., Inc. 619-565-4365
CA San Diego, Fisher Brownell 619-560-8545
CA Santa Clara, Fisher Brownell 408-988-6041
CA Sunnyvale, Acacia Sls., Inc. 408-745-7200
CO Denver, Integrated Elctrns. 303-292-6121
CO Lakewood, Acacia Sls., Inc. 303-232-2882
CT Milford, RC Comps. 203-874-0006
CT Orange, Milgray Elctrns. 203-795-0711
FL Altamonte Springs, Pioneer Elctrns. ... 305-834-9090
FL Deerfield Beach, Pioneer Elctrns. 305-428-8877
FL Ft. Lauderdale, Hammond Elctrns. 305-973-7103
FL Winter Park, Milgray Elctrns. 305-647-5747
GA Atlanta, Milgray Elctrns. 404-393-9666
IL Addison, L-Comp 312-628-1400
IL Bensenville, Milgray Elctrns. 312-350-0490
IL Elk Grove Village, RM Elctrns. 312-364-6622
IL Itasca, Voyager Elctrns. 312-773-4900
IL Palatine, OHM Elctrns. 312-359-5500
IN Indianapolis, Advent Elctrns. 317-872-4910
IN Indianapolis, RM Elctrns. 317-291-7110
KS Overland Park, Milgray Elctrns. 913-236-8800
KS Wichita, L-Comp 316-265-5100
MD Gaithersburgh, MS Elctrns. 301-921-0200
MD Rockville, Milgray Elctrns. 301-468-6400
MA Burlington, Milgray Elctrns. 617-272-6800
MA Wilmington, R C Comps. Inc. 617-273-1860
MI Grand Rapids, RM Elctrns. 616-531-9300
MI Livonia, LWC Distrs. 313-464-7700
MN Minneapolis, Industrial Comps. 612-831-2666
MN Minneapolis, Stark Elctrns. 612-332-1325
MO Kansas City, L-Comp 816-221-2400
MO Maryland Heights, L-Comp 314-291-6200
NH Hudson, C & H Elctrns. 603-882-1133
NJ Marlton, Milgray Elctrns. 609-983-5010
NY Bohemia, Key Comps. 516-567-7500
NY Buffalo, Summit Distrs. 716-884-3450
NY Farmingdale, Milgray Elctrns. 516-420-9800
NY Pittsford, Milgray Elctrns. 716-385-9330
NY Rochester, Summit Elctrns. 716-334-8110
NC Charlotte, Electronic Mktg. Corp. 714-394-6195
NC Greensboro, Hammond Elctrns. 919-275-6391
OH Cleveland, Alpha Distrs. 216-526-3716
OH Cleveland, Milgray Elctrns. 216-447-1520
OH Columbus, Electronic Mktg. Corp. 614-299-4161
OH Dayton, Electronic Mktg. Corp. 513-439-4711
OH Highland Heights, Electronic Mktg. Corp. 216-442-3441
OK Tulsa, Norvell Elctrns. 918-663-1247
OR Beaverton, Acacia Sls., Inc. 503-646-3377
PA Allentown, P.A. Peters 215-434-5237
PA Montgomeryville, Pyttronics Inds. 215-643-2850
SC Greenville, Hammond Elctrns. 803-233-4121
TX Austin, Norvell Elctrns. 512-458-8106
TX Dallas, Milgray Elctrns. 214-248-1603
TX Dallas, Norvell Elctrns. 214-233-0020
TX Houston, Force Elctrns. of TX 713-561-8644
TX Houston, Norvell Elctrns. 713-777-1666
TX Irving, Force Elctrns. of TX 214-438-5700
TX Richardson, Components Ctr. 214-644-3444
TX Richardson, Fisher-Brownell 214-235-3177
UT Salt Lake City, Bell Indus. 801-972-6969
VA Charlottesville, Virginia Radio & Supp. 804-296-4184
WI Milwaukee, Indl. Elctrns. 414-276-1212
WI New Berlin, RM Elctrns. 414-784-4420
Can Markham, Ont., International Rectifier 416-475-1897
Can Vancouver B.C., Intek Elctrns. 604-324-6831

E-TRONICS, 16774 Schoenborn, Sepulveda, CA 91343, Tel: 213-892-7279; Empl.: 28

EUBANKS ENGRG., 1307 So. Myrtle Ave., Monrovia, CA 91016, Tel: 818-357-7011, Telex: 675403; Empl.: 90; *Sls. Mgr.:* J. Reed

EVANS & SUTHERLAND COMPUTER CORP., P.O. Box 8700, 580 Arapeen Dr., Salt Lake City, UT 84108, Tel: 801-582-5847, Telex: 389492, TWX: 910-925-5818; Empl.: 850; *Sls. Mgr.:* William Elstun

EVANS ELECTRONICS, Box 5055, Berkeley, CA 94705, Tel: 415-653-3083

EVAPORATED COATINGS, P.O. Box 160, Huntingdon Valley, PA 19006, Tel: 215-947-1465; Empl.: 24; *Sls. Mgr.:* Stephen L. Schaffer

EVENTIDE, INC., One Alsan Way, Little Ferry, NJ 07643, Tel: 201-641-1200, TWX: 710-991-8715; Empl.: 38; *Sls. Mgr.:* Michele Natter; *Dist. Mgr.:* Michele Natter

EVEREADY-ENERGIZER, See Union Carbide Battery Prods. Div.

EVEREST INTERSCIENCE, INC., P.O. Box 345, Tustin, CA 92681, Tel: 714-992-4461, 714-730-0747, Telex: 295368 EVER OR; Empl.: 11; *Sls. Mgr.:* Steve A. Giffin

Local Sales Offices & Reps

AL Huntsville, Newcomb Assocs. 205-837-3233
CA Gardena, Instrument Lab. 213-327-3282
CO Littleton, Radco Elctrns. 303-794-4279
IL Decatur, Mueller Sls. 217-442-6379
IA Cedar Rapids, Mueller Sls. 319-365-1196
LA Baton Rouge, Allesco 504-928-1571
MN Golden Valley, Mueller Sls. 612-544-8888
NE Omahab' 402-571-3033
NY Buffalo, Seelbach & Schmitt Inc. 716-839-2300
OH Cincinnati, Pro-Con Analytical 513-272-3300
OR Portland, Fairman B. Lee Co. 503-283-9442
PA Havertown, Shelby Jones Co. 215-446-6600
TX Dallas, Allesco 817-261-3966

TX Houston, Allesco 713-771-0115
WA Seattle, Fairman B. Lee Co.
WI Brookfield, Mueller Sls. 414-781-5310

EVERETT/CHARLES AUTOMATION SYS. INC., 6101 Cherry Ave., Fontana, CA 92335, Tel: 714-899-2411, TWX: 4720716; *Sls. Mgr.:* Jim Meadville

EVERETT/CHARLES CONTACT PRODS. INC., 700 E. Harrison Ave., Pomona, CA 91767, Tel: 714-625-5551, Telex: 67-55-78, TWX: 910-581-1210; Empl.: 100; *Sls. Mgr.:* Bud Fabian

EVERETT/CHARLES TEST EQUIP. INC., 2887 N. Towne Ave., Pomona, CA 91767, Tel: 714-621-9511, TWX: 910-581-3838; Empl.: 200; *Sls. Mgr.:* Jim Malloy

EVERSHED & VIGNOLES, LTD., Acton Lane, Chiswick, London, England W4 5HJ, Tel: 01-994-3670, Telex: 22583; Empl.: 300; *Sls. Mgr.:* J. Gilpin

EV-GAME INC., See EVG, Inc.

EVI, INC., 8970 F Route 108, Columbia, MD 21045, Tel: 301-964-1660; Empl.: 4 ..... **D•1639**

EWALD INSTRS., Rte. 7R, Kent, CT 06757, Tel: 203-927-3278

EWC, INC., 725 Federal Ave., Kenilworth, NJ 07033, Tel: 201-245-3200, 800-526-4048, TWX: 710-996-5993; FSC No.: 15387;MIL-T-27D; Empl.: 210; *Sls. Mgr.:* C. G. Hiotis; *Dist. Mgr.:* C. G. Hiotis ..... **A•2136-2148**

Local Sales Offices & Reps

AZ Mesa, Cummings & Assoc. 602-994-9027
CA Canoga Park, Cummings & Assocs. ... 818-340-6035
CA Santa Clara, Cummings & Assocs. 408-247-8656
CO Denver, Cummings & Assocs., Mktg. Inc. 303-455-6860
CT Ridgefield, Phoenix Sales 203-438-9644
FL Apopka, Tech-Rep Assoc. 813-577-2779
FL Greenacres City, Tech-Rep. Assoc. ... 813-577-2779
FL St. Petersberg, Tech-Rep. Assoc. 813-577-2779
FL Winter Park, Tech-Rep Assoc. 813-577-2779
IL Pallatine, T-Squared Assoc. 312-991-2144
IN Fort Wayne, Giesting & Assoc. 219-486-1912
IA Cedar Rapids, Lorenz Sales 319-377-4666
KS Overland Park, Lorenz Sales 913-649-5556
MI Coloma, Geisting & Assoc. 616-468-4200
MI Farmington Hills, Giesting & Assoc. ... 313-478-8106
MN St. Paul, Proud Inds. 612-646-9428
NE Lincoln, Lorenz Sales 402-475-4660
NJ E. Brunswick, Winch Assoc. 201-828-4615
NY Cortland, Net Sales 607-756-6592
NY Roslyn Heights, Winch Assoc. 516-621-6378
NY Troy, Net Sls. Co. 518-274-4758
NY Webster, Net Sales 716-467-4538
OH Cincinnati, Giesting & Assoc. 513-385-1105
OH Cleveland, Giesting & Assoc. 216-261-9705
OH Dayton, Giesting & Assoc. 513-433-5832
OR Portland, DHS Sales 503-285-9790
PA Bensalem, Stemler Assoc. 215-638-4850
PA Greensberg, Pro-Mark 412-832-3800
RI Worwick, Cal-Greg Comps. 401-738-6170
RI Worwick, Monette Eng. & Assoc. 401-885-2205
TX Irving, Impaq Sales 214-257-3677
UT Salt Lake City, Cummings & Assocs., Mktg. Inc. 801-263-8131
VA Reston, Stinson Assoc. 703-471-0723, 703-620-0088
VA Troutville, Stinson Assoc. 703-992-5459
Can Montreal, Solid State Engrg. 514-481-3313

Local Distributors

CA Mountain View, Abacus Elctrns. 415-961-1500
CA San Diego, Park-West Inc. 619-277-8433
CA Woodland Hills, C & A Elctrns. 213-340-6036
CT Norwalk, Park Dist. 203-853-2010
FL West Palm Beach, Nurmi Elctrn. Supp. 305-686-8553
IL Arlington Heights, Reptron Elctrns. 312-593-7070
MD Baltimore, Whitney Dist. 301-944-8080
OR Portland, Dunn Elctrns. 503-285-0214
OR Portland, Radar Elec. 503-233-3691
PA McKean, Advocom Elctrns. 814-476-7774
WA Seattle, Radar Elec. 206-282-2511

EXACT ELECTRONICS, Div. of Dynatech Nevada Inc., Box 1925, 2000 Arrowhead Dr., Carson City, NV 89701, Tel: 702-883-3400, 800-648-7952, Telex: 170054; FSC No.: 34511; Empl.: 60; *Sls. Mgr.:* Joe Foster

EXAR CORP., P. O. Box 62229, 750 Palomar Ave., Sunnyvale, CA 94086, Tel: 408-732-7970, TWX: 910-339-9233; Empl.: 550; *Dist. Mgr.:* Jack Hanoka ..... **A•1668-1669**

Local Sales Offices & Reps

AZ Scottsdale, Summit Sls. 602-998-4850
CA Los Angeles, Landa/Minyard, Inc. 213-879-0770
CA San Diego, Harvey Kinc 619-566-5252
CA Santa Clara, Criterion Sls. 408-988-6300
CO Golden, Candal, Inc. 303-233-0155
CT Ridgefield, Phoenix Sls 203-438-9644
FL Orlando, Donato & Assocs. 305-352-0727
GA Tucker, Rep Inc. 404-938-4358
IL Des Plaines, Janus, Inc. 312-298-9330
MD Baltimore, Comp. Sls. 301-484-3647
MA Westwood, Mass Tech Sales 617-329-8820
MN Minneapolis, Dan'l Engrg. 612-854-7550
MO St. Louis, KKB & Co. 314-647-2400
NM Albuquerque, Syntech 505-266-7951
NY Buffalo, Quality Comps. 716-837-5430
NY Great Neck, Trionic Assocs. 516-466-2300
NC Raleigh, Zucker Assocs. 919-782-8433
OH Columbus, McFadden Sls. 614-459-1280
OR Tigard, Comps. West 503-684-1671
TN Jefferson City, Rep Inc. 615-475-4105
TX Carrollton, Technical Mktg. 214-387-3601
WA Redmond, Comps. West 206-885-5880
WI Milwaukee, Janus, Inc. 414-476-9104

Local Distributors

AL Huntsville, Pioneer Elctrns. 205-837-9300
CA Anaheim, Zeus Comps. 714-632-6880
CA Irvine, IEC/Jaco 714-660-1055
CA Sunnyvale, Bell Indus. 408-734-8570
CA Tustin, A.V.E.D. 213-770-0871
CT East Haven, J.V. Elctrns. 203-469-2321
FL Clearwater, Future Elctns. 813-596-8295
GA Comming, Pan American 404-577-2144
IL Arlington Hgts., Reptron 312-593-7070
IN Indianapolis, Graham Elctrns. 317-634-8202
IA Cedar Rapids, Deeco 319-377-5795
MA Norwood, Gerber Elctrns. 617-329-2400
MI Grand Rapids, R.M. Elctrns. 616-531-9300
MN Minneapolis, Merit Elctrns. 612-546-5583
NJ Berlin, GCI 609-768-6767
NY Melville, Diplomat Elctrns. 516-454-6400
OH Columbus, Reptron Elctrns. 614-436-6675
OK Tulsa, Quality Comps. 918-664-8812
OR Beaverton, Western Microtechnology 503-641-9312
PA Philadelphia, Almo Elctrns. 215-698-4000
TX Dallas, Act/ Diplomat Elctrns. 214-980-1818
WA Seattle, Radar Elec. Co., Inc. 206-282-2511
WI Berlin, RM Elctrns., Inc. 414-784-4420
Can Pt. Claire, Que., Future Elctrns. 514-694-7710

EXATRON AUTOMATIC TEST EQUIP., 3513 Ryder St., Santa Clara, CA 95051, Tel: 408-737-7111, 800-EXA-TRON, Telex: 172-090; Empl.: 14; *Sls. Mgr.:* Kathryn Henderson

Local Sales Offices & Reps

AL Huntsville, Pen-Tech Assocs. 205-881-9298
AZ Phoenix, Zeus Elctrns. 602-263-6022
CA Covina, Romar Intl. 213-332-8548
CA Sunnyvale, C.C.L.M. 408-578-6119
CO Denver, Zeus Elctrns. 303-321-4246
FL Casselberry, Pen Tech Assocs. 305-678-6809
FL Deerfield Beach, Pen Tech Assocs. ... 305-421-4989
GA Marietta, Pen Tech Assocs. 404-424-1931
IL Chicago, Solid St. Elctrns. of IL 312-889-8033
MA Tyngsboro, J. R. Sls. 617-649-3449
MN Edina, P.E.C./Levi 612-944-8540
NJ Vincentown, JRM Elctrns. 609-859-2106
NM Albuquerque, Zeus Elctrns. 505-842-6633
NC Greensboro, Pen Tech Assocs. 919-852-6000
OH Hudson, Technical Sls. 216-656-3978
OR Beaverton, Northwest Test & Meas. ... 503-646-9966
TX Dallas, Elctrn. Prod. Spec. 214-985-1932
UT Salt Lake City, Zeus Elctrns. 801-534-0500
WA Redmond, Northwest Test & Meas. ... 206-881-8857
Can Burlington, Ont., Arbell, Inc. 416-632-9494

EXCELLON AUTOMATION, 24215 Garnier St., Torrance, CA 90505, Tel: 213-325-8000, Telex: 67-4562; Empl.: 570; *Sls. Mgr.:* R. Schreuders

EXCEL PRODS., 401 Joyce Kilmer Ave., New Brunswick, NJ 08903, Tel: 201-249-6600, TWX: 710-480-6255; Empl.: 360; *Sls. Mgr.:* Jack Luch; *Dist. Mgr.:* Jack Luch

EXCEL SPECIALTY CORP., 6335 N. Broadway, Chicago, IL 60660, Tel: 312-262-4781; Empl.: 50

EXCEL TECHNOLOGY INTL. CORP., 4-5 Stryker La., Hillsborough Indl. Pk., Belle Mead, NJ 08502, Tel: 201-874-4747, TWX: 910-333-9588; *Sls. Mgr.:* Michi Chen ..... **B•1050-1052**

Local Sales Offices & Reps

CA Marina Del Ray, Electro-Optical Mktg. 213-822-0702
CA San Diego, Uni-Rep 619-746-5131
CA San Jose, Cerco 408-298-1918
FL Coral Springs, HAI Elctrns. 305-752-7520
GA Norcross, Mountain Electro Prods., Inc. 404-469-0603
IL Westchester, W. G. Brouillette & Assocs., Inc. 312-345-6500
MO Independence, Engrg. Svcs. Co. 816-254-3600
MO St. Louis, Engrg. Svcs. Co. 314-997-1515
NJ E. Brunswick, Kong Sys. 201-390-8523
NM Azcapotzaico, Dicopel 561-32-11
OR Portland, Frank Jackson, Assoc. 503-292-2638
TX Dallas, Southwest Elctrn. Inds. 214-690-9881
TX Houston, Dunkel Elctrn. Assocs. 713-729-1670

EXERGETIC SYS., INC., 1499 Franklin St., Oakland, CA 94612, Tel: 415-763-3460; *Sls. Mgr.:* R. W. Beckwith

EXIDE CORP., 101 Gibraltar Rd., Horsham, PA 19044, Tel: 215-674-9500, TWX: 215-725-7397; Empl.: 2200

EXIDE ELCTRNS., P.O. Box 58189, Raleigh, NC 27658, Tel: 919-872-3020, TWX: 510-928-0598; FSC No.: 31795; Empl.: 900; *Sls. Mgr.:* Richard King

EXPRESS TEST CORP., 239 Commercial Street, Sunnyvale, CA 94086, Tel: 408-732-9999, Telex: 4942091; *Sls. Mgr.:* Frank S. Gavin

EXTECH INTERNATIONAL CORP., 150 Bear Hill Rd., Waltham, MA 02154, Tel: 617-890-7440, Telex: 940913; *Sls. Mgr.:* Neal DeWitt

EYRING RESEARCH INST., INC., 1455 W. 820 N., Provo, UT 84601, Tel: 801-375-2434, TWX: 882000; FSC No.: 801-374-8339; Empl.: 350

E-Z-HOOK, Div. Tektest Inc., Box 450 - 225 N. Second Ave., Arcadia, CA 91006, Tel: 818-446-6175, TWX: 910-582-1614; FSC No.: 08505; Empl.: 23; *Sls. Mgr.:* C. Haskin; *Dist. Mgr.:* P. Wood

FABRICAST, 2517 Seaman Ave., P.O. Box 3176, S. El Monte, CA 91733, Tel: 818-443-3247; FSC No.: 13345; Empl.: 8 ..... **B•1154-1159**

FABRI-TEK CIRCUITS, INC., Circuits Division, 1560 Tenth Ave., Baldwin, WI 54002, Tel: 715-684-3381

Refer to CTS Corp., Elkhart, IN, for sales offices and representatives and for distributor listings.

FAB-TEK INC., 68 Morgan Ave., Danbury, CT 06810, Tel: 203-743-3312; Empl.: 5

FACET ENTERPRISES, INC., Elmira, NY 14903, Tel: 607-737-8011, Telex: 93-2490, TWX: 510-252-1594; Empl.: 400; *Sls. Mgr.:* Gary Packard

FACIT, INC., 9 Executive Park Dr., Merrimack, NH 03054, Tel: 603-424-8000

FAIRCHILD CAMERA & INSTR. CORP., 464 Ellis St., 20-2271, Mountain View, CA 94042, Tel: 415-962-5011, Telex: CORPHQ. MVAC; Empl.: 16,000; *Sls. Mgr.:* David Miller

FAIRCHILD CAMERA & INSTR. CORP., Digital Div., 333 Western Avenue, So. Portland, ME 04106, Tel: 207-775-8700, Telex: 710-221-1980; *Sls. Mgr.:* Dan Bongatti; *Dist. Mgr.:* Brigid O'Rourke

FAIRCHILD CAMERA & INSTR. CORP., Linear Div., 313 Fairchild Dr., Mountain View, CA 94139, Tel: 415-962-4011, Telex: MVLD

FAIRCHILD CAMERA & INSTR. CORP., Memory & High Speed Logic Div., P. O. Box 5000, Puyallup, WA 98373, Tel: 206-841-6000, TWX: 310-449-4425; *Sls. Mgr.:* Jim Brye

FAIRCHILD MICROCONTROLLER DIV., Fairchild Camera & Instr. Corp., 450 National Ave., Mountain View, CA 94042, Tel: 415-962-3838, TWX: 910-379-5091

FACTRON/SCHLUMBERGER, Titusville, 1400 White Dr., Titusville, FL 32780, Tel: 305-267-7212, TWX: 510-950-3043; Empl.: 103; *Sls. Mgr.:* Becki Rubin

FAIRCHILD WESTON, DATA RECORDERS, P.O. Box 3041, Sarasota, FL 33578, Tel: 813-371-0811, Telex: 4991610, TWX: 810-864-0406; FSC No.: GS-00K-8301-S0078; Empl.: 750; *Sls. Mgr.:* Steve Hoff ..... **D•1228**

Local Sales Offices & Reps

AZ	Mesa, Vic Myers Assocs.	602-897-7378
CA	Cupertino, Fairchild Weston	408-257-1813
CA	Laguna Hills, Elotek Sys.	714-830-4856
CA	Westlake, Fairchild Weston	213-889-1057
CO	Fort Collins, Vic Myers Assocs.	303-223-8907
CT	Higganum, Intersell	203-528-5357
FL	Fort Walton Beach, RAM-Z Assocs.	904-862-2700
FL	Maitland, Wade H. Boggs	305-647-2226
ID	Rathdrum, Hood Engrg. Sls., Inc.	208-772-7235
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-293-5437
IA	Cedar Rapids, Marsland Assocs.	319-396-8030
MD	Silver Spring, Sel-Tronics	301-589-3391
MA	Burlington, Intersell	617-273-3844
MI	Madison Heights, WKM Assocs.	313-588-2300
MN	Minneapolis, Marsland Assocs.	612-545-4481
MO	St. Lovis, Marsland Assocs.	314-991-1399
NJ	Cedar Grove, KLS Assocs.	201-785-4450
NM	Albuquerque, Vic Myers Assocs.	505-884-6878
NY	Rochester, Scientific Dvcs. NY	716-334-2445
OH	Dayton, WKM Assocs.	513-434-7500
OH	Independence, WKM Assocs.	216-524-5930
PA	Devon, Fairchild Weston	215-687-3220
TX	Conroe, Fairchild Weston	713-539-1315
WA	Bellevue, D.P.M., Inc.	206-747-3309
WI	New Berlin, Marsland Assocs.	414-786-6611

FAIRCHILD WESTON, See Weston Controls, Div. Fairchild

FAIRCHILD - WESTON - TELEMETRY, P.O. Box 3041, Sarasota, FL 33578, Tel: 813-377-5566, Telex: 052-890, TWX: 810-864-0406; FSC No.: 06141; Empl.: 825; *Sls. Mgr.:* Wyatt Bishop

FAIR-RITE PRODS., PO Box J, Wallkill, NY 12589, Tel: 914-895-2055, TWX: 510-249-4819; FSC No.: 34899; Empl.: 200 +; *Sls. Mgr.:* B. G. Tolen

Local Sales Offices & Reps

AL	Huntsville, Macro-Mktg. Assocs.	205-883-9630
CA	Anaheim, Micrometals	714-630-7420
CA	Sunnyvale, Schwerin & Merrill Assocs.	408-735-7900
CO	Aurora, A-G Elctrns.	303-690-0964
CT	W. Hartford, R. S. Pettigrew & Assocs.	203-236-5891
FL	New Smyrna Beach, J. Wetzel	904-423-5707
IL	Marshall, Fair-Rite Prods.	618-584-2944
IN	Indianapolis, Frank J. Campisano Co.	317-253-7651
MI	Southfield, J. L. Montgomery Assocs.	313-358-2616
MN	Bloomington, Holmes & Ladky Assocs. of Minn.	612-884-2125
NY	Hempstead, Kahgan Sls.	516-538-2300
OH	Cincinnati, F. J. Campisano & Assocs.	513-574-7111
OR	Portland, Freed Assocs.	503-289-5320
PA	Easton, Kendon Co.	215-253-3100
TX	Dallas, S.E.I., Inc.	214-690-9881
VA	Front Royal, Eltron Sls., Ltd.	703-635-7201
VA	Roanoke, A. B. Kreger & Co.	703-989-4738
WI	Milwaukee, Frank W. Ladky Assocs.	414-351-2112

FANCORT INDUSTRIES, INC., 31 Fairfield Place, W. Caldwell, NJ 07006, Tel: 201-575-0610; Empl.: 10; *Sls. Mgr.:* Ron Corey; *Dist. Mgr.:* Ron Corey

F & M SYSTEMS CO., See Texas Controls

FAN-S CORP., 7158 Industrial Pk. Blvd., Mentor, OH 44060, Tel: 216-951-3300, Telex: 985319; Empl.: 75; *Sls. Mgr.:* John Hallums; *Dist. Mgr.:* William Forkins

FARADAY ELECTRONICS, 743 Pastoria, Sunnyvale, CA 94086, Tel: 408-749-1900, Telex: 706738; Empl.: 41; *Sls. Mgr.:* Lou Panetta

FARIA, THOMAS G., CORP., P.O. Box 0983, Uncasville, CT 06382, Tel: 203-848-9271; Empl.: 225; *Sls. Mgr.:* A. Knupp

FARINON DIV., Harris Corp., 1691 Bayport, San Carlos, CA 94070, Tel: 415-594-3000, Telex: 34-8491; *Sls. Mgr.:* Jan Graaf

FARRAND CONTROLS, Div. of Farrand Industries, Inc., 99 Wall St., Valhalla, NY 10595, Tel: 914-RO1-2600, Telex: 646-640; Empl.: 120; *Sls. Mgr.:* George A. Quinn; *Dist. Mgr.:* George A. Quinn ...**B•1796**

FASCO INDUSTRIES, INC., Div. of Hawker Siddeley Grp. Plc., 601 North Federal Highway, Boca Raton, FL 33432, Tel: 305-368-0600, Telex: 51-5612; *Sls. Mgr.:* O. J. Binnette; *Dist. Mgr.:* Paul R. Reid

FASTEX, 195 Algonquin Rd., Des Plaines, IL 60016, Tel: 312-299-2222, TWX: 910-233-2786; FSC No.: 02768

FAST FEEDBACK TECHNOLOGIES, 1505 Aviation Blvd., Redoudo Beach, CA 90278, Tel: 213-379-6100; Empl.: 4; *Sls. Mgr.:* M. Lacas

FCM PLASTICS, Plastics Technologies Inc., 2555 Oak Industrial Dr. NE, Grand Rapids, MI 49505, Tel: 616-451-4502, TWX: 810-273-6038; *Sls. Mgr.:* Patrick K. Parsons

F-DYNE ELCTRNS., 449 Howard Ave., Bridgeport, CT 06605, Tel: 203-367-6431, TWX: 710-453-0087; Empl.: 175; *Sls. Mgr.:* Robert Furst

FEDERAL PACIFIC, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199, Tel: 800-245-4501, in OH 800-245-4497

FEEDBACK, 620 Springfield Ave., Berkeley Hghts., NJ 07922, Tel: 201-464-5181; Empl.: 28; *Sls. Mgr.:* M. J. Lawson

FEMA ELCTRNS. CORP., 12-6 Edgeboro Rd., E. Brunswick, NJ 08816, Tel: 201-238-1223, Telex: 299425 FEMA UR; Empl.: 10 to 20; *Sls. Mgr.:* Bob Cheng

FEMCO, INC., P.O. Box 26710 Parkmoor Sta., San Jose, CA 95159, Tel: 408-946-1188, Telex: 17-1618, TWX: 910-338-2290

FENWAL, INC., 400 Main St., Ashland, MA 01721, Tel: 617-881-2000; Empl.: 1000; *Sls. Mgr.:* John W. Rice

FENWAL ELCTRNS., 63 Fountain St., Framingham, MA 01701, Tel: 617-872-8841, Telex: 299550; Empl.: 500; *Sls. Mgr.:* W. M. Minnucci; *Dist. Mgr.:* Chester Tricca ..... **B•1751**

Local Sales Offices & Reps

AL	Huntsville, Conley & Assocs., Inc.	205-882-0316
AZ	Phoenix, Dorton Entprs., Inc.	602-944-2957
CA	Cupertino, Codella Mktg. Grp., Inc.	408-257-2561
CA	Los Angeles, Landa/Minyard, Inc.	213-879-0770
CO	Denver, Elcom, Inc.	303-337-2300
CT	Southington, Andrews Airtronics, Inc.	203-621-6158
FL	Deerfield Beach, Conley & Assocs., Inc.	305-421-7180
FL	Oviedo, Conley & Assocs., Inc.	305-365-3283
FL	Tampa, Conley & Assocs., Inc.	813-885-7658
GA	Doraville, Conley & Assocs., Inc.	404-447-6992
IL	Chicago, Century Elctrns. Corp.	312-777-9700
IN	Noblesville, Century Elctrns. Corp.	317-849-2026
IA	Cedar Rapids, Palatine Engrg. & Sls., Inc.	319-365-8071
KS	Mission, Palatine Engrg. & Sls., Inc.	913-831-0555
MD	Woodbine, Naudain Assoc. So., Inc.	301-442-2270
MA	Danvers, Andrews Airtronics, Inc.	617-246-2450
MI	Ferndale, Hilltronics, Inc.	313-398-5556
MN	So. St. Paul, Northport Engrg., Inc.	612-457-8000
MO	Hazelwood, Palatine Engrg. & Sls., Inc.	314-839-0800
NY	Huntington, CDB Entprs.	516-692-5200
NY	Kingston, R. P. Kennedy Co., Inc.	914-876-2700
NY	Rochester, R. P. Kennedy Co., Inc.	716-271-6322
NY	Rochester, R. P. Kennedy Co., Inc.	716-271-1910
NC	Raleigh, Conley & Assocs., Inc.	919-876-9862
OH	Cleveland, Arthur H. Baier Co.	216-461-6161
OH	Dayton, Arthur H. Baier Co.	513-276-4128
OR	Portland, Jas. J. Backer Co.	503-297-8744
OR	Salem, Jas. J. Backer Co.	503-362-0717
PA	Pittsburgh, Covert & Newman Co.	412-531-2002
PA	Wynnewood, Metz-Benham Assoc., Inc.	215-896-7300
TX	Austin, W. Pat Fralia Co. & Assoc., Inc.	512-835-7911
TX	Bedford, W. Pat Fralia Co. & Assoc., Inc.	817-267-3577
TX	Houston, W. Pat Fralia Co. & Assoc., Inc.	713-772-1572
UT	Salt Lake City, Elcom, Inc.	801-485-7415
WA	Seattle, Jas. J. Backer Co.	206-285-1300
WI	Milwaukee, Century Elctrns. Corp.	414-645-3680
EXP	MA, Framingham, Fenwal Elctrns.	617-872-8841

Local Distributors

CA	Burlingame, Rose Elctrn. Distr.	408-263-9700
CA	Chatsworth, Mil-Comm Distr.	213-998-3111
CO	Denver, Newark-Denver Elctrn. Supp.	303-757-3351
CO	Englewood, Indl. Elctrns. Corp.	303-694-9444
FL	Ft. Lauderdale, Newark Elctrns.	305-587-2372
GA	Norcross, Newark Elctrns.	404-321-0413
IL	Chicago, Newark Elctrns. Corp.	312-638-4411
IN	Indianapolis, Graham Elctrns. Supp.	317-634-8202
MD	Beltsville, Newark Elctrns.	301-937-5085
MA	Woburn, Newark Elctrns.	617-935-8350
MI	Grand Rapids, Newark Elctrns.	616-241-6681
MI	Oak Park, Newark Elctrns.	313-967-0600
MN	Minneapolis, Stark Elec.	612-332-1325
NJ	Springfield, Newark Elctrns.	201-376-9500
NY	Buffalo, Summit Dists.	716-887-2800
NY	Huntington, CDB Dev. Corp.	516-692-5200
NY	Rochester, Summit Elctrns.	716-334-8110
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Warrensville Heights, Newark Elctrns.	216-587-1700
OK	Tulsa, Radio, Inc.	918-587-9123
PA	Wynnewood, Metz-Benham Assoc., Inc.	215-896-7300
TX	Fort Worth, Patco Supply	817-429-8596
UT	Salt Lake City, Standard Supp.	801-486-3371

FERNO-SALESMAKER, Ferno-Washington, Inc., 70 Well Way, Wilmington, OH 45177, Tel: 513-382-1451, Telex: 214282; Empl.: 300; *Sls. Mgr.:* Gary Hiles

FERRANTI ELEC., 87 Modula Ave., Commack, NY 11725, Tel: 516-543-0200, TWX: 510-226-1490; *Sls. Mgr.:* Mike Kennett

FERRETEC INC., 1701A Fortune Dr., San Jose, CA 95131, Tel: 408-263-1216, TWX: 910-338-2353; *Sls. Mgr.:* Allen E. Rosenzweig

Local Sales Offices & Reps

AZ	Mesa, P.C.L. Elctrns.	602-892-9329
CA	San Jose, MCH Assocs.	408-246-7330
CA	Torrance, DeTomasi & Grupp Inc.	213-327-1775
FL	Mebourne Beach, Millett Assocs.	305-725-5055
IL	Wauconda, Cudahy Sls. Co.	312-526-2484
MD	Severna Park, Delmarva Engrg. Assocs.	301-647-8007
MA	Chelmsford, BBC	617-452-7211
MO	Leasburg, EIR Co.	314-245-6860
NY	Great Neck, Phase Four Inc.	516-482-1790
NY	Utica, B. D. Hummel Co.	315-736-7821
PA	Elkins Park, Snow Assocs.	215-379-4700
TX	Dallas, Tritex Technical Sls., Inc.	214-247-3041

FERRO CORP., Composites Div., 34 Smith St., Norwalk, CT 06852, Tel: 203-853-2123, Telex: 96-5929; *Sls. Mgr.:* Kenneth W. Kubofcik

FERRO CORP., Ottawa Chem. Div., 700 N. Wheeling St., Toledo, OH 43605, Tel: 419-691-3507

FERRO, Thick Film Sys. Div., 27 Castilan Dr., Santa Barbara, CA 93117, Tel: 805-968-5000, Telex: 98-0165; Empl.: 39; *Sls. Mgr.:* Cliff Ruderer

FERRO CERAMIC GRINDING, INC., 247 Water St., Wakefield, MA 01880, Tel: 617-245-1833; Empl.: 14; *Sls. Mgr.:* Philip Strasnick

FERRO CORP., Coatings Div., 4150 East 56th St., Cleveland, OH 44101, Tel: 216-641-8580, Telex: 98-0165

FERRO CORP. ELECTRONIC CERAMIC MATLS. DEPT., Transelco Div., P.O. Box 217, Penn Yann, NY 14527-0127, Tel: 315-536-3357

FERRO CORP, Comlas Reinforced Thermoplastics Bus., 5001 O'Mara Drive, Evansville, IN 47711, Tel: 812-423-5218; *Sls. Mgr.:* L. Steven Edge

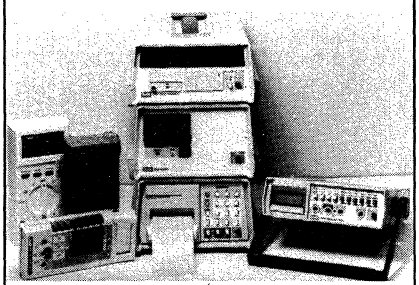
FLUKE®

DIGITAL MULTIMETERS & COUNTERS

AUTHORIZED DISTRIBUTOR

SSI SUNSHINE

THE SOURCE FOR METERS & TEST EQUIPMENT



Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT

(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area

(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

FLUKE®

DIGITAL MULTIMETERS & COUNTERS

AUTHORIZED DISTRIBUTORS

METERMASTER

FOR

Panel Meters • Test Equipment • Components
Sales, Modifications, Repair and Calibration

METERMASTER LOCATIONS:

ARIZONA
Phoenix ..... (602) 437-1425
Tucson ..... (602) 792-3411
CALIFORNIA
Los Angeles ..... (213) 685-4340
Palo Alto ..... (415) 960-8500
San Diego ..... (619) 560-4841
GEORGIA
Atlanta ..... (404) 446-0166
ILLINOIS
Chicago ..... (312) 250-0606
MASSACHUSETTS
Boston ..... (617) 523-2580
MINNESOTA
Minneapolis ..... (612) 332-6117
MISSOURI
St. Louis ..... (314) 454-0241
NEW MEXICO
Albuquerque ..... (505) 292-3330
OHIO
Cleveland ..... (216) 651-4100
OKLAHOMA
Tulsa ..... (918) 582-1444
PENNSYLVANIA
Pittsburgh ..... (412) 261-4548
TEXAS
Austin ..... (512) 473-8876
Dallas ..... (214) 271-5671
Houston ..... (713) 733-9814
WISCONSIN
Milwaukee ..... (414) 643-0554
ALL OTHER STATES ..... (800) 962-8128

FERRO CORP, Electronic Glasses Dept., 4150 East 56th St., P. O. Box 6550, Cleveland, OH 44101, Tel: 216-641-8580; *Sls. Mgr.:* John Brill

FERRO CORP.,STRYKER COLOR & ADDITIVE CONCENTRATE BUS, Thermoplastic Div., 3 Railroad Street, Stryker, OH 43557, Tel: 419-682-3311; *Sls. Mgr.:* Jon Stage

FERRONICS, 52 N. Main St., Fairport, NY 14450, Tel: 716-223-1010, TWX: 510-254-2893; Empl.: 35; *Sls. Mgr.:* M. Northrup

FERROTRAN ELCTRNS. CO., INC., 11 W. 25th St., New York, NY 10010, Tel: 212-691-3610; *Sls. Mgr.:* H. King ..... **D•1640-1641**

FERROXCUBE CORP., See Amperex Elctrns., Ferroxcube Div.

FG ENGRG., Box 476, Fredonia, AZ 86022, Tel: 602-643-7375; Empl.: 6; *Sls. Mgr.:* F. Griswold

FIBERGUIDE INDUSTRIES INC., 33 Poplar Dr., Stirling, NJ 07980, Tel: 201-647-6601

FIBEROPTIC FABRICATIONS, INC., 70 Pullman St., Worcester, MA 01606, Tel: 617-853-6449, Telex: 951838; *Sls. Mgr.:* A. John Cunningham

FIBEROPTICS TECHNLG., INC., Quassett Rd., Pomfret, CT 06258, Tel: 203-928-0443; *Sls. Mgr.:* J. H. Castonguay

FIBEROPTIC SYSTEMS, INC., 4525 - 3B E. Industrial St., Simi Valley, CA 93063, Tel: 805-583-2008; *Sls. Mgr.:* Richard Lockett

FIBRONICS INTL. INC., 325 Stevens St., Hyannis, MA 02601, Tel: 617-778-0700, Telex: 951297; *Sls. Mgr.:* Kenneth Bowes

fic

FIC CORP., 12216 Parklawn Dr., Rockville, MD 20852, Tel: 301-881-8124, 800-638-6594, TWX: 710-828-9809; FSC No.: 3613; Empl.: 46; *Sls. Mgr.:* Robert E. Frye; *Dist. Mgr.:* Robert E. Frye ..... **B•1235**

FIDELITY CHEM. PRODS. CORP., 472 Frelinghuysen Ave., Newark, NJ 07114, Tel: 201-242-4110; Empl.: 35

FIELD ELECTRONICS, 1416 Commerce St., Chatham, NJ 07928, Tel: 201-635-6566

FIELD-FAB, 43 School St., N. Springfield, VT 05150, Tel: 802-886-8278; *Sls. Mgr.:* Harold Lombard

FIFTH DIMENSION, INC., 801 New York Ave., Trenton, NJ 08638, Tel: 609-393-8350, TWX: 510-681-8412; Empl.: 50; *Sls. Mgr.:* William D. Kinney ..... **B•1348, 1567**

FIL-COIL ECONOMY INTL., INC., 800 Axinn Ave., Garden City, NY 11530, Tel: 516-228-9445, Telex: 960127 SWIFT NYK; FSC No.: 56528; Empl.: 85; *Sls. Mgr.:* William Goldman

FILM CAPACITORS, 100 8th St., Passaic, NJ 07055, Tel: 201-779-2240; Empl.: 55

FILM MICROELECTRONICS, 17 A St., Burlington, MA 01803, Tel: 617-272-5650, TWX: 710-332-1124; Empl.: 130; *Sls. Mgr.:* Denise Laplante

FILTER CONCEPTS INC., 2624 S. Rousselle, Santa Ana, CA 92707, Tel: 714-545-7003; *Sls. Mgr.:* Stan Jones ..... **A•1606-1607**

FILTRON CO., INC., Div. of Aeroflex Labs., Inc., 148-E Sweet Hollow Rd., Old Bethpage, NY 11804, Tel: 516-752-1144; FSC No.: 81831; Empl.: 70; *Sls. Mgr.:* Harold Samkoff ..... **A•1608**

Local Sales Offices & Reps

AL Huntsville, Rakes Engrg. & Mktg. 205-533-3763
AZ Tucson, WJM Sls. 602-887-4847
CA Granada Hills, C & W Comp. Sls. 213-368-4032
CA Sunnyvale, Esco Assoc. 408-745-1410
CO Boulder, A. Bissell Co. 303-444-1173
FL New Port Richey, Lobo Mktg. Assoc. .. 813-848-8578
KS Shawnee Mission, Technical Sls. Assoc. 913-888-3330
MD Baltimore, Bernard White & Co. 301-484-5400
MN Bloomington, Electronic Sls. Agy. 612-884-8291
NH Manchester, Charles A. Wallace Co. .. 603-622-5864
NY Melville, Carnes Assoc. 516-694-1600
NY Syracuse, Fountain, Young & Co. 315-437-7723
OH Kettering, J. May Assoc. 513-299-8424
PA Huntingdon Valley, Rabal Assoc. 215-947-4825
TX Bedford, De Armond Ent. 817-267-2048
WA Vashon, RTS, Inc. 206-285-1363

FINCOR, 3750 E. Market St., York, PA 17402, Tel: 717-757-4641, Telex: 840-432; FSC No.: 3622; Empl.: 500

FIRST COMPUTER CORP., 645 Blackhawk Dr., Westmont, IL 60559, Tel: 312-920-1050, TWX: 910-651-1916; Empl.: 30; *Sls. Mgr.:* Allan L. Parker

FISCHER AMERICA, INC.

FISCHER-AMERICA, INC., Div. of Technographics, Inc., 13756 Glenoaks Blvd., Sylmar, CA 91342, Tel: 818-362-9396, Telex: 499-4182; *Sls. Mgr.:* Steve DeFeo ..... **C•1193**

Local Sales Offices & Reps

CA Anaheim, Wayne Champa & Assocs. .. 714-662-2228
FL Indian Harbor Beach, Bill Toy & Assocs. 305-773-5805
EXP Switzerland, Fischer, SA 021 77.37.11

FITCHBURG COATED PRODS., Technographics, Inc., P.O. Box 1106, Scranton, PA 18501, Tel: 717-347-2035; Empl.: 300

FKC ENGINEERING CO., 161 Rand Street, Central Falls, RI 02863, Tel: 401-724-1760

FLAMBEAU PRODUCTS CORP., P. O. Box 97, Middlefield, OH 44062, Tel: 216-632-1631; Empl.: 184; *Sls. Mgr.:* Elmer J. Sunyog

FLEXCO MICROWAVE, INC., P.O. Box 174, Karrville Rd., Port Murray, NJ 07865, Tel: 201-689-3020, Telex: 467439; FSC No.: 52214; Empl.: 50; *Sls. Mgr.:* Robert C. Tappen; *Dist. Mgr.:* Robert C. Tappen

FLEX-CORE DIV., Morlan & Assocs., Inc., 6625 McVey Blvd., Worthington, OH 43085, Tel: 614-889-6152; *Sls. Mgr.:* D. Morlan ..... **A•2149**

FLEX-KEY DIVISION, Rogers Corp., 18 Sargent St., Gloucester, MA 01930, Tel: 617-281-2040, Telex: 94-0333; FSC No.: 51163; Empl.: 50; *Sls. Mgr.:* Philip P. Bodoni ..... **B•1714-1715**

FLEXPRINT DIV, Sanders Assocs., Inc., Grenier Field, Manchester, NH 03103, Tel: 603-669-4615, TWX: 710-220-1845; Empl.: 700

FLIGHT CONNECTOR CORP., Dubilier America, 233 E. Manville St., Rancho Dominguez, CA 90220, Tel: 213-631-1133, Telex: 664734; FSC No.: 28680; *Sls. Mgr.:* Ken Tillery; *Dist. Mgr.:* Ken Tillery

FLIGHT SYSTEMS, INC., Tracor, Inc., 1091 Dove St., Newport Beach, CA 92660, Tel: 714-833-9661, Telex: 183542 FSI NPBH; FSC No.: 6B468; Empl.: 514; *Sls. Mgr.:* William J. Weiss

FLITE-TRONICS COMPANY, INC., See Marathon Flite-Tronics Company

FLOATING POINT SYSTEMS, INC., P.O. Box 23489, Portland, OR 97223, Tel: 503-641-3151, Telex: 4742018 FLPT UI; *Sls. Mgr.:* Paul Shapiro

FLORIDA DATA, 600D John Rodes Blvd., Melbourne, FL 32935, Tel: 305-259-4700, Telex: 56-210 FDC MELB

FLOW TECHNOLOGY, INC., Box 21346, Phoenix, AZ 85036, Tel: 602-437-1315, Telex: 249-995; Empl.: 85; *Sls. Mgr.:* Art Marshall

FLUKE, JOHN, MFG. CO., Box C9090, MS 250C, Everett, WA 98206, Tel: 206-356-5400, Telex: 152662, TWX: 910-445-2943; Empl.: 2645; *Sls. Mgr.:* W. Hoffman; *Dist. Mgr.:* T. Rockney

FMC CORP., Ind'l. Chemical Grp., 2000 Market St., Philadelphia, PA 19103, Tel: 215-299-6000; Empl.: 800

FOGG SYS., 15592 E. Batavia Dr., Aurora, CO 80011, Tel: 303-344-1883; Empl.: 7

FOREDOM ELEC. CO., Blackstone Inds. Inc., Route 6, Bethel, CT 06801, Tel: 203-792-8622, Telex: 643483; Empl.: 80; *Sls. Mgr.:* Kent Kristensen; *Dist. Mgr.:* Kent Kristensen

FORK STANDARDS, INC., 666 Western Ave., Lombard, IL 60148, Tel: 312-932-9380; Empl.: 14

FORMA SCIENTIFIC, Div. of Mallinckrodt Inc., Box 649, Marietta, OH 45750, Tel: 614-373-4763, Telex: 29-8205; Empl.: 290; *Sls. Mgr.:* Ned Urschel

FORMULATED RESINS INC., Box 508, Greenville, RI 02828, Tel: 401-949-2060; Empl.: 15; *Sls. Mgr.:* H. R. Oldham

FORTE TECHNOLOGY, INC., 201 Carnegie Row, Norwood, MA 02062, Tel: 617-769-9150, TWX: 710-348-0872

FOUNDATION INSTRUMENTS INC., 24 Colonnade Rd., Nepean, ON, Canada K2E 7J6, Tel: 613-226-4000, Telex: 053-4153; *Sls. Mgr.:* Jean Paul Clermont

FOURJAY INDUSTRIES, Box 14617 Northridge Br., Dayton, OH 45414, Tel: 513-278-9416; Empl.: 30; *Sls. Mgr.:* M. W. Frawley

FOXBORO CO., 28020 Stanford Ave., Valencia, CA 91355, Tel: 805-257-4200, Telex: 67-4389

FOX ELECTRONICS

FOX ELCTRNS., P.O. Box 1078, Cape Coral, FL 33910, Tel: 813-482-7212, TWX: 510-951-7386; FSC No.: 61429; *Sls. Mgr.:* Vivian Lee/Lynn Thorsen ..... **A•1363**

Local Sales Offices & Reps

AL	Huntsville, Beacon	205-881-5031
AZ	Scottsdale, Thom Luke Sls., Inc.	602-941-1901
CA	El Monte, Cook Entprs.	213-686-2120
CA	Mountain View, Brooks Tech. Grp.	415-960-3880
CA	Riverside, Cal Rep Branch	714-682-6762
CA	San Diego, DePierre & Assocs.	619-578-2555
CO	Englewood, Delta Sls.	303-799-0646
CT	Waterbury, HLM CT	203-753-9894
FL	Clearwater, Beacon	813-796-2378
FL	Ft. Lauderdale, Beacon	305-491-1054
FL	Maitland, Beacon	305-647-3498
FL	Melbourne, Beacon	305-724-8010
GA	Atlanta, Beacon	404-256-9640
IL	Palatine, Technology Sls.	312-991-6600
KS	Wichita, D.L.E.	316-774-2126
LA	Mandeville, Design Mktg.	713-273-2319
LA	Mandeville, Design Mktg.	
MD	Gaithersburg, Naudain & Assocs.	301-258-5040
MD	Woodbine, Naudain Assocs. Southern	301-442-2270
MI	Fenton Lake, McNab & Assoc.	616-925-2166
MN	Bloomington, 2 M Sales	612-890-7774
MO	Gladstone, R.E.P.S.	816-452-1003
MO	St. Louis, R.E.P.S.	314-241-4432
NJ	Parsippany, HLM NJ	201-263-1535
NY	Northport, HLM NY	516-757-1606
NY	Syracuse, Pitronics	315-455-7346
NC	Raleigh, Beacon	919-787-0330
OH	Akron, B.J. Davis	216-645-0517
OK	Tulsa, Design Mktg.	918-622-7387
OR	Portland, Earl & Brown Co.	503-245-2283
PA	Southampton, Vista Sls. Assocs.	215-322-7420
TX	Dallas, Design Mktg.	214-680-9767
TX	Hurst, Design Mktg.	817-268-2004
TX	Round Rock, Design Mktg.	512-255-9896
WA	Seattle, Earl & Brown	206-284-1121
WI	Waukesha, Technology Sls.	414-786-5015

Local Distributors

AL	Hunstville, Component Distrs.	205-883-7501
AL	Huntsville, Contact Elctrns.	205-881-9321
AZ	Phoenix, CETEC	602-882-0808
AR	Little Rock, Component Distrs.	501-227-6278
CA	Belmont, Arndt	415-592-8097
CA	Chatsworth, Integrated Elctrns.	213-998-2200
CA	Irvine, CETEC	714-250-4141
CA	Irvine, Integrated Elctrns.	714-660-1055
CA	Sacramento, Integrated Elctrns.	916-424-5297
CA	San Diego, CETEC	619-278-5020
CA	San Jose, Cypress	408-945-8400
CA	San Jose, Future	408-945-9100
CA	San Jose, Integrated Elctrns.	408-287-6488
CA	Santa Clara, California Capac.	408-980-8495
CA	Santa Clara, Cypress	408-727-7080
CA	Santa Clara, CETEC	
CA	South Gate, CETEC	213-773-6521
CA	Torrance, Cypress	213-533-6005
CO	Denver, Integrated Elctrns.	303-292-6121
CO	Westminster, Future Elctrns.	303-650-0123
CO	Wheatridge, Cypress	
CT	Danbury, Future Elctrns.	203-743-9594
CT	Milford, R. C. Comp.	203-874-0006
CT	Wallingford, Cronin Elctrns.	203-265-3134
FL	Clearwater, Future Elctrns.	813-441-4771
FL	Ft. Lauderdale, Component Distrs.	305-971-4950
FL	Ft. Lauderdale, Reptron Elctrns.	305-974-3454
FL	Longwood, CAM/RPC	305-834-2031
FL	Orlando, Hammond Elec.	305-849-6060
FL	Tampa, Reptron	1-800-282-1360
GA	Atlanta, Reptron Elctrns.	404-455-8423
GA	Warcross, Component Distrs.	404-441-3320
IL	Arlington Heights, Reptron	
IL	Hoffman Estates, Integrated Elctrns.	312-843-2040
IL	Palatine, Technology Sls.	312-991-6600
IN	Carmel, Altex	317-848-1323
LA	Harvey, AFG Elctrn. Supp.	504-368-9696
MD	Columbia, Future Elctrns.	301-995-1222
MA	Needham, Cronin Elctrns.	617-449-5000
MA	Needham, Cronin Elctrns., Inc.	617-449-5000
MA	Westborough, Future Elctrns.	617-366-2400
MA	Wilmington, RC Comps.	617-273-1860
MI	Grand Rapids, Calder Elctrns.	616-698-7400
MI	Livonia, Reptron	313-525-2700
MI	Walled Lake, Ambur Elctrns.	313-659-3710
MN	Edina, Northern Elctrns. Supp.	612-944-1167
MO	St. Louis, Franklin Elctrns.	314-993-5333
NJ	Bellmawr, Mid Atlantic Elec. Corp.	609-931-5303
NJ	Mount Laurel, Future Elctrns.	609-778-7600
NY	Liverpool, Future Elctrns.	315-451-2371
NY	Rochester, Cam/RPC Ind. Elec.	716-865-2080
NY	Syracuse, Add	315-437-0300
NC	Raleigh, Component Distrs.	919-834-9465
OH	Cleveland, CAM/Ohio Ind. Elec.	216-461-4700
OH	Dayton, Televox	513-294-4499
OH	Worthington, Reptron	614-436-6675
OR	Beaverton, Almac Elctrns.	503-641-9070
PA	Lancaster, Cam/RPC Ind. Elec.	717-392-8141
PA	Pittsburgh, Cam/RPC Ind. Elec.	412-782-3770
TX	Austin, Tinkertronics	512-926-4420
TX	Channel View, Henry Radio	713-452-4451
TX	Dallas, Component Distrs.	214-644-0373
TX	Dallas, Cypress	214-869-1435
TX	Dallas, Heilind Elctrns.	713-988-2711
TX	Houston, Essential Elctrns.	713-493-5028
TX	McKinney, Sunbelt Elect.	214-235-0587
UT	North Salt Lake, Integrated Elctrns.	801-298-1868
UT	Salt Lake City, Future	801-972-8489
WA	Bellevue, Almac Elctrns.	206-643-9992
WA	Bellevue, Future Elctrns.	206-881-8199
WA	Bellevue, Integrated Elctrns.	206-455-2727
WV	Charleston, Cam/WVA Ind. Elec.	304-344-8029
WI	Waukesha, Technology Sls.	414-786-5015
Can	Calgary, Alb., Future Elctrns.	403-235-5325
Can	Downsview, Ont., Future Elctrns.	416-638-4771
Can	Edmonton, Alb., Future Elctrns.	403-438-2858
Can	Ottawa, Ont., Carsten Elctrns.	613-729-5138
Can	Ottawa, Ont., Future Elctrns.	613-820-8313
Can	Pointe Claire, Que., Future Elctrns.	514-694-7710
Can	Scarborough, Ont., Carsten Elctrns.	416-495-9999
Can	St. Laurent, Que., Carsten Elctrns.	514-334-8321
Can	Vancouver, B.C., Future Elctrns.	604-438-5545

FRAMAR METAL PRODUCTS CO., INC., 345 Carnegie Avenue, Kenilworth, NJ 07033, Tel: 201-241-0710; Empl.: 6; *Sls. Mgr.:* J. W. Moore

FRANEK, JOHN, CO., INC., P.O. Box 11752, Santa Ana, CA 92711-1752, Tel: 714-832-0290, 800-854-9420; Empl.: 8; *Sls. Mgr.:* John Franek; *Dist. Mgr.:* Tom Goreth ..... **D•1924-1927**

FRANK, B.H., CO., 3733 W. 139th St, Hawthorne, CA 90250, Tel: 213-675-9182, Telex: 674432; *Sls. Mgr.:* Andrew Hilbert

FRAZIER, 1930 Valley View La., Dallas, TX 75234, Tel: 214-241-3441; Empl.: 20; *Sls. Mgr.:* W. A. Wadkins

FREDERICK CABLE PRODS., Digital Systems Corp., 406 Sagner Ave., Frederick, MD 21701, Tel: 301-694-9355; *Sls. Mgr.:* Robert Pennington; *Dist. Mgr.:* Robert Pennington

AMPTRONIX

AUTHORIZED MASTER DISTRIBUTOR

E S I

ELECTRIC SWITCHES INCORPORATED

2478 Fletcher Dr, Los Angeles, California 90039

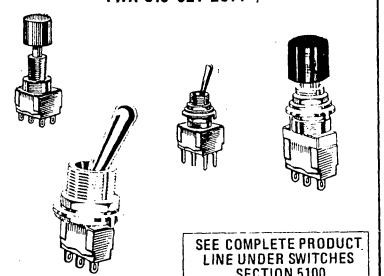
213-660-1310

CALL TOLL FREE

NATIONAL: 800-421-8855

CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100

FREE LINECARD AND CATALOG ON REQUEST

FREDERICK COMPONENTS INTL., 20806 Plummer St., Chatsworth, CA 91311, Tel: 818-882-0868, 800-354-0660, Telex: 691531; *Sls. Mgr.:* Tom Fitzpatrick ..... **B•1717; C•1194, 1641; D•1643**

Local Sales Offices & Reps

AZ	Scottsdale, Sales Engrg., Inc.	602-994-3230
CA	Chatsworth, Frederick Comps. Int'l.	818-882-0868
CO	Englewood, Dynatech, Inc.	303-773-2830
GA	Marietta, Rick Burns & Assocs.	404-951-1181
IL	Park Ridge, Bob Burns & Assocs.	312-823-9360
KS	Overland Park, Barnes Midwest Sls.	913-341-9317
MA	Framingham, Marathon Sls., Ltd.	617-875-3566
MN	Chanhassen, Barnes Sls. Assocs.	612-934-2907
NJ	Medford, Jack McCoy, Inc.	609-953-0770
NM	Albuquerque, Nelco Electronix	505-292-3657
NY	Hilton, Charles Avery Assocs.	716-271-2132
NY	Rye, Charles Avery Assocs.	914-967-7610
NC	Raleigh, Rick Burns Assocs.	415-941-0660
OH	Dayton, Electro-Com	513-898-5140
PA	McKean, Ecco Elctrn. Sls.	814-476-1376
PA	Murrysville, Ecco Elctrn. Sls.	412-795-6934
TX	Dallas, Electra III	214-358-0753
WA	Bellevue, Systems Tech. Sls.	206-462-8088
Can	Rexdale, Ont., Bestec Elctrns.	416-674-1330

Local Distributors

CA	Sacramento, Sacramento Elctrns.	916-441-4821
CA	Santa Ana, Advanced Computer	714-558-8813
CA	Santa Clara, RM/ISC, Inc.	408-496-0411
MA	Needham, You Do It Elctrn. Ctr.	617-449-1005
NH	Hampstead, Astrum Elctrns., Inc.	603-329-5656
NJ	Medford, Jack McCoy, Inc.	609-953-0770
NY	Rye, Electro/Mec	914-967-7610
TX	Dallas, Electra III	214-869-1959

FREDERICK ELCTRNS. CORP., 7630 Hayward Rd., P.O. Box 502, Frederick, MD 21701-0502, Tel: 301-662-5901, Telex: 893438; FSC No.: 15230; Empl.: 350; *Sls. Mgr.:* Marty Bandler

FREDERICKS CO., Philmont & Anne Sts., Huntingdon Valley, PA 19006, Tel: 215-947-2500; Empl.: 150

FREED TRANSFORMER, 1718 Weirfield St., Ridgewood, NY 11385, Tel: 212-386-1300; FSC No.: 73386; Empl.: 200; *Sls. Mgr.:* M. Salzberg ..... **A•2150-2153; D•1229**

Powerful reasons to stand by Gates cells and batteries.

- Float life of 8-10 years at 23°C before falling to 80% of rated capacity.
- Can deliver 50% of C/10 room temperature capacity at −40°C.
- Sealed, no-maintenance design prevents drying out and corrosion.
- Cells rated at 2V in 2.5Ah, 5Ah, 12.5Ah and 25Ah. Monoblocs rated at 4V & 6V in 2.5Ah and 5Ah. All offer a wealth of configurations.

Gates Energy Products

P.O. Box 5887
1050 S. Broadway
Denver, CO 80217 U.S.A.
303/744-4806
TWX 910-931-2658 • Telex 045-511

© 1985 Gates Energy Products

Local Sales Offices & Reps

CA	San Gabriel, R. G. Moye Co.	213-283-1669
CO	Denver, Nelson Co.	303-573-1516
CT	Marlborough, Precision Sls.	203-295-0580
GA	Smyrna, B-C. Elctrn. Sls.	404-436-5169
MD	Baltimore, B. White & Co.	301-484-5400
NY	Pittsford, Noeth-Honsinger Assoc.	716-586-9002
NY	White Plains, QED Elctrns.	914-946-3424
OH	Cleveland, Scott Elctrns.	216-473-5050
OH	Trotwood, I. Atkind & Assoc.	513-837-4750
PA	King of Prussia, Freedman-Malta Assoc.	215-337-9211
EXP	NY, Plainview, Morhan Exp.	516-293-5582

FTS • FREQUENCY AND TIME SYSTEMS, INC.

FREQUENCY AND TIME SYSTEMS, INC., DATUM, INC., 34 Tozer Rd., Beverly, MA 01915, Tel: 617-927-8220, Telex: 94-0518 FTS BVLY; FSC No.: 56219; Empl.: 126; *Sls. Mgr.:* Richard Kelley ..... **A• 1364 -1365; D• 1230**

Local Sales Offices & Reps

AL	Huntsville, Lee Assocs.	205-533-5896
AZ	Tempe, Mar Tech Assocs., Inc.	602-968-4944
CA	Anaheim, Datum Timing	714-533-6333
CA	Santa Clara, Ward-Davis Assocs.	408-245-3700
FL	Coral Springs, Electrocraft	305-753-8666
FL	Largo, Electrocraft	813-530-4749
FL	Winter Park, Electrocraft	305-628-4705
IL	Park Ridge, Electronic Instr. Assocs.	312-298-2290
IN	Indianapolis, Electronic Instr. Assocs.	317-257-7231
IA	Hiawatha, Gassner & Clark Co.	319-393-5763
MD	Burtonsville, Eastern Instrmn.	301-384-8500
MA	Lexington, Del-Con Sls.	617-862-1118
MN	Minneapolis, Electronic Instr. Assocs.	612-374-5628
NJ	Haddonfield, G. L. Williams Assocs.	609-428-6060
NY	Bayside, Robert Diamond, Inc.	718-423-7330
NY	Liverpool, R & D Assocs.	315-457-0100
NC	Burlington, P.J. Nahser Co., Inc.	919-226-8053
OH	Centerville, Micro Sls. Corp.	513-433-8171
TX	Houston, Lear Assocs., Inc.	713-488-7893
TX	Richardson, Lear Assocs., Inc.	214-231-5388
WA	Kirkland, Manon Engrg.	206-827-7449
Can	St. Laurent, Que., RF Microwave, Ltd.	514-335-2335

FREQUENCY CONTROL PRODS., INC., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377, Tel: 212-458-5811, TWX: 710-582-2637; FSC No.: 59559;03040; *Sls. Mgr.:* Sanford Cohen - Crystals, Ed Cohen - Oscillators Servo, John Murray - Electro Optic

FREQUENCY DEVICES™

FREQUENCY DEVICES, INC., 25 Locust St., Haverhill, MA 01830, Tel: 617-374-0761, TWX: 710-347-0314; Empl.: 60; *Sls. Mgr.:* Warren Munroe ..... **A•1609; D•1231**

Local Sales Offices & Reps

AL	Huntsville, Lee Assocs. Mid-South, Inc.	205-533-5896
CA	San Jose, Texel North	408-272-6836
CA	Seal Beach, Texel	213-596-9411
IL	Palatine, Kingston Comps., Inc.	312-359-7990
MA	Holbrook, McLellan Assocs.	617-767-4771
NJ	East Brunswick, Winch Sls. Assocs.	201-828-4615
NY	Roslyn Heights, Winch Sls. Assocs.	516-621-6376
TX	Houston, TCI Elctrns.	713-774-5019
Can	Don Mills, Ontario, R. D. Assocs.	416-444-0959

FREQUENCY ELCTRNS., 55 Charles Lindbergh Blvd., Mitchel Field, NY 11553, Tel: 516-794-4500, TWX: 510-223-0418; Empl.: 350; *Sls. Mgr.:* A. Lazar ..... **A•1366-1367**

Local Sales Offices & Reps

CA	Mountainview, Disman-Baker	415-969-3010
FL	Orlando, Truex Assoc.	305-859-2160
MD	Hunt Valley, Marktron	301-628-1111
MD	Rockville, Marktron	301-251-8990
MA	Cochituate, High-Tech Sls.	617-653-3838
NJ	East Windsor, Micro Lambda	609-443-3113
NJ	W. Orange, E-F Techn. Sls.	201-731-7203
NY	Huntington Sta., E-F Techn. Sls.	516-549-1818
OH	Cleveland, Tiby Co.	216-371-5335
TX	Houston, Spectra Sls. Corp.	713-783-8333
TX	Richardson, Spectra Sls. Corp.	214-234-3600
VA	Charlottesville, Marktron	804-973-5874
EXP	NY, New York, Henley Elctrns.	212-986-5544

FREQUENCY SELECTIVE NETWORKS, INC., 69-20 Garfield Ave., Woodside, NY 11377, Tel: 718-424-7500; FSC No.: 56662; Empl.: 30; *Sls. Mgr.:* Michael L. Izzolo ..... **A•1369**

Local Sales Offices & Reps

FL	Ft. Lauderdale, Donato Assoc.	305-733-3450
MN	Bloomington, 2M Sls.	612-888-7414
NY	Huntington, Carnes Assocs.	516-694-1600
OH	Dayton, Aschbacher Assocs.	513-252-7785

FREQUENCY SOURCES, KSW Semiconductor Div., 16 Maple Rd., Chelmsford, MA 01824, Tel: 617-256-8101, TWX: 710-343-0404; FSC No.: 50101; Empl.: 80

FREQUENCY WEST, INC., 3140 Alfred St., Santa Clara, CA 95054, Tel: 408-727-8500, TWX: 910-338-0163; FSC No.: 8F150; Empl.: 158; *Sls. Mgr.:* James K. McGuinness

FRESNEL OPTICS, Div. of Alliance Tool Corp., 1300 Mt. Read Blvd., Rochester, NY 14606, Tel: 716-647-1140, Telex: 97-8322; *Sls. Mgr.:* Helmut Walter

FRONT PANEL DEVICES, INC., 530 Burnside Ave., Inwood, NY 11696, Tel: 212-471-9800, Telex: 645-580; Empl.: 20; *Sls. Mgr.:* Michael Geller

FSI/FORK STANDARDS INC., 666 Western Ave., Lombard, IL 60148, Tel: 312-231-3511, 312-932-9380; FSC No.: 14986; Empl.: 20; *Sls. Mgr.:* A. E. Toht; *Dist. Mgr.:* A. E. Toht

FTS SYS., POB 158, Stone Ridge, NY 12484, Tel: 800-824-0400, TWX: 510-247-0547; Empl.: 100; *Sls. Mgr.:* T. N. Thompson, Jr.

FUJI-SVEA, P.O. Box 3375, Torrance, CA 90510, Tel: 213-533-1221, Telex: 182-392

FUJITSU

FUJITSU AMERICA, INC., 918 Sherwood Dr., Lake Bluff, IL 60044, Tel: 312-295-2610, Telex: 206196, TWX: 910-651-2259; Empl.: 40 ..... **B•1349-1368; C•1104, 1195-1224**

Local Sales Offices & Reps

AZ	Phoenix, Sanford Sls.	602-957-3570
CA	San Diego, Earle Assocs., Inc.	619-278-5441
CA	San Jose, Applied Elctrn. Mktg.	408-971-9377
CA	Thousand Oaks, SC Cubed	805-496-7307
CA	Tustin, SC Cubed	714-731-9206
CO	Denver, Donohue Sls.	303-455-1719
FL	Altamonte Springs, 'C' Assocs.	305-831-1717
FL	Pompano Beach, 'C' Assocs.	305-972-9200
IA	Cedar Rapids, R. W. Kunz & Assocs.	319-396-5386
GA	Lawrenceville, Tek-Rep Mktg.	404-963-1600
IL	Elk Grove Vl., John G. Twist	312-593-0200
IL	Highland Park, Bransky Sls.	312-433-2375
KS	Prairie Village, R. W. Kunz & Assocs., Inc.	913-648-3535
ME	E. Sabago, Electrical Comps. Inc.	207-787-3145
MD	Baltimore, Component Sls., Inc.	301-484-3647
MA	Fall River, Elec. Comps.	617-674-0064
MA	Longmeadow, Elec. Comps.	413-567-0153
MA	Natick, Elec. Comps.	617-655-2225
MI	Warren, DEM Elctrn. Sls.	313-575-9444
MN	Bloomington, John G. Twist	612-835-2120
MO	St. Louis, R. W. Kunz & Assocs., Inc.	314-966-4977
NJ	Bellmawr, TAI Corp.	609-933-2600
NJ	Parlin, JMR Sls.	201-254-8484
NY	E. Setauket, JMR Sls.	516-689-8871
NY	E. Syracuse, Nycom, Inc.	315-437-8343
NC	Charlotte, Robert W. Chapman Co.	704-525-2421
NC	Greensboro, Robert W. Chapman	919-275-0003
NC	Raleigh, Robert W. Chapman	919-782-2624
OH	Columbus, McFadden Sls.	614-459-1280
OR	Aloha, Whisler Sls. Co.	503-649-9078
PA	Greensburg, Pro-Mark	412-832-3800
TX	Garland, Savarese & Assocs.	214-475-8360
UT	Bountiful, Anderson Assocs.	801-292-8991
VA	Richmond, Component Sls., Inc.	804-741-4072
WA	Bellevue, Whisler Sls. Co.	206-643-1463
WI	Brookfield, John G. Twist	414-782-2670
WI	Cedarburg, Bransky Sls.	414-377-6837
Can	Concord, Ont., Votran Elctrns., Inc.	416-669-9870, 416-661-5190

Local Distributors

CA	Brisbane, Automated Process Controls	415-467-6162
CA	Buena Park, Control Design Supp.	714-521-5040
CA	San Carlos, Control Design Supp.	415-592-4808
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Santa Ana, Pacesetter Elctrns.	714-557-7131, 213-233-5800
CA	Santa Monica, Distr. Specialists	213-393-9666
CA	Torrance, Cypress Elctrns.	213-533-6005, 714-761-3366
CO	Denver, CSID	303-292-9594
CO	Wheat Ridge, Cypress Elctrns.	303-431-2622
CT	Orange, Milgray Elctrns.	203-795-0711
FL	Altamonte Springs, Control Design Supp.	305-788-3220
FL	Lakeland, A-A Elec.	813-665-6941
FL	Winter Park, Milgray Elctrns.	305-647-5747
GA	Atlanta, Milgray Elctrns.	404-393-9666
GA	Atlanta, Prehler Elctrns., Inc.	404-447-5540
GA	Stone Mountain, Control Design Supp.	404-979-3500
IL	Addison, L Comp.	312-628-1400
IL	Bensenville, Milgray Elctrns., Inc.	312-350-0490
IL	Carol Stream, Lectro Comps.	312-690-0520
IL	Chicago, Prehler Elctrns., Inc.	312-384-6100
IL	Genoa, Control Design Supp.	815-784-6519
IL	Northbrook, Classic Comp. Supp.	312-272-9650
IL	Wheeling, Hawk Elctrns.	312-459-4030
IN	Indianapolis, Classic Comps. Supp., Inc.	317-872-4777
IN	Indianapolis, Control Design Supp.	317-788-0551
IA	Cedar Rapids, Bergquist	910-525-1335
IA	Marian, Control Design Supply, Inc.	319-373-2923
KS	Wichita, L Comp.	316-265-5100
ME	Gray, Longhill Electro-Tech	207-657-2183
MD	Rockville, Milgray Elctrns.	301-468-6400
MA	Burlington, Milgray Elctrns.	617-272-6800
MA	Burlington, Q.P.L. Elctrns.	617-947-2424
MA	Middleboro, Glynn Electronics	617-947-4262
MA	Natick, Tec-Con Elctrns.	617-655-9333
MA	Somerville, Electro Sls.	617-666-0500
MI	Farmington Hills, Prehler Elctrns., Inc.	313-473-7200
MN	Burnsville, Custom Connections	612-894-4090
MN	Minneapolis, Bergquist	612-835-2322
MN	Minneapolis, Control Design Supp.	612-721-1628
MO	Kansas City, L Comp.	816-221-2400
MO	Maryland Heights, L Comp.	314-291-6200
MO	St. Louis, Control Design Supp.	314-426-3160
MO	St. Louis, Interstate Industrial Elctrns.	314-423-4322

NE Omaha, Radio Equip. 402-341-7700
NJ Marlton, Milgray Elctrns. 609-983-5010
NJ Nutley, Vantage Comps. 201-667-1840
NY Buffalo, Summit Distrs., Inc. 716-887-2800
NY Farmingdale, Milgray Elctrns. 516-420-9800
NY Farmingdale, Pride Elctrns. 516-293-4020
NY Pittsford, Milgray Elctrns. 716-385-9330
NC Charlotte, Control Design Supp. 704-588-4410
NC Raleigh, Prehler Elctrns., Inc. 919-876-9111
OH Cleveland, Milgray Elctrns. 216-447-1520
OH Middleburg Heights, Prehler Elctrns., Inc. 216-243-5510
OH Solon, Repco 216-248-8900
OK Tulsa, Altair Co. 918-252-5781
PA Harrisburg, Cumberland Elctrns. 717-232-5999
PA Malvern, Control Design Supp. 215-296-0150
PA McKean, Advacom, Inc. 814-476-7774
TX Austin, Altair Co. 512-837-4490
TX Dallas, Control Design Supp. 214-358-1441
TX Dallas, Cypress Elctrns. 214-869-1435
TX Dallas, Milgray Elctrns. 214-248-1603
TX Houston, Altair Co. 713-462-3029
TX Richardson, Altair Co. 214-231-5166
UT Salt Lake City, ACT/Diplomat 801-486-4134
WA Bellevue, Integrated Elctrns., Inc. 206-455-2727
WI Milwaukee, Indl. Elctrns. 414-276-1212
WI New Berlin, Classic Comp. Supp. 414-786-5300
WI New Berlin, Control Design Supp. 414-784-1016
WI New Berlin, NEP Elctrns. 414-785-9100
WI Racine, Badger Elctrn. Parts Co. 414-637-1256

FURMAN SOUND, INC., 30 Rich St., Greenbrae, CA 94904, Tel: 415-927-1225, Telex: 172029 SPXSRFL; *Sls. Mgr.:* Diane Poole; *Dist. Mgr.:* Diane Poole

FURNAS ELEC., 1197 McKee St., Batavia, IL 60510, Tel: 312-879-6000, Telex: 72-0458; Empl.: 1360; *Sls. Mgr.:* T. W. Thornton; *Dist. Mgr.:* R. Lanser

FUSECOM, 14864 NE 95th St., Redmond, WA 98052, Tel: 206-881-2442; *Sls. Mgr.:* Bruce Barndt

Distributor

FUSES UNLIMITED, 9300 Mason Av., Chatsworth, CA 91311, Tel: 818-882-1515 ..... **B•1234**

FUSION INC., 4658 E. 355th. St., Willoughby, OH 44094, Tel: 216-946-3300, Telex: 98-0445; Empl.: 85; *Sls. Mgr.:* Raymond C. Yuhasz

GABRIEL ELCTRNS., Box 70, Scarborough Indl. Pk., Scarborough, ME 04074, Tel: 207-883-5161, Telex: 95-0113; Empl.: 135; *Sls. Mgr.:* D. B. Crisman

GALILEO ELECTRO-OPTICS CORP., Galileo Pk., Sturbridge, MA 01518, Tel: 617-347-9191, TWX: 710-347-1190; FSC No.: 28719; Empl.: 330; *Sls. Mgr.:* L. P. Thompson

GALITE, 2 Tower Dr., Wallingford, CT 06492, Tel: 203-265-7126, TWX: 710-476-0764; FSC No.: 56447; *Sls. Mgr.:* James W. Campbell, Jr.

GAMBLE, CHARLES T., INDS., 605 Perkins La., Delanco, NJ 08075, Tel: 609-461-1900; Empl.: 150; *Sls. Mgr.:* W. Snyder

GAMMA HIGH VOLTAGE RESCH. INC., 152 S. MacQuesten Pkwy., Mt. Vernon, NY 10550, Tel: 914-667-5050 ..... **D•1644-1645**

Local Sales Offices & Reps

IL Chicago, Ropek, Cahill & Vogt 312-631-0070
MD Timonium, Eastern Comps. 301-561-5811
NJ Nutley, Irwin Brill Sls. 201-667-0653
NM Albuquerque, Cleveland Entprs. 505-265-7893
NC Raleigh, Eastern Comps. 800-223-3850
PA W. Conshocken, Eastern Comps. 215-825-8610

GAMMA SCIENTIFIC INC., 3777 Ruffin Rd., San Diego, CA 92123, Tel: 619-279-8034, Telex: 69-7938; Empl.: 65; *Sls. Mgr.:* G.C. Unangst

GANDALF DATA, INC., 1019 S. Noel Ave., Wheeling, IL 60090, Tel: 312-541-6060, TWX: 910-651-4951; Empl.: 350; *Sls. Mgr.:* Ken Charbauski

GANDALF TECHNOLOGIES, INC., 350 E Dundee Rd., Suite 301, Wheeling, IL 60090, Tel: 312-459-6630, TWX: 910-651-4951

GAP INSTR., 40 Oser Ave., Hauppauge, NY 11787, Tel: 516-273-0909, TWX: 510-227-6237; FSC No.: 00607; Empl.: 50

GARDINER ELCTRNS., 4729 North 7th Ave., Phoenix, AZ 85013, Tel: 602-274-9681

GARDINER SOLDER CO., Div. of Gardiner Metal Co., 4820 S. Campbell Ave., Chicago, IL 60632, Tel: 312-847-0100, TWX: 910-221-2510; Empl.: 100; *Sls. Mgr.:* John A. Seyda ..... **C•1738**

Local Sales Offices & Reps

AZ Phoenix, Astro Prods. 602-268-2948
AZ Phoenix, Tooltronics, Inc. 602-257-0768
CA Glendale, Tooltronics, Inc. 818-240-4000
CA La Mirada, Gardiner Solder 714-994-6350
CA Santa Clara, Tooltronics, Inc. 408-496-6000
CO Littleton, West Mark Denver, Inc. 303-979-3720
FL Merritt Island, James A. Kennedy Assocs. 305-452-9821
GA Tucker, Electrical Concepts, Inc. 404-491-3154
IA Princeton, Johnson Mfg. 319-289-5123
MA Woburn, Yankee Tech Sls. 617-935-6278
MI East Detroit, Fred Harris & Assocs. ... 313-776-5430
MO St. Charles, Phillips & Assocs. 314-441-0148
NJ Norwood, Wilson Inds. 201-767-7060
NJ Scotch Plains, Gardiner Solder Co. ... 201-232-1965
NC Charlotte, Electro-Rep Assocs., Inc. ... 704-527-2530
OH Cleveland, Jim Finnegan & Co. 216-238-5905
PA Carnegie, Lloyd K. Lombardi 412-279-2017
TX Dallas, Elctrn. Production Specialists .. 214-422-5476
TX El Paso, Aztec Microelectronics 915-581-6130
WA Bellevue, Doland Co. 206-454-4952
PR Rio Tiedras, Electronic Sls. Assocs. ... 809-762-6459

Local Distributors

CA So. San Francisco, Electrical Specialty Co. 415-589-9611
AL Birmingham, E.I.S., Inc. 205-252-9046
AZ Phoenix, Elctrl. Specialty Co. 602-275-5736
CA Anaheim, Advance Electrical Sls., Inc. 714-870-0300
CA Anaheim, Elctrl. Specialty Co. 714-630-7050
CA Belmont, Advance Elctrl. Sls. 415-592-4550
CA Chino, Tracy Elctrns. 714-591-4736
CA Fawnskin, Pat Dooley 714-866-3413
CA Glendale, Mac Donald & Co. 818-241-1101
CA Lakeside, CASCO 619-560-9319
CA Los Angeles, Elctrl. Specialty Co. 213-724-9600
CA Los Angeles, John Cameron Supply Co. 213-870-7403
CA San Diego, Casco 619-560-9319
CA San Diego, Elctrl. Specialty Co. 619-560-1800
CA San Diego, Hi-Tech Metals Co. 619-270-8081
CA Santa Clara, RGB Electro Indl. Tool ... 408-980-1300
CA Simi Valley, Cal-Pacific Suppliers 213-998-4982
CO Denver, Advance Elctrl. Sls. 303-388-0923
CO Denver, Elctrl. Specialty Co. 303-321-0226
CO Denver, Integrated Elec. 303-292-6121
CT Wallingford, ASTECH 203-265-4241
FL Boca Raton, KIMCO 305-994-0590
FL Clearwater, Your Production Cupboard 813-447-2581
FL Orlando, E.I.S., Inc. 305-855-7100
FL Orlando, Mavidon Entprs. 305-298-7324
FL Palm Bay, Enstice Tool Grinding 305-734-2100
GA Atlanta, E.I.S., Inc. 404-355-1651
IL Addison, International Soldering Supplies 312-628-8083
IL Bensenville, MASTCO 312-595-0414
IL Chicago, Fay Elec. Wire Corp. 312-267-9222
IL Hillside, Complete-Reading Electric Co. 312-547-5400
IN Indianapolis, Complete-Reading Electric Co. 317-872-3710
IA Princeton, Johnson Mfg. Co. 319-289-5123
KS Louisburg, Ambrose Sls. Co. 913-541-8476
KY Louisville, E.I.S., Inc. 502-636-0384
LA New Orleans, Complete-Reading Elec. Co. 504-733-9435
MD Baltimore, Complete-Reading Elec. Co. 301-646-1330
MA Leominster, Elctrn. Tool Specialists ... 617-534-3324
MA Woburn, Pacer Elctrns. 617-935-8330
MI Warren, Complete-Reading Elec. Co. .. 313-755-6020
MN Edina, Complete-Reading Elec. Co. ... 612-831-8145
MN Minneapolis, W. D. Forbes Co., Inc. 612-378-1917
MN New Brighton, Chris Elctrns. 612-631-2647
MN St. Paul, Nordic Elctrns. 612-228-9027
MO Kansas City, Complete-Reading Elec. Co. 816-471-5966
MO Maryland Heights, Complete-Reading Elec. Co. 314-569-1611
MO St. Charles, Finnigan Wire & Cable 314-946-6201
NV Carson City, Gibson Tool Co. 702-883-3566
NH Manchester, E.P.E. Corp. 603-669-9181
NJ Livingston, Robert McKeown Co., Inc. 201-992-0700
NJ Stirling, Janel 201-647-5600
NY Fairport, Pacer Elctrns. 716-377-0462
NY Farmingdale, S.A.I. 516-293-2710
NY Liverpool, Complete-Reading Elec. Co. 315-457-1350
NY Sidney, Wingate & Assocs. 607-563-2113
NC Charlotte, E.I.S., Inc. 704-392-7366
NC Raleigh, E.I.S., Inc. 919-781-4750
OH Cincinnati, E.I.S., Inc. 513-771-4073
OH Cleveland, Complete-Reading Elec. Co. 216-827-8891
OH Mentor, Kimco 216-255-1992
OK Tulsa, Complete-Reading Elec. Co. ... 918-664-4000
OR Portland, Elctrl. Specialty Co. 503-227-3601
PA Pittsburgh, Complete-Reading Elec. Co. 412-788-1580
RI Warwick, Bayside Tech Inds. 401-737-5366
TN Memphis, E.I.S., Inc. 901-947-4176
TN Nashville, E.I.S., Inc. 612-883-0862
TX Beaumont, Complete-Reading Elec. Co. 713-842-2117
TX Dallas, Complete-Reading Elec. Co. ... 214-827-8891
TX El Paso, Elctrl. Specialty Co. 915-594-8251
TX Garland, Complete Reading Elec. Co. 214-840-6000
TX Houston, Complete-Reading Elec. Co. 713-691-0080
TX Houston, Fay Elec. Wire Corp. 713-923-2825
TX Plano, Fay Elec. Wire Corp. 214-422-2797
UT Salt Lake City, Electrical Specialty Co. 801-972-4184
VA Bluefield, Complete-Reading Elec. Co. 703-322-5424
VA Richmond, E.I.S., Inc. 804-649-9221
WA Kirkland, R G B Electro Indl. Tool 800-958-5811
WA Seattle, Advanced Elctrl. Sls., Inc. 206-575-4323
WA Tukwila, Electrical Specialty Co. 206-241-1010
WV Bluefield, E. I. S. 703-322-5424
WI Mequon, Complete-Reading Elec. Co. 414-241-3880
WI Oshkosh, Fay Elec. Wire Corp. 414-426-0792
EXP PR, Carolina, E. I. S. 809-757-6565
PR San Juan, Distributronics, Inc. 809-781-0631

GAR ENTERPRISES, 2029 N. Lincoln Ave., Pasadena, CA 91103, Tel: 818-798-0785; Empl.: 25

GARNER GLASS CO., 177 S. Indian Hill Blvd., Claremont, CA 91711, Tel: 714-624-5071; Empl.: 50; *Sls. Mgr.:* Joseph C. Hyatt

GARRY MFG. CO., DIV. OF BRAND-REX CO., 9 Queen Anne Ct., Laghorne, PA 19047, Tel: 215-949-2300; Empl.: 250; *Sls. Mgr.:* Tom Malek; *Dist. Mgr.:* Bob D'Autrachy

GASKET INTL. INC., 49 Ackerman St., Bloomfield, NJ 07003, Tel: 201-338-6814; Empl.: 5; *Sls. Mgr.:* Russell L. Steinman

GATES, GEO. W., & CO., INC., Hempstead Tpke. & Lucille Ave., Franklin Sq., NY 11010, Tel: 516-352-2904; Empl.: 10; *Sls. Mgr.:* T. E. Schulz, Jr

GATES DATA PRODUCTS, Gates Corporation, 2455 Executive Circle, Colorado Springs, CO 80906, Tel: 303-579-0330; *Sls. Mgr.:* Donald D. Stucker; *Dist. Mgr.:* Gregory D. Easton

GATES ENERGY PRODS., 1050 S. Broadway, Denver, CO 80217, Tel: 303-744-4806, Telex: 045-511, TWX: 910-931-2658; Empl.: 500; *Sls. Mgr.:* R. O. Hammel; *Dist. Mgr.:* M. R. Harrison

GATEWAY COMMUNICATIONS INC., 16782 Redhill Ave., Irvine, CA 92714, Tel: 714-261-0762; *Sls. Mgr.:* David S. McMaster

GAVITT WIRE & CABLE, Brookfield, MA 01506, Tel: 617-867-6476; Empl.: 75

GAYNOR ELEC. CO., 135 South Main St, P.O. Box 316, Thomaston, CT 06787-0316, Tel: 203-283-4388; Empl.: 50; *Sls. Mgr.:* John Swanson; *Dist. Mgr.:* John Swanson

Local Sales Offices & Reps
CA Chatsworth, Porter Co. 818-700-0808
CT Madison, United Comps. 203-562-4002
IL Elk Grove Village, Control Sls. 312-595-2110
MN St. Louis, Lestronix 612-926-8466
NJ Mountain Lakes, Browning-Naughton Co., Inc. 201-335-2029
OH Cleveland, Jubell Assoc. 216-831-0364
OH Mentor, Appliance Elctrns. 216-257-6019
WI Thiensville, Control Sls. 414-242-4580

G B INSTRUMENTS INC., 2030 Coolidge St., Hollywood, FL 33020, Tel: 305-920-0225, TWX: 510-954-9813; FSC No.: 31601; Empl.: 30; *Sls. Mgr.:* B. J. Weiss

GC ELCTRNS., 400 S. Wyman St., Rockford, IL 61101, Tel: 815-968-9661, Telex: 237-318, TWX: 257318 GC Elect; Empl.: 360; *Sls. Mgr.:* Owen Jackson

GCI, INC., 14520 Lima Rd., Fort Wayne, IN 46818, Tel: 219-637-5520, TWX: 883910; Empl.: 108; *Sls. Mgr.:* C. Ward

GECO, 145 Penn St., Millheim, PA 16854, Tel: 814-349-5555; Empl.: 21

GEC TECHNOLOGY CORP., 4430 Forest Lane, Garland, TX 75042, Tel: 214-276-1164

GEMCOR, See General-Electro-Mechanical Corp.

GEMINI
INCORPORATED

GEMINI, 103 Mensing Way, Cannon Falls, MN 55009, Tel: 507-263-3957; *Sls. Mgr.:* Gary Pearson ...**C•1060-1061**

Local Sales Offices & Reps
AL Huntsville, L & D, Inc. 205-836-1469
AZ Phoenix, Ken Maynard Assocs. 602-581-8107
AR North Little Rock, Leo Barker Co. 501-834-2537

H890 HECON
COUNTERS
PRINTERS
IN STOCK • IN STOCK
Franchised
Distributor
HECON-HENGSTLER
LOGICOMP
ELECTRONICS, INC.
1009 W. BOSTON POST ROAD
MAMARONECK, NEW YORK 10543
PHONE: (914) 698-9332
TOLL FREE
(Outside N.Y.)
800/431-2625

CA Orange, XBX Sls., Inc. 714-998-8200
CA San Diego, Qualtronics 619-560-8955
CA San Jose, Gemini, Inc. 408-225-3362
CO Arvada, Delconec, Inc. 303-422-7023
FL Key Largo, Jerrold Helbein & Assocs. 305-367-3025
GA Atlanta, L & D, Inc. 404-455-3483
IL Palatine, JRS Assocs. 312-991-6626
IN Noblesville, Century Elctrns. 317-849-2026
IA Cedar Rapids, Dick Taylor 319-364-2282
LA Folsom, Leo Barker Co. 504-796-9825
MA Brookline, Harman Assocs. 617-232-6687
MI Plymouth, Jay Mktg. Assocs. 313-459-1200
MN Bloomington, Heil's Temi 612-854-2001
MO St. Louis, Harris Hanson Co. 816-763-6200
NY New York, Reuse Pkg. 212-939-6080
NY Rochester, Leonard D. Allen, Inc. 716-377-3530
NY Syracuse, Leonard D. Allen, Inc. 315-437-8387
NC Thomasville, Jerrold Helbein & Assocs. 919-476-2365
OH Cleveland, Jim Finnegan Co., Inc. 216-238-5905
OH Dayton, Jim Finnegan & Co., Inc. 513-890-8322
OR Beaverton, Underwood-Hanify 503-641-4463
PA King of Prussia, Freedman-Malta Assocs. 215-337-9211
TN Knoxville, L & D, Inc. 615-573-6511
TX Dallas, J. Clay Co. 214-350-1281
TX Houston, J. Clay Co. 713-583-2912
UT Salt Lake City, Medax 801-266-4545
WA Bellevue, Underwood-Hanify 206-451-8223
WI Wauwatosa, Larsen Assocs. 414-258-0529
Can Markham, Ont., Avotronics, Ltd. 416-475-2024

GEN/COMP INC., 6 Algonquin Rd., Canton, MA 02021, Tel: 617-828-2008; *Sls. Mgr.:* G. Nutter

GENERAL ATRONICS CORP., 1200 E. Mermaid Lane, Philadelphia, PA 19118, Tel: 215-233-4100

GENERAL AUTOMATIC CORP., 70 Liberty St., Metuchen, NJ 08840, Tel: 201-494-9300; Empl.: 59; *Sls. Mgr.:* M. Barron

GENERAL BUSINESS TECH., 1891 McGraw Avenue, Irvine, CA 92714, Tel: 714-261-1891; Empl.: 32

GENERAL CABLE CO., Cornish Products Div., 160 Water Street, Williamstown, MA 01267, Tel: 413-458-8171

GENERAL CABLE CO., Fiber Optics Div., 160 Fieldcrest Ave., Raritan Ctr., Edison, NJ 08818, Tel: 201-225-4780, Telex: 642892; *Sls. Mgr.:* Pieter de Bruijn

GENERAL COMPUTERS, 1624 Veteran Ave., Los Angeles, CA 90024; Empl.: 10

GENERAL CONNECTOR CORP., 80 Bridge St., Newton, MA 02158, Tel: 617-244-5706

GENERAL CONTROL CO., 1200 Soldiers Field Rd., Boston, MA 02134, Tel: 617-782-7440; Empl.: 25

GENERAL DATACOMM, INC., Rt. 63, Middlebury, CT 06762-1299, Tel: 203-574-1118; *Dist. Mgr.:* Vince Dailey

GENERAL DEVICES, Box 39100, Indianapolis, IN 46239-9632, Tel: 317-897-7000, Telex: 27-2169; Empl.: 220 ..... **C•1062-1065**

Local Sales Offices & Reps
AL Huntsville, Hughes Assocs., Inc. 205-533-9108
AZ Phoenix, Snyder Engrg. 602-279-2010
CA Fullerton, Groh Assoc. 714-738-7105
CA Mountain View, G. Woempner Co. 415-964-5454
CO Boulder, R. F. Mayo Assoc. 303-499-2155
CT North Haven, Coakley, Boyd & Abbett 203-481-2828
FL Lighthouse Point, J. Krutek & Assoc. 305-941-6544
FL Maitland, J. Krutek 305-628-4837
GA Norcross, Hughes Assocs., Inc. 404-622-1587
IL Glencoe, Howard Benjamin 312-835-0150
IN Noblesville, Century Elctrns. 317-849-2026
KS Shawnee Mission, Lowell & Kangas 913-631-3515
MA Needham, Coakley, Boyd & Abbett 617-444-5470
MN St. Paul, Northport Engrg. 612-457-8000
MS Corinth, Hughes Assocs., Inc. 601-287-2915
MO St. Louis, Lowell & Kangas 314-821-4050
NH Plaistow, Coakley, Boyd & Abbett 617-444-5470
NJ Mountainside, Henry G. Richter 201-233-4615
NY Fayetteville, H.G. Richter 315-637-6713
NC Raleigh, Hughes Assocs., Inc. 919-782-2065
OH Cleveland, Electronic Comps., Inc. 216-261-4103
OH Dayton, Electronic Comps., Inc. 513-866-3340
OK Tulsa, Advance Tech. Sls. 918-664-0482
PA Doylestown, Monteiro Assoc. 215-345-5855
TN Morristown, Hughes Assocs., Inc. 615-587-2433
TX Austin, Advance Tech. Sls. 512-440-7677
TX Dallas, Advance Tech. Sls. 214-340-1300
TX Houston, Advance Tech. Sls. 713-440-3888
WA Olympia, Bergford & Assocs. 206-866-2001

GENERAL DIGITAL CORP., 700 Burnside Ave., E. Hartford, CT 06108, Tel: 203-528-9041; Empl.: 70 ..... **D•1067**

Local Sales Offices & Reps
MA Wayland, Daner-Hayes, Inc. 617-894-7290

GENERAL DIGITAL INDUSTRIES INC., 7702 Governors Dr. W., Huntsville, AL 35805, Tel: 205-837-8305; Empl.: 29; *Sls. Mgr.:* Nelson Carney

GENERAL ELECTRIC CO., 333 W. Seymour Ave., Cincinnati, OH 45216, Tel: 513-948-5050, Telex: 810-461-2070; FSC No.: 05326

GENERAL ELECTRIC CO., Battery Business Dept., P.O. Box 992, Gainesville, FL 32602, Tel: 904-462-4480, TWX: 810-836-8500; *Sls. Mgr.:* K. Edwards

GENERAL ELEC. CO., Carboloy Systems Dept., Box 237, Detroit, MI 48232, Tel: 313-536-9100, TWX: 810-226-9617; Empl.: 1800; *Sls. Mgr.:* R. A. Alukonis

GENERAL ELEC. CO., Electromaterials Bus. Dep., Coshocton, OH 43812, Tel: 614-622-5310, Telex: 810-255-2921; Empl.: 1100; *Sls. Mgr.:* R.L. Morris; *Dist. Mgr.:* J. L. Schreiber

GENERAL ELECTRIC CO., Instrument Prods. Section, See Yokogawa Corp. of America

GENERAL ELECTRIC CO., Lamp Comps. & Technical Prods. Div. Sls. Oper., 21800 Tungsten Rd., Cleveland, OH 44117, Tel: 216-266-2451, Telex: 985569; *Sls. Mgr.:* P. A. Wrobleski

GENERAL ELECTRIC CO., Microwave Tube Operation, 1 River Road, Schenectady, NY 12345, Tel: 518-385-2211 (main NBR)

GENERAL ELECTRIC CO., OEM Marketing Dept., Nela Park, Clevland, OH 44112, Tel: 216-266-2121; *Sls. Mgr.:* W. D. Wells

GENERAL ELECTRIC CO., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021, Tel: 315-253-7321; Empl.: 4000; *Sls. Mgr.:* George H. Oliver; *Dist. Mgr.:* Richard Levitre

GENERAL ELECTRIC CO., RELAY OPERATION, See Genicom Corp.

GENERAL ELECTRIC CO., Wire & Cable, 1285 Boston Ave., Bridgeport, CT 06602, Tel: 203-382-2000, Telex: 96-4209; Empl.: 2000; *Sls. Mgr.:* D. A. Pritchard; *Dist. Mgr.:* M. Peterson

GENERAL ELECTRO-MECHANICAL CORP., 785 Hertel Ave., Buffalo, NY 14207, Tel: 716-876-9685, Telex: 91-222; Empl.: 100; *Sls. Mgr.:* Tom Speller, Jr.

GENERAL FIBER OPTICS, INC., 98 Commerce Rd., Cedar Grove, NJ 07009, Tel: 201-239-3400; *Sls. Mgr.:* Herb Berkowitz

GENERAL HARDWARE MFG., 80 White St., New York, NY 10013, Tel: 212-431-6100, Telex: 126394 Aegis; *Sls. Mgr.:* Tom McGannon

GENERAL INDS., Taylor & Olive St., Elyria, OH 44035, Tel: 216-323-3136, TWX: 810-424-2109; Empl.: 1100; *Sls. Mgr.:* Bruno Raynes; *Dist. Mgr.:* David Cassidy

GENERAL INSTR., Discrete Semiconductor Div., 600 West John St., Hicksville, NY 11802, Tel: 516-733-3333, TWX: 510-221-1865; *Sls. Mgr.:* Tom Hurley; *Dist. Mgr.:* R. Graziano

GENERAL INSTR., Govt. Sys., 600 W. John St., Hicksville, NY 11802-0709, Tel: 516-933-3000, Telex: 311512, TWX: 510-221-1865; Empl.: 550

GENERAL INSTR., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640, Tel: 312-784-1020, TWX: 910-221-5445; FSC No.: 71744; Empl.: 390; *Sls. Mgr.:* Jim Flanagan

GENERAL INSTRUMENT CORP., Microelectronics Div., 600 W. John St., Hicksville, NY 11802, Tel: 516-733-3107, TWX: 510-221-1866; *Sls. Mgr.:* A. Lindgren; *Dist. Mgr.:* J. Johnson

GENERAL INSTR., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304, Tel: 415-493-0400, Telex: 348430, TWX: 910-373-1767; FSC No.: 58361; Empl.: 500; *Sls. Mgr.:* J. Beach; *Dist. Mgr.:* W. Clark

GENERAL LASER, INC., 7662 East Gray Rd., Scottsdale, AZ 85260, Tel: 602-991-0674; *Sls. Mgr.:* Robert L. Bagley, II

GENERAL MAGNETICS, 211 Grove St., Bloomfield, NJ 07003, Tel: 201-743-2700; FSC No.: 99165; Empl.: 60

GENERAL MFG., 724 Ruberta Ave., Glendale, CA 91201, Tel: 818-243-2069; FSC No.: 10454

GENERAL MICROWAVE CORP., 155 Marine St., Farmingdale, NY 11735, Tel: 516-694-3600, Telex: 310-287-780; FSC No.: 11332; Empl.: 200; *Sls. Mgr.:* F. Perry ..... **A•1712; D•1232**

Local Sales Offices & Reps

AL	Huntsville, Saber Assocs.	800-327-0853
AZ	Phoenix, Odyssey One	602-246-8846
CA	Los Angeles, RF Assocs.	213-478-1586
CA	Palo Alto, RF Assocs.	415-494-3331
CO	Englewood, Odyssey One	303-773-8176
FL	Apopka, Saber Assocs.	800-432-6288
FL	Bradenton, Saber Assocs.	800-432-6288
FL	Coral Springs, Saber Assocs.	800-432-6288
FL	Ft. Lauderdale, Saber Assocs.	800-432-6288
FL	Melbourne, Saber Assocs.	305-724-0920
GA	Atlanta, Saber Assocs.	800-327-0853
IL	Mt. Prospect, Cain Forlaw	312-253-3578
MA	Burlington, Microwave Mktg. Specialists	617-272-7530
NJ	West Orange, EF Tech. Sls.	201-731-7203
NM	Albuquerque, Odyssey One	505-265-6645
NY	Huntington Sta., EF Tech. Sls.	516-549-1818
NY	Rochester, TCS (Technical Comp. Sls.)	716-342-2406
NC	Clayton, Saber Assocs.	800-327-0853
OH	Lancaster, Cain Forlaw	614-654-4800
PA	Andalusia, Hes Assocs.	215-245-5250
TX	Dallas, Cain & Co.	214-247-3901
VA	McLean, Creative Mktg. Assocs., Ltd.	703-442-9100

GENERAL NUMERIC CORPORATION, 390 Kent Avenue, Elk Grove Village, IL 60007, Tel: 312-640-1595, Telex: 210036; Empl.: 100; *Sls. Mgr.:* David Sturwold

GENERAL OPTRONICS, 3005 Hadley Rd., So. Plainfield, NJ 07080, Tel: 201-549-9000, TWX: 710-997-9556; Empl.: 65; *Sls. Mgr.:* Mas Oishi

GENERAL POWER SYSTEMS
A Division of ALS Corporation

GENERAL POWER SYS., 1400 N. Baxter St., Anaheim, CA 92806-1201, Tel: 714-956-9321, Telex: 182283; FSC No.: 04801; Empl.: 450; *Sls. Mgr.:* M. E. Heyman; *Dist. Mgr.:* M. E. Heyman ..... **D•1929**

Local Sales Offices & Reps

AL	Huntsville, Synergetic Reps., Inc.	205-882-1691
CA	Reseda, Schlines Reps.	818-344-0277
CA	Sunnyvale, Pacific Power Controls	408-745-0944
CA	Tustin, Schlines Reps.	714-544-9941
CT	Vernon, George Urban Assocs.	203-647-3991
FL	Coral Springs, Synergetic Reps., Inc.	305-753-6700
FL	Largo, Synergetic Reps., Inc.	813-586-2871
GA	Atlanta, Synergetic Reps., Inc.	404-446-6224
GA	Lawrenceville, Synergetic Reps., Inc.	404-457-5321
IN	Indianapolis, Fuller Engrg. & Sls.	317-253-3287
MD	Burtonsville, BEKR Inds., Inc.	301-421-1200
MA	Dover, George Urban Assocs.	617-329-4068
MO	Independence, Engrg. Svcs.	816-254-3600
MO	St. Louis, Engineering Svcs. Co.	314-997-1515
NY	E. Aurora, Bromor Co.	716-626-4593
NY	Port Washington, Aaron-J. R. Assocs.	516-883-0600
NC	Greensboro, Synergetic Reps., Inc.	919-288-1254
NC	Raleigh, Synergetic Reps., Inc.	919-876-3679
OH	Ashley, Mitchell Assocs.	614-747-2567
OH	Cleveland, Marlow Assocs.	216-991-6500
OH	Columbus, Marlow Assocs.	614-885-7643
PA	Media, Klinetics	215-565-5388
PA	Pittsburgh, Marlow Assocs.	412-831-6113
RI	Vernon, George Urban Assocs.	203-647-3991
TN	Memphis, Data Power Corp.	901-794-2821
TX	Richardson, Hi Tech Mktg. Assocs.	214-669-4003
VT	Dover, George Urban Assocs.	617-329-4068
VA	Mechanicsville, BEKR Inds., Inc.	804-746-3003
VA	Richmond, BEKR Inds., Inc.	804-741-0296

Local Distributors

AZ	Tempe, RHM Assocs.	602-966-5959
CA	Corte Madera, Simbora Sys.	415-927-1122
CA	Gilroy, Tyson Data Sys.	408-847-0440
CA	Huntington Beach, Computer Power Spec.	
CO	Lakewood, Challenge Tech.	303-232-6660
FL	Miami, Computer Supp.	305-620-6400
GA	Norcross, RTS Distrs.	404-449-0411
LA	Metairie, Computer Enviromental Equip.	504-838-8388
NJ	Westwood, Phoenix Computer Technlg.	201-666-5500
NM	Albuquerque, Battery Power Spec.	505-242-5662
NY	Port Washington, Connector Concepts Corp.	516-883-3800
NY	Tonawanda, Ronco	716-873-0760
TN	Memphis, Data Power Corp.	901-794-2821
TX	Bellaire, Bud Griffin & Assocs,	713-664-5462
UT	Orem, Digital Tech. Intl.	801-226-2987

GENERAL PRODUCTS CORP., 9030 Carroll Way, San Diego, CA 92121, Tel: 619-578-9690

GENERAL RESISTANCE

GENERAL RESISTANCE, INC., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, Tel: 203-481-5721, TWX: 710-452-3092; FSC No.: 05591; Empl.: 60; *Sls. Mgr.:* J. L. Jamieson ..... **A•1870; D•1233**

Local Sales Offices & Reps

Instruments

AL	Birmingham, SESCO	205-988-8304
AZ	Phoenix, Qualtech	602-967-4655
CA	Long Beach, Saber Entprs.	213-595-5646
CA	Palo Alto, Gado Instr. Sls.	415-961-2222
CA	San Diego, Saber Entrps.	619-271-1523
CO	Littleton, Radco	303-794-4279
CT	Cheshire, MECO, Inc.	203-271-0026
FL	Palm Bch. Grdns., SESCO, Inc.	305-832-0770
FL	St. Petersburg, SESCO	813-576-6991
GA	Altanta, SESCO	404-458-6423
IL	Des Plaines, Marsland Assocs.	312-694-2262
IA	Cedar Rapids, Marsland Assocs.	319-396-8030
LA	Baton Rouge, SESCO	504-928-4951
MA	Reading, MECO, Inc.	617-944-6660
MI	Mt. Clemens, O'Hara Assocs.	313-791-7140
MN	Minneapolis, Marsland Assocs.	612-545-4481
MO	St. Louis, Marsland Assocs.	314-991-1399
NJ	Hillsdale, CB Associates	201-664-6230
NJ	Pennsauken, Scientific Reps	609-662-5222
NM	Albuquerque, Qualtech	505-243-5605
NY	Rochester, TAE-REP	716-586-8710
NY	Whitney Point, TAE-REP, Inc.	607-692-3705
NC	Cary, SESCO, INC.	919-467-7482
OH	Dayton, RIXAN Assocs.	513-278-4216
OH	Stow, Rixan Assocs.	216-686-2909
OK	Tulsa, SESCO	918-622-3868
TN	Knoxville, SESCO, Inc.	615-588-5455
TX	Austin, SESCO	512-892-2490
TX	Dallas, SESCO	214-231-9364
TX	Houston, SESCO	713-999-3510
TX	Plano, SESCO, Inc.	214-867-8880
VA	Fairfax, Scientific Assocs.	703-385-0600
WA	Seattle, Datacom Assocs.	206-285-2525
WI	New Berlin, Marsland Assocs.	414-786-6611

Components

AZ	Phoenix, Qualtech, Inc.	602-967-4655
CA	Saratoga, TESTCO	408-253-1900
CO	Golden, J. F. Hurlbut Co.	303-279-7796
MD	Gaithersburg, Beacon North, Inc.	301-869-3289
MD	Mt. Airy, Beacon North, Inc.	703-591-1300
MD	Randallstown, Beacon North, Inc.	703-591-1300
MI	Farmington, W. R. Hummon & Assoc.	313-474-0661
OH	Dayton, RIXAN Assocs.	513-278-4216
OH	Stow, Rixan Assocs.	216-686-2909
TX	Dallas, Blackburn Assocs.	214-692-8885
TX	Houston, Blackburn Assocs.	713-463-1354
UT	Salt Lake City, J. F. Hurlbut Co.	801-531-7472
VA	Fairfax, Beacon North Inc.	703-591-1300
VA	Forest, Beacon North Inc.	804-239-8486

Local Distributors

CA	Saratoga, TESTCO	408-253-1900
OH	Dayton, RIXAN Assocs.	513-278-4216

GENERAL ROBOTICS CORP., 57 N. Main St., Hartford, WI 53027, Tel: 414-673-6800, Telex: 269686; *Sls. Mgr.:* Barbara Pick; *Dist. Mgr.:* Barbara Pick

GENERAL SCANNING, 500 Arsenal St., Watertown, MA 02272, Tel: 617-924-1010, Telex: 443-0105; Empl.: 250

GENERAL SEMICONDUCTOR IND., INC., Square D Company, 2001 W. 10 Pl., Tempe, AZ 85281, Tel: 602-968-3101, Telex: 910-950-1942; FSC No.: 24444;19500; Empl.: 425; *Sls. Mgr.:* Jim Williams; *Dist. Mgr.:* Howard Israel

GENERAL TECHNOLOGY CORP., 6816 Washington Avenue, NE, Albuquerque, NM 87109, Tel: 505-345-5591; Empl.: 50; *Sls. Mgr.:* Ralph H. Anderson

GENERAL TRANSISTOR CORP., 216 W. Florence Av., Inglewood, CA 90301, Tel: 213-673-8422, Telex: 653474; FSC No.: 1P738; Empl.: 39; *Sls. Mgr.:* Al Barrios

GENICOM®
GENICOM Corporation, GENICOM Relays,

GENICOM CORP., General Electric Dr., Waynesboro, VA 22980, Tel: 703-949-1471, TWX: 710-839-0403; FSC No.: 01526; Empl.: 2300; *Sls. Mgr.:* W. O. Bare ..... **B•1370-1373**

Local Sales Offices & Reps

CA	Los Angeles	213-701-0353
CA	San Francisco	408-925-6648
CT	Meriden	203-238-6800
DC	Washington	301-770-4434
GA	Atlanta	404-256-1966
IL	Chicago	312-577-1100
MA	Boston	617-657-4800

Local Distributors

CA	Santa Ana, Norstan	714-540-4165
GA	Norcross, Schweber	404-449-9170
MD	Towson, Electronic Comp. Sls.	301-296-6282
NY	Rochester, Rochester Radio Supp.	716-454-7800
NC	Charlotte, Electronics Mktg. Corp.	704-394-6195
OH	Cleveland, Electronics Mktg. Corp.	216-442-3441
OH	Columbus, Electronics Mktg. Corp.	614-299-4161
OH	Dayton, Elctrns Mktg. Corp.	513-278-5745
OH	Highland Heights, Electronics Mktg. Corp.	216-442-3441

GENISCO MEMORY PRODS. CORP., 10874 Hope St., Cypress, CA 90630, Tel: 714-220-0720, TWX: 910-347-6773; FSC No.: 96682; Empl.: 120; *Sls. Mgr.:* Harry Watt

GENISCO TECHNOLOGY CORP., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221, Tel: 213-537-4750, TWX: 910-346-6773; FSC No.: 03797; Empl.: 450; *Sls. Mgr.:* W. R. Esser

GENISCO TECHNLG. CORP., Filters Div., 18435 Susana Rd., Rancho Dominguez, CA 90221, Tel: 213-537-4750, TWX: 910-346-6773; FSC No.: 07294; Empl.: 450; *Sls. Mgr.:* B. Hanna

GENISCO TECHNLG. CORP., Rotating Test Div., 18435 Susana Rd., Rancho Dominguez, CA 90221, Tel: 213-537-4750, TWX: 910-346-6773; FSC No.: 13946; Empl.: 450; *Sls. Mgr.:* F. Schodlbauer

GENISCO TECHNLG. CORP., Transducers Prods. Div., 650 Easy St., Simi Valley, CA 93065, Tel: 805-581-3985, TWX: 910-346-6773; FSC No.: 13946; Empl.: 450; *Sls. Mgr.:* J. Becker

GENRAD, INC., 300 Baker Ave., Concord, MA 01742, Tel: 617-369-4400

GENSTAR RENTAL ELCTRNS., 2445 Faber Pl., Palo Alto, CA 94303, Tel: 415-856-7600, Telex: 348368

GENTEX, Box 315, Carbondale, PA 18407, Tel: 603-434-0311, Telex: 831-883; FSC No.: 97427; *Sls. Mgr.:* Ture Heline

GENTRON CORP., 6667 N. Sydney Pl., Milwaukee, WI 53209, Tel: 414-351-1660, Telex: 26881; Empl.: 100; *Sls. Mgr.:* William Tennie

Local Sales Offices & Reps

AL	Huntsville, Murcota	205-539-8476
CA	Mission Viejo, Steven Engrg.	818-308-9200
CA	San Francisco, Steven Engrg.	415-588-9200
FL	Sunrise, Arnold Milrot & Assocs.	305-748-6446
IN	Greenwood, Valentine & Assoc.	317-888-2260
KS	Overland Park, WEB Elctrns.	913-381-2225

MA Millis, Selmark Assocs. 617-376-2914
MN Minneapolis, Furber Sls. 612-881-3620
MO Florissant, WEB Elctrns. 314-921-5794
NH Hopkinton, Selmark Assocs. 603-623-5774
NJ Parlin, JMR Sales, Inc. 201-254-8484
NY E. Setauket, JMR Sales, Inc. 516-689-8871
NY Kingston, D.L. Eiss Assocs. 914-338-7588
NY Rochester, D.L. Eiss Assocs. 716-328-3000
NC Winston-Salem, Murcota 919-722-9445
OH Centerville, Omega Sales, Inc. 513-434-5507
OH University Heights, Omega Sales, Inc. 216-381-1404
OR Portland, SPS Elctrns. 503-285-0214
PA Philadelphia, Fite Eltech 215-248-3171
TX Lewisville, Jim Hughes Co. 214-434-2566
TX Stafford, Jim Hughes Co. 713-343-0673
WA Seattle, SPS Elctrns. 206-323-4140
WI Mequon, Stumm Sls. 414-241-8414

Local Distributors

CA San Francisco, Steven Engrg. 415-588-9200
CA Santa Ana, AMCOTEC 714-957-3003
NY Ronkonkoma, Trace Elctrns. 516-645-6111
NC Gastonia, JMT Elctrn. Supply Co. 704-867-4401
TX Fort Worth, Allied Elctrns. 817-336-5401
WI Milwaukee, Seaker Elctrns. 414-878-3727

GEOPHYSICAL SURVEY SYS., INC., 15 Flagstone Dr., Hudson, NH 03051, Tel: 603-889-4841, Telex: 953038; FSC No.: 02-0278634; Empl.: 35; *Sls. Mgr.:* J. V. Rosetta, Jr.

GEORATOR CORP., Box 70, Manassas, VA 22110, Tel: 703-368-2101, Telex: 892-431; Empl.: 49; *Sls. Mgr.:* Charles E. Trefzger ..... **D•1930-1932**

GERBER SYS. TECHNLGY., INC., 40 Gerber Rd. E., South Windsor, CT 06074, Tel: 203-644-2581, Telex: 6819200 GSTH UW, TWX: 710-447-5300 GST HFD; *Sls. Mgr.:* A. John Klein

TNR
TECHNICAL, INC.
DISTRIBUTORS, MANUFACTURERS AND ENGINEERING SUPPORT FOR
Gates
Energy Products
BATTERIES
• SEALED RECHARGEABLE LEAD-ACID
• CYCLON® MONOBLOC BATTERIES
• "D" CELL - 2V, 2.5 Ah
• "X" CELL - 2V, 5.0 Ah
• "J" CELL - 2V, 12.5 Ah
• "BC" CELL - 2V, 25.0 Ah
TOLL FREE 800-842-0035
IN N.Y. CALL (516) 242-4800
45 Jefryn Blvd. West
Deer Park, New York 11729

GERMANIUM POWER DEVICES, Box 3065, Shawsheen Village Sta., Andover, MA 01810, Tel: 617-475-5982, Telex: 94-7150; Empl.: 100; *Sls. Mgr.:* R. W. Kassiotis

GEYER SYSTEMS, See GSI Corp.

GFC/HAMMOND ELCTRNS., INC., 1690 Walden Ave., Buffalo, NY 14225, Tel: 716-835-5742, Telex: 91-6452; *Sls. Mgr.:* Dave Oliver ..... **D•1647**

Local Sales Offices & Reps

CA Sunnyvale, Computer Modules Inc. ... 408-737-7727
CT Guilford, Rosenbaum Elctrns. 203-453-5424
MN Minneapolis, Loren Green Assoc. 612-571-6666
NY Cooperstown, Lloyd Hart Assoc. 607-547-9333
NY Rochester, Lloyd Hart Assoc. 716-244-3253
OR Portland, Westcon Inc. 503-283-0132
TX Houston, Scientific Sls. Co. 713-460-9170
TX Richardson, Scientific Sls. Co. 214-231-6541

GGB INDUSTRIES, INC., Picoprobe Division, P.O. Box 125, Gillette, NJ 07933, Tel: 201-464-1749, Telex: 136692 GGB; *Sls. Mgr.:* Greg Boll

GIANNINI PETRO MARINE, 9474 Chesapeake Dr., San Diego, CA 92123, Tel: 619-569-1668, Telex: 181754; FSC No.: 24727; Empl.: 12

GIBSON/EGAN, 2666 E. Huntington Dr., Duarte, CA 91010, Tel: 818-358-0191; Empl.: 40

GIC SYSTEMS, 2324 A Ridgepoint Dr., Austin, TX 78754, Tel: 512-926-8840; *Sls. Mgr.:* Ed Barry; *Dist. Mgr.:* Bob Lynch

Refer to Gordos Corporation, Bloomfield, New Jersey for Representatives and Authorized Distributor information.

GIC THERMODYNAMICS, 2611 Parmenter, Royal Oak, MI 48073, Tel: 313-280-1648, Telex: 23-5714; Empl.: 7

GIDDINGS & LEWIS ELCTRNS., A Unit of AMCA Intl., 666 S. Military Rd., P.O. Box 1658, Fond du Lac, WI 54935, Tel: 414-921-7100, Telex: 26-2722, TWX: 910-275-1100; Empl.: 200; *Sls. Mgr.:* Tom Bullock

GILTRONIX, 3780 Fabian Way, Palo Alto, CA 94303, Tel: 415-493-1300, Telex: 345542; *Sls. Mgr.:* Erv Stein

GILWAY TECHNICAL LAMP, 165 New Boston Street, Woburn, MA 01801, Tel: 617-935-4442, Telex: 287617 GWAY UR; Empl.: 17; *Sls. Mgr.:* Clark Benjamin III; *Dist. Mgr.:* Anne Thibodeau ..... **B•1053-1055**

GIMIX, INC., 1337 W. 37th Place, Chicago, IL 60609, Tel: 312-927-5510, TWX: 910-221-4055; Empl.: 14; *Sls. Mgr.:* Richard Don

GLAR-BAN DIV. OF MARK IV INDS., INC., 2937 Alt Blvd., Grand Island, NY 14072, Tel: 716-773-2871, Telex: 91578; Empl.: 85; *Sls. Mgr.:* Scott Simons

GLASGAL COMMUNICATIONS, INC., 207 Washington St., Northvale, NJ 07647, Tel: 201-768-8082, TWX: 710-991-8585; *Sls. Mgr.:* Ralph Glasgal; *Dist. Mgr.:* Al Harnisch

GLASSEAL PRODUCTS INC., HCC Industries, 16311 Ventura Blvd., Encino, CA 91436, Tel: 201-370-9100, TWX: 710-723-8314; Empl.: 150; *Sls. Mgr.:* Carlton C. Applegate

GLASSMAN HIGH VOLTAGE INC., P.O. Box 551, Salem Indl. Pk., Whitehouse Sta., NJ 08889, Tel: 201-534-9007, TWX: 710-480-2839; Empl.: 60; *Sls. Mgr.:* John R. Belden ..... **D•1234-1235, 1648-1651**

Local Sales Offices & Reps

AZ Scottsdale, Power Specialists 602-996-4100
CA Los Alamitos, Power Specialists 213-594-9418
CA San Diego, Power Specialists 619-586-1160

GLATZER INDUSTRY CORP., 15 River St., New Rochelle, NY 10801, Tel: 914-576-2700; Empl.: 15

GLENAIR INC., 1211 Air Way, Glendale, CA 91201-2497, Tel: 818-247-6000, Telex: 67-3485, TWX: 910-497-2066; FSC No.: 06324; Empl.: 485; *Sls. Mgr.:* Ronald E. Platz

GLENMARC MFG., 330 Melvin Dr., Northbrook, IL 60062, Tel: 312-272-9030, Telex: 28-3499; Empl.: 13; *Sls. Mgr.:* David Greenwood

GLOBAL SPECIALTIES, Interplex Electronics, Inc., 70 Fulton Terrace, P.O. Box 1942, New Haven, CT 06509, Tel: 203-624-3103, TWX: 710-465-1227; Empl.: 125; *Sls. Mgr.:* Frank Gregorio; *Dist. Mgr.:* Nevin Garland/Claude Roux

Local Sales Offices & Reps

AZ Phoenix, More Sls., Inc. 602-265-9201
CA Cambell, Lco Tech. Sls. 408-378-9900
CA Manhattan Beach, Ray Garneau Co. .. 213-376-5712
CA San Francisco, Global Specialties Corp. 415-648-0611
CO Denver, West High Tech. 303-477-8180
CT Madison, Eastronix, Inc. 203-421-4514
FL Lakeworth, Adams & Assocs. 305-588-7630
GA Marietta, Adams & Assocs. 404-973-0853
IL Park Ridge, Bob Burns & Assocs. 312-775-1233
IN Indianapolis, STB & Assocs. 317-844-9227
MA Bedford, Eastronix 617-275-5775
MI Warren, Burcaw Co. 313-573-4605
MS Hattiesburg, Mfg. Sls. & Mktg. 601-264-4755
MO Kansas City, Forristal-Young Sls. 816-358-6771
NE Omaha, Forristal Young Sls. Co., Inc. .. 402-333-0800
NJ Englewood, Baum & Epstein 212-564-4105
NY Grand Island, L. J. H. McTaggart Assocs. 716-773-9222
NY New York, Baum and Epstein 212-564-4105
NC Greensboro, Adams & Assocs. 919-272-6838
OH Chesterfield, K. T. Depco 216-729-3588
OH Westchester, K. T. Depco 513-381-0232
OK Tulsa, ION Assocs. 918-664-0186
PA Doylestown, Tech. Instr. 215-345-4110
PA Pittsburgh, K. T. Depco 412-367-1011
TX Grand Prairie, ION Assocs. 212-647-8225
WA Tumwater, Global Spec. - San Fran. Office 415-648-0611

GLOBE BATTERY DIV., See Johnson Controls, Globe Battery Div.

GLOBE PLASTICS, 1342 S. Signal Dr., Pomona, CA 91766, Tel: 714-623-2747; FSC No.: 21071; Empl.: 27; *Sls. Mgr.:* J. R. Humphreys

GLOBE UNION, See Johnson Controls, Globe Battery Div.

GM NAMEPLATE, INC., 2040 15th Ave. West, Seattle, WA 98119, Tel: 206-284-2200, TWX: 910-444-2053; *Sls. Mgr.:* Ed Westfall

GMR CO., 8801 Sepulveda Blvd., Los Angeles, CA 90045, Tel: 213-216-9516, Telex: 499 2468; Empl.: 87; *Sls. Mgr.:* Harvey Mushman

GNB BATTERIES INC., Ind'l. Battery Div., 2010 Cabot Blvd. W., Langhorne, PA 19047, Tel: 215-752-0555, TWX: 510-667-2056

GNT AUTOMATIC, 1560 Trapelo Rd., Waltham, MA 02154, Tel: 617-890-3305; FSC No.: 617-890-7825; Empl.: 14; *Sls. Mgr.:* K. P. Olson

GOLDEN PACIFIC ELCTRNS., INC., 1020 N. Batavia St., Ste. Q, Orange, CA 92667, Tel: 714-538-9752/9753, TWX: 910-593-1620

GOLDWELL COMPS., 1815 W. 205th St. Ste. 201, Torrance, CA 90501, Tel: 213-533-1228, Telex: 182-392; *Sls. Mgr.:* S. Komori

GOOD-ALL ELECTRIC, INC., 3725 Canal Drive, Fort Collins, CO 80524, Tel: 303-484-3080, TWX: 910-930-9015; FSC No.: 22096; Empl.: 100; *Sls. Mgr.:* Dennis M. Pearson

GORDON, CLAUD S., CO., 5710 Kenosha St., Richmond, IL 60071, Tel: 815-678-2211, Telex: 72-2427; Empl.: 260

GORDON, L., PACKAGING, 1050 S. Paca St., Baltimore, MD 21230, Tel: 301-539-6537; Empl.: 150

GORDON PRODS., 67 Del Mar Dr., Brookfield, CT 06804, Tel: 203-775-4501; Empl.: 30; *Sls. Mgr.:* Leon Najman; *Dist. Mgr.:* Leon Najman

GORDOS CORPORATION

GORDOS CORPORATION, Gordos International Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, Tel: 201-743-6800, TWX: 710-994-4787; Empl.: 350; *Sls. Mgr.:* Ed Barry; *Dist. Mgr.:* Ed Barry ..... **B•1375-1379, 1568-1570**

Local Sales Offices & Reps

CA	Costa Mesa, Jim Pancake	714-751-6760
CA	Milpitas, Maxim Elctrn. Sls.	408-946-6001
CO	Wheatridge, Waugaman Assocs.	303-423-1020
CT	Orange, R. F. Duffy Assocs.	203-795-3678
NJ	Red Bank, Jack Silance	201-530-3222
NY	Pittsford, Noeth-Howsinger Assocs.	716-586-9002
NC	Peachland, D. P. McDonald	704-272-8474
OR	Aloha, Micro Sls.	503-642-1818
WA	Bellevue, Micro Sls.	206-451-0568
WI	Milwaukee, Bill Swanson	414-543-2727

Local Distributors

AL	Birmingham, Regal Controls	205-967-5770
AL	Huntsville, Pioneer	205-837-9300
AL	Huntsville, RM	205-852-1550
AZ	Phoenix, Arizona Comps.	602-279-9446
AZ	Phoenix, Be Switched	602-275-4805
AZ	Phoenix, Newark	602-957-0085
AZ	Tempe, Bell Inds.	602-966-7800
AZ	Tempe, Time	602-967-2000
CA	Buena Park, Control Design	714-521-5040
CA	Chatsworth, IEC	213-998-2200
CA	Foster City, Newark	415-572-8300
CA	Garden Grove, Advanced Digital	714-897-0319
CA	Inglewood, Newark	213-671-7066
CA	Los Angeles, Elec. Switches	213-660-1310
CA	Riverside, Elctrn. Supp.	714-683-7300
CA	San Carlos, Control Design	415-592-4808
CA	San Diego, Elctrn. Supp.	619-693-8222
CA	Santa Clara, Manco	408-496-6611
CA	Sunnyvale, Time	408-734-9888
CA	Torrance, Time Elctrns.	213-320-0880
CO	Denver, Integrated Elctrns.	303-534-6121
CO	Denver, Newark	303-757-3351
CO	Wheatridge, Bell Inds.	303-424-1985
CO	Wheatridge, Hannah Hill	303-424-0108
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7130
FL	Ft. Lauderdale, Newark	305-587-2372
FL	Ft. Lauderdale, Pioneer	305-771-7520
FL	Ft. Lauderdale, Power Comps.	305-565-1614
FL	Lakeland, A. A. Elec.	813-665-6941
FL	Orlando, Hammond Elctrns.	305-849-6060
FL	Orlando, Pioneer	305-834-9090
GA	Atlanta, Control Design	404-979-3500
GA	Norcross, A. A. Elec.	404-449-8670
GA	Norcross, Newark	404-448-1300
GA	Norcross, Pioneer	404-448-1711
IL	Addison, L Comp	312-628-1400
IL	Chicago, Newark	312-784-5100
IL	Elk Grove Village, Pioneer	312-437-9680
IL	Genoa, Control Design	815-784-6515
IL	Lombard, RM	312-364-6622
IN	Carmel, Altex Elctrns.	317-848-1323
IN	Indianapolis, Control Design	317-788-4559
IN	Indianapolis, Pioneer	317-849-7300
IN	Indianapolis, RM	317-291-7110
IA	West Des Moines, Ramco	515-225-6933
KS	Wichita, L Comp	316-265-8501
LA	New Orleans, Currier P Roser	504-734-1147
MD	Columbia, Time	301-964-3090
MD	Gaithersburg, Pioneer	301-921-0660
MA	Westboro, Future Elctrns.	617-366-2400
MA	Woburn, Newark	617-935-8350
MA	Woburn, Time	617-935-8080
MI	Grand Rapids, RM Elctrns.	616-531-9300
MI	Livonia, Pioneer	313-525-1800
MI	Oak Park, Newark	313-967-0600
MN	Minneapolis, Control Design	612-721-1628
MN	Minneapolis, Newark	612-331-6350
MN	Minnetonka, Pioneer	612-935-5444
MO	Kansas City, L Comp	816-221-2400
MO	St. Louis, Control Design	314-426-3150
MO	St. Louis, L Comp	314-291-6200
NE	Omaha, L Comp	402-895-5517
NJ	East Rutherford, A. A. Elec.	201-777-5477
NJ	Fair Lawn, Relay Specialties	201-797-3313
NJ	Pennsauken, Resco	609-662-4000
NJ	Springfield, Newark	201-376-9500,212-349-7087
NM	Albuquerque, Bell Inds.	505-292-2700
NM	Albuquerque, Elctrn. Dvcs.	505-884-2950
NY	Buffalo, Summit	716-887-2800
NY	Hauppauge, JACO	516-273-5500
NY	New York, Time	516-273-0100
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Rochester, Summit	716-334-8110
NC	Charlotte, Pioneer/Carolina	704-527-8188
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Pineville, Control Design	704-588-4410
NC	Shelby, Dixie Indl. Supply	704-482-5641
OH	Cleveland, Pioneer	216-587-3600
OH	Columbus, Elctrns. Mktg. Corp.	614-299-4153
OH	Dayton, Pioneer	513-236-9900
OH	Kettering, Elctrns. Mktg. Corp.	513-439-4711
OH	Solon, REH Elctrns.	216-248-1636
OH	Valley View, Newark	216-447-1050
OK	Tulsa, Newark	918-832-7004
OR	Beaverton, Cascade Data Mktg.	503-641-9266
OR	Lake Oswego, Bell Inds.	503-241-4115
OR	Portland, Dunn Elctrns.	503-285-0214
PA	Horsham, Pioneer	215-674-4000
PA	King of Prussia, Time Elctrns.	215-337-0900
PA	Malvern, Control Design	215-296-0150
PA	Pittsburgh, Pioneer	412-782-2300
PA	Willow Grove, Resco Elctrns.	215-659-4575
SC	Greenville, Hammond	803-233-4121
TX	Austin, Pioneer	512-835-4000
TX	Dallas, Control Design	214-358-1441
TX	Dallas, Pioneer	214-386-7300
TX	Dallas, RM Elctrns.	214-263-8361
TX	Garland, Newark	214-494-5911
TX	Houston, Newark	713-782-4800
TX	Houston, Pioneer	713-988-5555
TX	Richardson, JACO	214-235-9575
UT	Salt Lake City, Ballard Supp. Corp.	801-972-2435
UT	Salt Lake City, Bell Inds.	801-972-6969
VA	Chester, Virginia Control Equip. Co.	804-796-3001
WA	Bellevue, Bell Inds.	206-747-1515
WA	Bellevue, IEC	206-455-2727
WA	Bellevue, Newark	206-641-9800
WA	Kirtland, Cascade Data Mktg.	206-747-6190
WI	Milwaukee, Indl. Elctrns.	414-276-1212
WI	New Berlin, Control Design	414-784-1015
WI	New Berlin, RM Elctrns.	414-784-4420
PR	Carolina, Newark	809-762-4490
Can	Alberta, Future Elctrns.	403-259-6408
Can	Calgary, L. A. Varah	403-255-9550
Can	Downsview, Future Elctrns.	416-663-5563
Can	Hamilton, L. A. Varah	416-561-9311
Can	Montreal, Future Elctrns.	514-694-7710
Can	Ottawa, Future Elctrns.	613-820-8313
Can	Pointe Clare, Futrue Elctrns.	514-694-7710
Can	Vancouver, Future Elctrns.	604-438-5545
Can	Vancouver, L. A. Varah	604-873-3211
Can	Winnepeg, L. A. Varah	204-633-6190

GORDOS ARKANSAS, Gordos International Corp., 1000 N. Second St., Rogers, AR 72756, Tel: 501-636-5000, TWX: 910-720-7998; *Dist. Mgr.:* Ed Barry ..... **B•1380-1383**

Local Sales Offices & Reps

CA	Costa Mesa, Jim Pancake	714-751-6760
CA	Milpitas, Maxim Elctrn. Sls.	408-946-6001
CO	Wheat Ridge, Waugaman Assocs.	303-423-1020
CT	Orange, R. F. Duffy Assocs.	203-795-3678
MA	Braintree, R. F. Duffy Assocs.	617-848-3550
NJ	Red Bank, Jack Silance	201-530-3222
NY	Pittsford, Noeth-Honsinger	716-586-9002
NC	Peachland, D.P. McDonald	704-272-8474
OR	Aloha, Micro Sls.	503-642-1818
WA	Bellevue, Micro Sls.	206-451-0568
WI	Milwaukee, Bill Swanson	414-543-2727

Refer to Gordos Corporation, Bloomfield, New Jersey for Authorized Distributor information.

W. L. GORE & ASSOCS., INC., 1505 N. Fourth St., P.O. Box 1389, Flagstaff, AZ 86002, Tel: 602-526-1290, TWX: 910-972-0969; FSC No.: 60622; *Sls. Mgr.:* Burt Chase (Intl.)

W. L. GORE & ASSOCS., 555 Paper Mill Rd., Newark, DE 19714, Tel: 302-738-4880, TWX: 510-666-0825; Empl.: 2000; *Sls. Mgr.:* A. B. Chase

GORMAN MACHINE CORP., 7 Burke Dr., Brockton, MA 02401, Tel: 617-588-2900, TWX: 710-345-0679; Empl.: 25; *Sls. Mgr.:* Kenneth P. Gorman

GORMAN-REDLICH MFG. CO., 6 Curtis St., Athens, OH 45701, Tel: 614-593-3150; Empl.: 4; *Sls. Mgr.:* Jim Gorman

GOULD INC., Corporate Headquarters, 10 Gould Center, Rolling Meadows, IL 60008; Empl.: 20,650

GOULD-AMI, Sub. Gould Inc., 3800 Homestead Rd., Santa Clara, CA 95051, Tel: 408-554-2150, TWX: 910-338-0018;910-338-0024; *Dist. Mgr.:* Judi MacGregor

GOULD INC., Circuit Protection Div., 374 Merrimac St., Newburyport, MA 01950, Tel: 617-462-6662/3131, Telex: 94-7427, TWX: 710-347-0264; *Sls. Mgr.:* Malcolm Allison

GOULD COMPION, 1101 E. University, Urbana, IL 61081, Tel: 217-384-8500

GOULD INC., Computer Sys. Div., 6901 W. Sunrise Blvd., Ft. Lauderdale, FL 33313, Tel: 305-587-2900, TWX: 510-955-9843; FSC No.: 59-0913135; Empl.: 2376; *Sls. Mgr.:* Howard Kossak; *Dist. Mgr.:* Lionel Agar (Intl.)

GOULD
Electronics

GOULD INC., Design & Test Sys. Div., 4650 Old Ironsides Dr., Santa Clara, CA 95054-1279, Tel: 408-988-6800, TWX: 910-338-0509; *Sls. Mgr.:* Dan Cockcroft ..... **D•1237**

Local Sales Offices & Reps

AL	Huntsville, W. A. Brown Instrs.	205-883-8660
AZ	Scottsdale, Barnhill Assocs., Inc.	602-947-7841
CA	Redondo Beach, Ward/Davis Assocs., Inc.	213-643-6977
CA	San Diego, Ward/Davis Assocs.	619-292-1000
CA	Santa Clara, Ward/Davis Assocs.	408-245-3700
CO	Englewood, Barnhill Assocs., Inc.	303-779-4494, 303-779-3600
CT	Wallingford, Pat Jenks Assocs.	203-265-9939
FL	Ft. Lauderdale, W. A. Brown Instrs.	305-776-4800
FL	Ft. Lauderdale, W.A. Brown Instrs.	305-949-1022, 305-776-4800
FL	Melbourne, W.A. Brown Instrs.	305-723-0835, 305-723-0766
FL	Orlando, W.A. Brown Instrs.	305-425-5505
GA	Norcross, W. A. Brown Instrs.	404-441-2980
IN	Indianapolis, Dytec Central	317-247-1316
KS	Lenexa, Dytec South	913-888-0215
LA	Mandeville, W. A. Brown Instrs.	504-626-9701
MA	Woburn, Pat Jenks Assocs.	617-938-0488
MI	Farmington Hills, Carter, McCormic & Peirce, Inc.	313-477-7700
MN	Minneapolis, Sector Engrg. Sls.	612-593-1809
MO	Maryland Heights, Dytec South	314-569-2990
NE	Omaha, Dytec South, Inc.	402-345-6477
NM	Albuquerque, Barnhill Assocs., Inc.	505-299-7658
NY	De Witt, D.B. Assocs.	315-446-0220
NY	Great Neck, RTI	516-829-3770
NC	Durham, W. A. Brown Instrs.	919-479-5200
OH	Cleveland, Carter, McCormic & Peirce, Inc.	216-779-5100
OH	Englewood, Carter, McCormic & Peirce, Inc.	513-836-0951

GLOBAL SPECIALTIES

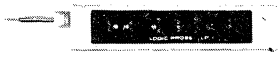
Authorized Distributors

RAG ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



Model LP-1

DIGITAL LOGIC PROBE **$19.95**

- Use to 50 ns. 10 MHz
- Circuit powered, portable
- Compatible with most logic families

OR Beaverton, Northwest Test & Meas. ... 503-646-9966
PA Bensalem, Eastern Instrmn. 215-245-6660
PA Pittsburgh, Carter, McCormic & Peirce, Inc. 412-372-4415
SC Columbia, W. A. Brown Instrs. 803-798-8070
TN Oak Ridge, W. A. Brown Instrs. 615-482-5761
TX Austin, Barnhill Assocs., Inc. 512-451-0217
TX Houston, Barnhill Assocs., Inc. 713-688-9971
TX Richardson, Barnhill Assocs., Inc. 214-231-2573
UT Murray, Barnhill Assocs., Inc. 801-262-3000
VA McLean, Creative Mktg. Assocs. 703-442-9100
WA Redmond, Northwest Test & Meas. ... 206-881-8857
Can Burnaby, B.C., Allan Crawford Assocs. 604-294-1326
Can Calgary, Alb., Allan Crawford Assocs. 403-230-1341
Can Darthmouth, N. S., Allan Crawford Assocs. 902-463-8640
Can Mississauga, Ont., Allan Crawford Assocs. 416-890-2010
Can Ottowa, Ont., Allan Crawford Assocs. 613-722-7682
Can St. Laurent, Mon., Allan Crawford Assocs. 514-731-8564

GOULD INC., Foil Div., 35129 Curtis Blvd., Eastlake, OH 44094, Tel: 216-953-5000, TWX: 810-427-2506; *Sls. Mgr.:* Richard Steiner

GOULD INC., Imaging & Graphics Div., 1870 Lundy Ave., San Jose, CA 95131, Tel: 408-263-7155, TWX: 910-338-7656; Empl.: 200; *Sls. Mgr.:* Mike Battaglia; *Dist. Mgr.:* Ernie Ohrenstein

GOULD INC., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, Tel: 301-876-2214, TWX: 710-862-0846; Empl.: 325; *Sls. Mgr.:* M. Freyermuth

GOULD INC., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030, Tel: 805-487-8511, Telex: 65-9223; Empl.: 500

GOULD INC., Medical Prods. Div., 1900 Williams Dr., Oxnard, CA 93030, Tel: 805-983-1300, Telex: 182-204

GOULD INC., Motion Control Div., 2701 N. Green Bay Rd., Racine, WI 53404, Tel: 414-637-6591, Telex: 201-309

GORDOS

FULL LINE
AUTHORIZED DISTRIBUTOR

E S I

ELECTRIC SWITCHES
INCORPORATED

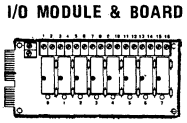
2478 Fletcher Dr, Los Angeles, California 90039

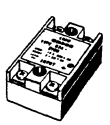
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

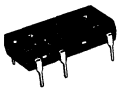
TWX 910-321-2971

I/O MODULE & BOARD





REED & SOLID STATE RELAYS



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

GOULD INC., POWER CONVERSION DIV., See RTE Deltic Corporation 4c

GOULD INC., Programmable Control Div., Box 83, S.V.S., Andover, MA 01810, Tel: 617-475-4700, Telex: 947-402, TWX: 710-347-6610; *Sls. Mgr.:* George Dannecker; *Dist. Mgr.:* Richard Bell

GOULD INC., Recording Systems Div., 3631 Perkins Ave., Cleveland, OH 44114, Tel: 216-361-3315, Telex: 196113GLD RS UT; FSC No.: 96795; Empl.: 550; *Sls. Mgr.:* David Friggle ..... **D•1400, 1404**

Local Sales Offices & Reps
CA Cerritos, Gould Inc., Recording Sys. Div. 213-404-1919
CA Hayward, Gould Inc., Recording Sys. Div. 415-782-0852
CO Englewood, Gould Inc., Recording Sys. Div. 303-781-4473
FL Altamonte Springs, Gould Inc., Recording Sys. Div. 305-830-0695
GA Atlanta, Gould Inc., Recording Sys. Div. 404-441-5556
HI Honolulu, Hawaiian Industrial Instr. 808-523-3676
IL Elk Grove Village, Gould Inc., Recording Sys. Div. 312-640-4135
IN Indianapolis, Gould Inc., Recording Sys. Div. 317-842-4484
MD Greenbelt, Gould Inc., Recording Sys. Div. 301-345-0050
MA Burlington, Gould Inc., Recording Sys. Div. 617-272-0750
MI Madison Heights, Gould Inc., Recording Sys. Div. 313-588-4020
MN Minneapolis, Gould Inc., Recording Sys. Div. 612-544-5253
MO Florissant, Gould Inc., Recording Sys. Div. 314-921-3444
NJ Saddle Brook, Gould Inc., Recording Sys. Div. 201-845-0220
NM Albuquerque, Gould Inc., Recording Sys. Div. 505-292-4063
NY Albany, Gould Inc., Recording Sys. Div. 518-584-7999
NY Rochester, Gould Inc., Recording Sys. Div. 716-235-4980
NC Greensboro, Gould Inc., Recording Sys. Div. 919-275-1978
OH Centerville, Gould Inc., Recording Sys. Div. 513-433-9586
OH Cleveland, Gould Inc., Recording Sys. Div. 216-361-3315
PA Malvern, Gould Inc., Recording Sys. Div. 215-647-2214
PA Pittsburgh, Gould Inc., Recording Sys. Div. 412-838-7700
TN Hermitage, Gould Inc., Recording Sys. Div. 615-754-7100
TX Dallas, Gould Inc., Recording Sys. Div. 214-634-2131
TX Houston, Gould Inc., Recording Sys. Div. 713-680-1121
VA Richmond, Gould Inc., Recording Sys. Div. 804-282-5533
WA Bellevue, Gould Inc., Recording Sys. Div. 206-453-2461

GOULD DATAMETRICS, See Datametrics Inc.

GOWANDA ELCTRNS., 1 Industrial Pl, Gowanda, NY 14070, Tel: 716-532-2234, TWX: 710-529-1211; FSC No.: 24226;15305; Empl.: 250; *Sls. Mgr.:* K. Strohmeyer ..... **A•1240**

Local Sales Offices & Reps
CA Fremont, William Parks Assocs. 415-490-2011
CA Huntington Beach, J. J. Riley Assocs. 714-841-1411
CA San Diego, Earle & Assocs. 619-278-5441
FL Longwood, NSL Assocs. 305-629-5226
GA Atlanta, L & D, Inc. 404-455-3483
IL Chicago, W. F. Hamilton Co. 312-867-5030
IA Cedar Rapids, Snider Sls. Co. 319-362-4410
KS Overland Park, Barnes MidWest Sls. .. 913-341-9317
MD Baltimore, Mech-Elec. Sls. 301-342-1984
MA Reading, Lincoln Assocs. 617-944-9020
MI Southfield, Fred H. Gehrke & Assocs. 313-559-5363
MN Chanhassen, Barnes Sls. Assocs. 612-934-2907
NJ Medford, Mech Elec. Sls. 609-654-8209
NY Cazenovia, Naylor Elec. 315-655-8174
NY Kew Gardens, Robert Smith Assocs. .. 212-780-0097
NY New York, Robert Smith Assocs. 212-541-4885
NY Plainview, Robert Smith Assocs. 516-681-3155
NC Greensboro, L & D, Inc. 919-292-3201
NC Raleigh, L & D, Inc. 919-876-5301
TX Dallas, P. J. Scanlon Co. 214-231-4661
VA Richmond, L & D, Inc. 804-359-0125
WA Olympia, Bergford & Assocs. 206-866-2001

GOW-MAC INSTR. CO., P.O. Box 32, Bound Brook, NJ 08805, Tel: 201-560-0600, Telex: 833-174; Empl.: 40; *Sls. Mgr.:* R. J. Mathieu

GRADO LABS., 4614 Seventh Ave., Brooklyn, NY 11220, Tel: 718-435-5340

GRALEX INDS., 295 Community Dr., Great Neck, NY 11021, Tel: 516-487-7289, 800-645-6535; FSC No.: 11332; Empl.: 15; *Sls. Mgr.:* Gene Belgard ..... **D•1354-1356**

GRA-MAR INC., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803, Tel: 305-894-3351, TWX: 810-850-0125; FSC No.: 58-12-31006-40

GRAND TRANSFORMERS, Box 188, Grand Haven, MI 49417, Tel: 616-842-5430; Empl.: 125; *Sls. Mgr.:* G. V. Retzlaff

GRANGER ASSOCS., 3101 Scott Blvd., Santa Clara, CA 95051, Tel: 408-727-3101, Telex: 34-8380; Empl.: 750; *Sls. Mgr.:* Rick Green

GRANITE STATE CIRCUITS, Power Elctrns. Corp., P.O. Box 2208, 96 Milton Rd., Rochester, NH 03867, Tel: 603-332-3334, TWX: 510-297-4462; *Sls. Mgr.:* Robert S. Karstedt

GRANT HARDWARE CO., Div. of Grant Inds. Inc., 7 Hoover Ave, Haverstraw, NY 10927-1092, Tel: 914-EL8-4400, TWX: 914-358-3541; FSC No.: 83508; Empl.: 490; *Sls. Mgr.:* F. Centrillo

Local Sales Offices & Reps
CA Canoga Park, Catlin Inds. 213-347-0444
CA City of Industry, Grant Hardware Co. .. 213-686-2110
CA Santa Clara, Nova-Tronix 408-243-9530
CO N. Glenn, Challege Sls. 303-450-2402
FL Deerfield Bch., Electro-Comp Assocs. 305-429-0802
IL Des Plaines, Lincoln, Hodges & Assocs. 312-297-3810
KS Overland Park, J. Singer Indl. Sls. Corp. 913-381-3684
MA Lexington, E.F. Del Fino Co. 617-938-1217
MI Farmington, Carter, McCormic & Peirce 313-477-7700
MN St. Paul, Repco 612-642-2828
NJ Ridgefield, M - D Inds. 201-941-3113
NY Liverpool, Precision Sls. 315-451-3480
NC Charlotte, J. Corn Assocs. 704-552-0991
OH Cincinnati, Tri State Mktg. 513-761-7993
OH Cleveland, Carter, McCormic & Peirce 216-779-5100
TX Dallas, Blackburn Assocs. 214-692-8885
WA Kirkland, Norwest Co. 206-827-9562
WI Waukesha, Lincoln, Hodges & Assocs. 414-542-3087

GRANT TECHNOLOGY SYS. CORP., Computer Products, 11 Summer St., Chelmsford, MA 01824, Tel: 617-256-8881; Empl.: 1122; *Sls. Mgr.:* V.P.T. McLéod

Local Sales Offices & Reps
CA Hacienda Heights, Mico Assocs. 213-330-6819
CA Los Gatos, Datarep, Inc. 408-395-1212
CT Portland, BBI 203-342-0648
FL Port St. Lucie, Shamrock Computer ... 305-878-6771
GA Marietta, SEA, Inc. 404-953-3970
MD Rockville, J4 Computer Sys., Inc. 301-424-0700
MA Chelmsford, R.O.I., Inc. 617-250-0099
NY Latham, L-Tron Corp. 518-785-5032
NY Wainscott, CPS of New York 516-324-7965
PA Mendenhall, Clark Bach Assocs. 215-388-7903
PA Pittsburgh, C G Controls, Inc. 412-931-9351
WA Bellevue, Meritech 503-644-0304
Can Mississauga, Tracan Elctrns. 416-625-7752

GRAPHITE METALLIZING CORP., 1036 Nepperhan Ave., P.O. Box 110, Yonkers, NY 10702, Tel: 914-968-8400, Telex: 13-1571; Empl.: 178; *Sls. Mgr.:* E. Walker ..... **B•1160**

Local Sales Offices & Reps
OR Beaverton, Graphite Metallizing 503-646-9964

GRAPHTEC SERVICES, INC., 1600 N.W. Madrid Way, Boca Raton, FL 33432, Tel: 305-392-3373; Empl.: 12

GRASSLIN CONTROLS CORP., Dieter Grasslin Feinwerktechnik, 45 Spear Rd., Ramsey, NJ 07446, Tel: 201-825-9696, Telex: 135038; Empl.: 5

GRAYHILL INC., 569 Hillgrove Ave., La Grange, IL 60525, Tel: 312-354-1040, Telex: 6871375 GHLG UW, TWX: 910-683-1850; FSC No.: 5930; Empl.: 1000; *Sls. Mgr.:* Richard K. Neumann; *Dist. Mgr.:* Robert J. Ferrel
.. **B•1384-1385, 1571-1587, 1704, 1718-1725; C•1225**

Local Sales Offices & Reps

AL	Huntsville, Rep, Inc.	205-881-9270
AZ	Phoenix, Mercury Engrg. Sls.	602-244-0123
CA	Anaheim, Impact Elctrns.	714-533-1351
CA	Cupertino, West-Comp	408-996-1001
CA	San Diego, Earle Assocs.	619-278-5441
CO	Denver, Lindberg Co.	303-758-9033
FL	Deerfield Beach, Newell-Hynes	305-429-3207
GA	Tucker, Rep, Inc.	404-938-4358
IL	La Grange, Grayhill, Inc.	312-354-1040
IN	Ft. Wayne, Menze Sls.	219-747-5616
IA	Cedar Rapids, Lorenz Sls.	319-377-4666.
KS	Overland Park, PMR, Inc.	913-381-0004
KS	Wichita, PMR, Inc.	316-684-4141
MD	Gaithersburg, Naudain Assocs. Southern	301-258-5040
MA	Needham Hgts., Newscott Co.	617-444-1923
MI	Troy, C. B. Jensen & Assocs.	313-643-0506
MN	S. St. Paul, Northport Engrg.	612-457-8000
MO	St. Louis, PMR Corp.	314-569-1220
NJ	Marlton, Naudain Assocs.	609-983-5300
NM	Albuquerque, Lindberg Co.	505-881-1006
NY	Great Neck, Tylinski Assocs.	516-466-9070
NY	Ithaca, B. Dean, Inc.	607-257-1111
NC	Charlotte, R. W. Chapman & Co.	704-525-2421
NC	Greensboro, R. W. Chapman	919-275-0003
NC	Raleigh, R. W. Chapman	919-782-2624
OH	Cleveland, A. H. Baier Co. & Assocs. ..	216-461-6161
OH	Dayton, A. H. Baier Co. & Assocs.	513-276-4128
PA	Pittsburgh, Covert & Newman Co.	412-531-2002
TN	Jefferson City, Rep, Inc.	615-475-9012
TX	Austin, W. Pat Fralia Co.	512-835-7911
TX	Bedford, W. Pat Fralia Co.	817-267-3577
TX	Houston, W. Pat Fralia Co.	713-772-1572
UT	Salt Lake City, Lindberg Co.	801-467-1794
WA	Bellevue, Eltech, Inc.	206-643-4330
WI	Mequon, Badgerep	414-241-9200

Local Distributors

AL	Huntsville, Powell Elctrns.	205-539-2731
AZ	Tempe, Fisher/Brownell	602-967-1464
AR	Little Rock, Carlton-Bates Co.	501-562-9100
CA	Alhambra, Fisher/Brownell	213-289-0255
CA	Gardena, Calif. Switch	213-770-2330
CA	Los Angeles, Electric Switches	213-660-1310
CA	Los Angeles, Richey/Western	213-820-3777
CA	Riverside, Electronic Supp.	714-683-7300
CA	San Diego, Fisher/Brownell	619-560-8545
CA	San Diego, Richey/Western Electrns.	619-271-4511
CA	San Jose, Powell Elctrns.	408-943-9020
CA	Santa Clara, Fisher/Brownell	408-988-6041
CA	Santa Clara, Richey/Western Electrns.	408-727-7411
CO	Denver, CSID, Inc.	303-292-9594
CO	Denver, Newark Elctrns.	303-757-3351
CO	Denver, Ragon Elctrns.	303-777-9430
CT	Bethel, Heilind Elctrns.	203-797-8600
CT	Wallingford, Midan Elctrns.	203-265-2077
CT	Wallingford, Sager	203-265-4600
FL	Ft. Lauderdale, Powell Elctrns.	305-972-4300
FL	Orlando, Hammond Elctrns.	305-849-6060
FL	Pompano Beach, Peerless Radio	305-973-4141
GA	Norcross, A-A Elec.	404-449-8670
HI	Honolulu, Precision Radio	808-537-5291
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Elk Grove, GBL	312-593-3220
IL	Northbrook, Classic Comp. Supp.	312-272-9650
IL	Palatine, Ohm Elctrn.	312-359-5500
IL	Peoria, Klaus Radio	309-691-4840
IN	Evansville, Hutch & Son	812-425-7201
IN	Fort Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Genesis Elctrns.	317-637-5571
IN	Indianapolis, Graham Elctrns.	317-634-8202
IA	Cedar Rapids, Deeco, Inc.	319-365-7551
KS	Wichita, LComp, Inc.	316-265-5100
MD	Baltimore, Resco	301-529-0500
MD	Columbia, Powell Elctrns.	301-621-4070
MD	Gaithersburg, Pioneer/Wash.	301-921-0660
MD	Kensington, Marine Air Supp.	301-949-9560
MA	Burlington, Heilind Elctrns.	617-272-5610
MA	Hingham, Sager Elctrns.	617-749-6700
MA	North Adams, Elctrn. Supp. Ctr.	413-663-6828
MA	Norwood, Gerber Elctrns.	617-329-2400
MA	Worcester, R M Elctrns.	617-791-7861
MI	Livonia, Pioneer Mich	313-525-1800
MI	Livonia, R.S. Elctrns.	313-525-1155
MI	Oak Park, Newark Detroit Elctrns.	313-967-0600
MI	St. Clair Shores, Spemco	313-771-2700
MN	Minneapolis, Newark Elec.	612-331-6350
MN	Minneapolis, Stark Elctrns.	612-332-1325
MN	St. Paul, Gopher Elctrns.	612-483-3322
MS	Jackson, Ellington Elctrn. Supp.	601-355-0561
MO	Kansas City, LComp, Inc.	816-221-2400
MO	Maryland Hgts., LComp, Inc.	314-291-6200
MO	St. Louis, Olive Indl. Elctrns.	314-426-4500
NE	Lincoln, Scott Elctrns.	402-466-8221
NH	Hudson, Heilind Elctrns.	603-883-9536
NJ	East Hanover, State Elec.	201-887-2550
NJ	Englewood, Powell Elec.	201-894-8900
NJ	Kenilworth, Federated Purch.	
NJ	Mt. Laurel, Jerseyswitch, Inc.	609-778-8190
NM	Albuquerque, Intl. Elctrns.	505-345-8127
NM	Albuquerque, Walker Elctrn. Supp.	505-247-2288
NY	Bohemia, Car-Lac Elctrns.	516-567-4200
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Endwell, A.S.I. Elctrns.	607-754-3823
NY	Hempstead, Electronic Equip.	516-538-5510
NY	Lynbrook, Peerless Radio	516-593-2121
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Rome, Rome Elctrns.	315-337-5400
NC	Cary, Powell Elec.	919-467-1212
NC	Charlotte, Pioneer/Carolina	704-527-8188
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cincinnati, URI Elctrns.	513-761-4030
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Columbus, Hughes-Peters	614-294-5351
OH	Dayton, Pioneer/Dayton	513-236-9900
OH	Dayton, Stotts-Friedman	513-298-5555
OK	Oklahoma City, Electro Entprs.	405-427-6591
OK	Tulsa, Norvell	918-254-8608
PA	Erie, REM Elctrns.	814-453-5626
PA	Harrisburg, Cumberland Elctrns.	717-232-5999
PA	McKean, Advacom	814-476-7774
PA	Philadelphia, Almo Elctrns.	215-698-4000
PA	Philadelphia, Herbach & Rademan	215-426-1700
PA	Philadelphia, Powell Elctrns.	215-365-1900
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
PA	Reading, George D. Barbey Co.	215-376-7451
RI	Pawtucket, Major Edwards Elctrns.	401-725-7400
SC	Columbia, Dixie Elctrns.	803-779-5332
SC	Greenville, Hammond Elctrns.	803-233-4121
TX	Dallas, Associated Air	214-331-4381
TX	Dallas, Harrison Equip. Co.	214-239-2750
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	El Paso, Intl. Elctrns.	915-598-3406
TX	Garland, Newark Elctrns.	214-494-5911
TX	Richardson, Fisher/Brownell	214-235-3177
TX	Stafford, Harrison Equip.	713-879-2600
TX	Stafford, Southwest Elctrns.	713-491-4900
UT	Salt Lake City, Standard Supp.	801-486-3371
VA	Richmond, Sterling Elctrns.	804-226-2190
WI	Milwaukee, Marsh Elctrns.	414-475-6000

GREEN ENGINEERING, 78 Stone Place, Melrose, MA 02176, Tel: 617-665-8994

GREENLEE TOOL CO., 2330 23rd Ave., Rockford, IL 61108, Tel: 815-399-3903; *Sls. Mgr.:* J. Kraysman

GREENRAY INDS., INC., 840 W. Church Rd., Mechanicsburg, PA 17055, Tel: 717-766-0223, TWX: 510-650-4939; FSC No.: 16681; Empl.: 65; *Sls. Mgr.:* D. R. Widener

GREGG ELEC., 608 W. Emporia, Ontario, CA 91761, Tel: 714-983-1794; FSC No.: 53014; Empl.: 8

GREIBACH INSTRS. DIV., 25 Dock St., Mt. Vernon, NY 10550, Tel: 914-699-9717; FSC No.: 32590; Empl.: 35

Local Sales Offices & Reps

IL	Lincolnwood, Saffro & Assocs.	312-677-9720
MD	Baltimore, Whitcomb Assocs.	301-889-1245
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
WI	Lake Mills, Saffro & Assocs.	414-648-2605

G. R. ELECTRONICS, 1640 5th St., Suite 224, Santa Monica, CA 90401, Tel: 213-395-4774, Telex: 65-2337 (BT Smedley SNM); *Sls. Mgr.:* Jillian I. Girard; *Dist. Mgr.:* Christopher E. Thomson

GRIES/DYNACAST, Div. Coats & Clark Inc., 162 Beechwood Ave., New Rochelle, NY 10801, Tel: 914-633-8600, TWX: 914-235-2188; Empl.: 600

GRIM CORPORATION, Box 67, Medford, NJ 08055, Tel: 609-267-7950, TWX: 510-683-9392; FSC No.: 21870; Empl.: 125; *Sls. Mgr.:* Eileen Muzina ..... **D•1051**

GRM CORP., See Grim Corp.

GROVER PATENT PRODUCTS, 339 W. Arden Ave., Glendale, CA 91203, Tel: 213-245-4400; Empl.: 4

GRUENBERG OVEN CO., INC., P.O. Box 3246, 2121 Reach Rd., Williamsport, PA 17701, Tel: 717-326-1755, Telex: 350079; Empl.: 90; *Sls. Mgr.:* James Polk

GSE, 23640 Research Dr., Farmington Hills, MI 48024, Tel: 313-476-7875, Telex: 23-0738; Empl.: 105; *Sls. Mgr.:* Harold G. Munn

GSI

GSI CORP., 1917 Greenspring Dr., Timonium, MD 21093, Tel: 301-252-1768, Telex: 292319 GSIC UR; FSC No.: 60990; Empl.: 28; *Sls. Mgr.:* R. A. Higgins ..... **C•1840**

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg., Inc.	205-830-0498
FL	Palmetto, Southeast Tech. Sls., Inc.	813-729-3112
GA	Norcross, Montgomery Mktg., Inc.	404-447-6124
NC	Cary, Montgomery Mktg., Inc.	919-467-6319
VA	Charlottesville, Electronic Sources	804-293-4041

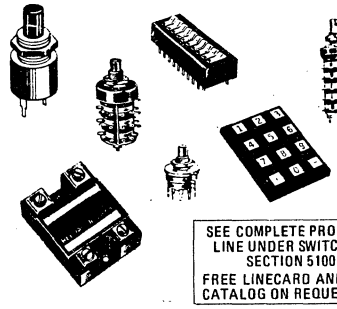
GTE CORP., Sylvania Emissive Prods./Process Heat, Portsmouth Ave., Exeter, NH 03833, Tel: 603-772-4331, TWX: 510-294-4471; Empl.: 200000

GTEK, INC., 307 Coleman Ave., Waveland, MS 39576, Tel: 601-467-8048, Telex: 315814; Empl.: 8; *Sls. Mgr.:* Bill Groves; *Dist. Mgr.:* Bill Groves

GTE METAL LAMINATES, 1704 Barnes St., Reidsville, NC 27320, Tel: 918-342-2381; Empl.: 260; *Sls. Mgr.:* J. W. Leone

GTE MICROCIRCUITS, 2000 W. 14th. St., Tempe, AZ 85281, Tel: 602-968-4431, TWX: 910-951-1383; FSC No.: 16766; Empl.: 432; *Sls. Mgr.:* David Thompson

GTE PRODUCTS GRP. (SYLVANIA), See Sylvania Miniature Lighting

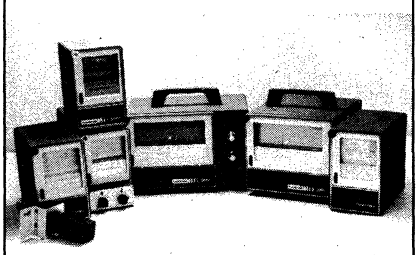
Grayhill INC.
MILITARY SPECIFICATION
INDUSTRIAL AND COMMERCIAL
AUTHORIZED DISTRIBUTOR
E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

rustrak

AUTHORIZED DISTRIBUTOR

SUNSHINE

THE SOURCE FOR METERS & TEST EQUIPMENT



Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT
(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area
(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

HAMEG

Oscilloscopes

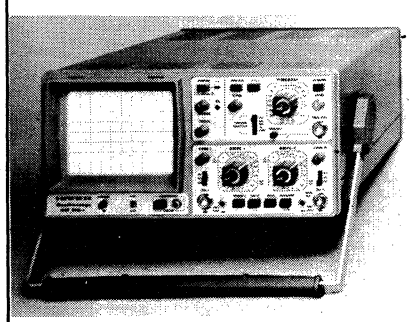
Authorized Distributors

RAG ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



Model 203

GTE SUPPLY, GTE Communications Systems, 5225 Wiley Post Way, Salt Lake City, UT 84116, Tel: 801-537-5237, TWX: 910-925-4081; Empl.: 500; *Sls. Mgr.:* J. E. Murphy

GTE SWITCHING & TELEPHONE PRODUCTS, 400 N. Wolf Rd., Northlake, IL 60164, Tel: 312-681-7100

GTE SYLVANIA, INC., CHEM. & METAL. DIV., See Sylvania Chemicals/Metals

GTE SYLVANIA LIGHTING PRODS., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923, Tel: 617-777-1900

GTE SYLVANIA, INC., CIRCUIT MOD. OPER., See Sylvania Electronics

GTE SYLVANIA, INC., CONNECTOR PRODS. OPER., See Sylvania Connector Prods. Oper.

GTE SYLVANIA, INC., DETROIT, MI, See GTE Metal Laminates

GTE SYLVANIA, INC., ELCTRN. SYS. GRP., See Sylvania Electronics

GTE SYLVANIA, INC., STANDISH, ME, See Sylvania Control Devices

GTE SYLVANIA, INC., TECH PRODS. DIV., See Sylvania Parts

GTE SYS.-SYLVANIA SYS. GRP., Western Div., P.O. Box 7188, Mountain View, CA 94039, Tel: 415-966-2000, Telex: 415-966-3401, TWX: 910-379-6948; Empl.: 2500; *Sls. Mgr.:* Evan S. Baker; *Dist. Mgr.:* Evan S. Baker

GTE WESGO TECHNICAL CERAMICS & METALS, 477 Harbor Blvd., Belmont, CA 94002, Tel: 415-592-9440; Empl.: 500; *Sls. Mgr.:* R. Pangborn

GTI/CIRCUITS DIV., Box 217, Leesburg, IN 46538, Tel: 219-453-3261, Telex: 023-2653; Empl.: 150; *Sls. Mgr.:* Hugh M. Walker

GTI/ELCTRNS. DIV., P.O. Box 96, Hadley, PA 16130, Tel: 412-253-3161, Telex: 914-545; Empl.: 250; *Sls. Mgr.:* Richard C. Kaufman; *Dist. Mgr.:* Richard C. Kaufman

GUARDIAN ELEC. MFG. CO., 1550 W. Carroll Ave., Chicago, IL 60607, Tel: 312-243-1100, TWX: 910-221-5073; FSC No.: 312-243-1100, Ext. 297; Empl.: 500; *Sls. Mgr.:* Ken Harthin; *Dist. Mgr.:* Mac Rowell ..... **B•1386-1387**

GUILDLINE INSTRS., 4403 Vineland Rd, Suite B-10, Orlando, FL 32811-9998, Tel: 305-423-8215, Telex: 856443; Empl.: 85; *Sls. Mgr.:* W. Dietz

GULTON INDS., INC., ELCTRN. COMPS. DIV., See Gulton Inds., Inc., Piezo Products Div.

GULTON INDUSTRIES, INC., Engineered Magnetics Division, 13041 Cerise Ave., Hawthorne, CA 90250, Tel: 213-679-0111, TWX: 910-325-6208; FSC No.: 06509; Empl.: 250

GULTON INDS., INC., Graphic Instruments Div., Gulton Ind'l. Pk., E. Greenwich, RI 02818, Tel: 401-884-6800, TWX: 710-387-1500; Empl.: 400; *Sls. Mgr.:* Anthony Tuccillo

GULTON INDS., INC., Piezo Prods. Div., Box 4300, Fullerton, CA 92634, Tel: 714-871-2150, TWX: 910-592-1247; Empl.: 120; *Sls. Mgr.:* J. Sloane

GULTON INDS., INC., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627, Tel: 714-642-2400, 800-854-4066, Telex: 183-532, TWX: 910-596-1352; FSC No.: 99564; Empl.: 320; *Sls. Mgr.:* Tom Perrin, Jr.

Local Sales Offices & Reps

AL Tanner, W. Tom Escue, So. Rdeg. Sls. Mgr. 205-232-1549
CA Ventura, Harry Stonelake, W. Reg. Sls. Mgr. 805-658-1484
CT Tolland, Phillip Butler, N.E. Reg. Sls. Mgr. 203-872-3454

GUNTHER, W., GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany, Tel: (0)911/65521 or 65520, TWX: 622351 Wigu d; Empl.: 340; *Sls. Mgr.:* Peter Hammel

Refer to Gordos Corporation, Bloomfield, New Jersey for Representatives and Authorized Distributor information.

GW3

G W THREE INCORPORATED, 7623 Fullerton Rd., 2nd Floor, Springfield, VA 22153, Tel: 703-451-2043 ..... **D•1088-1090**

HACKER INSTRS., Box 657, Fairfield, NJ 07007, Tel: 201-226-8450, Telex: 642769; Empl.: 12

HADCO PRINTED CIRCUITS, Manchester Rd. Rte. 28, Derry, NH 03038, Tel: 603-432-9541, TWX: 710-366-0788; *Sls. Mgr.:* Ronald Boutin

HADES MFG. CORP., 151-A Verdi St., Farmingdale, NY 11735, Tel: 516-249-4244; FSC No.: 51578; Empl.: 18; *Sls. Mgr.:* K. Norris

HADLEY, ROBERT M. CO., INC., 750 West 51st St., Los Angeles, CA 90037, Tel: 213-234-9091

HAFSTROM TECHNICAL PRODUCTS, INC., P.O. Box 9829, San Diego, CA 92109, Tel: 619-274-8822; Empl.: 10; *Sls. Mgr.:* J. R. Hafstrom ..... **D•1169**

Local Sales Offices & Reps

AZ Scottsdale, Sales Engrg., Inc. 602-994-3230
CA San Carlos, Electronic Engrg. Assocs. 415-593-2189
CT Fairfield, Wexler-Court Sls. Co. 203-334-1122
IL South Elgin, RK Elctrns. 312-695-8552
NY East Syracuse, Ossman Instrs. 315-437-6666
NY Rochester, Ossman Instrs. 716-473-5720
NY Saratoga Springs, Ossman Instrs. 518-377-8604
NY Vestal, Ossman Instrs. 607-785-9947
WA Edmonds, Cunningham Sls. 206-771-4848

THE HALL COMPANY, 420 East Water St., Urbana, OH 43078, Tel: 513-652-1376; Empl.: 69

HALLMARK METALS INC., 610 W. Foothill Blvd., Glendora, CA 91740, Tel: 213-335-1263; Empl.: 20; *Sls. Mgr.:* Robert Schoenick

HALLMARK NAMEPLATE, INC./ELECTROPANEL CO., 1855 New Highway, Farmingdale, NY 11735, Tel: 516-454-0700, Telex: 510-222-0884; *Sls. Mgr.:* Florence Finkle

HALMAR ELECTRONICS, INC., 900 N. Hague Ave., Columbus, OH 43204, Tel: 614-275-0131, TWX: 810-482-1654; Empl.: 110

HAMAMATSU PHOTONICS K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, Japan, Tel: 0534-52-2141; FSC No.: 0534-52-2139; Empl.: 900; *Sls. Mgr.:* M. Ito

HAMEG, INC., 88-90 Harbor Rd., Port Washington, NY 11050, Tel: 516-883-3837, TWX: 510-223-0889; *Sls. Mgr.:* John F. King

HAMILTON METALCRAFT, 848 N. Fair Oaks Ave., Pasadena, CA 91103, Tel: 818-795-4811; *Sls. Mgr.:* Mel Stahler

HAMILTON STANDARD CONTROLS/STANCOR, See Stancor/Hamilton Standard Controls

HAMILTON STANDARD CONTROLS, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859, Tel: 219-747-6142, TWX: 810-295-0699; Empl.: 3,700; *Sls. Mgr.:* C. Michalski ..... **B•1447**

Local Sales Offices & Reps

CA Santa Fe Springs 213-946-4807
IN Logansport 219-753-7521
PA E. Stroudsburg 717-421-1025

HAMILTON STANDARD DIV., United Technologies Corp., Windsor Locks, CT 06096, Tel: 203-623-1621

HAMLIN, Lake & Grove Sts., Lake Mills, WI 53551, Tel: 414-648-2361, TWX: 910-260-3740; Empl.: 1800; *Sls. Mgr.:* Ken Deans ..... **B•1389, 1588**

Local Sales Offices & Reps

AZ Phoenix, Shefler-Kahn Co. 602-257-9015
CA Anaheim, Westrep 213-404-3881
CA San Diego, Westrep 619-566-6580
CA San Diego, Westrep 619-276-0751
CA Santa Clara, Westrep 408-988-8833
CO Boulder, R-G Entprs. 303-447-9211
CT North Haven, Coakley, Boyd & Abbett, Inc. 800-225-8402
FL Casselberry, Southern Elctrn. Mktg. ... 305-695-3334
FL Ft. Lauderdale, Southern Electrn. Mktg. 305-475-3686
GA Jonesboro, Wallace Elctrn. Sls. 404-471-6297
IL Chicago, Indl. Rep. 312-647-7755
IN Carmel, Rich Elctrn. Mktg. 317-844-8462
IN Fort Wayne, Rich Elctrn. Mktg. 219-432-5553
IA Cedar Rapids, Palatine Sls. 319-365-8071
KS Mission, Palatine Sls. 913-831-0555
KY Louisville, Rich Elctrn. Mktg. 502-499-7808
MD Churchville, Atlantic Technical Sls. 301-879-2236
MA Needham Heights, Coakley, Boyd & Abbett, Inc. 617-444-5470
MI Brighton, A.P. Assocs. 313-229-6550
MN Minneapolis, R-J, Inc. 612-866-3661
MO Hazelwood, Palatine Sls. 314-839-0800
NH Plaistow, Coakley, Boyd & Abbett, Inc. 800-225-8402
NJ Marlton, Naudain Assoc. 609-983-5300
NJ West Caldwell, Grimm Siegel 201-575-9300
NM Albuquerque, Shefler-Kahn 505-296-0749
NY Great Neck, Tylinski Assocs. 516-466-9070
NY Ithaca, Bob Dean, Inc. 607-257-1111
NC Kernersville, Wallace Elctrn. Sls. 919-996-2742
OH Richfield, Bear Mktg. 216-659-3131
OR Portland, Syscom 503-644-2505
TX Dallas, Allied Comps. 214-238-0408
TX Houston, Allied Comps. 713-988-1600
TX Hurst, Allied Comps. 817-589-0456
TX Round Rock, Allied Comps. 512-244-1166
WA Bellevue, Syscom 206-641-5080
WA Bellevue, Testco, Inc. 206-454-7422
WI Milwaukee, Indl. Rep. 414-259-0965
Can Calgary, Alb., Weber Div. of DGW Elctrns. 403-264-5963
Can Markham, Ont., Weber Div. of DGW Elctrns. 416-475-8500
Can Ottawa, Ont., Weber Div. of DGW Elctrns. 613-728-2746

Local Distributors

AZ Tempe, Circuit Specialties 602-966-0764
CA Fullerton, Pyramid Elctrns. 714-773-0781
CA San Jose, Cypress Elctrns. Inc. 408-945-8400
CA Santa Clara, Pyramid Elctrns. 408-727-9810
CA Torrence, Cypress Elctrns. Inc. 213-533-6005
CA Van Nuys, Patane Avionics 213-988-4455
CO Englewood, Ind. Elctrns. 303-694-9444
CT Bethel, Heilind Elctrns. 203-797-8600
CT Hartford, Hatry Elctrns. 203-527-1881
CT New Haven, Hatry Elctrns. 203-787-5921
CT Stratford, Hatry Elctrns. 203-375-5866
CT Wallingford, Sager Elect. Supp. 203-265-4600
CT Waterbury, Hatry Elctrns. 203-755-1181
FL Lakeland, AA Elec. 813-665-6941
FL Longwood, Intertec Inc. 305-834-7777
FL Miami, Elctrn. Equip. Co. 305-871-3500
FL Orlando, Hammond Elctrn. 305-849-6060
FL Tampa, Leader Elctrns. 813-870-3315
GA Norcross, AA Elec. 404-449-8670
IL Chicago, Newark Elctrns. 312-638-4411
IL Palatine, Ohm Elctrns. 312-359-5500
IN Carmel, Altex Elctrns. 317-848-1323
IN Ft. Wayne, Graham Elctrns. 219-424-3422
IN Indianapolis, Graham Elctrns. 317-634-8202
IA Cedar Rapids, Iowa Radio Supp. Co. .. 319-393-4510
MD Gaithersburg, Pioneer/Wash. 301-921-0660
MA Hingham, Sager Elec. Supp. 617-749-6700
MA Norwood, Gerber Elctrns. 617-769-6000
MI Oak Park, Newark Elctrns. 313-967-0600
MN Fridley, Voyager Electronics 612-571-7766
MN Minneapolis, Newark Elctrns. 612-331-6350
MO St. Louis, Olive Indl. Elctrns. 314-426-4500
NH Hudson, Heilind Elctrns. 603-883-9536
NJ Berlin, General Comps., Inc. 609-768-6767
NJ Fairlawn, Relay Spec. 201-797-3313
NJ Pennsauken, Resco Elctrns. 609-662-4000
NM Albuquerque, Bell Inds. 505-292-2700
NY Buffalo, Summit Distr. 716-844-3540
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY Rochester, Masline Elctrns. 716-546-5373
NY Rome, Rome Elctrns. 315-337-5400
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
OH Cincinnati, Graham Elctrns. 513-772-1661
OH Solon, Repco 216-248-8900
OK Tulsa, Radio, Inc. 918-587-9123
OR Portland, Radar Elec. 503-233-3691
PA McKeesport, Barno Radio 412-751-5966
RI Providence, Wm. Dandreta & Co. 401-861-2800
TX Austin, Harrison Equip. Co. 512-458-3555
TX Dallas, Harrison Equip. Co. 214-239-2750
TX Dallas, Heilind Elctrns. 214-351-2058
TX Fort Worth, Allied Elctrns. 214-265-9341
TX Houston, Harrison Equip. 713-879-2711
TX Houston, Heilind Elctrns. 713-988-2711
WA Kent, Interface Elctrns. 206-872-5800
WA Seattle, Radar Elec. Co. 206-282-2511
WA Spokane, Radar Elec. Co. 509-747-3053
WI Cedarburg, AA Elec. 414-377-7500
WI Mequon, Taylor Elec. 414-241-4321
Can Burnaby, B. C., Rae Indl. Elctrns. 604-291-8866
Can Burnaby, B. C., Semad Elctrns. 604-438-2515
Can Dorval, Que., Semad Elctrns. 514-636-4614
Can Downsview, Ont., Rae Indl. Elctrns. 416-736-1750
Can Markham, Ont., Semad Elctrns. 416-475-3922
Can Ottawa, Ont., Semad Elctrns. 613-729-6145
Can Surrey, B. C., Memco Elctrn. Mkts. 604-590-1553

HAMMOND MANUFACTURING

HAMMOND MFG. CO., 1690 Walden Ave., Buffalo, NY 14225, Tel: 716-894-5710, Telex: 91-6452; Empl.: 850; *Sls. Mgr.:* Ray Shatzel ..... **C•1066-1067**

Local Sales Offices & Reps

AZ Scottsdale, Mahaffey & Assocs. 602-991-9790
CA Laguna Hills, English/Damco Sls. Assocs. 714-837-3801
CA Redwood City, Hickey Indl. Sls. 415-368-3849
GA Atlanta, Millar Elctrns. 404-261-6160
IL Highland Park, Bransky Sls. 312-433-2375
IN Indianapolis, Wilson Tech. Sls. 317-298-3345
MD Silver Spring, Mid Atlantic Sls. 301-593-7749
MA N. Scituate, W. A. Hendrickson Co. 617-545-0652
MI Southfield, Component Assocs. 313-557-3232
MN Golden Valley, Ambassador Inds. Mktg. 612-542-8437
MO St. Louis, Kathrinus, Kelly & Baumhauer 314-647-2400
NY Bellmore, Selectra Sls. 516-221-7865
NY Syracuse, Paston-Hunter Co., Inc. 315-437-2992
NC Raleigh, Millar Elctrns. 919-787-9564
OH Dayton, Shamrock Elctrn. Sls. 513-258-1227
OR Portland, Dussault & Assocs., Inc. 503-641-8780
PA Springfield, George M. Conneen 215-544-5884
TX Dallas, J. Y. Schoonmaker Co., Inc. 214-349-1650
WA Seattle, Dussault & Assocs., Inc. 206-527-5454

Local Distributors

AZ Phoenix, Electronic Parts Co. 602-277-7281
AZ Tucson, Southwest Sls. 602-628-1613
AR Ft. Smith, Carlton Bates 501-646-8201
AR Little Rock, Carlton Bates 501-562-9100
AR Texarkana, Lavender Dist. Corp. 501-773-4631
CA Burlingame, Logan Elctrns. 415-697-6481
CA Chatsworth, Poco Sls. 818-700-8727
CA Manhattan Beach, Prime Electro 213-379-3642
CA Palo Alto, Zack Elctrns. 415-326-5432
CA Redwood City, H.D.B. 415-368-1388
CA San Diego, Western Radio Elec. 619-268-4400
CA San Jose, Con. Parts, Inc. 408-263-9521
CA San Jose, Quement Elctrns. 408-998-5900
CA San Rafael, Elctrns. Plus 415-457-0466
CA Santa Ana, ITT Multicomponents 714-835-9019
CA Santa Clara, Pyramid Elctrns. 408-727-9810
CO Denver, Fistell Elctrns. 303-629-1312
CO Denver, Integrated Elctrns. 303-292-6121
CT Danbury, Pilgrim Elec. 203-792-7274
CT Hartford, Hatry Elec. 203-527-1881
CT Middletown, Midstate Elec. 203-347-5638
CT Norwalk, Cobra 203-853-8228
CT Norwalk, Park Distrbg. 203-853-2011
CT Stratford, Hatry Elec. 203-375-5866
FL Ft. Lauderdale, Hammond Elctrns. 305-973-7103
FL Orlando, Hammond Elctrns. 305-849-6060
GA Atlanta, Wholesale Dist. 404-447-8431
IL Chicago, Newark Elec. 312-638-4411
IL Joliet, Mainline Elec. 815-436-3900
IL Mt. Prospect, Magnuson Elctrns. 317-247-5108
IL Niles, Joseph Elec. 312-297-4200
IL Northbrook, Classic Comps. 312-272-9650
IL Wheeling, Hawk Elec. 312-459-4030
IN Indianapolis, Advent Elec. 317-872-4910
IN Indianapolis, Mar Elec. 317-875-4510
IN Lafayette, C.W.Y. Elec. 317-448-1611
IA Cedar Rapids, Deeco, Inc. 319-365-7551
IA Davenport, Warren Radio 319-322-5301
KY Louisville, Peerless Elctrns. 502-637-7677
LA Harvey, A.F.G. Elec. 504-368-9696
LA Shreveport, Industrial Elec. Supp. 318-222-9459
MD Bethesda, Empire Elec. 301-656-3300
MD Rockville, M. S. Elec. 301-921-0200
MA, Haverhill, Spartan Elctrns. 617-373-1200
MA Lynn, Land Elec. Supp. 617-592-2220
MA Wellesley Hills, Target Elctrns. Supp. .. 617-235-2545
MA Woburn, Abbott Elec. 617-935-2040
MI Farmington Hills, Advent Elctrns. 313-477-1650
MI Grand Rapids, S. F. Electrns. 616-459-0216
MN Eden Prairie, Cassidy Elctrns. 612-944-0100
MO Kansas City, Electronic Supp. 816-931-1321
MO St. Louis, Van Sickle Radio 314-621-5000
NH Dover, American Radio Corp. 603-742-6800
NJ Fairlawn, Relay Specialties 201-797-3313
NJ Totowa, Route Elctrns. 201-256-8555
NM Albuquerque, Beta Tron Elctrns. 505-344-2381
NY Buffalo, Genesee Radio 716-873-9661
NY Buffalo, Summit Dist. 716-884-3450
NY Commack, Sparton Elec. 516-499-9500
NY Hempstead, Davis Elctrns. 516-483-9200
NY Rochester, Goldcrest Elec. 716-546-8464
NY Rochester, Masline Elec. 716-546-5373
NY Rochester, Rochester Radio 716-454-7800
NY Rome, Rome Elec. 315-337-5400
NY Syracuse, Salina Elec. 315-422-2336
NY Troy, Trojan Elec. 518-272-4481
NC Greensboro, Hammond Elec. 919-275-6391
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
OH Cincinnati, URI Elctrns. 513-716-4030
OH Cleveland, Roberts Elec. 216-238-1711
OH Cleveland, Selectronics 216-243-9700
OH Columbus, Thompson Elec. Supp. 614-228-6191
OH Dayton, Stott Friedman 513-298-5555
OH Toledo, Warren Radio 419-248-3364
OK Oklahoma City, Radio, Inc. 405-528-2391
OK Tulsa, Radio, Inc. 918-587-9123
PA Drexel Hill, Kass Elec. 215-449-2300
PA Erie, J. V. Duncombe Elec. 814-454-5278
PA Erie, Warren Radio 814-454-5285
PA McKean, Advacom 814-476-7774
PA Wayne, Peak Elec. 215-293-9000
PA York, Rosen Elctrns. 717-843-3875
RI Pawtucket, Major Elec. Supp. 401-725-7400
RI Providence, Hope Elctrns. 401-521-5600
SC Charleston, Wholesale Inds. Elctrns. .. 803-722-2634
SC Greensville, Hammond Elec. 803-242-6880

PoCo

We Stock

HAMMOND MANUFACTURING

PLASTIC BOXES
DIE CAST BOXES
INSTRUMENT CASES
DESK TOP CONSOLES
RACK & PANEL
CABINETS

POCO SALES
8925 Fullbright Street
Chatsworth, California 91311
(818) 700-8727
Serving Western Region

TN Memphis, Bluff City Elec. 901-345-9500
TX Austin, Galtronics 512-837-7470
TX Corpus Christi, Douglas Elec. 512-883-5103
TX Dallas, Electrotex 214-234-0433
TX Dallas, Wholesale Elec. 214-824-3001
TX Ft. Worth, Allied Elec. 817-336-5401
TX Houston, Electrotex 713-526-3456
TX Houston, The Altair Co. 713-462-3029
TX Midland, ESI Supp. 915-694-9657
TX San Antonio, Sherman Elec. 512-224-1001
UT Salt Lake City, Standard Elec. Supp. .. 801-486-3371
VT Burlington, Greylock Elec. 802-658-5700
WA Bellevue, Integrated Elec. 206-455-2727
WI Mequon, Taylor Elec. 414-241-4321
WI New Berlin, R. M. Wisconsin 414-784-4420

H&T COMPONENTS INC., H&T Components Ltd., 35 Carlough Road, Bohemia, NY 11716, Tel: 516-567-2282, Telex: 510-228-7886; *Sls. Mgr.:* Bert Freifeld; *Dist. Mgr.:* Mario Nardini ..... **C•1226**

Local Sales Offices & Reps
AL Huntsville, Advanced Comps. Mktg. ... 205-881-5493
AZ Phoenix, Adtek, Inc. 602-931-9289
CA Laguna Niguel, H & T Comps., Inc. 714-831-8705
CA San Jose, Class One Corp. 408-297-8666
CO Englewoood, Elctrn. Comp. Sys. 303-781-5901
CT Milford, Todino Engrg. Sls. 203-874-6643
FL FtLauderdale, Freeman Assocs. 305-522-5606
IL Chicago, Esco Assocs. 312-293-5310
KS DeSoto, Midtec Assocs. 913-441-6565
LA Hammond, Design Mktg. 504-296-3076
MD Columbia, Delta III Assocs. 301-730-4700
MA Needham Heights, Todino Engrg. Sls. 617-444-7925
MI Birmingham, Favco 313-644-0173
MN Minneapolis, D. A. Case Assocs. 612-869-3700
MO Florissant, Midtec Assocs. 314-837-5200
NY Hackensack, Meg Elctrns. 201-489-7700
NY Syracuse, Advanced Comp. Corp. 315-699-2671
NC Raleigh, McGee Assocs. 919-781-9579
OH Akron, Augnat Assocs. 216-273-1211
OR Beaverton, Eclipse Mktg. 503-642-1661
TX Hurst, Design Mktg. 817-268-2004
UT Salt Lake City, Charles Fields & Assocs. 801-531-6177
VA Richmond, Delta III Assocs. 804-771-9204
WA Redmond, Eclipse Mktg. 206-885-6991

Local Distributors
AL Huntsville, Contact Elctrns. 205-881-9321
AZ Tempe, Pacer Elctrns. 602-829-0330
AZ Tucson, Inland Elctrn. Supp. 602-294-2628
AZ Tuscon, Southwest Sls. 602-628-1613
CA Canuga Park, Tim-Co 818-992-5040
CA Corona, Konex Corp. 800-821-8021
CA Cypress, On-Line Elctrns. 714-826-8200
CA Huntington Beach, California Connector & Cable 714-895-3990
CA Mountain View, Bell Inds. 415-960-1440
CA S. San Francisco, Peters deLaet 415-873-9595
CA San Diego, D. Squared Sls. 619-560-6266
CA San Jose, Cablecon 408-298-3011
CA Santa Ana, C. R. Elctrns. 714-556-2040
CA Van Nuys, Mil-Conn Dvcs., Inc. 818-782-2644
CO Englewood, Colorado Computer Cable 303-789-1869
CT Bridgeport, Accurate Elctrns. 203-366-0214
CT Bridgeport, Millennium Elctrns. 203-372-2037
FL Ft. Lauderdale, Simcona 305-485-4455
GA Norcross, Whitehead Elctrns. 404-923-6667
IL Lisle, Components, Inc. 312-852-7707
LA Lafayette, Ralphs Indl. Elctrn. Supp. ... 318-234-4507
MD Baltimore, Pyttronic Inds. 301-792-0780
MA Hopkinton, Interface Elctrns. 617-435-6858
MA Lowell, Colonial Wire & Cable 617-459-6400
MA Wilmington, Aved Elctrns. 617-657-8310
MI Farmington Hills, Advent Elctrns. 313-477-1650
MN Shore View, Northern Automatic 612-481-0022
NH Manchester, Components North 603-624-4661
NY Buffalo, Summit Distrs. 800-462-1880
NY Farmingdale, Pride Elctrns. 516-293-4020
NY Hauppauge, Broadline Elctrns. 516-231-4100
OH Cleveland, Roberts Elctrns. 216-238-1711
OH Columbus, Whitehead Elctrns. 614-224-1186
OH Dayton, Televox, Inc. 513-294-4499
OR Beaverton, Murphy Elctrns. 503-642-2001
PA Montgomeryville, Pyttronic Inds. 215-242-6700
TN Knoxville, Mac-1 Elctrns. 615-966-4143
TX Dallas, Computer Comps. 214-239-0271
TX Houston, Ralphs Indl. Elctrn. Supp. 713-748-4902
UT Salt Lake City, Pen-Tec Entprs. 801-972-4817
WA Redmond, Murphy Elctrns. 206-881-1234

HANDY & HARMAN, 850 Third Ave., New York, NY 10022, Tel: 212-752-3400; Empl.: 800; *Sls. Mgr.:* C. P. Zitzmann

HANDY & HARMAN ELCTRN. MATLS. CORP., 72 Elm St. N., Atteboro, MA 02760, Tel: 617-695-1401, Telex: 6711549; Empl.: 600

HANKSCRAFT MOTORS, Div. of Gerber Prods. Co., P.O. Box 120, Reedsburg, WI 53959, Tel: 608-524-4341; Empl.: 550

HANSCOM, H. F., CO., INC., 225 Chapman St., Providence, RI 02905, Tel: 401-941-1455, Telex: 952107; Empl.: 50; *Sls. Mgr.:* William E. Taplin

HAPCO, Box 1205, Boulder, CO 80302, Tel: 303-447-0441; Empl.: 8; *Sls. Mgr.:* Allen Lopez

HARBISON INDL. PRODS., Sub. of Polymer Corp., 7205 Hibbs La., Levittown, PA 19057, Tel: 215-943-9000; Empl.: 65

HARDIGG INDS., INC., North Main St., South Deerfield, MA 01373, Tel: 413-665-2163, Telex: 955431; FSC No.: 11214; *Dist. Mgr.:* Warren H. Bickford

HARDMAN INC., 600 Cortlandt St., Belleville, NJ 07109, Tel: 201-751-3000, TWX: 710-995-4940; Empl.: 105; *Sls. Mgr.:* Carl T. Sanford

HAROWE SERVO CONTROLS, Bowmar Inst. Corp., Westtown Rd. at West Chester Pike, W. Chester, PA 19380, Tel: 215-692-2700, Telex: 83-5486, TWX: 510-663-0335; FSC No.: 06989; Empl.: 329; *Sls. Mgr.:* Dennis B. Daisy/Chuck Burgess

HARREL, INC., 16 Fitch St., E. Norwalk, CT 06855, Tel: 203-866-2573; *Sls. Mgr.:* W. Becker ..... **D•1122**

Local Sales Offices & Reps
CA Sherman Oaks, Windsor Dynamics ... 213-990-4173
CA Walnut Creek, Viking Instr. 415-946-1226
NY Cazenovia, P. M. Decew, Inc. 315-655-8602
NC Pineville, Beck Sls. 704-542-9329
OH Medina, Odessa Instr. Co. 216-725-0575
PA Elkins Park, Edwin F. Gregg 215-635-0450
TN Knoxville, Robert Olsen Co. 615-688-4038

HARRIS CALORIFIC, Emerson Electric Co., 400 Clark St., Elyria, OH 44036, Tel: 216-961-5700; *Sls. Mgr.:* Phil Preuninger

HARRIS CIRCUITS MFG., 2706 Colley Ave., Norfolk, VA 23517, Tel: 804-467-1116; Empl.: 15

HARRIS CORP., Computer Systems Div., 2101 W. Cypress Creek Rd., Ft. Lauderdale, FL 33309, Tel: 305-974-1700, TWX: 510-956-3096; FSC No.: 29436; Empl.: 1000; *Sls. Mgr.:* Frank P. Carollo

HARRIS CORP., Dracon Div., 809 Calle Plano, Camarillo, CA 93010, Tel: 805-987-9511, Telex: 182327; Empl.: 400; *Sls. Mgr.:* Tom Erdmann; *Dist. Mgr.:* Keith Boutillier

Local Sales Offices & Reps
CA Anaheim, Marlene Chase 714-921-1156
CA Cypress, Keith Boutillier 714-892-1439
CA Fremont, Dave Buechner 415-490-2816
CO Denver, Richard Jones 303-337-7779
FL Eustis, Jeff Hearsey 904-589-4412
IL Rantoul, Howard Darnell 217-897-6666
MO Lake Ozark, Gary Foster 314-365-5055
NJ Oak Ridge, J. B. Behan 201-697-5222

HARRIS CORP., PRD Elctrns. Div., 6801 Jericho Tpke., Syosset, NY 11791, Tel: 516-364-0400, TWX: 510-222-4494; FSC No.: 77327; Empl.: 1,850; *Sls. Mgr.:* R. A. Lebowitz

HARRIS MICROWAVE SEMICONDUCTOR, 1530 McCarthy Blvd., Milpitas, CA 95035, Tel: 408-262-2222, TWX: 910-338-2247

HARRIS SEMICONDUCTOR, Box 883, Melbourne, FL 32901, Tel: 305-724-7400, TWX: 510-959-6259; FSC No.: 34371; Empl.: 2300; *Sls. Mgr.:* Dan McCranie; *Dist. Mgr.:* Charles H. Beaty

HARSHAW FILTROL PARTNERSHIP, 1945 E. 97th St., Cleveland, OH 44106, Tel: 216-721-8300; *Sls. Mgr.:* Robert Anfang

HARTLEY PRODS., 620 Island Rd., Ramsey, NJ 07446, Tel: 201-327-4443; *Sls. Mgr.:* R. Schmetterer

HARTMAN SYSTEMS, Figgie Intl., 360 Wolf Hill Rd., Huntington Sta., NY 11746, Tel: 516-427-7500, TWX: 510-226-6982; FSC No.: 92220; Empl.: 310; *Sls. Mgr.:* Robert Griffith

HARTWELL CORP., 900 S. Richfield Rd., Placentia, CA 92670, Tel: 714-993-4200, Telex: 683-485, TWX: 910-596-1294; FSC No.: 83014; Empl.: 425

HARWIL, 1548 17th St., Santa Monica, CA 90404, Tel: 213-829-2310; Empl.: 8

HASCO COMPONENTS, INC., 247-40 Jericho Tpke., Bellrose Village, NY 11001, Tel: 516-328-9292, TWX: 710-582-5750; Empl.: 6; *Sls. Mgr.:* Tab Hauser ..... **B•1390-1396, 1589-1591**

HAVERLY SYSTEMS, INC., 78 Broadway, Denville, NJ 07834, Tel: 201-627-1424, Telex: 710-987-8402; Empl.: 33; *Sls. Mgr.:* Wm. Parkins

HAYDON SWITCH & INSTR., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705, Tel: 203-756-7441, Telex: 643852 - HSIINTLWBY; FSC No.: 02005; Empl.: 350; *Sls. Mgr.:* Scott Moulton

HAZELTINE CORP., 500 Commack Rd., Commack, NY 11725, Tel: 516-462-5100, Telex: 64-0525, TWX: 510-226-0239; Empl.: 2,500

H-A-Z LABORATORIES, Brass Castle Rd., P.O. Box 67-M, Washington, NJ 07882, Tel: 201-689-0110; *Sls. Mgr.:* Henry Zajac

HBS EQUIPMENT DIV., 3000 Supply Ave., Los Angeles, CA 90040, Tel: 213-726-3033, TWX: 910-580-3179; Empl.: 40; *Sls. Mgr.:* K. Lowery

HDR POWER SYS., INC., 600 Oakland Park Ave., Columbus, OH 43214, Tel: 614-262-6832, Telex: 246524; Empl.: 41; *Sls. Mgr.:* Harlan W. Bates

HDS INC., 12310 Pinecrest Rd., Reston, VA 22091, Tel: 703-620-6200, Telex: 64585; Empl.: 65

HEADWAY RESCH., INC., 3713 Forest La., Garland, TX 75042, Tel: 214-272-5431, Telex: 73-0257; Empl.: 50; *Sls. Mgr.:* Mina Kelly

Local Sales Offices & Reps
CA Santa Clara, California Tech. Serv. 408-496-1156, 408-496-1157
CA Tarzana, California Tech. Serv. 818-343-3131
PA Haverford, Blason Ent., Inc. 609-767-6733

HEATH CO., Benton Harbor, MI 49022, Tel: 616-982-3886, Telex: 72-9421

HEAT SYSTEMS-ULTRASONICS, INC., 1938 New Hwy., Farmingdale, NY 11735, Tel: 516-694-9555, Telex: 14-3101; *Sls. Mgr.:* Irwin Leibson

HECON CORP., 31 Park Rd., Tinton Falls, NJ 07724, Tel: 201-542-9200, Telex: 13-2457; Empl.: 200; *Sls. Mgr.:* P. Shine; *Dist. Mgr.:* R. Drum

HEI CORPORATION, 290 S. Main Place, Carol Stream, IL 60188, Tel: 312-665-5500; Empl.: 8

HEI, INC., 1495 Steiger Lake La., Victoria, MN 55386, Tel: 612-443-2500, TWX: 910-578-3961; Empl.: 175; *Sls. Mgr.:* R. D. Young ..... **B•1211**

Local Sales Offices & Reps
AL Huntsville, REP, Inc. 205-881-9270
AZ Phoneix, Toward Engrg. 602-955-3193
CA Brea, MASCO 714-529-0866
CA Mountain View, Leddy Assocs. 415-969-6313
CA Vista, MASCO 619-758-5562
CO Denver, Ausco Sls. 303-750-3846
FL Coral Springs, CBC Elctrns. 305-755-1111
FL Longwood, CBC Elctrns. 305-831-5380
GA Tucker, REP, Inc. 404-938-4358
IL Schaumburg, Micro-Tex 312-885-1131
KS De Soto, Midtec Assocs. 913-441-6565
MI Grand Rapids, Miltimore Sls. 616-942-9721
MI Novi, Miltimore Sls. 313-349-0260
NH Salem, Sls. Engrg. 603-893-5521
NJ Pitman, Colrud Corp. 609-589-5866
NY Kingston, D. L. Eiss Assocs. 914-338-7588
NY Massapequa, Coughlin Assoc. 516-799-7743
NY Rochester, D. L. Eiss Assocs. 716-328-3000
NC Raleigh, REP, Inc. 919-851-3007
OH Rocky River, Norm Case Assocs. 216-333-0400
TN Jefferson City, REP, Inc. 615-475-9012
TX Austin, Quad State Mktg. 512-282-2046
TX Dallas, Quad State Mktg. 214-680-0411
VA Reston, Colrud Corp. South 703-620-6612
WA Bellevue, Comtec 206-453-1188
WI Waukesha, Micro-Tex 414-542-5352
Can Oakville, Ont., Haltronics, Ltd. 416-844-2121

HEINEMANN ELEC. CO., Brunswick Pike, Alt. Rte. #1, P.O.Box 6800, Lawrenceville, NJ 08648-0800, Tel: 609-882-4800, Telex: 843431; FSC No.: 74193; Empl.: 625; *Sls. Mgr.:* N. J. Alzamora ..... **B•1236-1237**

Local Sales Offices & Reps

AL	Birmingham, Austin Brown Assocs. Inc.	205-822-6198
AL	Mobile, Austin Brown Assocs., Inc.	205-344-0728
AZ	Phoenix, O'Donnell Assocs. SW	602-944-9542
CA	Chatsworth, Porter Co.	818-700-0808
CA	San Diego, Porter Co.	619-275-0641
CA	San Jose, O'Donnell Assocs. No.	408-263-6500
FL	Deerfield Beach, Conley & Assoc.	305-421-7180
FL	Oviedo, Conley & Assocs.	305-365-3283
FL	Tampa, Conley & Assocs.	813-885-7658
GA	Atlanta, Austin Brown Assocs. Inc.	404-457-6381
IL	Chicago, D. Dolin Sls.	312-498-6770
IN	Ft. Wayne, O.H. Bromberg & Assocs.	219-456-6010
KY	Louisville, O.H. Bromberg & Assocs.	502-245-8916
MD	Pikesville, Imagitron Sls. Co.	301-521-2020
MA	Framingham, Sullivan Tech. Sls.	617-620-0195
MI	Southfield, L. H. Dickelman Co.	313-353-8210
MN	Minneapolis, Furber Sls. Co., Inc.	612-881-3620
MO	Creve Coeur, Hill & Co.	314-432-1136
NJ	Ridgewood, Ballou, Inc.	201-444-6990
NY	Rochester, Canavan-Scanlon	716-424-1830
NY	Syracuse, Canavan-Scanlon	315-437-1271
NC	Charlotte, J. Rudisill Assocs.	704-377-6901
OH	Cincinnati, O.H. Bromberg & Assocs.	513-771-9333
OH	Cleveland, Brown Elect. Prod.	216-331-2072
OH	Dayton, KW Elctrn. Sls.	513-890-2150
OH	Dayton, O. H. Bromberg & Assocs.	513-434-8788
PA	Allison Park, KW Electrn. Sls.	412-487-4300
PA	Washington Crossing, DVS Co.	215-493-4642
TN	Brentwood, Austin Brown Assocs. Inc.	615-373-2068
TX	Dallas, Glidden Electro Equip.	214-341-0610
TX	Houston, Glidden Electro Equip.	713-681-1415
WA	Mercer Island, Andersen Assocs.	206-232-0484
WI	Elm Grove, Key Entpr.	414-784-3390

Local Distributors

AL	Montgomery, Southern Controls	205-277-5030
CA	Burlingame, Campbell & George	415-697-2965
CA	Chatsworth, POCO Sls.	818-700-8727
CA	San Jose, Cazco Sls.	408-263-6503
CO	Denver, CSID Inc.	303-292-9594
CT	Hartford, L. E. Whelan Co.	203-246-5694
CT	New Haven, Green Shaw Co.	203-397-0710
FL	Oviedo, Dixie Sls.	305-365-5211
IL	Chicago, Nedco Elctrns.	312-286-5565
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Northbrook, Classic Comps. Supp.	312-272-9650
IN	Indianapolis, Graham Elctrns.	317-634-8202
KS	Edwardville, C. Tennant & Sons	913-441-1801
MA	Boston, Apparatus Svc.	617-787-1300
MA	Newton, Green Shaw Co.	617-969-8900
MI	Southfield, Michigan Lectrols Corp.	313-353-1350
MN	Minneapolis, Northland Elec. Supp.	612-341-6100
NH	Hudson, C & H Elctrns.	603-882-1133
NY	Syracuse, Baldwin Hall	315-463-9251
NY	Whitestone, Power Electro Supp. Co.	212-767-1447
NC	Charlotte, Joyce Sls. Co.	704-377-1555
OH	Cincinnati, Cartessa Corp.	513-385-7700
OH	Dayton, Duellman Elec.	513-461-5010
OH	Dayton, Stotts Friedman Co.	513-298-5555
OH	Solon, REH Electrns.	216-248-1636
OH	Valley View, Newark Elctrns.	216-447-8860
OR	Portland, Taylor Elec.	503-233-5321
PA	Washington Crossing, Riverside Comps.	215-493-5228
PA	West Chester, West Chester Elec. & Electrn.	215-696-7500
TN	Chattanooga, Techni-Tronics	615-875-5449
TX	Dallas, Geeco Sls. Co.	214-341-2626
VA	Charlottesville, Va. Radio Supp. Co. Inc.	804-296-4184
VA	Richmond, General Elec. Supp.	804-358-4941

HEINEMANN ELECTRIC CO., P.O. Box 6800, Lawrenceville, NJ 08648-0800, Tel: 609-882-4800

HEITZ, KARL, INC., P.O. Box 427, Woodside, NY 11377, Tel: 718-565-0004; Empl.: 15

HELICAL PRODS. CO., INC., Box 1069, Santa Maria, CA 93456, Tel: 805-928-3851, TWX: 910-351-5856; FSC No.: 13201; Empl.: 55

HELIONETICS, INC., DECC Div., 17312 Eastman St, Irvine, CA 92714, Tel: 714-546-4731, 800-421-7915, TWX: 910-595-2829; *Sls. Mgr.:* R. S. Tullock

HELLESENS BATTERY ENGRG., INC., A/S Hellesens, 1636 Hyde Park Ave., Hyde Park, MA 02136, Tel: 617-361-7555, Telex: 294116 BOSTELEX; FSC No.: 617-361-1835; *Sls. Mgr.:* James Epstein

HELM INSTR. CO., INC., 1387 Dussel Drive, Maumee, OH 43537, Tel: 419-893-4356, Telex: 28-6078

HENES PRODS., 4301 E. Madison St., Phoenix, AZ 85034, Tel: 602-275-4126; Empl.: 25

HENSCHEL, General Signal Corp., 9 Hoyt Drive, P.O. Box 30, Newburyport, MA 01950, Tel: 617-462-2400, Telex: (RCA) 294074; FSC No.: 28199;Multiple; Empl.: 190

HERAEUS-VOLKERT INC., 222-34 96th Ave., Queens Village, NY 11429, Tel: 212-464-8400, Telex: 142338; Empl.: 250

HERBERT PRODS. INC., 180 Linden Ave., Westbury, NY 11590-0384, Tel: 516-334-6500, TWX: 510-222-5963; Empl.: 98; *Sls. Mgr.:* L. C. Peshkin

HERMETIC SEAL, 4232 Temple City Blvd., Rosemead, CA 91770, Tel: 818-283-0411, TWX: 910-587-3352; FSC No.: 04820; Empl.: 220

HERMETIC SWITCH, Box 1325, Hwy. 92, Chickasha, OK 73018, Tel: 405-224-4046, Telex: 796125 Hermetic CKSA; Empl.: 150; *Sls. Mgr.:* E. R. Andrus ..... **B•1592**

Local Sales Offices & Reps

CA	Arcadia, V. Gott & Assocs.	818-445-9728
CA	San Diego, V. Gott & Assocs.	612-272-8452
GA	Atlanta, Electro Technlg. Prods.	404-458-4427
MD	Timonium, Heller Sls.	301-252-4780
MA	Canton, New England Elctrn. Sls.	617-828-4835
MN	Minneapolis, Peterson Sls. & Assocs.	612-944-0030
NY	Oceanside, Current Inds.	516-678-3895
NY	Rochester, Electronic Mktg. Assocs.	716-427-8115
OR	Beaverton, LD Elctrns.	503-649-8556
PA	Furlong, Avenir	215-348-8290
TX	Austin, R. F. Kimball Co.	800-442-4506
TX	Houston, R. F. Kimball Co.	713-840-0590
TX	Richardson, R. F. Kimball Co.	214-231-3447
WA	Snohomish, LD Elctrns.	206-568-0511
WA	Spokane, LD Elctrns. (Boise, ID #)	208-343-2741

HERTNER DIV., 12690 Elmwood Ave., Cleveland, OH 44111, Tel: 216-252-4242, Telex: 98-5552; Empl.: 125; *Sls. Mgr.:* S. Steven

HERTZ FILTER, 3 Aerial Way, Syosset, NY 11791, Tel: 516-822-4770; Empl.: 22

HEURIKON CORPORATION, 3201 Latham Dr., Madison, WI 53713, Tel: 800-356-9602, 608-271-8700, Telex: 469532; Empl.: 80; *Sls. Mgr.:* Ed DeWitt ..... **D•1091**

Local Sales Offices & Reps

AL	Huntsville, Magaro & Assocs.	205-882-0827
AZ	Tempe, Mar Tech Assocs.	602-968-4944
CA	Concord, Qualtech	415-680-1800
CA	N. Hollywood, Qualtech	818-765-1419
CA	Orange, Qualtech	714-639-9820
CA	Palo Alto, Qualtech	415-494-9060
CA	San Diego, Mesa Engrg. & Sls.	619-278-8021
CA	Sunnyvale, Qualtech	408-732-4800
CO	Aurora, Par Assocs.	303-363-6636
CO	Denver, PAR Assocs.	303-371-4140
GA	Atlanta, Magaro & Assocs.	404-451-8862
IN	Indianapolis, CMP, Inc.	317-844-4175
KS	Kansas City, Panatek	913-362-3349
KS	Prairie Village, Panatek	913-362-3349
MD	Rockville, Spectro Assocs.	301-294-9770
MA	Brockton, Daner-Hayes, Inc.	617-538-0598
MA	Canton, Daner-Hayes, Inc.	617-828-1997
MA	Concord, Daner-Hayes, Inc.	617-828-1997
MA	Waltham, Daner-Hayes	617-894-7290
MA	Wayland, Daner-Hayes, Inc.	617-655-0888
MA	Weston, Daner-Hayes, Inc.	617-891-5548
MI	Detroit, CMP, Inc.	313-477-7700
MN	Minneapolis, Micro Resources Corp.	612-830-1454
NJ	Glen Gardner, Daner-Hayes, Inc.	201-537-4534
NJ	Scotch Plains, Daner-Hayes, Inc.	201-889-4515
NM	Albuquerque, Mar Tech Assocs.	505-821-2775
NY	Brewster, Daner-Hayes, Inc.	914-279-2168
NY	Rochester, Daner-Hayes, Inc.	716-288-0921
NC	Greensboro, Magaro & Assocs.	919-294-4783
OH	Cincinnati, Applied Data Mgmt.	513-579-8108
OH	Cleveland, CMP, Inc.	216-779-5100
OH	Dayton, CMP, Inc.	513-836-0951
OK	Stillwater, Acudata, Inc.	405-743-1886
PA	Doylestown, Daner-Hayes, Inc.	215-345-6056
PA	Pittsburgh, CMP, Inc.	412-372-4415
TX	Dallas, Acudate, Inc.	214-424-3567
TX	Houston, Acudata, Inc.	713-580-2451
TX	Plano, Acudata	214-424-3567
TX	Austin, Acudata, Inc.	512-478-1018
UT	Centerville, PAR Assocs.	801-292-8145
UT	Salt Lake City, Par Assocs.	801-537-1900
VT	White River Junction, Daner-Hayes, Inc.	802-295-5260
WI	Madison, Heurikon Corp.	608-271-8700
Intl	Japan, Tokyo, NPS, Inc.	Telex-781/27832
Intl	UK, Thame, Oxon, Thame Sys. Lt.	011-44-84-421-5471
Intl	W. Germany, Munchen, Tekelec Airtronic	011-49-89-59-4621
Can	Nepean, Ont., Multilek, Inc.	800-267-1070
Can	Ottawa, Multilek, Inc.	613-226-2365

HEWLETT-PACKARD CO., P.O. Box 301, 815 Southwest 14th St., Loveland, CO 80537, Tel: 303-667-5000

HEWLETT-PACKARD CO., 1820 Embarcadero Rd., Palo Alto, CA 94303, Tel: Call Local Sls. Off.; Empl.: 68,000 ..... **D•1653-1656**

Local Sales Offices & Reps

AL	Birmingham	205-881-6802
AL	Huntsville	205-830-2000
AZ	Phoenix	602-273-8000
AZ	Tucson	602-573-7400
CA	Brisbane	415-330-2500
CA	Fresno	209-252-9652
CA	Fullerton	714-999-6700
CA	Goleta	805-967-3405
CA	Lawndale	213-970-7500
CA	Los Angeles	213-643-7500
CA	Palo Alto	415-857-8000
CA	Sacramento	916-929-7222
CA	San Diego	714-279-3200
CA	San Ramon	415-838-5900
CA	Santa Ana	714-641-0977
CA	Santa Clara	408-988-7000
CA	Westlake Village	213-706-6800
CO	Englewood	303-649-5000
CT	Bridgeport	203-371-6454
CT	Wallingford	203-265-7801
FL	Ft. Lauderdale	305-973-2600
FL	Jacksonville	904-398-0663
FL	Orlando	305-859-2900
FL	Pensacola	904-476-8422
FL	Tampa	813-884-3282
GA	Atlanta	404-955-1500
HI	Honolulu	808-526-1555
IL	Bloomington	309-662-9411
IL	Chicago	312-930-0010
IL	Naperville	312-357-8800
IL	Rolling Meadows	312-255-9800
IN	Carmel	317-844-4100
IA	Cedar Rapids	319-390-4250
IA	West Des Moines	515-224-1435
KY	Louisville	502-426-0100
LA	Kenner	504-467-4100
MD	Baltimore	301-644-5800
MD	Rockville	301-948-6370
MA	Andover	617-682-1500
MA	Lexington	617-861-8960
MI	Grand Rapids	616-957-1970
MI	Novi	313-349-9200
MI	Troy	313-643-6474
MN	St. Paul	612-644-1100
MO	Bridgeton	314-344-5100
MO	Kansas City	816-941-0411
NE	Omaha	402-334-1813
NJ	Paramus	201-265-5000
NJ	Piscataway	201-981-1199
NM	Albuquerque	505-292-1330
NY	Albany	518-458-1550
NY	Clarence	716-759-8621
NY	Fairport	716-223-9950
NY	Liverpool	315-451-1820
NY	Manhattan	212-971-0800
NY	Syracuse	315-455-2486
NY	White Plains	914-684-6100
NY	Woodbury	516-921-0300
NC	Cary	919-467-6600
NC	Charlotte	704-527-8780
NC	Greensboro	919-852-1800
OH	Cincinnati	513-891-9870
OH	Cleveland	216-243-7300
OH	Miamiburg	513-859-8202
OH	Westerville	614-436-1041
OK	Oklahoma City	405-446-9499
OK	Tulsa	918-665-3300
OR	Wilsonville	503-682-8000
PA	Harrisburg	717-657-5900
PA	Pittsburgh	412-782-0400
PA	Valley Forge	215-666-9000
SC	Columbia	803-732-0400
SC	Greenville	803-297-4120
TN	Knoxville	615-966-4747
TN	Memphis	901-346-8370

TN Nashville 615-255-1271
TX Austin 512-835-6771
TX El Paso 915-833-4400
TX Fort Worth 817-232-9500
TX Houston 713-776-6400
TX Irvine 214-556-1950
TX Richardson 214-231-6101
TX San Antonio 512-494-9336
UT Salt Lake City 801-974-1700
VA Richmond 804-747-7750
WA Bellevue 206-643-4000
WA Spokane 509-922-7000
WV Charleston 304-925-0492
WI Brookfield 414-784-8800

HEXACON ELEC., 161 W. Clay Ave., Roselle Park, NJ 07204, Tel: 201-245-6200, Telex: 13-8812; Empl.: 150; *Sls. Mgr.:* Robert L. Miller ..... **C•1739**

Local Sales Offices & Reps

AL Huntsville, BJR Mfrs. Reps. 205-881-3569
AZ Tucson, Ross IV Assocs. 602-299-1425
CA Newport Beach, Ross IV Assocs. 714-650-5542
CA Sunnyvale, J. F. Pell Co. 408-730-5869
CO Littleton, Production Equip. Sls. 303-795-5022
CT E. Woodstock, H & M Assocs. 203-928-9442
FL Merritt Island, J. A. Kennedy Co. 305-452-9821
IL Elk Grove Village, Bradley Reps. 312-228-8450
IN Indianapolis, Bradley Reps, Ind. 317-631-3106
MD Phoenix, B&W Mktg. 301-592-8907
MN Edina, Pec/Levi 612-944-8540
NJ Jersey City, Dunn & Bryan 201-963-4478
NY New Hartford, V. Clair 315-735-8122
OH Solon, KDF Co. 216-248-8010
OR Gladstone, Northcoast Mfrs. Agy. II 503-657-9427
PA West Chester, B&W Mktg. 215-692-7155
TX Dallas, P. J. Scanlon 214-231-4661
WA Seattle, Northcoast Mfrs. Agy. 206-284-5024
EXP NY, New York, W. D. Blood & Co. 212-344-0210

HEYCO MOLDED PRODUCTS, Box 160, Kenilworth, NJ 07033, Tel: 201-245-0033, 800-526-4182, Telex: 844771; FSC No.: 28520; Empl.: 135 ..... **C•1227**

Local Distributors

Intl Australia, Kilkenny, Werner Elctrn. Inds. 268-2766
Intl Austria, Braunau/Inn, Albert Berner 07722-2211
Intl Belgium, Bruxelles, N.V. Beluma S.A. ... 02-427-42-15
Intl Denmark, Herlev, Harttung Fasteners A/S 02-84-11-00
Intl England, Wimborne, Heyco Mfg. 0202-89-68-28
Intl Finland, Tampere, United Shoe Mach. 28-180
Intl France, Paris, M.F.O.M. 205-67-39
Intl Germany, Giessen, Heyman Mfg. 0641-76250
Intl Hong Kong, North Point, S & T Entprs. ... 5-784-0921
Intl Israel, Tel Aviv, Helet Trading Ltd. 216-157
Intl Italy, Milan, Elektrozubehor 02-74-90-541
Intl Japan, Tokyo, Hakuto Co. Ltd. 03-341-2611
Intl Korea, Seoul, Phoenix Corp. 261-5768
Intl Mexico, Mexico City, Retenes y Refacciones Ind. 5-754-0503
Intl Netherlands, Diemen, Onkenhout & Onkenhout B.V. 020-90-40-40
Intl Norway, Oslo, United Shoe Mach. 02-21-86-50
Intl S. America, Columbia - Cordoba, Ira Export 40-4648
Intl Singapore, 1334, S & T Entprs. 745-9235
Intl South Africa, Durban, Three-D Agencies 23-42-61
Intl South Africa, Johannesburg, Three-D Agencies 825-5065
Intl South Africa, Port Elizabeth, Three-D Agencies 52-1644
Intl Sweden, Orebro, United Shoe Mach. ... 019-12-42-30
Intl Switzerland, Hunzenschwil, Agro AG 064-472-61
Intl Taiwan, Taipei, Shigma Inc. 771-3403
Can Toronto, Ont., Cords Canada 416-787-1114

HGA ELCTRNS., 519 S. Fifth Ave., Mt. Vernon, NY 10550, Tel: 914-664-5393; Empl.: 2

HH CONTROLS CO., INC., 16 Frost St., Arlington, MA 02174, Tel: 617-646-2626; Empl.: 13

HHK IND., Telan Int., Rte. 611, P. O. Box 690, Plumsteadville, PA 18949, Tel: 215-766-0990; *Sls. Mgr.:* Fred Yodis; *Dist. Mgr.:* Fred Yodis

HICKOK ELEC. INSTR., 10514 DuPont Ave., Cleveland, OH 44108, Tel: 216-541-8060, TWX: 810-421-8286; Empl.: 450; *Sls. Mgr.:* Norm Holliday; *Dist. Mgr.:* Jeff Snider

HICO HORIZONS INTL CO., See Maxon Precision Motors

HI G, CO., INC., 580 Spring St., Windsor Locks, CT 06096, Tel: 203-623-2481

HI-G COMPANY, A Subsidiary of Nytronics Inc., 101 Locust St., Hartford, CT 06114, Tel: 203-522-8600, Telex: 643394, TWX: 710-425-1379; FSC No.: 02289; Empl.: 550; *Sls. Mgr.:* J. Parsons ..... **B•1398-1407**

Local Sales Offices & Reps

AL Huntsville, L & D Inc. 205-837-1469
AZ Phoenix, Westrep 602-997-8899
CA Anaheim, Westrep 213-404-3881
CA San Diego, Westrep 619-566-6580
CA Santa Clara, Westrep 408-988-8833
CO Englewood, Omega 303-762-1921
FL Melbourne, Beacon 305-724-8010
IL Highland Park, Bransky Sls. 312-433-2375
IN Fort Wayne, Given Corp. 219-432-5585
IA Cedar Rapids, Lorenz Sls. 319-377-4666
KS Overland Park, Advanced Tech. Sls. .. 913-642-6675
MD Pikesville, Imagitron Sls. Co. 301-521-2020
MA Woburn, Astrorep New England 617-938-6692
MI Ann Arbor, Elliott Sls. Co. 313-662-4087
MN St. Paul, Repco 612-642-2828
MO St. Louis, Advanced Tech. Sls. 314-878-2921
NE Lincoln, Lorenz Sls. 402-475-4660
NJ Perth Amboy, Astrorep 201-826-8050
NY Babylon, Astrorep 516-422-2500
NY Fayetteville, Tri-Tech Elctrns. 315-446-2881
NY Ronkonkoma, Hallmark Elctrns. 516-737-0600
NC Greensboro, L & D Inc. 919-292-3201
OH Miamisburg, Elctrns. Comps., Inc. 513-866-3340
OK Tulsa, Bonser-Philhower Sls. 918-744-9964
OR Wilsonville, RTS 503-638-5670
TX Richardson, Bonser - Philhower Sls. .. 214-234-8438
WA Vashon, RTS 206-285-1363
WI Cedarburg, Bransky Sls. 414-377-6837

Local Distributors

AL Huntsville, Hallmark Elctrns. 205-837-8700
AZ Phoenix, Hallmark Elctrns. 602-243-6601
AR Little Rock, Electro Entprs. 501-664-9207
CA Chatsworth, IEC/Jaco 818-998-2200
CA San Diego, Hallmark Elctrns. 619-268-1201
CA San Jose, Cypress Elctrns. 408-945-8400
CA Santa Ana, Norstan Elctrns. 714-250-4903
CA Sunnyvale, Bell Inds. 408-734-8570
CA Torrance, Cypress Elctrns. 714-761-3366
CA Tustin, Hallmark Elctrns. 714-669-4700
CO Englewood, Hallmark Elctrns. 303-790-1662
CT Branford, A.C.I. 203-481-9335
CT Wallingford, Hallmark Elctrns. 203-269-0100
FL Clearwater, Hallmark Elctrns. 305-530-4543
FL Ft. Lauderdale, Hallmark Elctrns. 305-971-9280
FL Orlando, Hallmark Elctrns. 305-855-4020
GA Norcross, Hallmark Elctrns. 404-447-8000
IL Bensenville, Hallmark Elctrns. 312-860-3800
IL Northbrook, Classic Comps. 312-272-9650
IN Indianapolis, Classic Comps. 317-872-4777
KS Lenexa, Hallmark Elctrns. 913-888-4747
KS Wichita, Lee Prods. 316-264-2172
MD Columbia, Hallmark Elctrns. 301-988-9800
MA Waltham, QPL Elctrn. Distrs. 617-229-2424
MA Woburn, A.C.I. Elctrns. 617-935-7230
MA Woburn, Hallmark Elctrns. 617-935-9771
MN Bloomington, Hallmark Elctrns. 612-834-3223
MN St. Paul, Ragon Elctrns. 612-642-2828
MO Maryland Heights, Hallmark Elctrns. ... 314-291-5350
NJ Cherry Hill, Hallmark Elctrns. 609-424-7300
NJ Fair Lawn, Relay Specialties 201-797-3313
NJ Fairfield, Hallmark Elctrns. 201-575-4415
NM Albuquerque, Bell Inds. 505-292-2700
NY Farmingdale, Midway 516-293-6800
NY Hauppauge, Jaco Elctrns. 516-273-5500
NY Hauppauge, Sherburn Elctrns. 516-231-4300
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY Ron Kon Koma, Hallmark Elctrns. 516-737-0600
NC Raleigh, Hallmark Elctrns. 919-832-4465
OH Solon, Hallmark Elctrns. 216-349-4632
OH Westerville, Hallmark Elctrns. 614-891-4555
OK Oklahoma City, Electro Entprs. 405-478-1752
OK Tulsa, Hallmark Elctrns. 918-665-3200
TX Austin, Hallmark Elctrns. 512-837-2814
TX Dallas, Hallmark Elctrns. 214-341-1147
TX Houston, Hallmark Elctrns. 713-781-6100
UT Salt Lake City, Bell Inds. 801-972-6969
WI New Berlin, Classic Comps. 414-786-5300
WI Oak Creek, Hallmark Elctrns. 414-761-3000
Can Toronto, Designtronics 416-936-0196

HIGH ENERGY, Lower Valley Rd., Parkesburg, PA 19365, Tel: 215-593-2800, Telex: 759888, TWX: 510-0663-0332; Empl.: 100

HIGHLAND TECHNOLOGY, INC., 320 Judah Street, San Francisco, CA 94122, Tel: 415-753-5814

Advertisement

Electronic energy metering products for commercial and industrial applications. Product line includes packaged volt/amp/watt/kmh meters with local display, data logging, and integral RS232 or modem. Also available are remote-readable pulse count meters, PC-based headend computers, and data acquisition/trend/billing software.

Local Sales Offices & Reps

CA Pleasanton, Pluta & Assocs., Inc. 415-829-9020

HIGH REL BURN-IN, Riverside Assoc. Inc., 2326 Kruse Dr., San Jose, CA 95131, Tel: 408-946-1300; Empl.: 18

HIGHTEMP RESINS, INC., 225 Greenwich Ave., Stamford, CT 06902, Tel: 203-357-7401; Empl.: 5

HIGH VOLTAGE ENGRG. CORP., S. Bedford St., Burlington, MA 01803, Tel: 617-272-1313, TWX: 710-332-0245; Empl.: 750

HILEVEL TECH., INC., 18902 Bardeen Way, Irvine, CA 92715, Tel: 714-752-5215, Telex: 655316; *Sls. Mgr.:* Norbert Laengrich

HILTON INDUSTRIES, INC., Div. of Core Industries, 1177 Cattlemen Road, Sarasota, FL 33582, Tel: 813-371-2600, TWX: 810-864-4363; Empl.: 125; *Sls. Mgr.:* F. Moloney

HILTRONICS CORP., 111 S. Liberty Dr., Stony Pt., NY 10980, Tel: 914-942-1222

HIPOTRONICS, P.O. Drawer A, Brewster, NY 10509, Tel: 914-279-8091, Telex: 425476 (Ams. Back:Hipo UI), TWX: 710-574-2420 (Ams. Back:Hipo Brws NY); Empl.: 200; *Sls. Mgr.:* Steve Peschel ..... **A•2154-2156; D•1238-1240, 1658-1659, 1934-1935**

Local Sales Offices & Reps

AL Birmingham, E. J. Ruth Assocs. 205-979-0880
AZ Phoenix, Qualtech 602-998-1848
CA Pasadena, RDX Corp. 213-681-3451
CA San Diego, RDX Corp. 619-292-7744
CA Sunnyvale, RDX Corp. 408-734-4500
CO Denver, E. C. Rudy Co. 303-433-1660
CT Meriden, Abbott Allison Co. 203-481-0405
FL Ft. Lauderdale, Powercom Engrg. Corp. 305-463-6059
HI Honolulu, B. F. Wittenberg 808-833-1602
IL Hawthorne Woods, Ryan & Assocs. ... 312-438-2905
IN Ossian, Science Sls. 219-622-7383
KS St. Louis, Fitzgerald Sls. Co. 314-862-1660
MN Edina, Ainslie Co. 612-920-2996
NJ East Orange, Friedman Assocs. 201-964-6200
NM Albuquerque, Hewitt & Assocs. 505-229-7746
NY Cazenovia, Peter De Cew Agy. 315-655-8602
PA Downingtown, Kenn Ebert-Hipotronics 215-269-5898
TX Richardson, Hipotronics-Dusty Arnold 214-644-7607
WA Bellevue, Topp Engrg. Sls. Corp. 206-747-5400
Can Scarborough, Ont., A.B. Chance of Can. 416-759-1144

HIRAM JONES

HIRAM JONES ELCTRNS., 11607 Vanowen St., No. Hollywood, CA 91605, Tel: 213-875-0213; FSC No.: 04867; Empl.: 8 ..... **C•1228-1231**

Local Distributors

TX Houston, Lenert Co. 713-225-1465

Hirschmann

RICHARD HIRSCHMANN OF AMERICA, Industrial Row, Riverdale, NJ 07451, Tel: 201-835-5002, Telex: 133576; *Sls. Mgr.:* C. Patten ..... **C•1232-1237**

HISONIC, INC., 249 N. Troost, P.O. Box 1130, Olathe, KS 66061-1130, Tel: 913-782-0012, Telex: 4-2562; FSC No.: 11402; Empl.: 130; *Sls. Mgr.:* W. S. Bonebright ..... **A•1610, 2157**

Local Sales Offices & Reps

AL Huntsville, MacKay, Smith & Assocs. .. 205-539-8000
AZ Scottsdale, Arcom Sls., Inc. 602-947-5745
FL Ft. Lauderdale, MacKay, Smith & Assocs. 305-467-3888
FL Madeira Beach, MacKay, Smith & Assocs. 813-393-7144
FL Orlando, MacKay, Smith & Assocs. ... 305-277-1513
FL St. Petersburg, MacKay, Smith & Assocs. 813-393-7144
GA Atlanta, MacKay, Smith & Assocs. 404-449-7444
KS Shawnee Mission, Florence & Meyer 913-722-5210
MO St. Louis, Florence & Meyer 913-722-5210
NC Cary, MacKay, Smith & Assocs. 919-467-5400
NC Charlotte, MacKay, Smith & Assocs. .. 704-372-1188
NC Raleigh, MacKay, Smith & Assocs. 919-851-5000
TX Houston, AID Elctrns. 713-777-3882
TX Irving, AID Elctrns. 214-259-4761

HITACHI AMERICA, 1800 Bering Dr., San Jose, CA 95112, Tel: 408-292-6404, Telex: 17-1581, TWX: 910-338-2103; *Sls. Mgr.:* Jack Ordway; *Dist. Mgr.:* Michael Barthman

HITACHI AMERICA, LTD., 59 Route 17 South, Allendale, NJ 07401, Tel: 201-825-8000, Telex: (WU) 642734; *Sls. Mgr.:* William J. Pearson

HITACHI DENSHI AMERICA LTD., Test & Meas. Div., 175 Crossways Pkwy. W., Woodbury, NY 11797, Tel: 516-921-7200, TWX: 510-221-1899; Empl.: 110

HI-TECH COMPONENTS, Mitsubishi International Corp., 520 Madison Ave., New York, NY 10022, Tel: 212-605-2607; Empl.: 10; *Sls. Mgr.:* Bill Adikes; *Dist. Mgr.:* Fred Weiner ..... **A•2018-2019; B•1239**

Local Sales Offices & Reps

AL Huntsville, Beacon Sls. Co. 205-881-5031
AZ Tucson, WJM Sls. Co. 602-888-4847
CA San Diego, De Pierre & Assocs. 619-578-2555
CA San Jose, Q.C.I. 408-942-1070
CA Tustin, S.C.S.C.S.C. 714-731-9206
CT Southington, The Orion Grp. 203-621-8371
FL Boca Raton, Beacon Sls. Co. 305-392-3500
GA Atlanta, Beacon Sls. Co. 404-256-9640
IL Rolling Meadows, Eagle Tech. Sls. 312-991-0700
MA Wakefield, The Orion Grp. 617-245-5220
MI Novi, Action Comp. Sls. 313-349-3940
MN St. Paul, State of The Art Comps. 612-646-8178
NY Great Neck, F & F Metro, Inc. 516-482-4080
NY Syracuse, Leonard D. Allen, Inc. 315-437-8387
NC Raleigh, Beacon Sls. Co. 919-787-0330
OH Medina, J. C. Hofstetter Co. 216-241-4880
TX Richardson, O.M. Sls., Inc. 214-690-6746

HI-TECH, INC., 3600 16th St., Zion, IL 60099, Tel: 312-746-2447; Empl.: 35 ..... **C•1642**

Local Sales Offices & Reps

AL Birmingham, Wade Prods. 205-822-5546
AR Fort Smith, Electro-Related Prods. 501-452-4030
CA San Francisco, Serra Assocs. 415-964-4300
CA Woodland Hills, Glenn M. Stevenson Co. 213-348-5506
CO Denver, Palmer Assocs. 303-233-9423
CT South Windsor, Maher Assocs. 203-644-2481
FL Orlando, Alcott Prods. Co. 305-295-5457
KS Derby, Jay-Len Assocs. 316-788-1594
MA Lynn, Maher Assocs. 617-581-3244
MI Sheridan, MacDougall and Assocs. ... 517-291-3334
MN Minneapolis, Elec. Comp. Sls. 612-933-2594
NJ River Edge, Maher Assocs. 201-261-2225
NY Rochester, Talty Assocs. 716-323-1210
NC Fairview, Maher Assocs. 704-628-2191
OH Seven Hills, Nenaoal Entprs. 216-524-4293
OR Beaverton, Gauss Inds. 503-629-9692
TN Chattanooga, Wade Prods. Co. 615-266-2262

HITRAN
Division of AGEX

HITRAN CORP., Agex, Rte. 31, RD 5-65, Flemington, NJ 08822, Tel: 201-782-5525, Telex: 833701/AGEX/FLEM; FSC No.: 27672; Empl.: 120; *Sls. Mgr.:* Chris Hughes ..... **A•2158; D•1660, 1936-1937**

Local Sales Offices & Reps

AL Huntsville, Mac Kay, Smith & Assocs. 205-539-8000
CA Los Angeles, RF Assocs. 213-478-1586
CA Palo Alto, RF Assocs. 415-494-3331
CO Denver, Calvert Controls 303-428-4852
CT Ridgefield, Manning & Assocs., Inc. ... 203-438-5027
FL Ft. Lauderdale, MacKay, Smith & Assocs. 305-467-3888
FL Orlando, MacKay, Smith & Assocs. ... 305-423-4353
FL St. Petersburg, MacKay, Smith & Assocs. 813-393-7144
GA Atlanta, MacKay, Smith & Assocs. 404-449-7444
ID Boise, Calvert Controls 208-343-3964
NY Moravia, Electrotech Sys. 315-497-1598
NC Charlotte, MacKay, Smith & Assocs. .. 704-372-1188
NC Raleigh, MacKay, Smith & Assocs. 919-851-5000
OH Dayton, Mohawk Intronics 513-434-8873
OR Eugene, Calvert Controls 503-683-2018
OR Portland, Calvert Controls 503-222-6473
PA Fort Washington, Hostvedt-Pavoni, Inc. 215-643-5757
PA Pittsburgh, Greye Glass Assocs. 412-366-6664
UT Salt Lake City, Calvert Controls 801-531-8129
VA Charlottesville, Marktron 804-973-5874
WA Seattle, Calvert Controls 206-447-9375
WA Spokane, Calvert Controls 509-244-3601
WA Tri-Cities, Calvert Controls 509-545-4506

Local Distributors

FL Orlando, Elctrn. Tech. 305-291-1047
PA Plymouth Meeting, Data Envrts. 215-825-5950

HIVEC/ASTRODYNE, INC., 35 Executive Dr., Hudson, NH 03051, Tel: 603-880-8600; FSC No.: 28023; Empl.: 45; *Sls. Mgr.:* Warren Heinzelmann; *Dist. Mgr.:* Warren Heinzelmann

HM ELCTRNS., 6151 Fairmount Ave., San Diego, CA 92120, Tel: 619-280-6050, Telex: 697-122; Empl.: 55; *Sls. Mgr.:* John Kenyon

HMW ENTERPRISES, INC., 604 Salem Road, Etters, PA 17319, Tel: 717-938-4691, TWX: 510-650-3536; FSC No.: 06A150; Empl.: 40; *Sls. Mgr.:* Gerhard Schmutz

HOBART ENGRG., 4143 Cheshire Dr., Cypress, CA 90630, Tel: 714-827-2135; *Sls. Mgr.:* D. C. Hobart

HOBBS, Div. of Steward Warner, Ash at Yale Blvd., Springfield, IL 62705, Tel: 217-753-7600

HOBSON BROS., 4940 W. Lawrence Ave., Chicago, IL 60630-3884, Tel: 312-283-3600; Empl.: 75; *Sls. Mgr.:* H. L. Behm

Local Sales Offices & Reps

CA Fremont, Spence Assocs. 415-656-9506
CA Los Angeles, Corcoran Assocs. 213-823-4589
IN Indianapolis, Specialty Mfrs. 317-241-1111
NY Buffalo, R. W. Mitscher Co. 716-633-7970
NC Raleigh, R. W. Mitscher Co. 919-848-0941
WA Bothell, Temco Northwest 206-488-1254

HODGE MANUFACTURING CO., INC., 55 Fisk Ave., Springfield, MA 01107, Tel: 413-781-6800, TWX: 710-350-7583

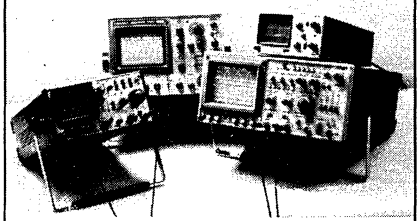
HOFFMAN, P.R., CO., DIV. AIKEN INDS., See Hoffman, P.R., Co.

HITACHI

AUTHORIZED DISTRIBUTOR

SUNSHINE

THE SOURCE FOR METERS & TEST EQUIPMENT



Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT
(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area
(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

HITACHI
Hitachi Denshi, Ltd.

Oscilloscopes, Video Monitors, CCTV Cameras and Monitors

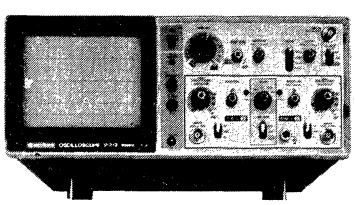
Authorized Distributors

RAG ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



Model V-212

HOFFMAN, P. R., CO., MATERIALS PROCESSING DIV., Amstar Tech. Prods. Co., Inc., 321 Cherry St., Carlisle, PA 17013, Tel: 717-243-2011, TWX: 510-650-2285; Empl.: 125; *Sls. Mgr.:* Lee Kingsborough

HOFFMAN ENGRG., Federal Cartridge, 9th & Tyler Sts., Anoka, MN 55303, Tel: 612-421-2240, Telex: 29-0499, TWX: 910-578-2211; *Sls. Mgr.:* Larry Muehlbauer

HOFFMAN ENGINEERING CORP., P.O. Box 300, Old Greenwich, CT 06870, Tel: 203-325-8933, Telex: 643621; FSC No.: 06097; Empl.: 35; *Sls. Mgr.:* Jeffrey O. Brown

HOFFMAN INDUSTRIAL PRODS., 170 Allen Blvd., Farmingdale, NY 11735, Tel: 516-293-5244, Telex: 14-4578; Empl.: 30; *Sls. Mgr.:* Sy Friedman; *Dist. Mgr.:* J. Dunnells

HOKE, 1 Tenakill Pk., Cresskill, NJ 07626, Tel: 201-568-9100, Telex: 135428; *Sls. Mgr.:* Mark Christensen; *Dist. Mgr.:* Len Bruscia

HOLADAY INDUSTRIES, INC., 14825 Martin Drive, Eden Prairie, MN 55344, Tel: 612-934-4920, Telex: 290922; *Sls. Mgr.:* Burton Gran

HOLIDAY-HAMMOND CORP., 220 S. 2nd Street, Waco, TX 76701, Tel: 817-756-7401, TWX: 910-350-7188; Empl.: 30; *Sls. Mgr.:* Pat Holiday

HOLLEX, INC., 81 W. Wyoming Ave., Melrose, MA 02176, Tel: 617-665-2413; Empl.: 28; *Sls. Mgr.:* H. E. Holley; *Dist. Mgr.:* H. E. Holley

HOLLINGSWORTH SOLDERLESS TERMINAL CO., See Electronic Connector Div.-Midland Ross

HOLLIS ENGRG., INC., Charron Ave., Box 1189, Nashua, NH 03061, Tel: 603-889-1121, TWX: 710-228-1881; Empl.: 121; *Sls. Mgr.:* R. Abercrombie

HOLLIS ENGRG./WIRE-WRAP, 15 Charron Ave., Nashua, NH 03061, Tel: 603-889-1121, Telex: 710-2281881; Empl.: 250; *Sls. Mgr.:* Gary Barrett

HOLMBERG ELECTRONICS

HOLMBERG ELCTRNS., Asheville Hwy., Inman, SC 29349, Tel: 803-472-4141, TWX: 810-690-2302; Empl.: 300; *Dist. Mgr.:* Frank Pellatt ..... **C•1239-1270**

Local Sales Offices & Reps

AZ	Phoenix, JR Engrg.	602-956-4670
AZ	Scottsdale, Fred Board & Assocs.	602-994-9388
AR	Little Rock, Erickson Sls., Inc.	501-255-7379
CA	Costa Mesa, Berman Gravely	714-549-2122
CA	San Diego, Hadden Assocs., Inc.	619-565-9444
CA	San Jose, Class 1 Elctrns.	408-297-8666
CO	Aurora, Electrodyne	303-695-8903
FL	Boca Raton, Lawrence Assocs., Inc.	305-368-7373
FL	Clearwater, Lawrence Assocs., Inc.	813-584-8110
GA	Lawrenceville, B.T.F., Inc.	404-963-9495
IL	Cary, ECRO, Inc.	312-639-1162
IN	Indianapolis, Electronic Mktg. Conslts.	317-253-1668
LA	Chalmette, Erickson Sls., Inc.	504-271-1976
MA	Hopedale, H.E.S. Comps.	617-473-4324
MI	Novi, Lektronics	313-349-3304
PA	Philadelphia, Check Assocs.	215-487-3007
NJ	Manville, Dynorep, Inc.	201-685-0135
NM	Alburquerque, Fred Board & Assocs.	505-293-1399
NY	Morrisville, Promark Elctrns.	315-662-3310
NC	Raleigh, B.T.F., Inc.	919-782-3493
OH	Dayton, Del Steffen & Assocs., Inc.	513-293-3145
OK	Broken Arrow, Erickson Sls., Inc.	405-682-2947
OR	Beaverton, Eclipse Mktg. Grp.	503-642-1661
TX	Austin, Erickson Sls., Inc.	512-244-3068
TX	Dallas, Erickson Sls., Inc.	214-739-5833
TX	Houston, Erickson Sls., Inc.	713-266-1604
UT	Salt Lake City, Electrodyne	801-486-3801
VA	Herndon, Stinson Assocs.	703-620-0088
WA	Redmond, Eclipse Mktg. Grp.	206-885-6991
PR	Caguas, K.D. Tronics	809-746-0275
Can	Rexdale, Ont., Frank Eakin Sls., Ltd.	416-245-3600

Local Distributors

AZ	Mesa, Bergquist Co.	602-986-4271
AZ	Phoenix, Arizona Comps. Co.	602-269-5655
AZ	Tempe, Bell Inds.	602-966-7800
CA	Belmont, Lodan, Inc.	415-592-4600
CA	Cerritos, El-Com Sls.	619-739-5656
CA	Riverside, Electronic Supp.	714-787-9220
CA	Sacramento, Integrated Elctrns.	916-424-5297
CA	San Diego, El-Com Sls.	619-578-0900
CA	San Diego, Electronic Supp.	619-693-8222
CA	San Francisco, Peters-De-Laet	415-873-9595
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Santa Clara, El-Com Sls.	408-496-0800
CA	Santa Clara, Peters-De-Laet	415-980-9243
CO	Denver, CSID Elctrns.	303-292-9594
CO	Englewood, Industrial Elctrns.	303-694-9444
CT	Yalesville, Schaal Assocs.	203-269-3779
FL	Ft. Lauderdale, K.S.M. Elctrns.	305-971-5900
FL	Longwood, Intertec Comps., Inc.	305-834-7777
FL	Winter Park, Deanco	305-671-5100
GA	Atlanta, K.S.M. Elctrns.	404-458-2013
GA	Cumming, Pan American	404-577-2113, 800-554-9796
GA	Marietta, Deanco	404-429-0126
IL	Addison, K.S.M.	312-953-9473
IL	Arlington Heights, Lodan Elctrns.	312-398-5311
IL	Lisle, Components, Inc.	312-852-7707
IN	Indianapolis, RM Indiana, Inc.	317-291-7110
IA	Cedar Rapids, Bergquist Co.	319-366-8733
MD	Baltimore, Whitney Distrs.	301-944-8080
MD	Beltsville, Resco/Baltimore	301-937-9100
MD	Gaithersburg, Deanco	301-948-5444
MD	White Marsh, Resco/Baltimore	301-529-0500
MA	Burlington, Deanco, Inc.	617-272-1506
MA	Burlington, Schaal Assocs.	617-272-7940
MA	Natick, Tec-Con Elctrns., Inc.	617-655-9333
MI	Farmington Hills, Prehler	313-473-7200, 800-321-5982
MN	Bloomington, Prehler	612-854-6780
MN	Minneapolis, Bergquist Co.	612-835-2322
MO	Kansas City, Finnigan Elctrns.	816-421-4277
NJ	Fairfield, Deanco	201-575-7960
NJ	Rockaway, Tonar Inds.	201-884-1400
NY	Farmingdale, Tri-Start Elctrns.	516-293-0400
NY	Hauppauge, Schaal Assocs.	516-434-7100
NY	Ithaca, Deanco	607-257-4444
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NY	Mt. Vernon, QAR Inds. Elctrn. Sls., Inc.	914-699-2224
NY	Rome, Rome Elctrns.	315-337-5400,315-735-2249
NC	Raleigh, Century Elctrns.	919-872-2203
NC	Raleigh, Deanco	919-851-2065
OH	Dayton, Televox, Inc.	513-294-4499
OH	Middleburg Hts., Prehler	216-243-5510, 800-824-0178
OR	Beaverton, Murphy Elctrns.	503-642-2001
OR	Lake Oswego, Bell Inds.	503-241-4115
PA	McKean, Advacom, Inc.	814-476-7774
PA	Montgomeryville, Pytronic Inds., Inc.	215-643-2850
PA	Norristown, Century Elctrn. Comps.	215-631-5400
TX	Addison, Connec/Tek, Inc.	214-733-4411
TX	Corpus Christi, Douglas Elctrns.	512-883-5103
TX	Fort Worth, Texas Connector Corp.	817-246-0109
UT	Salt Lake City, Diplomat	800-453-5503
VA	Virginia Beach, Deanco	804-460-3558
WA	Bellevue, Bell Inds.	206-747-1515
WA	Redmond, Murphy Elctrns.	206-881-1234
WI	Hartland, G.W. Elctrns.	414-367-6003
WI	New Berlin, RM Elctrns.	414-784-4420
EXP	CA, Irvine, Product Supp. Co.	714-250-0622
Can	London, Ont., C.M. Peterson Co., Ltd.	519-434-3204
Can	Scarborough, Ont., Carsten-Elctrns., Ltd.	416-495-7705,416-495-9999
Can	Vancouver, L.A. Varah, Ltd.	604-873-3211

HOLT INC., 9351 Jeronimo Rd., Irvine, CA 92718, Tel: 714-859-8800, Telex: 753307; Empl.: 77; *Sls. Mgr.:* Ed Fernandez

HOLUB INDUSTRIES, 1701 W. Bethany Rd., Sycamore, IL 60178, Tel: 815-895-6501, Telex: 25-7359; Empl.: 90; *Sls. Mgr.:* R. J. Morrison

HONEYWELL INC., Aerospace & Defense Grp., Honeywell Plaza, Minneapolis, MN 55408, Tel: 612-870-5186, TWX: 910-576-2692; Empl.: 15,000

HONEYWELL INC., Commercial Div., MN 27-7246, Honeywell Plaza, Minneapolis, MN 55408, Tel: 612-870-5357; Empl.: 3000; *Sls. Mgr.:* Doyle G. Adams

HONEYWELL INFO. SYS., 200 Smith St., MS 440, Waltham, MA 02154, Tel: 617-895-6000

HONEYWELL MICRO SWITCH DIV., See Micro Switch, a Honeywell Division

HONEYWELL OPTOELECTRONICS, 830 E. Arapaho Dr., Richardson, TX 75080, Tel: 214-234-4271, Telex: 73-0890; Empl.: 300; *Sls. Mgr.:* Joe Tucker; *Dist. Mgr.:* Joe Tucker

HONEYWELL, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034, Tel: 800-321-5111, Ext. 596; Empl.: 2500

HONEYWELL, Test Instrs. Div., P.O. Box 5227, Denver, CO 80217, Tel: 303-773-4700, Telex: 45793 DVR; Empl.: 850; *Sls. Mgr.:* Frank Doherty

THE HOOSIER MAGNETICS GROUP, Hoosier of Ohio, Inc., 700 North Wheeling Street, Toledo, OH 43607, Tel: 419-698-8087; Empl.: 90

HOOSIER MAGNETICS, INC., 520 E. Van Trees St., P.O. Box 753, Washington, IN 47501, Tel: 812-254-1901; Empl.: 90

HOOSIER OF NEW YORK, INC., Lower Denny Street, P.O. Box 372, Ogdensburg, NY 13669, Tel: 315-393-2293; Empl.: 90

HOPKINS ENGRG., 12900 Foothill Blvd., San Fernando, CA 91342, Tel: 213-361-8691, TWX: 910-496-1531; FSC No.: 02777; Empl.: 100; *Sls. Mgr.:* Gary M. Smith; *Dist. Mgr.:* Clyde M. Salisbury

HOPT, KARL, CO., 118 First Ave., Atlantic Highlands, NJ 07716, Tel: 201-291-0633, Telex: 132496; Empl.: 400; *Sls. Mgr.:* G.C. Ellis

HOTPACK CORP., Heinicke Instrs., 10940 Dutton Rd., Philadelphia, PA 19154, Tel: 215-824-1700, 800-523-3608, TWX: 710-670-1694; FSC No.: 66; Empl.: 100; *Sls. Mgr.:* Tim Fitzgerald

Hotpack is a manufacturer and is sold direct. To contact the salesman in your area call 800-523-3608 or 215-824-1700.

HOTTINGER BALDWIN MEASUREMENTS, 139 Newbury St., Framingham, MA 01701, Tel: 617-875-8282, Telex: 94-8499; Empl.: 179; *Sls. Mgr.:* Robert Haggerson

HOUSE OF METAL ENCLOSURES, 500 W. 9th St., Box 225, Hermann, MO 65041, Tel: 314-486-3111; Empl.: 100; *Sls. Mgr.:* Richard L. Kastel

HOUSTON INSTRUMENT, 8500 Cameron Rd., Austin, TX 78753, Tel: 512-835-0900, TWX: 910-874-2022; Empl.: 450; *Dist. Mgr.:* Rod Schaffner

HOWARD INDUSTRIES, MSL Ind., Inc., Box 287, Milford, IL 60953, Tel: 815-889-4105, TWX: 910-642-2950; FSC No.: 815-889-4105; Empl.: 500; *Sls. Mgr.:* Ralph Young; *Dist. Mgr.:* Alan Mancuso

HOWELL INSTRS., 3479 W. Vickery Blvd., Ft. Worth, TX 76107, Tel: 817-336-7411, Telex: 75-8233; FSC No.: 98869; Empl.: 180; *Sls. Mgr.:* Bruce Pike

HTL ELECTRO KINETICS, 402 E. Gutierrez St., Santa Barbara, CA 93101, Tel: 805-963-2055, TWX: 910-334-1177; Empl.: 180; *Sls. Mgr.:* Robert E. Lynch

HUDSON TOOL & DIE CO., INC., 18 Malvern St., Newark, NJ 07105, Tel: 201-589-1800, TWX: 710-995-4445; FSC No.: 02875; Empl.: 300; *Sls. Mgr.:* William Miller

HUGHES AIRCRAFT CO., 6155 El Camino Real, Carlsbad, CA 92008, Tel: 619-931-3000, TWX: 910-322-1393; Empl.: 1000

HUGHES AIRCRAFT CO, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009, Tel: 213-670-1515, Telex: 67222, TWX: 213-871-5210; *Sls. Mgr.:* W. L. Pemberton

HUGHES AIRCRAFT CO., Connecting Devices Div., 17150 Von Karman Ave., Irvine, CA 92714, Tel: 714-660-5701, TWX: 910-595-2523; FSC No.: 53669; *Sls. Mgr.:* Bill Strobel

HUGHES AIRCRAFT CO., Electron Dynamics Div., 3100 W. Lomita Blvd., P.O. Box 2999, Torrance, CA 90509-2999, Tel: 213-517-6000, Telex: 67-7064, TWX: 910-347-7321; Empl.: 2,200; *Sls. Mgr.:* Robert L. Woods

HUGHES AIRCRAFT CO., Indl. Prods. Div. FACT Sys., 6155 El Camino Real, Carlsbad, CA 92008, Tel: 619-931-3000, TWX: 910-332-1393

HUGHES AIRCRAFT CO., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715, Tel: 714-752-3800, TWX: 910-595-2435; *Sls. Mgr.:* J. L. Waters

HUGHES

HUGHES AIRCRAFT COMPANY

HUGHES SOLID STATE PRODUCTS, 500 Superior Ave., Dept. E8, Newport Bch., CA 92658-8903, Tel: 714-759-2411, TWX: 910-596-1374 ..... **A•1370-1373**

Local Sales Offices & Reps

AL Huntsville, L & D Inc. 205-837-1469
AZ Phoenix, Toward Engrg. Assocs. 602-955-3193
CA Mountain View, Weseloh/Swanson ... 415-961-0565
CA San Diego, Wes-K Assocs. 619-295-3501
CA Van Nuys, Wes-K Assocs. 213-989-3070
CT Ansonia, R. H. Sturdy Co. 203-734-2186
CT Rocky Hill, R. H. Sturdy Co. 203-563-8455
FL Clearwater, Delmac Sls. 813-447-5192
FL Orlando, Delmac Sls. 305-898-4688
FL Tamarac, Delmac Sls. 305-726-1330
GA Atlanta, L & D Inc. 404-455-3483
IL Elk Grove Village, Carlson Elctrn. Sls. 312-956-8240
IN Indianapolis, J & W Sales 317-842-3740
IA Cedar Rapids, Carlson Elctrn. Sls. 319-377-6341
KS Shawnee Mission, Technical Sls. Assocs. 913-888-3330
MD Glen Burnie, Faion Lott & Co. 301-744-4611
MA Salisbury, R. H. Sturdy Co. 617-465-1505
MA Wellesley Hills, R. H. Sturdy Co. 617-235-2330
MI Livonia, Luebbe Sls. 313-477-3131
MN Minneapolis, Deming (Bill) & Assocs. 612-888-5000
MO Ferguson, Technical Sls. Assocs. 314-725-5361
NY Endwell, Tri-Tech Elctrns. 607-754-1094
NY Fairport, Tri-Tech Elctrns. 716-223-5720
NY Fayetteville, Tri-Tech Elctrns. 315-446-2881
NY Great Neck, Cooper-Simon & Co. 516-487-1142
NY Poughkeepsie, Tri-Tech Elctrns. 914-473-3880
NC Greensboro, L & D Inc. 919-292-3201
NC Raleigh, L & D Inc. 919-876-5301
OH Cincinnati, Luebbe Sls. 513-891-5770
OH Cleveland, Luebbe Sls. 216-333-0425
OH Columbus, Luebbe Sls. 614-431-0474
OH Dayton, Luebbe Sls. 513-294-0426
PA Bala Cynwyd, Electro-Comp Sls. 215-667-9360
PA Pittsburgh, Luebbe Sls. 412-931-0414
TX Dallas, Southern States Mktg. 214-248-8600
TX Houston, Southern States Mktg. 713-988-0991
WI Milwaukee, Carlson Elctrn. Sls. 414-476-2790

HUGHEY & PHILLIPS, INC., 3050 N. California St., Burbank, CA 91504, Tel: 818-849-1104, TWX: 910-498-2252; FSC No.: 94295; Empl.: 38; *Sls. Mgr.:* C.L. Phillis; *Dist. Mgr.:* C.L. Phillis

HUGIN INDS. INC., 745 Distel Dr., Los Altos, CA 94022, Tel: 415-961-2950, Telex: 348 399; Empl.: 4; *Sls. Mgr.:* Peter Hugin

Local Sales Offices & Reps

IL Chicago, Patton Sls. 312-325-2170
NJ Tenafly, D&D Engrg. 201-568-5032
NY Rochester, Irondequoit Inds. 716-544-6257
NC Fayetteville, Zim-Tek 919-488-4101
OH Dover, AJ Assocs. 216-343-2224

HULL CORP., Davisville Rd., Hatboro, PA 19040, Tel: 215-672-7800, TWX: 510-665-6822; Empl.: 200; *Sls. Mgr.:* Eldon Avery

HUMISEAL DIV., Columbia Chase Corp., 26-60 Bklyn.-Queens Expwy., Woodside, NY 11377, Tel: 718-932-0800, TWX: 710-582-2141; FSC No.: 99109;46058; Empl.: 150

HUMPHREY, INC., 9212 Balboa Ave., San Diego, CA 92123, Tel: 619-565-6631, TWX: 910-335-2001; Empl.: 220

HUNTER STANLEY ELEC., 1813 Church St., Nashville, TN 37203, Tel: 615-321-0500; FSC No.: 21675; Empl.: 10; *Sls. Mgr.:* W. D. Stanley

HUNTER TOOLS, 6721 Baymeadow Dr., Glen Burnie, MD 21061, Tel: 301-760-2200; Empl.: 450

HUNTINGTON ELECTRIC INC., P.O. Box 366, Dept. EEM 80-81, Huntington, IN 46750, Tel: 219-356-0778; *Sls. Mgr.:* Robert Smith ..... **A•1871**

Local Sales Offices & Reps

CA Chino, Tracy Elctrns. Sls. 714-591-4736
FL Lighthouse Point, Mr. Jack Krutek & Assocs., Inc. 305-941-6544
IL Arlington Heights, Rozner Sls. 312-577-0067
IN Huntington, HEI 219-356-0756
MA Burlington, Tri-Com Assocs., Inc. 617-272-8163
MN St. Louis Park, Parq Sls. 612-920-3643
MO St. Louis, Rep-Tronics 314-576-9816
NJ Medford, Champion Elctrns. Sls. Co. .. 609-983-0932
OK Tulsa, Genzel Sls. & Assocs., Inc. 918-622-7744
PA Greensberg, Pro-Mark 412-832-3800
TX Fort Worth, Component Concepts, Inc. 817-292-5803

Local Distributors

AZ Phoenix, Camco Elctrn. Comps. 602-269-6201
CA Burbank, Welco Elctrns. 213-840-9020
CA Costa Mesa, Orange County Comps., Inc. 714-979-3597
CA Los Angeles, Cal State Elctrns. 213-933-8187
CA Tustin, Cal-Tronic Sls., Inc. 714-730-0350
CA Van Nuys, EW Elctrns. 818-782-9020
FL Fort Lauderdale, NRC Elctrns., Inc. 305-772-4500
IN Huntington, HEI 219-356-0756
MI St. Clair Shores, Spemco 313-771-2700
NY Valley Stream, L & S Elctrns., Inc. 516-561-2474
OK Oklahoma City, She Elctrns., Inc. 405-843-5941

HUNTRON INSTRS., INC., 15123 Highway 99, Lynnwood, WA 98036, Tel: 206-743-3171, 800-426-9265, Telex: 152951 Hunt Inst, TWX: Lywd; FSC No.: 57705; *Sls. Mgr.:* Jim Crosson; *Dist. Mgr.:* Jim Crosson

HURRICANE ELECTRNS. LAB, P.O. Box 1280, Hurricane, UT 84737, Tel: 801-635-2003; FSC No.: 64109; Empl.: 11; *Sls. Mgr.:* C. R. Reeve

HURST MFG. CORP., Emerson Elec. Co., Box 326, Princeton, IN 47670, Tel: 812-385-2564; Empl.: 200; *Sls. Mgr.:* Jac Diano

HUTSON INDS., 1000 Hutson Cir., Frisco, TX 75034, Tel: 214-377-3557, TWX: 910-860-5051; *Sls. Mgr.:* Bill Giles

Hybricon Corporation

HYBRICON CORP., 410 Great Rd., Littleton, MA 01460, Tel: 617-486-0311, TWX: 710-347-0654; Empl.: 74; *Sls. Mgr.:* Richard W. Palmer ..... **C•1710**

Local Sales Offices & Reps

AZ Phoenix, Cristee-Meade Co. 602-867-6000
CA Inglewood, Basic Sys. Corp. 213-673-4300
CA San Diego, Basic Sys. Corp. 619-268-8000
CA Santa Clara, Basic Sys. Corp. 408-727-1800
CO Lakewood, Cristee-Meade Co. 303-232-0287
MN Minneapolis, Mark Co. 612-933-3026
NH Salem, OEM Mktg. & Sls. 603-893-0009
NY New Hartford, PDQ Assocs. 315-768-8167
OH Cincinnati, Applied Data Mgmt. 513-579-8108
OR Beaverton, Elctrns. Tech. Sls. Assoc. .. 503-641-5180
PA Huntingdon Valley, Lynbar Grp. Inc. ... 215-947-3554
TX Houston, System Tech. Assocs. 713-440-8340
VA Alexandria, Scott Corp. 703-765-7901
WA Kirkland, Elctrns. Tech. Sls. Assoc. 206-827-8086

HYBRID ELCTRNS., 142 Adams St., Newton, MA 02158, Tel: 617-527-2711; Empl.: 28; *Sls. Mgr.:* D. Kates

HYBRID SVCS. INC., 38 Main St., North Reading, MA 01864, Tel: 617-664-5500; Empl.: 45; *Sls. Mgr.:* Richard A. Vogel

HYBRID SYSTEMS CORP., 22 Linnell Circle, Billerica, MA 01821, Tel: 617-667-8700, TWX: 710-347-1575; Empl.: 250; *Sls. Mgr.:* H. Diamond

HYBRILONICS, INC., P.O. Box 217, Lasalle Sta., Niagara Falls, NY 14304, Tel: 716-731-9080, TWX: 910-333-0624; Empl.: 20

Local Sales Offices & Reps

AZ Tempe, Wm. Brierton & Assocs. 602-839-9107
CA Torrance, Basic Trade, Inc. 213-214-4677
CT Avon, Martech 203-673-5132
GA Norcross, Mountain Electro Prods. 404-448-5594
IL Woodridge, Trend-Tronics 312-985-0626
KS Overland Park, Lorenz Sls. Co. 913-649-5556
MA Peabody, OEM Sls. of New England .. 617-535-2521
MN Wayzata, White Sls. Co. 612-920-3558
NY Buffalo, Antil-Thrasher Assocs. 716-652-0423
NY Manhasset, Martech 516-627-1151
NY Syracuse, Antil-Thrasher Assocs. 315-468-2370
NC Raleigh, Mountain Electro Prods. 919-846-1514
OH Cincinnati, Bill Teplitz Assocs. 513-481-1648
OH Cleveland, Bill Teplitz Assocs. 216-439-3265
PA Langhorne, Spiral Sls. 215-968-9250
TX Arlington, Electronic Prods. Rep. 817-467-0377
VA Front Royal, Eltron Sls. 703-635-7201
WI Waukesha, Trend-Tronics 414-542-4919
Can Markham, Ont., Avotronics, Ltd. 416-475-2024

HY-CAL ENGRG., 9650 Telstar Ave., El Monte, CA 91731, Tel: 213-444-4000, Telex: 67-5548; FSC No.: 12199; Empl.: 120

HyComp, Inc.

HYCOMP INC., 75 Union Ave., Box 377, Sudbury, MA 01776, Tel: 617-443-4631, TWX: 710-347-0385; FSC No.: 34707; Empl.: 60; *Sls. Mgr.:* James Chacharone ..... **A•1670, 1872-1873**

Local Sales Offices & Reps

AL Huntsville, Magaro & Assocs. 205-882-0827
AZ Mesa, SEDCO Sls. 602-835-6281
CA Mountain View, Leddy Assocs. 415-969-6313
CA Santa Ana, Calif. Elctrn. Mktg. 714-835-2701
CT Collinsville, Dynamic Sls. of New Eng. 203-693-6567
FL Clearwater, Cherith Sls. 813-797-3004
GA Atlanta, Magaro & Assocs. 404-451-8862
IL Palatine, T-Squared Assocs. 312-991-2144
IN Ft. Wayne, Scott Elctrns. 219-484-7865
IN Indianapolis, Scott Elctrns. 317-897-9976
KS Kansas City, BC Elctrns. 913-342-1211
KS Wichita, BC Elctrns. 316-942-9840
KY Louisville, Scott Elctrns. 502-964-0640
MD Lutherville, Walker-Houck Assocs. 301-296-6021
MA Burlington, Dynamic Sls. of New Eng. 617-272-5676
MN Minnetonka, S.A.I. Mktg. Corp. 612-935-0777
MO Bridgeton, BC Elctrns. 314-291-1101
NY Lynbrook, HLJ Comp-Tech 516-599-2999
NY Rochester, Murcan Sls. Corp. 716-586-4450
NY Syracuse, Murcan Sls. Corp. 315-437-0734
NC Greensboro, Magaro & Assocs. 919-294-4783
OH Cincinnati, Scott Elctrns. 513-791-2513
OH Cleveland, Scott Elctrns. 216-473-5050
OH Kettering, Scott Elctrns. 513-294-0539
OH Reynoldsburg, Scott Elctrns. 614-863-1281
PA Norristown, Rivco January 215-631-1414
PA Pittsburgh, Scott Elctrns. 412-963-6116
TX Austin, Dyna Mktg. 512-454-3114
TX Dallas, Dyna Mktg. 214-438-6528
TX Houston, Dyna Mktg. 713-460-0314
VA Moneta, Walker-Houck Assocs. 703-297-4496
WI Racine, T-Squared Assocs. 414-633-9456

HYDRA-ELECTRIC CO., 3151 Kenwood St., Burbank, CA 91503, Tel: 213-843-6211

HYDROCAP CORP., 975 N.W. 95 St., Miami, FL 33150, Tel: 305-696-2504; Empl.: 5

HYDROSTATICS, INC., 2005 Industrial Dr., Bethlehem, PA 18017, Tel: 215-694-0121, 1-800-441-7301 Outside PA., TWX: 510-662-3306

HYLETRONICS, Newtown Rd., Littleton, MA 01460, Tel: 617-486-8911, TWX: 710-347-0656; FSC No.: 22534; Empl.: 82; *Sls. Mgr.:* Norman Hill

HYPERTRONICS CORP., 16 Brent Dr., Hudson, MA 01749, Tel: 617-568-0451, 800-225-9228, Telex: 95-1152; FSC No.: 50541; Empl.: 100; *Sls. Mgr.:* E. Dalrymple ..... **C•1271**

Local Sales Offices & Reps

AL Brownsboro, JHU Assoc. 205-536-7455
AZ Scottsdale, Western Tech. Sls. 602-991-7306
CA Mountain View, Leddy Assocs. 415-969-6313
CA N. Hollywood, Jewett Co. 213-789-8103
CO Commerce City, Williams Assocs. 303-289-5647
CT Bethany, Reps. Corp. 203-393-0024
DC Washington, Tyler Griffin Co. EN1-4821
FL Orlando, Design Mktg. 305-291-8208
GA Atlanta, Design Mktg. 404-457-5621
IL Downers Grove, Momak Sls. 312-936-6400
IN Indianapolis, CC Elctrns. 317-255-1508
KS Merriam, Midwest Tech. Sls. 913-236-8557
MD Baltimore, Tyler Griffin Co. EN9-4821
MA Wellesley, Reps. Corp. 617-237-6476
MI Lake Orion, CC Elctrns. 313-338-7400
MN St. Paul, Murnco, Inc. 612-484-8200

NJ Wayne, G.T. Assocs. 201-694-6040
NM Albuquerque, Williams Assocs. 505-255-0622
NY Fayetteville, R. D. Sherman 315-637-9861
NC Greensboro, JHU Assoc. 919-852-9097
OH Centerville, Dolfuss-Root & Co. 513-433-6776
PA Paoli, Tyler Griffin Co. 215-647-1550
TN Talbot, JHU Assoc. 615-581-4141
TX Freeport, Marathon Assoc. 409-233-7026
TX Lewisville, Marathon Assoc. 214-436-8882
UT Salt Lake City, Williams Assocs. 801-532-7701
WA Bellevue, A.I.E. Inc. 206-455-4697

HYSOL, 15051 E. Don Julian, City of Industry, CA 91746, Tel: 818-968-6511, TWX: 910-584-1342; *Sls. Mgr.:* Hugh Dotson

HY-TEC INDUSTRIES, Div. of Topo Industries, Inc., P.O. Box 91, Shoreham, NY 11786, Tel: 516-744-5062; *Sls. Mgr.:* Tom Poole

hytek

HYTEK MICROSYSTEMS, 980 University Ave., Los Gatos, CA 95030, Tel: 408-395-2300, TWX: 910-597-5393; FSC No.: 57474; Empl.: 340; *Sls. Mgr.:* Greg Kizik; *Dist. Mgr.:* Richard Fryhoff ..... **A•1522-1527, 1671**

Local Sales Offices & Reps

AL Huntsville, Reynolds & Assocs. 305-259-7000
AZ Tempe, Cantec Sls. 602-829-0191
CA Del Mar, Chapman & Chapman 619-755-0412
CA Irvine, Centaur Corp. 714-261-2123
CA Los Gatos, Pro Assocs. 408-358-3861
CO Englewood, Dynatech, Inc. 303-773-2830
CO Englewood, Dynatech, Inc. 705-773-2830
FL Melbourne, Reynolds & Assocs. 305-259-7000
FL St. Petersburg, Reynolds & Assocs. ... 305-259-7000
MA Tyngsboro, Comtech, Inc. 617-649-3030
MN Minneapolis, Components Grp. 612-374-1250
MN Minneapolis, Comps. Grp. 612-374-1250
MN Roseville, Components Grp. 612-636-5060
NV Carson City, Hytek Microsystems 702-883-0820
NM Albuquerque, Power Entprs. 505-298-1918
NY Rochester, L-Mar Assocs., Inc. 716-323-1000
NY Wantagh, Tri-Tek 516-221-7600
NC Raleigh, Reynolds & Assocs. 305-259-7000
TX El Paso, Power Entprs. 915-533-9902
TX Grapevine, Elctrns. Mktg. Assocs. 817-481-7502
TX Grapevine, Electronics Mktg. Assocs. 817-488-6583
TX Houston, Electronics Mktg. Assocs. ... 713-498-8120
Can Burnaby, B.C., GNT 604-430-3302
Can Toronto, Que., Cantec Reps. 613-725-3704

ICCI, 196 Broadway, Cambridge, MA 02139, Tel: 617-864-3270, Telex: 95-1106; *Sls. Mgr.:* Jeremiah Snow

ICI, 570 W. Lambert, Ste. C, Brea, CA 92621, Tel: 714-990-1707; Empl.: 10

I.C. INDS., Box 104, Altamonte Springs, FL 32701, Tel: 305-339-8298, Telex: 56-4303; *Sls. Mgr.:* William S. Hodges

INTERNATIONAL CONTROLS AND MEASUREMENTS CORP., P. O. Box 2578, Syracuse, NY 13220, Tel: 315-699-5262, TWX: 710-545-0235; FSC No.: 52516; Empl.: 45; *Sls. Mgr.:* Frederick W. Schulze; *Dist. Mgr.:* Robert Ford

ICON, 156 Sixth St., Cambridge, MA 02142, Tel: 617-868-5400, TWX: 710-321-1883; Empl.: 81; *Sls. Mgr.:* Irvin L. McKittrick

ICO-RALLY, 2575 E. Bayshore Rd., Palo Alto, CA 94303, Tel: 415-856-9900, Telex: 34-8335; FSC No.: 51705; Empl.: 45; *Dist. Mgr.:* Barbara Enad

ICS ELECTRONICS CORP., 2185 Old Oakland Rd., San Jose, CA 95131, Tel: 408-263-4844, TWX: 910-338-7810; *Sls. Mgr.:* Robert H. Prosin; *Dist. Mgr.:* Robert H. Prosin

ICS, INC., 520 Interstate Rd., Addison, IL 60101, Tel: 312-543-6200, TWX: 910-991-5945; Empl.: 50; *Sls. Mgr.:* Marion Servos; *Dist. Mgr.:* Susan Earnest

IDEAL INDUSTRIES, 4450 Becker Pl., Sycamore, IL 60178, Tel: 815-895-5181, TWX: 910-639-0613; Empl.: 700

IDEAL PRECISION METER, 214 Franklin St., Brooklyn, NY 11222, Tel: 212-383-6904, TWX: 710-584-2160; FSC No.: 11707;10304-41; Empl.: 150; *Sls. Mgr.:* T. Bell

IDE ASSOCIATES, INC., 35 Dunham Rd., Billerica, MA 01821, Tel: 617-663-6878; Empl.: 40; *Sls. Mgr.:* James Bender

IDEC

IDEC SYSTEMS & CONTROLS CORP., 1213 Elko Drive, Sunnyvale, CA 94089-2211, Tel: 408-747-0550, Telex: 34-0601, TWX: 910-339-9383; Empl.: 60; *Sls. Mgr.:* D.J. Synnott; *Dist. Mgr.:* James Young ..... **B•1056, 1408-1412**

Local Sales Offices & Reps

AL Decatur, El Tech, Inc. 205-353-7899
AZ Phoenix, Neal-Miller Sls. 602-274-0898
AR Jonesboro, Electro-Tech, Inc. 501-932-0366
CA Fremont, Thebrege Sls. Reps. 415-651-8775
CA Santa Fe Springs, J. H. Grace Co. 213-868-6771
CO Lakewood, T.M.M.I. 303-232-1516
FL Oldmar, Boggs & Assocs. 813-855-1812
FL Sarasota, Boggs & Assocs. 813-351-3338
GA Grayson, El Tech, Inc. 404-466-2997
IL Hoffman Estates, Bu-Nell Engrg. 312-843-8600
IN Indianapolis, Gurney Indl. Sls. 317-293-2333
KS Overland Park, TMW 913-383-1818
MA Norwood, Hyland Assocs. 617-762-0345
MI Southfield, Component Assocs. 313-557-3232
MN Minnetonka, S. J. Collins & Assocs. ... 612-933-7661
NJ W. Long Branch, Eastern Indl. Sls. 201-544-0600
NM Albuquerque, T.M.M.I. 505-298-6893
NY Syracuse, WM Stamp Co. 315-463-4390
NC Kernersville, Heritage Sls. Assocs. 919-996-4374
OH Cincinnati, James Murray & Assocs. .. 513-574-8500
OH Cleveland, Matthew Haley Co. 216-892-1820
OH Toledo, Matthew Haley Co. 419-382-9588
OK Tulsa, Associated Sls. Agy. 918-838-8930
OR Portland, SPS Elctrns. 503-297-6919
PA Ingomar, RW Moulton Assocs. 412-935-3333
PA Philadelphia, Fite-El Tech 215-248-3171
SC Taylors, Heritage Sls. Assocs. 803-292-1723
TN Knoxville, Tubbs Agy. 615-577-0689
TX Dallas, SW Mktg. Assocs. 214-341-8631
TX Houston, SW Mktg. Assocs. 713-864-6281
UT Salt Lake City, T.M.M.I. 801-487-7676
VA Alexandria, T.D.I. 703-971-8982
VA Richmond, Dunnington & Assocs. 804-282-8383
WA Redmond, SPS Elctrns. 206-323-4140
WV Bluefield, RW Moulton Assocs. 304-327-6421
WI Appleton, Bu-Nell Engrg. 414-733-4242
WI Waukesha, Bu-Nell Engrg. 414-784-0994

IDENTATRONICS, INC., 425 Lively Blvd., Elk Grove, IL 60007, Tel: 312-437-2654, 1-800-323-5403, Telex: 254708; *Sls. Mgr.:* Gregg Powell

VERTEX INDUSTRIES, INC., Indenticon Div., 23 Carol St., P. O. Box 1123, Clifton, NJ 07014, Tel: 201-472-2121, TWX: 710-989-7021 VER TOT CLIF; Empl.: 85; *Sls. Mgr.:* Ronald Byer

Local Sales Offices & Reps

AZ Tempe, Burland Assocs. 602-894-5564
CA Santa Ana, California Elec. Mktg. 714-835-2702
FL Melbourne, Reynolds & Assocs. 305-259-7000
IL Elk Grove Village, Quad Data 312-228-1722
KS Shawnee Mission, Panatek Tech. Sls. 913-362-3349
MA Wayland, Daner Hayes, Inc. 617-655-0888
MI Farmington Hills, Carter, McCormic & Pierce 313-477-7700
MO Rockville, Spectro Assocs. 301-294-9770
TX Dallas, IBL Engrg. & Sls. 214-363-2921
WA Seattle, SJI Corp. 206-763-8981

IEC CORPORATION, 3100 Longhorn Blvd., Austin, TX 78759, Tel: 512-836-0547, Telex: 757025; FSC No.: 16071; Empl.: 23; *Sls. Mgr.:* Florencio Canizales, Jr.

IEC ELCTRNS., 105 Norton St., Newark, NY 14513, Tel: 315-331-7742, TWX: 510-250-2515; Empl.: 650; *Sls. Mgr.:* Russ Stingel; *Dist. Mgr.:* Steve Hotchkiss

IEE, See Industrial Elctrn. Engrs., Inc.

IEI-ISKRA

IEI-ISKRA ELECTRONICS, INC., 222 Sherwood Ave., Farmingdale, NY 11735, Tel: 516-753-0400, Telex: 645127; *Sls. Mgr.:* Tom Juliano ..... **A•1080-1083, 1875, 2020, 2072-2073; B•1413**

Local Sales Offices & Reps

AZ Tempe, Sunwest Mktg. 602-838-7586
CA San Diego, C. K. Assocs. 619-279-0420
CA San Jose, K-Lectron 408-942-9177
IL Chicago, Berndt Assocs., Inc. 312-283-0713
IN Indianapolis, Electronic Reps. 317-894-1414
KS Shawnee Mission, K & M Sls. 913-262-1444
MD Pikesville, Muncy Sls. 301-484-6376
NY Macedon, M. M. Hare Co. 315-986-3742
NY West Hempstead, Schmitt Indl. Mktg. .. 516-486-3510
PA Philadelphia, Paragon Sls. 215-563-7060
SC Easley, R A Sls. 803-859-1859
TX El Paso, EPEC Elctrns., Inc. 915-593-8481
UT South Jordan, MAC III 801-566-3781
WA Bellevue, Communication Comp. Sls. 206-643-0500

Local Distributors

GA Tucker, Shamrock Comps. 404-939-9198
NY West Islip, Shamrock Comps. 516-669-2027
TX El Paso, Shamrock Comps. 915-593-8554

IERC, 135 W. Magnolia Blvd., Burbank, CA 91502, Tel: 818-849-2481, 818-786-1182, TWX: 910-498-2206; *Sls. Mgr.:* Richard Schuckman ..... **C•1643**

Local Sales Offices & Reps

AL Huntsville, Murcota Corp. 205-539-8476
AZ scottsdale, SMS & Assocs. 602-998-0831
CA Burlingame, Jack Logan & Assocs. ... 415-348-8822
CA Burlingame, Mollard Mktg., Inc. 415-961-0456
CA Los Angeles, Ed Landa Co. 213-879-0770
CO Denver, Elcom, Inc. 303-337-2300
FL Boca Raton, Lawrence & Assocs. 305-368-7373
IL Mt. Prospect, Magnuson & Assocs. ... 312-956-0700
IN Indianapolis, Magnuson & Assocs. 317-247-5108
KS Leawood, Thunderbird Tech. Sls. & Svcs., Inc. 913-642-7220
KS Wichita, Thunderbird Tech. Sls. & Svcs., Inc. 316-684-3941
MA Lexington, Hathaway Elctrns., Inc. 617-861-7010
MI Ferndale, Shalco, Inc. 313-547-4771
MO Maryland Heights, Thunderbird Tech. Sls. & Svcs., Inc. 314-567-6488
NJ Wayne, G. T. Assocs., Inc. 201-694-6040
NY Rochester, Ossman Comp. Sls. Corp. 716-424-4460
NY Syracuse, Ossman Comp. Sls. Corp. .. 315-455-6611
NC Winston-Salem, Murcota Corp. 919-722-9445
OH Cleveland, Norm Case & Assocs. 216-333-0400
OR Portland, Frank Jackson & Assocs. ... 503-292-2638
PA Philadelphia, Kenneth B. Erdman Co. 215-224-1833
PA Pittsburgh, Russell F. Clark Co., Inc. ... 412-242-9500
TX Houston, Barry Sls., Inc. 713-784-5860
TX Richardson (Dallas), Barry Sls., Inc. ... 214-234-0255
UT Salt Lake City, Elcom, Inc. 801-532-7940
WA Redmond, Frank Jackson Assocs. 206-881-7277
Can Burlington, Ont., White Radio Ltd. 416-632-6894
Can Montreal, Que., White Radio Ltd. 514-481-0158

Local Distributors

CA Burlingame, Rose Elctrns. 415-348-2740
CA Chatsworth, Mil-Comm Distrs. 213-998-3111
CA San Diego, Deco Elctrns. 619-693-1595
CO Denver, Integrated Elctrns. 303-292-6121
CO Englewood, Industrial Elctrns., Inc. 303-694-9444
CT Norwalk, Park Distrs., Inc. 203-853-2011
FL Clearwater, Lynch Gentry Assocs. 813-433-2697
GA Atlanta, Ack Radio Supp. Co. 404-351-6340
IL Mt.Prospect, Magnuson & Assocs. 312-956-0700
MD Towson, Jones-Maryland Elctrns. 301-823-5721
MA Billerica, A. W. Mayer Co., Inc. 617-667-6900
MA Waltham, Sterling Elctrns. 617-894-6200
NH Hudson, C & H Elctrns., Inc. 603-882-1133
NY Bohemia, Car-Lac Elctrn. Indl. Sls. 516-567-4200
NY Rochester, Modutex Corp. 716-424-1620
NY West Hempstead, March Elctrns. 516-486-6511
OH Englewood, Argent Inds., Inc. 513-836-8633
PA McKeesport, Barno Radio 412-751-5966
RI Providence, William Dandreta & Co. .. 401-861-2800
TX Fort Worth, C & W Supp. 817-831-0395
TX Houston, Lenert Co. 713-225-1465
UT Provo, Omega Elctrns. 801-375-4664
UT Salt Lake City, Kimball Elctrns., Inc. ... 801-328-2075
WA Redmond, Elwood Inds. 206-881-7277

IET LABS, INC.

IET LABS, INC., 534 Main St., Westbury, NY 11590, Tel: 516-334-5959; FSC No.: 62015; *Sls. Mgr.:* Sam Sheena ..... **D•1242-1245**

ILC DATA DEVICE CORPORATION

ILC DATA DEVICE CORP., 105 Wilbur Pl., Bohemia, NY 11716, Tel: 516-567-5600, TWX: 510-228-7324; FSC No.: 19645; Empl.: 850; *Sls. Mgr.:* J. P. Sheahan; *Dist. Mgr.:* Mort Lux ..... **D•1150-1151**

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
AZ	Scottsdale, Fred Board Assocs.	602-994-9388
AZ	Tuscon, Fred Board Assocs.	602-299-1508
CA	Santa Clara, ILC Data Dev.	408-244-0831
CA	Woodland Hills, ILC Data Dev.	818-992-1772
CO	Englewood, Western Sls., Inc.	303-798-0945
CT	Canton Center, Dynamic Sls. of New Eng.	203-693-6567
FL	Boca Raton, Perrott Assocs.	813-443-5214
FL	Clearwater Beach, Perrott Assocs.	813-443-5214
FL	Orlando, Perrott Assocs.	305-298-7748
GA	Norcross, Montgomery Mktg., Inc.	404-447-6124
HI	Kihea, Aloha Assocs.	808-879-5296
IL	Chicago, John Alexander & Assocs.	312-233-7788
IL	Des Plaines, Elctrn. Mktg.	312-298-2330
IN	Carmel, Giesting & Assocs.	317-844-5222
IN	Fort Wayne, Giesting & Assocs.	219-486-1912
KS	Lenexa, Dytec/South	913-888-0215
MA	Burlington, Dynamic Sls. of New Eng.	617-272-5676
MI	Coloma, Giesting & Assocs.	616-468-4200
MI	Farmington Hills, Giesting & Assocs.	313-478-8106
MN	Minneapolis, Comprehensive Techn.	612-888-7011
MO	Maryland Hgts., Dytec/South	314-569-2990
NJ	Totowa, ILC Data Dev. Corp.	201-785-1734
NM	Albuquerque, Vermillion Co.	505-883-3668
NY	E. Rochester, Tri Tech Elctrns.	716-385-6500
NY	Endwell, Tri Tech Elctrns.	607-754-1094
NY	Fayetteville, Tri Tech Elctrns.	315-446-2881
NY	Fishkill, Tri Tech Elctrns.	914-897-5611
NC	Cary, Montgomery Mktg., Inc.	919-467-6319
OH	Cincinnati, Giesting & Assocs.	513-385-1105
OH	Cleveland, Giesting & Assocs.	216-261-9705
OH	Dayton, Giesting & Assocs.	513-433-5832
OH	Dayton, Lionel Fedotin	513-275-9345
OK	Tulsa, Bonser-Philhower Sls.	918-744-9964
OR	Aloha, Venture Elctrns.	503-642-9090
PA	Glenside, Koebert Assocs.	215-887-2310
PA	New Kensington, Bobar Instr.	412-339-3565
PA	Pittsburgh, Giesting & Assocs.	412-963-0727
TX	Austin, Bonser-Philhower Sls.	512-346-9186
TX	Houston, Bonser-Philhower Sls.	713-531-4144
TX	Richardson, Bonser-Philhower Sls.	214-234-8438
VT	Burlington, Dynamic Sls. of New Eng.	802-863-6665
VA	Vienna, ILC Data Dev.	201-785-1734
WA	Bellevue, Venture Elctrns.	206-454-4594
WI	Milwaukee, JM Sls.	414-546-0040
WI	Waukesha, Electron Mktg.	414-547-1505
Can	Montreal, Repco Engrg.	514-694-1877

ILC TECHNOLOGY, INC., 399 Java Dr., Sunnyvale, CA 94089, Tel: 408-745-7900, TWX: 910-339-9389; *Sls. Mgr.:* Robert Turner

ILLINOIS CAPACITOR, INC.

ILLINOIS CAPACITOR, INC., 3757 W. Touhy Ave., Lincolnwood, IL 60645, Tel: 312-675-1760, Telex: 72-4361; Empl.: 44; *Sls. Mgr.:* C. Kurland .... **A•1084-1085**

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech. Sls.	205-533-2100
AZ	Phoenix, Howe & Howe Sls.	602-264-7971
CA	El Cajon, KCE Corp.	619-588-1198
CA	Palo Alto, Mollard Mktg.	415-961-0456
CA	Woodland Hills, Illinois Capacitor, Inc.	800-323-3652
CO	Denver, Elcom	303-337-2300
CT	Bristol, Technology Prods. Grp.	617-731-0858
FL	Miami Beach, Ben Goldner	305-932-2782
GA	Norcross, Electro-Mech. Sls.	404-447-6478
IN	Indianapolis, Fred Dorsey Assoc.	317-842-0060
KY	Louisville, Fred Dorsey Assoc.	502-426-3540
MA	Brookline, Technology Prods. Grp.	617-731-0858
MI	Warren, Dem Elctrns. Sls.	313-575-9444
MN	Golden Valley, Highland Elctrn. Sls. Co.	612-545-4028
MS	Jackson, IL Capacitor	312-675-1760
MO	Hazelwood, Jim Moore & Assocs.	314-731-2240
MO	Overland Park, Guernsey-Moore Assocs.	913-381-2225
NY	Commack, ERA	516-543-0510
NY	De Ruyter, Net Sales, Inc.	315-662-7996
NY	Fairport, Net Sls.	716-467-4538
NY	Webster, Net Sales, Inc.	716-671-0022
NC	Raleigh, Electro-Mech. Sls.	919-851-8165
OR	Beaverton, Caruso-Northcutt	503-646-4973
PA	Narberth, J. Bresson Assocs.	215-664-6460
TN	Jonesboro, Electro-Mech. Sls.	615-753-2964
TX	Austin, Mil-Rep	512-459-8602
TX	El Paso, EPEC, Inc.	915-593-8481
TX	Houston, Mil-Rep	713-444-2557
TX	Richardson, Mil-Rep Assocs.	214-664-6731
UT	Salt Lake City, Elcom	801-532-7940
WA	Bellevue, Caruso-Northcutt	206-454-9699
WI	Milwaukee, Erdman Sls. Co.	414-281-1330
Can	Downsview, Ont., Designtronics	416-747-1171

Local Distributors

CA	Anaheim, A to Z Elctrns.	714-634-3620
CA	Canoga Pk., Myco/Vickers Elctrn. Supp.	213-340-2025
CA	Irvine, Hi-Rel Distr. Sls.	714-768-6656
CA	Santa Ana, Projections Unltd.	714-641-1472
CA	Santa Clara, California Capacitor	408-980-8495
CO	Englewood, Industrial Elctrns.	303-694-9444
IL	Northbrook, Classic Comps.	312-272-9650
IN	Carmel, Altex Elctrns.	317-848-1323
IA	Cedar Rapids, Bergquist Co.	319-366-8733
LA	Harvey, AFG Electrn. Supp.	504-368-9696
MD	Columbia, General Radio Supp.	301-997-6337
MA	Wakefield, Lorcor	617-246-1903
MA	Woburn, Semtex	617-935-2150
MI	Grand Rapids, R M Elctrns.	616-531-9300
MN	Minneapolis, Bergquist Co.	612-835-2322
MO	St. Charles, Finnigan Elctrns.	314-946-6201
NJ	Camden, General Radio Supp. Co.	609-964-8560
NJ	Roselle, Lectron Ind.	201-245-5859
NY	Buffalo, Genesee Radio & Parts Co.	716-873-9661
NY	Buffalo, Summit Distrbg.	716-887-2890
NY	E. Syracuse, Add Elctrns.	315-437-0300
NY	Freeport, Semtex Ind. Corp.	800-645-3960
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Troy, Trojan Elctrn. Supp.	518-274-4481
NC	Greensboro, Hammond Elctrns.	919-275-6391
OH	Dayton, Semtex Ind. Corp.	513-435-6600
OK	Tulsa, Altair Elctrns.	918-252-5781
SC	Greenville, Hammond Elctrns.	803-233-4121
TX	Austin, Altair Elctrns.	512-837-4490
TX	Channelview, Henry Elctrns.	713-452-4451
TX	Houston, Altair Elctrns.	713-462-3029
TX	Richardson, Altair Elctrns.	214-231-5166
WI	Milwaukee, Badger Capacitor Sls.	414-281-1330
EXP	Rexdale, ON, Electrn. Supp., Inc.	416-741-4000

ILLINOIS LOCK CO., The Eastern Co., 301 W. Hintz Rd., Wheeling, IL 60090, Tel: 312-537-1800; *Sls. Mgr.:* Kim Palmer ..... **B•1593-1595**

Local Sales Offices & Reps

AZ	Tempe, Desert-West Technical Sls.	602-244-0735
CA	Los Angeles, Spectrum Assocs.	213-641-4255
CA	San Rafael, Wright Assoc.	415-457-9940
FL	New Port Richey, Lobo Mktg. Assocs.	813-848-8578
IN	Carmel, TMC	317-844-8462
IN	Fort Wayne, TMC	219-432-5553
KY	Louisville, TMC	502-499-7808
MN	Minneapolis, Jos. Co/Melius	612-861-3343
NJ	Haddonfield, Gray Assocs.	
VA	Front Royal, Eltron Sls.	

Local Distributors

CA	Gardena, California Switch & Signal	213-770-2330
CA	San Leandro, Electro-Components	415-352-5210

IMAGE GRAPHICS, INC., 107 Ardmore Street, Fairfield, CT 06430, Tel: 203-259-1394; FSC No.: 5M867; Empl.: 35; *Sls. Mgr.:* J. P. Whitley

IMAGE MAKERS OF PITTSFORD, 6 Wood Gate, Pittsford, NY 14534, Tel: 716-385-4567; *Sls. Mgr.:* Richard H. Roberts; *Dist. Mgr.:* Richard H. Roberts

IMAGE TECHNOLOGY METHODS CORP., 103 Moody St., Waltham, MA 02154, Tel: 617-894-1720

IMAGING TECHNOLOGY, INC., 600 W. Cummings Park, Woburn, MA 01801, Tel: 617-938-8444, Telex: 948263; Empl.: 70; *Sls. Mgr.:* Ronald A. Massa

imc

IMC MAGNETICS CORP., Exec. Off., 100 Jericho Quadrangle, Ste. 221, Jericho, NY 11753, Tel: 516-938-0800, TWX: 510-221-2126; *Sls. Mgr.:* E. Egan ..... **B•1161; C•1644-1645, 1647**

IMC MAGNETICS CORP., Arizona Div., 1900 East Fifth St., Tempe, AZ 85281, Tel: 602-968-4441, Telex: 910-951-0001; *Sls. Mgr.:* Alex Lazutin

IMC MAGNETICS CORP., Eastern Div., 570 Main St., Westbury, NY 11590, Tel: 516-334-7070, TWX: 510-222-4469; *Sls. Mgr.:* A. Chillemi .... **B•1161; C•1644-1645**

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Tempe, Gassner & Clark	602-968-9037
CA	Cerritos, El-Com, Inc.	213-404-2961
CA	Los Altos, Recht Assocs.	415-964-6321
CA	San Diego, El-Com, Inc.	619-578-0900
CO	Englewood, Thorson Rocky Mtn.	303-779-0666
CT	Middletown, Gerber Sls. Corp.	203-347-3000
FL	Coral Springs, HAI Elctrns.	404-256-9640
GA	Atlanta, Beacon Elctrns.	404-256-9640
IL	Chicago, Industrial Reps., Inc.	312-647-7755
MD	Mt. Airy, Beacon N.	800-336-3747
MA	Monson, Gerber Sls. Corp.	413-267-5051
MA	Newton Upper, Gerber Sls. Corp.	617-969-2620
MN	Minneapolis, Holmgren Assocs.	612-786-7641
MO	Grandview, Harris-Hanson Co.	816-763-6200
MO	St. Louis, Harris-Hanson	314-432-3611
MO	St. Louis, Harris-Hanson Co.	314-432-3611
NJ	Haddonfield, Mesa Tech Assoc.	609-429-9531
NJ	Haddonfield, Mesa Tech. Assoc.	609-429-9531
NY	Fairport, Net Sales Co.	716-467-4538
NY	Great Neck, Trionics Assocs.	516-466-2300
NY	Syracuse, Electra Sls. Corp.	315-463-1248
NC	Greensboro, Beacon Elctrns.	919-275-9997
NC	Raleigh, Beacon Elctrns.	919-787-0330
OH	Dayton, Electrical Sys. Co.	513-434-9822
OH	Dayton, Electrical Systems Co.	513-434-9822
OH	Westlake, Electrical Sys. Co.	216-835-8672
OR	Alhoa, Huntley Assocs.	503-649-5388
OR	Lake Oswego, Huntley Assocs.	503-636-7558
TX	Dallas, Kruvand Assocs.	214-691-4592
TX	Dallas, Kruvand Assocs.	801-973-7969
UT	Valley City, Thorson Rocky Mtn.	214-437-3355
VA	Fairfax, Beacon N.	703-591-1300
VA	Falls Church, Beacon North	703-534-7200
WA	Everett, Huntley Assocs.	206-353-1833
PR	San Juan, Jorge Donato Assocs.	809-790-1300
Can	Markham, Ont., Lenbrook Elctrns.	416-477-7722
Can	Surrey, B.C., Lenbrook Elctrns.	604-585-9599

IMC/HANSEN, Box 23, Princeton, IN 47670, Tel: 812-385-3415, Telex: 27-8458 HANSON PEON; Empl.: 350; *Sls. Mgr.:* George A. Gilbert

IMC MAGNETICS CORP., New Hampshire Div., Rte. 16B, Rochester, NH 03867, Tel: 603-332-5300, TWX: 510-297-4466; *Sls. Mgr.:* William Beaulieu; *Dist. Mgr.:* Dave Flanagan ..... **C•1647**

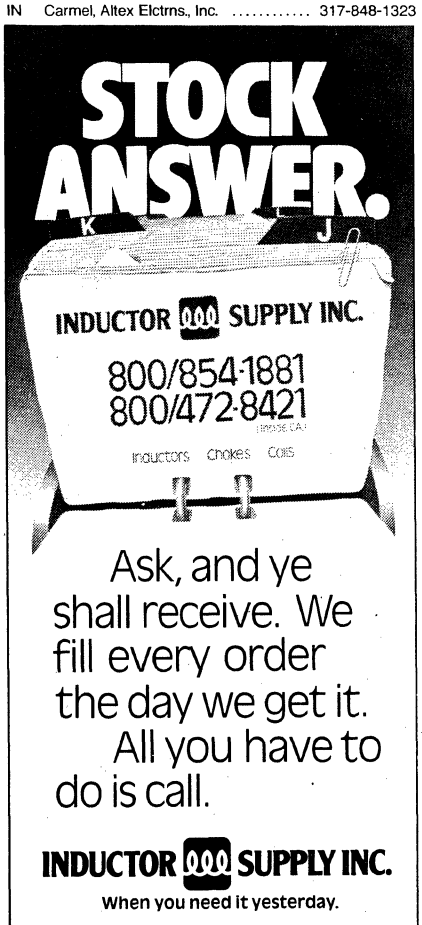
Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Tempe, Gassner & Clark	602-968-9037
CA	Cerritos, El-Com, Inc.	213-404-2961
CA	Los Altos, Recht Assocs.	415-964-6321
CA	San Diego, El-Com, Inc.	619-578-0900
CO	Englewood, Thorson Rocky Mtn.	303-779-0666
CT	Middletown, Gerber Sls. Corp.	203-347-3000
FL	Coral Springs, HAI Elctrns.	404-256-9640
GA	Atlanta, Beacon Elctrns.	404-256-9640
IL	Chicago, Industrial Reps., Inc.	312-647-7755
MD	Mt. Airy, Beacon N.	800-336-3747
MA	Monson, Gerber Sls. Corp.	413-267-5051
MA	Newton Upper, Gerber Sls. Corp.	617-969-2620
MN	Minneapolis, Holmgren Assocs.	612-786-7641

MO Grandview, Harris-Hanson Co. 816-763-6200
MO St. Louis, Harris-Hanson Co. 314-432-3611
NJ Haddonfield, Mesa Tech Assoc. 609-429-9531
NY Great Neck, Trionics Assocs. 516-466-2300
NY Syracuse, Electra Sls. Corp. 315-463-1248
NC Raleigh, Beacon Elctrns. 919-787-0330
OH Dayton, Electrical Sys. Co. 513-434-9822
OH Westlake, Electrical Sys. Co. 216-835-8672
OR Alhoa, Huntley Assocs. 503-649-5388
TX Dallas, Kruvand Assocs. 214-437-3355
UT Valley City, Thorson Rocky Mtn. 801-973-7969
VA Fairfax, Beacon N. 703-591-1300
WA Everett, Huntley Assocs. 206-353-1833
PR San Juan, Jorge Donato Assocs. 809-790-1300
Can Markham, Ont., Lenbrook Elctrns. 416-477-7722
Can Surrey, B. C., Lenbrook Elctrns. 604-585-9599

Local Distributors

AL Huntsville, C.D.I. 205-883-7501
AK Little Rock, C.D.I. 501-227-6278
AZ Phoenix, Sterling Elctrns. 602-268-2121
AZ Tempe, Bell Inds. 602-966-7800
AZ Tuscon, Southwest Sls. 602-325-4087
CA Cerritos, El-Com 213-404-2961
CA Garden Grove, Bell Inds. 714-220-0681
CA Gardena, Bell Inds. 213-515-1800
CA Inglewood, Newark Elctrns. 213-671-7387
CA Roseville, Graham Elctrns. 916-969-3100
CA San Diego, Bell Inds. 619-268-1277
CA San Diego, El-Com 619-578-0900
CA Santa Clara, El-Com 408-496-0880
CA Sunnyvale, Bell Inds. 408-734-8570
CA Thousand Oaks. Bell Inds. 805-499-6821
CO Denver, Newark Denver Elctrnd. 303-757-3351
CO Ravada, Denver Wintronics 303-431-7161
CO Wheatridge, Bell Inds. 303-424-1985
CT East Haven, J. V. Elctrns. 203-469-2321
CT Wallingford, Sager Elctrl. Supp. Co. 203-265-4600
CT Wallingford, Sterling Elctrns. 203-265-9535
FL Ft. Lauderdale, C.D.I. 305-971-4950
FL Ft. Lauderdale, Hammond Elctrns. 305-973-7103
FL Largo, Graham Elctrns. 813-541-4434
FL Orlando, Hammond Elctrns. 305-849-6060
GA Norcross, C.D.I. 404-441-3320
IL Chicago, Bell Inds. 312-982-9210
IL Chicago, Newark Elctrns. 312-638-4411
IL Northbrook, Classic Comps. 312-272-9650
IN Carmel, Altex Elctrns., Inc. 317-848-1323



IN Ft. Wayne, Graham Elctrns. 219-423-3422
IN Indianapolis, Graham Elctrns. 317-634-8202
IN Lafayette, Graham Elctrns. 317-423-5564
IA Cedar Rapids, Bell Inds. 319-395-0730
KS Wichita, RSC Elctrns., Inc. 316-267-5213
MD Columbia, Lionex Corp. 301-964-0040
MD Savage, Pyttronic Inds. 301-792-0780
MA Hingham, Sager Elctrl. Sup. Co. 617-749-6700
MA Norwood, Gerber Elctrns. 617-769-6000
MA Somerville, Electro Sls. 617-666-0500
MA Waltham, Sterling Elctrns. 617-894-6200
MA Wilmington, Lionex Corp. 617-657-5170
MI Adrian, Wedemeyer Elctrn. Supp. Co. 517-263-2925
MI Ann Arbor, Graham Elctrns. 313-884-4725
MI Ann Arbor, Wedemeyer Elctrn. Supp. Co. 313-665-8611
MI Lansing, Wedemeyer Ecltrn. Supp. Co. 517-484-9009
MN Minneapolis, Aero-Space Computer Supps., Inc. 612-884-4725
MO St. Louis, Olive Elctrns., Inc. 314-426-4500
NJ Bellmawr, Mid-Atlantic 609-931-5303
NJ Fairfield, Lionex Corp. 201-227-7960
NJ Perth Amboy, Sterling Elctrns. 201-442-8000
NM Albuquerque, Bell Inds. 505-292-2700
NM Albuquerque, International Elctrns. 505-345-8127
NM Albuquerque, Sterling Elctrns. 505-884-1900
NY Buffalo, Summit Distrs. 716-884-3450
NY Endwell, A.S.I. Elctrns. 607-754-3823
NY Hauppauge, Lionex Corp. 516-273-1660
NY Mt. Vernon, Q.A.R. Indl. Sls. 914-699-2224
NY Plainview, Progress Elctrns. 516-433-1700
NY Rochester, Summit Elctrns. 716-334-8110
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Raleigh, C.D.I. 919-834-9465
OH Cincinnati, Graham Elctrns. 513-772-1661
OH Columbus, Graham Elctrns. 614-895-1590
OH Columbus, Wedemeyer Elctrn. Supp. Co. 614-436-2410
OH Dayton, Bell Inds. 513-434-8231
OH Dayton, Esco Elctrons. 513-293-1133
OH Dayton, Stotts-Friedman 513-298-5555
OH Youngstown, Newark Elctrns. 216-793-6134
OR Lake Oswego, Bell Inds. 503-241-4115
PA Braddock, Leff Elctrns. 412-351-5000
PA Horsham, Lionex Corp. 215-443-5150
PA McKean, Advacom, Inc. 814-476-7774
PA Montgomeryville, Pyttronic Inds. 215-643-2850
PA Reading, Barbey Elctrns. 215-376-6116
RI Providence, William Dandreta Co. 401-861-2800
SC Greenville, Hammond Elctrns. 803-233-4121
TN Nashville, Electra Distrbg. Co. 615-329-3971
TN Nashville, Graham Elctrns. 615-242-2682
TX Austin, Sterling Elctrns. 512-836-1341
TX Dallas, Heilind Elctrns. 214-351-2050
TX Dallas, Sterling Elctrns. 213-243-1600, 800-225-9618
TX El Paso, International Elctrns. 915-598-3406
TX Houston, Sterling Elctrns. 713-623-6600
UT Salt Lake City, Bell Inds. 801-972-6969
UT Salt Lake City, Standard Supp. 801-486-3371
VA Richmond, Sterling Elctrns. 804-226-2190
WA Bellevue, Bell Inds. 206-747-1515
WI New Berlin, Classic Comps. 414-786-5300
WI Waukesha, Bell Inds. 414-547-8879
Can Downsview, Ont., Westburne Indl. Entprs., Ltd. 416-635-2950
Can Montreal, Que., Electronic Whls., Ltd. 514-769-8851/61
Can Ottawa, Ont., Electronic Whls., Ltd. 613-746-4413
Can Ottawa, Ont., Wackid Radio 613-728-1821
Can Pointe Claire, Que., Future Elctrns. 514-694-7710

THERMAL PRODS. GROUP, IMC Magnetics Corp., 100 Jericho Quad., Ste. 221, Jericho, NY 11753, Tel: 516-938-0800, TWX: 510-221-2126

IMC MAGNETICS CORP., Western Div., 12627 Hiddencreek Way, Cerritos, CA 90701, Tel: 213-926-0927, TWX: 910-583-1355; FSC No.: 99743; *Sls. Mgr.:* Joe Gute

IMEC CORP., 2434 Southport Way, National City, CA 92050, Tel: 619-474-8991

IMPANDEX, INC., 203 Brookdale St., Maywood, NJ 07607, Tel: 201-845-4664, Telex: 134 656; Empl.: 11; *Sls. Mgr.:* Stanley I. Goldberg; *Dist. Mgr.:* Rober F. Carlson

I.M.S. EQUIPMENT, INC., P.O. Box 16909, Irvine, CA 92713, Tel: 714-857-6302, Telex: 678317; *Sls. Mgr.:* Frank Buday

Local Sales Offices & Reps

AL Huntsville, Naylor Assocs. 205-830-1957
AZ Phoenix, Tri Fab Sls. 602-265-3341
AZ Tucson, W.J.M. Sales 602-888-4847
CA Orange, E.T.A. 714-998-9241
CA San Diego, Savage Assocs. 619-457-2644
CA Santa Clara, M2 Mktg. Grp. 408-986-0676
CO Sedalia, Jensen Reps. 303-688-4154
FL Casselberry, Southern Elctrn. Mktg. 305-695-3334
IL Chicago, Electro-Tech Mktg. 312-672-3151
MD Silver Springs, Mid Atlantic Sls. 301-583-7749
MA Framingham, Sullivan Tech. Sls. 617-620-0195
MN Minnetonka, Frank Anthony Mktg. 612-934-0773
MO Clayton, Mertens Co. 314-993-6600
MO Silver Springs, Mid Atlantic Sls. 301-593-7749
NJ Mountainside, Henry G. Richter 201-233-4615
NY Rochester, Henry G. Richter 716-436-0300
NC Research Triangle Park, Naylor Assocs. 919-286-7007
OH Columbus, Micro-Tec 614-888-9761
OR Portland, Power Sources, Unltd. 503-292-0820
PA Pittsburgh, Micro-Tec 412-931-3380
SC Greenville, Naylor Assocs. 803-297-9969
TX Dallas, Milco Mktg. 214-783-2716
TX Houston, Milco Mktg. 713-723-5003
WA Lynnwood, Power Sources, Unltd. 206-743-6641
WI Brookfield, Electro-Tech Mktg. 414-785-9554
Can Pointe Claire, Que., A. R. Gray & Assocs. 514-694-6378

Local Distributors

AZ Phoenix, Tri Tek, Inc. 602-995-9352
CA Costa Mesa, Escot 714-557-3252
CA Fullerton, Pyramid Elctrns. 714-773-0781
CA San Diego, Lauber Elctrns. 619-274-7242
CA San Jose, Compumech 408-289-9171
CA Santa Ana, C. R. Elctrns. 714-556-2040
CA Santa Clara, Escot 408-988-4991
CA Santa Clara, Pyramid Elctrns. 408-727-9810
CA Sunnyvale, Sierra West 408-747-1188
CO Broomfield, Escot 303-465-2346
FL Longwood, Cam RPC 305-834-2031
GA Norcross, Cam RPC 404-441-1188
IL Wheeling, Escot 312-459-5750
MD Aberdeen, Harco Elctrns. 301-575-6885
MD Beltsville, Treeko Sls. 301-937-8260
MD Towson, Cam RPC 301-337-5545
MA Newton, Greene-Shaw Co. 617-969-8900
MN Bloomington, N.W.R. Elctrns. 612-854-7329
NJ East Brunswick, Brothers Elec. 201-238-2200
NY Henrietta, Cam RPC 716-334-5600
OH Cleveland, Cam RPC 216-461-4700
OH Dayton, Micro-Mil/Bell 513-434-8231
PA Philadelphia, Cam RPC 215-739-4095
PA Pittsburgh, Cam RPC 412-782-3770
TX Dallas, Cam RPC 214-644-4325
VA Annandale, Arcade Elctrns. 703-256-4610
WA Kent, Pyramid Elctrns. 206-872-5800

IMTRONICS INDS., 11930 31st Ct., St. Petersburg, FL 33715, Tel: 813-577-9010, Telex: 566027 IMTRON CWTR UD; Empl.: 10; *Sls. Mgr.:* Steven B. Cohen

INCOM, INC., 205 Chapin St., P.O. Drawer G, Southbridge, MA 01550, Tel: 617-765-9151, TWX: 710-347-1604; *Sls. Mgr.:* David MacGrath

INCONIX CORP., 10 Tech Circle, Natick, MA 01760, Tel: 617-655-1170, TWX: 710-386-1997; Empl.: 60; *Sls. Mgr.:* Al Vitale

INDEPENDENT CABLE, INC., 43 Broad St., Hudson, MA 01749, Tel: 617-562-9913; Empl.: 120; *Sls. Mgr.:* Gary W. Nace

INDIANA GENERAL/DIV. EMM CORP., Magnet Prods., 405 Elm St., Valparaiso, IN 46383, Tel: 219-462-3131, Telex: 25-8489, TWX: 910-690-4891; Empl.: 1200; *Sls. Mgr.:* Royce D. Wright

INDOCOMP, INC., Newcor, 5409 Perry Dr., P.O. Box 157, Drayton Plains, MI 48020, Tel: 313-674-2294; Empl.: 26; *Sls. Mgr.:* Robert Watt

Distributor

INDUCTIVE PRODS., INC., 11733 Markon Dr., Garden Grove, CA 92641, Tel: 714-891-2572; Empl.: 10; *Sls. Mgr.:* Michael Rynkewicz ..... **A•1230**

Distributor

INDUCTOR SUPPLY, 15204 Transistor Lane, Huntington Beach, CA 92649, Tel: 714-891-4524 ..... p. 700

INDUSTRIAL COMPUTER DESIGNS, INC., 31264 La Baya Drive, Westlake Village, CA 91362, Tel: 818-889-3179; Empl.: 33; *Sls. Mgr.:* David J. Knight

INDUSTRIAL CONTROL CO., 3100 Pineda Ave., Rockledge, FL 32955, Tel: 305-259-7105; Empl.: 15; *Sls. Mgr.:* I. Nobilio ..... **D•1988**

INDUSTRIAL DEVICES, INC., 7 Hudson St., Edgewater, NJ 07020, Tel: 201-224-4700, Telex: 12-7459; FSC No.: 91802; Empl.: 200; *Sls. Mgr.:* Michael Diceglie ..... **B•1014, 1017, 1057-1077**

Local Sales Offices & Reps

AL	Huntsville, E.M.A., Inc.	205-837-7363
AZ	Scottsdale, Bill Earl Assocs., Inc.	602-994-3813
CA	Los Angeles, Universal Comps.	213-641-4255
CA	Mountain View, Westech Sls.	415-961-1422
CO	Aurora, Sage Sls.	303-750-3501
FL	Casselberry, Southern Elctrn. Mktg.	305-831-2822
GA	Atlanta, E.M.A., Inc.	404-448-1215
IL	Chicago, K. D. Engle	312-539-1820
IN	Indianapolis, Elctrn. Mktg. Conslts.	317-253-1668
KS	Shawnee Mission, Lowell-Kangas Assocs.	913-631-3515
MD	Towson, Ernie Stefkovic Assocs.	301-321-6008
MA	Newton Upper Falls, Anchor Engrg.	617-964-6205
MI	Oak Pk., W. Spenser	313-967-0808
MN	Minneapolis, Elec. Comp. Sls.	612-933-2594
MO	St. Louis, Lowell-Kangas Assocs.	314-821-4050
NJ	Cherry Hill, Ernie Stefkovic Assocs.	609-667-4066
NJ	Manville, Dyno Rep	201-685-0135
NY	Rochester, Apex Assocs.	716-254-6050
NC	Raleigh, E.M.A., Inc.	919-847-8800
OH	Cleveland, Marlow Assocs.	216-991-6500
OH	Columbus, Marlow Assocs.	800-362-2265
OR	Portland, Earl & Brown	503-245-2283
PA	Pittsburgh, Marlow Assocs.	412-367-8886
SC	Greenville, E.M.A., Inc.	803-233-4637
TX	Austin, R. F. Kimball Co.	512-443-5284
TX	Houston, R. F. Kimball Co.	713-890-8810
TX	Richardson, R. F. Kimball Co.	214-231-3447
UT	Salt Lake City, Sage Sls.	801-467-5451
WA	Seattle, Earl & Brown	206-284-1121
EXP	NY, Jericho, E.T.I., Inc.	516-931-3434

Local Distributors

AZ	Phoenix, Dalis Elctrn. Supp.	602-275-2885
CA	Gardena, Calif. Switch & Signal	213-770-2330
CA	Los Angeles, Elec. Switches	213-664-1141
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Pasadena, Empire Elctrn. Distr.	213-681-2711
CA	S. San Francisco, Steven Engrg.	415-588-9200
CA	San Diego, Shanks & Wright	619-239-0176
CA	San Diego, Sigma Elctrns.	714-565-2000
CA	San Francisco, Zack Elctrns.	415-626-1444
CA	San Jose, Quement Elctrns.	408-998-5900
CA	Santa Monica, Master Distrs.	213-452-1229
CO	Arvada, Denver Wintronics	303-431-7161
CT	Norwalk, Park Distrs.	800-243-5006
CT	Stratford, Utronics, Inc.	203-378-4201
CT	Wallingford, Sager Electrical Supp.	203-265-4600
FL	Longwood, Inter Tec	800-432-1654
FL	Miami, Electro Standard Lab (ESL)	305-593-6060
FL	Tampa, Leader Elctrns.	813-870-3315
FL	W. Palm Beach, Nurmi Elctrn.	305-686-8553
GA	Atlanta, Wholesale Indl. Elec.	800-282-1857
IL	Villa Park, Melvin Elctrns.	312-279-5015
IL	Wood Dale, Electro-Kinetics	312-595-6700
IN	East Chicago, ACRO Elctrns.	312-375-1269
IN	Evansville, Hutch & Son	812-425-7201
IN	Fort Wayne, Graham Elctrs.	219-423-3422
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	South Bend, Genesis Elctrns.	219-287-2911
IA	Cedar Rapids, Bergquist Co.	319-366-8733
IA	Cedar Rapids, Iowa Radio Supp.	319-393-4510
KY	Bowling Green, Crescent Elctrns.	502-842-2444
LA	Lafayette, Ralph's	318-234-4507
LA	New Orleans, Wm. B. Allen Supp. Co.	800-462-9520
MD	Rockville, Capitol Radio Whlsrs.	301-881-2270
MA	Hingham, Sager Elec. Supp.	617-749-6700
MA	N. Wilbraham, Indl. Comps.	413-596-3854
MA	Norwood, Gerber Elctrns.	617-329-2400
MA	Worcester, RM Elctrns.	617-756-8311
MI	Flint, Shand Elctrns.	313-743-8940
MN	Minneapolis, Bergquist Co.	612-835-2322
MN	Minneapolis, Elctrn. Center	612-371-5200
MN	Minneapolis, Stark Elctrns.	612-332-1325
MO	Kansas City, Olive Indl. Elect.	816-842-8556
MO	St. Louis, Olive Indl. Elctrns.	314-426-4500
MO	St. Louis, Van Sickle Radio-Elec.	314-621-5000
NE	Lincoln, Scott Elctrn. Supp.	402-466-8221
NV	Las Vegas, Kiesub Elctrns.	702-733-3888
NJ	Fair Lawn, Relay Spec.	201-797-3313
NJ	Hanover, State Elctrns. Parts	201-887-2550
NJ	Springfield, Route Elctrns.	201-379-7710
NY	Albany, E. E. Taylor Co.	518-438-7811
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Hauppauge, Broadline Elctrns.	516-231-4100
NY	Hempstead, Elctrn. Equip.	800-645-1605
NY	Mt. Vernon, Q.A.R. Indl. Elctrn. Sls.	914-699-2224
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Rochester, Summit Elctrns.	716-334-8110
NC	Raleigh, Southeastern Radio Supp.	919-828-2311
OH	Cincinatti, Hughes-Peters	513-351-2000
OH	Cincinnati, United Radio	513-761-4030
OH	Cleveland, Roberts Elctrns.	216-238-1711
OH	Columbus, Hughes Peters	614-294-5351
OH	Dayton, Stotts-Friedman Co.	513-298-5555
OH	Toledo, Warren Radio	419-248-3364
OK	Oklahoma City, Trice Whls. Elctrns.	405-524-4411
OK	Tulsa, Oil Capitol Elctrns.	918-622-8520
OR	Eugene, United Radio Supp.	503-342-3381
OR	Portland, United Radio Supp.	503-233-7151
PA	Erie, Rem/Mace Elctrns.	814-453-5626
PA	Harrisburg, Cumberland Elctrns.	717-233-5883
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
TN	Memphis, Bluff City Elctrns.	901-345-9500
TN	Nashville, Randolph & Rice	615-255-5601
TX	Fort Worth, Swieco	817-335-6521
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Houston, Altair Co.	713-462-3029
TX	Richardson, Altair Co.	214-231-5166
TX	San Antonio, Sherman Elctrns. Supp.	512-224-1004

Industrial Devices, Inc.

FULL LINE
AUTHORIZED DISTRIBUTOR

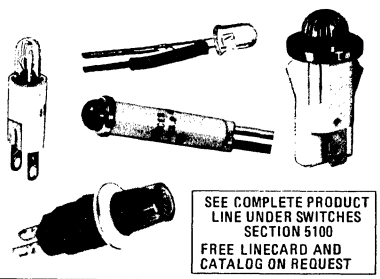
E S I

ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

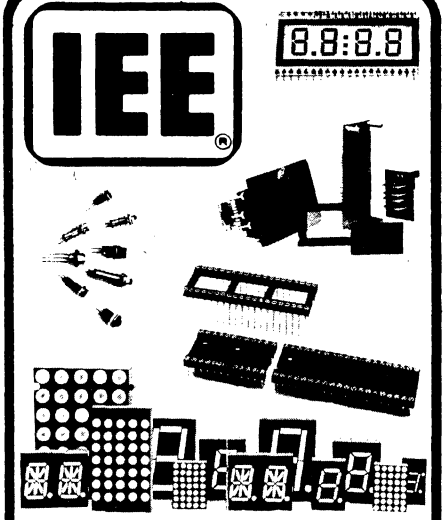
TWX 910-321-2971

SOURCE FOR INDICATOR LIGHTS



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

IEE



AUTHORIZED & STOCKING DISTRIBUTOR

ALPHA DISTRIBUTOR CORP

550 E. ROYALTON ROAD
CLEVELAND, OHIO 44147
PHONE 216/526-3716

IEE

INDUSTRIAL ELECTRONIC ENGINEERS, INC.

LAMPS • LED's • LCD's
PRECI-DIP

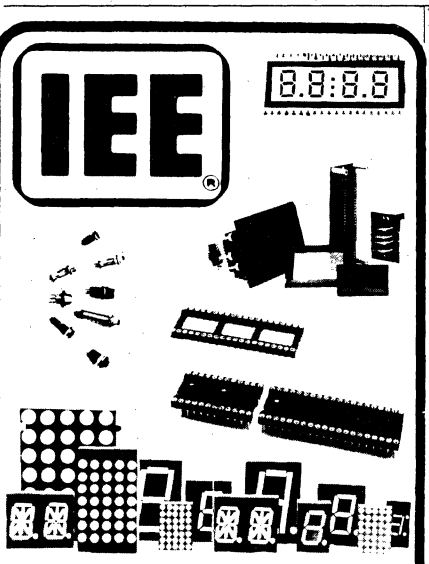
IN STOCK • IN STOCK

Franchised Distributor

LOGICOMP
ELECTRONICS, INC.

1009 W. BOSTON POST ROAD
MAMARONECK, NEW YORK 10543
PHONE: (914) 698-9332

TOLL FREE
(Outside N.Y.)
800/431-2625



AUTHORIZED & STOCKING DISTRIBUTOR

ALPHA DISTRIBUTOR CORP

550 E. ROYALTON ROAD
CLEVELAND, OHIO 44147
PHONE 216/526-3716

IEE

INDUSTRIAL ELECTRONIC ENGINEERS, INC.

LAMPS • LED's • LCD's
PRECI-DIP

IN STOCK • IN STOCK

Franchised Distributor

LOGICOMP ELECTRONICS, INC.

1009 W. BOSTON POST ROAD
MAMARONECK, NEW YORK 10543
PHONE: (914) 698-9332

TOLL FREE
(Outside N.Y.)
800/431-2625

UT	Salt Lake City, Standard Supp.	801-486-3371
VA	Arlington, Arlington Elctrn. Whlsrs.	703-524-6256
VA	Glenn Allen, Hermitage Distrs.	804-798-3830
WI	Milwaukee, Marsh Elctrns.	414-475-6000

IEE THE DISPLAY MAKERS
INDUSTRIAL ELECTRONIC ENGINEERS

INDUSTRIAL ELCTRN. ENGRS., INC., 7740 Lemona Ave., Van Nuys, CA 91405, Tel: 818-787-0311, TWX: 910-495-1707; Empl.: 400; *Sls. Mgr.:* Darryl Bloom/J. Hart/I. Minarik; *Dist. Mgr.:* J. Hart ..... **B•1078-1079, 1726**

Local Sales Offices & Reps

		716-479-9700
	Cantrell Whls.	
	Circuit Specialist Co.	
	Elctrn. Equip. Co., Inc.	
	Ital Elctrn. Sls., Inc.	
	Philadelphia Elctrns., Inc.	
AL	Huntsville, TMA Technlg. Mktg. Assocs.	205-883-7893
AZ	Phoenix, Gramer & Co.	602-995-9455, 602-942-1415
CA	Brea, Masco Elctrns., Inc.	714-529-0866
CA	Campbell, LCO Tech. Sls.	408-378-9900
CA	Los Angeles, Masco Elctrns., Inc.	714-529-0866
CA	Vista, Masco Elctrns., Inc.	619-758-5562
CO	Lakewood, Cristee-Meade Co.	303-232-0287
CA	San Jose, Class One Elctrns.	408-297-8666
CT	North Haven, Kitchen & Kutchin, Inc.	203-239-0212
FL	Melbourne, TMA Tech. Mktg. Assocs.	305-676-3776
FL	Orlando, TMA Tech. Mktg. Assocs.	305-857-3760
FL	Pompano Beach, TMA Tech. Mktg. Assocs.	305-942-0774
GA	Atlanta, TMA Tech. Mktg. Assocs.	404-257-0374
ID	Boise, Huntley Assocs.	208-343-3753
IL	Highland Park, Bransky Sls.	312-433-2375
IN	Carmel, TMC Tech. Mktg. Corp.	317-844-8462
IN	Ft. Wayne, TMC Techng. Mktg. Corp.	219-432-5553
KS	De Soto, Midtec	913-441-6565
KY	Louisville, TMC Tech. Mktg. Corp.	502-499-7808
MD	Hunt Valley, Marktron, Inc.	301-628-1111
MD	Rockville, Marktron, Inc.	301-251-8990
MA	Burlington, Kitchen & Kutchin, Inc.	617-229-2660
MI	Southfield, L. H. Dickelman Co.	313-353-8210
NJ	Englewood, ABS	201-871-0020,212-594-4090
MN	Burnsville, 2M Sales, Inc.	612-890-7774
MO	Florissant, Midtec	314-837-5200
NC	Raleigh, DHR Mktg, Inc.	919-876-5450
OH	Cleveland, Geotronix, Inc.	216-526-2535
OH	Trotwood, Geotronix, Inc.	513-252-6700
OR	Aloha, Huntley Assocs.	503-649-5388
PA	Norristown, RJI	215-631-1414
SC	Greenville, DHR Mktg., Inc.	803-235-3594
TX	Dallas, MGR Elctrns., Inc.	214-238-5246, 713-759-0187
UT	Sandy, Cristee-Meade/GTM Assocs.	801-483-4103
VA	Charlottesville, Marktron, Inc.	804-973-5874
WA	Everett, Huntley Assocs.	206-353-1833
WI	Cedarburg, Bransky Sls.	414-377-6837

Local Distributors

AL	Huntsville, C.D.I.	205-883-7501
AZ	Phoenix, Tri-Tek, Inc.	602-995-9352
AZ	Tempe, Circuit Specialist Co.	602-966-0764
AR	Little Rock, C.D.I.	501-227-6278
CA	Cerritos, El-Com, Inc.	213-404-2961
CA	Gardena, California Switch & Signal Co.	213-538-9830
CA	Industry, Ital Elctrn. Sls., Inc.	818-968-8515, 714-990-0922
CA	Lakeside, Mouser Elctrn. Corp.	619-449-2229
CA	San Diego, El-Com, Inc.	619-578-0900
CA	San Diego, Richey/Western Elctrns.	619-565-4444
CA	San Jose, Richey/Western Elctrns.	408-946-6611
CA	Santa Clara, Waltronic Sls.	408-727-1200
CA	Sun Valley, Richey/Western Elctrns.	818-768-3800
CO	Denver, Integrated Elctrns.	303-292-6121
CT	East Haven, J. V. Elctrns.	203-469-2321
FL	Alamonte Springs, Pioneer/Orlando	305-834-9090, 800-432-6094
FL	Ft. Lauderdale, C.D.I.	305-971-4950
FL	Miami, Elctrn. Equip. Co., Inc.	305-871-3500
GA	Norcross, C.D.I.	404-441-3320
IL	Chicago, Bell Inds.	312-982-9210
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Elgin, Allied Elctrns.	312-697-8200
IL	Elmhurst, Semiconductor Specialists, Inc.	312-279-1005
IL	Northbrook, Classic Comps.	312-272-9650
IN	Carmel, Altex Elctrns., Inc.	317-848-1323, 800-692-6039
KS	Wichita, R.S.C.	316-267-5213
MD	Beltsville, Treeko Sls.	301-937-8260
MD	Gaithersburg, Pioneer/Washington	301-948-0710
MA	Billerica, A. W. Mayer Co., Inc.	617-667-6900
MA	Danvers, Criterion Elctrns.	617-777-4725
MA	Needham, Cronin Elctrns., Inc.	617-449-5000
MI	Grand Rapids, S-F Elctrn. Supp. Inc.	616-459-0216
MI	Southfield, Michigan Lectrols Corp.	313-353-1350
MN	Minneapolis, Stark Elctrns.	612-332-1325
MO	Kansas City, Semiconductor Specialists, Inc.	816-452-3900
MO	St. Louis, Olive Indl. Elctrns.	314-426-4500
NM	Albuquerque, Betatron Elctrns.	505-344-2381
NM	Albuquerque, Intl. Elctrns.	505-345-8127
NY	Farmingdale, Pride Elctrns.	516-293-4020
NY	Farmingdale, S.A.I.	516-293-2710
NY	Mamaroneck, Logicomp Elctrns.	914-698-9332
NY	Rochester, Masline Elctrns.	716-647-9700
NY	Rochester, Modutex Corp.	716-647-9700
NC	Greensboro, Hammond Elec.	919-275-6391
NC	Raleigh, So. Eastern. Elctrns.	919-828-2311
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Cleveland, Alpha Distr. Corp.	216-526-3716
OH	Dayton, The Stotts-Friedman Co.	513-298-5555
OK	Oklahoma City, Electro Entrs., Inc.	405-427-6591
PA	Philadelphia, Herbach & Rademan, Inc.	215-426-1700
PA	Philadelphia, Philadelphia Elctrns., Inc.	215-568-7400
SC	Taylors, Cantrell Whls.	803-268-1194
TX	Austin, Southwest Elctrns.	512-837-8971
TX	Austin, The Altair Co.	512-837-4490
TX	Fort Worth, Allied Elctrns.	817-336-5401
TX	Houston, Solid State Elctrns.	713-772-8483
TX	Houston, The Altair Co.	713-462-3029
TX	Irving, Solid State Elctrns.	214-438-5700
TX	Richardson, Southwest Elctrns.	214-234-3050
TX	Richardson, The Altair Co.	214-231-5166
TX	Stafford, Southwest Elctrns.	713-491-4900
WA	Kent, Shannon Ltd.	206-763-0545
WI	Mequon, Taylor Elec. Co.	414-241-4321
WI	Milwaukee, Marsh Elctrns.	414-475-6000

IEH

INDUSTRIAL ELCTRN. HARDWARE CORP., 109 Prince St., New York, NY 10012, Tel: 212-677-1881, TWX: 710-581-4338; FSC No.: 97913; Empl.: 430; *Sls. Mgr.:* Louis Roberts; *Dist. Mgr.:* Louis Roberts ..... **C•1272**

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Phoenix, Knight Co.	602-582-8506
CA	Los Angeles, Knight Co	213-670-2833
CA	San Diego, Knight Co.	619-743-5136
CA	Sunnyvale, M2 Mktg. Grp.	408-986-0676
FL	Maitland, Ellis Assocs.	305-645-1101
GA	Atlanta, Beacon Elctrns.	404-256-9640
KS	Wichita, Thunderbird Tech. Sls.	316-684-3941
MD	Ellicot City, Techn. Sls.	301-461-2400
MA	Lowell, Todino Engrg.	617-444-7925
MN	St. Paul, Countryman	612-645-9151
NJ	Fort Lee, FJK Assocs., Inc.	201-592-1002
NJ	Haddonfield, Brown Assocs.	609-429-1005
NY	Buffalo, Franklin Sls.	716-248-8251
NY	Pittsford, Franklin Sls.	716-248-8251
NY	Ronkonkoma, PMR	516-467-8200
NC	Raleigh, Beacon Elctrns.	919-787-0330
OH	Beachwood, Elctrn. Salesmasters, Inc.	216-831-9555
OR	Beaverton, Eclipse Mktg.	206-885-6991
TX	Dallas, Pro-Mark	214-644-0497
WA	Redmond, Eclipse Mktg.	206-885-6991

Local Distributors

AL	Huntsville, Powell Elctrns.	205-539-2731
CA	San Jose, Powell Elctrns.	408-943-9020
CA	Sunnyvale, Time Elctrns.	408-734-9888
FL	Ft. Lauderdale, Time Elctrns.	305-974-4800
MA	Westborough, Powell Elctrns.	617-366-6100
MA	Woburn, Time Elctrns.	617-935-8080
NY	Hauppauge, Time Elctrns.	516-273-0100
PA	Philadelphia, Powell Elctrns.	215-365-1900
TX	Dallas, Time Elctrns.	214-385-0566
TX	Los Colinas, Powell Elctrns.	214-258-6841

INDUSTRIAL FABRICATING CO., 820 Woodend Ave., Stratford, CT 06497, Tel: 203-375-5853; Empl.: 30; *Sls. Mgr.:* Ray Peterson

INDUSTRIAL INDEXING SYS., INC., 626 Fishers Run, Victor, NY 14564, Tel: 716-924-9181; Empl.: 30; *Sls. Mgr.:* Raymond F. Coller

Local Sales Offices & Reps

CA	San Carlos, Cymatix	415-592-8076
IN	Fort Wayne, Aktron Corp.	219-747-3650
MA	Bedford, AID Engrg. Sls.	203-663-2225
MI	Grand Rapids, Ackerman Elec. Supp.	616-459-8327
MI	Walled Lake, Static Controls	313-363-4500
NY	East Rochester, A & D Dvcs.	716-385-2778
NY	Sidney, A & D Dvcs.	603-563-8488
OH	Medina, Cygnus Corp.	216-725-1663
PA	Media, Homersmith, Inc.	215-543-2434
WI	Milwaukee, KMA Sls. Co.	414-259-1771

INDUSTRIAL MIDWEC CAPACITORS, 4902 Tollview Dr., Rolling Meadows, IL 60008, Tel: 312-577-0120, TWX: 910-687-3375; Empl.: 800; *Sls. Mgr.:* Andy Kaluski

Powertron

INDUSTRIAL TEST EQUIP., 21 Yennicock Ave., Port Washington, NY 11050, Tel: 516-883-1700; FSC No.: 99074; *Sls. Mgr.:* Robert Loiacono **D•1247, 1938-1941**

INERTIAL MOTORS, 280 N. Broad St., Doylestown, PA 18901, Tel: 215-345-1010, Telex: 83-1633; Empl.: 49; *Sls. Mgr.:* Lori Clarkin

INFICON LEYBOLD-HERAEUS, INC., 6500 Fly Rd, E. Syracuse, NY 13057, Tel: 315-437-0377, TWX: 710-541-0594; Empl.: 165; *Sls. Mgr.:* D. A. DiRenzo

INFINETICS INC., Friskem Div., 201 Vandever Ave., Wilmington, DE 19802, Tel: 302-658-2471, TWX: 510-632-2332; *Sls. Mgr.:* M. Schwartz

INFOCAP, INC., 31119 Via Colinas #502, Westlake Village, CA 91362, Tel: 818-991-1410; *Sls. Mgr.:* David Knight

INFODEX

INFODEX, INC., 395 W. Main St., Waterbury, CT 06702, Tel: 203-757-9291, Telex: 178702 IFDX; FSC No.: 09087; Empl.: 45; *Sls. Mgr.:* E. H. Ulm .. **B•1080-1081; D•1410**

Local Sales Offices & Reps

CA	Pasadena, A-F Sales Engrg.	818-681-5631
MA	Boston, Nortech Engrg. Sls.	617-359-6063
MA	Concord, Nortech Engrg. Sls.	617-259-0032

INFOLINK CORP., 1925 Hoiste Rd., Northbrook, IL 60062, Tel: 312-291-2900; Empl.: 200; *Sls. Mgr.:* Joseph F. Guzman; *Dist. Mgr.:* Joseph F. Guzman

INFO-LITE CORP., See Dio-Rey and Crosspoint

INFO-PROS INC., 2102 Business Center Dr., Irvine, CA 92715, Tel: 714-851-8975

INFORMATION CONTROL, Dept. EM7 9610 Bellanca Ave., Los Angeles, CA 90045, Tel: 213-641-8520, TWX: 910-328-7234; Empl.: 55; *Sls. Mgr.:* Carol J. Smith

INFORMATION CONTROL CORP., Abacus Div. Dept. EM7, 9610 Bellanca Ave., Los Angeles, CA 90045, Tel: 213-641-8520, TWX: 910-328-7234; Empl.: 50

INFORMATION CONTROL CORP., 9610 Bellanca Ave., Los Angeles, CA 90045, Tel: 213-641-8520, TWX: 910-328-7234; Empl.: 30; *Sls. Mgr.:* J. M. Boyle

INFORMATION TECHNOLGOY A.D.S.C., P.O. Box 470, College Park, MD 20740, Tel: 301-779-5110; *Sls. Mgr.:* Daniel Akers

INFORMATION TERMINALS, See Verbatim Corp.

THE SWITCHING COMPANY

INFORMATION TRANSFER INDL., Box 357, Holcomb, NY 14469, Tel: 716-657-7074; FSC No.: 55137; Empl.: 70; *Sls. Mgr.:* J. E. Wiseman .... **D•1152-1154, 1248-1249**

Local Sales Offices & Reps

AZ	Scottsdale, Luscombe Engrg.	602-949-9333
CA	Campbell, Luscombe Engrg.	408-370-2020
CA	Pasadena, Luscombe Engrg.	213-684-2000
CA	San Diego, Luscombe Engrg.	714-295-4300
CO	Littleton, Pond Assocs., Inc.	303-798-2904
CT	Marion, Polytek Assocs.	203-621-4542
IL	Schaumburg, Kenneth W. Meyers Co.	312-882-4808
IN	Indianapolis, Kenneth W. Meyers Co.	317-783-1030
IA	Cedar Rapids, Kenneth W. Meyers Co.	319-363-8987
MD	Clarksville, Riffe Assocs.	301-953-2811
MA	Ashland, Polytek Assocs.	617-881-4741
MN	Minneapolis, Kenneth W. Meyers Co.	612-920-7080
NJ	Oxford, Malin Assocs.	201-689-7398
NY	Albany, R. F. Lamb Co.	518-869-3355
NY	Buffalo, R. F. Lamb Co.	716-874-4900
NY	Rochester, R. F. Lamb Co.	716-323-1250
NY	Syracuse, R. F. Lamb Co.	315-454-2469
OR	Portland, Tasco	503-245-8168
PA	Melrose Park, Robert Meyers Assocs.	215-224-1663
TX	Houston, Sci. Sls. Co.	713-460-9170
TX	Richardson, Sci. Sls. Co.	214-231-6541
WA	Bellevue, Tasco	206-453-1414
WI	Brookfield, Kenneth W. Meyers Co.	414-784-3790
EXP	Brampton, Ontario, Misner Mktg. Ltd.	416-456-3777

INFOSPHERE, INC., 4730 S.W. Macadam Ave., Portland, OR 97201, Tel: 503-226-3515, Telex: 360312; *Sls. Mgr.:* Wm. David Sharon; *Dist. Mgr.:* Wm. David Sharon

INFRARED INDS., INC., P.O. Box 14200, Orlando, FL 32857, Tel: 305-282-7700, Telex: 568908; Empl.: 80; *Sls. Mgr.:* Thomas Chisholm

INJECTORALL ELCTRNS., 98-100 Glen St., Glen Cove, NY 11542, Tel: 516-671-6010 ..... **C•1101**

Local Sales Offices & Reps

AL	Birmingham, John F. Russell Co.	205-822-2196
CA	Burlingame, Carelli-Ema	415-342-4514
CA	Long Beach, Ross Sls.	213-424-9818
FL	Miami Beach, Everett Wollman Sls.	305-932-1790
MA	Northboro, W. B. Pray Co.	617-393-3434
MI	Livonia, Harvey Sales Co.	313-476-1974
NY	Brooklyn, Moet Maltz & Co.	212-252-1139
WA	Edmonds, McLaughlin Mktg. Inc.	206-743-1161

Local Distributors

AL	Huntsville, Mock	205-539-2401
AZ	Tucson, Electronic City	602-622-1173
CA	Los Angeles, ITC	213-388-0621
CA	San Jose, Quement	408-998-5900
CA	San Rafael, Elctrns. Plus	415-457-0466
CA	Sunnyvale, Halted Specialties	408-732-1573
FL	Pensacola, Pensacola Elctrns.	904-478-3771
GA	Atlanta, Delta	404-458-4690
IL	Chicago, Tron Elctrns.	312-640-8822
IN	East Chicago, Acro	219-397-8681
KY	Louisville, P.I. Burkes	502-589-3960
MA	Needham, Y.D.I.	617-449-1005
MI	Bay City, KDC	517-892-1594
MI	Port Huron, Main	313-985-5103
NJ	Vineland, Laraco	609-691-2900
NY	Elmsford, Ancar	914-592-7100
NY	Levittown, Edlies Elctrns.	516-735-3330
NY	New York City, Taft	212-575-5194
NY	Richmond Hill, Anchor	212-846-2420
OR	Beaverton, Norvac	503-644-1025
PA	Norristown, Philadelphia Elctrns.	215-275-5550
TX	Fort Worth, Sweico	817-335-6521
WA	Seattle, Elctrn. Supermart	206-575-1093
WA	Seattle, Radar	206-282-2511

INLAND MOTOR DIV. KOLLMORGEN, INDL. DRIVES GRP., See Kollmorgen Corp.

INLAND MOTOR DIVISION, Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635, Tel: 602-459-1150, Telex: 62858, TWX: 910-973-9869; *Sls. Mgr.:* Mike Malcoun

INLAND MOTOR KOLLMORGEN CORPORATION

INLAND MOTOR, Kollmorgen Corp., 501 First St., Radford, VA 24141, Tel: 703-639-9045, TWX: 710-875-3740; FSC No.: 11384; Empl.: 450

Local Sales Offices & Reps

PA	Media, Homersmith, Inc.	215-543-2434
FL	Melbourne, Technology Mktg. Assocs.	305-676-3776
FL	Orlando, Technology Mktg. Assocs.	305-857-3760
FL	Pampano Beach, Technology Mktg. Assocs.	305-942-0774
FL	Winter Park, Magna Engrg. Sls.	305-671-8716
OH	Medina, Cygnus	216-725-1663
PA	Doylestown, Magna Engrg. Sls.	215-345-5111

Specialty/Instrument/Industrial Drive Group

AL	Huntsville, Technology Mktg. Assocs.	205-883-7893
AZ	Phoenix, Thor Engrg. Mfrs. Reps.	602-437-1463
AZ	Sierra Vista, Inland Motor	602-459-1150
CA	Alhambra, Thorson Co. of Southern CA	818-281-2280
CA	Goleta, Thorson Co. of Southern CA	805-964-8751
CA	Mountain View, Thorson Co. of Southern CA	415-964-9300
CA	San Diego, Thorson Co. of San Diego	619-292-8525
CA	Signal Hill, Thorson Co. of Southern CA	213-595-0361
CO	Englewood, Thorson Rocky Mt., Inc.	303-779-0666
CT	Wolcott, Vanguard Elctrns. Corp.	203-879-9310
GA	Atlanta, Technology Mktg. Assocs.	404-257-0374
IL	Collinsville, Magna Engrg. Sls.	618-345-5583
IL	Elk Grove Village, Carlson Elctrn. Sls.	312-956-8240
IN	Indianapolis, J & W Sls.	317-842-3740
IA	Cedar Rapids, Carlson Elctrn. Sls.	319-377-6341
KS	Wichita, Magna Engrg. Sls.	316-744-0851
MD	Baltimore, Rep-Tron, Inc.	301-799-7490
MA	Needham Heights, Vanguard Elctrns. Corp.	617-449-5578
MI	Grand Rapids, R. P. Urban & Assocs.	616-245-0511
MI	Redford, R. P. Urban & Assocs.	313-535-2355
MN	St. Paul, John J. Exon Co.	612-636-5533
NJ	Wayne, SHL Assocs., Inc.	201-790-1714
NY	E. Rochester, A & D Dvcs.	716-385-2778
OR	Beaverton, Thorson Co. Northwest	503-644-5900
TX	Dallas, Magna Engrg. Sls.	214-349-6171
UT	W. Valley City, Thorson Rocky Mt., Inc.	801-973-7969
WA	Bellevue, Thorson Co. Northwest	206-455-9180
WI	Milwaukee, Carlson Elctrn. Sls.	414-476-2790

INMAC, 2465 Augustine Dr., Santa Clara, CA 95054, Tel: 408-727-1970, TWX: 910-338-2091; Empl.: 500

INMARK CORP., 147 West Cedar St., Norwalk, CT 06854, Tel: 203-866-8474, Telex: 99-6419; *Sls. Mgr.:* Lars Giers

INMOS CORP., P.O. Box 16000, Colorado Springs, CO 80935, Tel: 303-630-4000 Ext. 4454, TWX: 910-920-4904; Empl.: 1500; *Sls. Mgr.:* Peter Fowler; *Dist. Mgr.:* Jim O'Sullivan

INNOTRONICS, Brooks Rd., Lincoln, MA 01773, Tel: 617-678-8720; *Dist. Mgr.:* Stephen Scheuer

INNOVATEK MICROSYSTEMS, INC., Smithfield Rd., R1 Box 104, Millerton, NY 12546-9720, Tel: 914-373-9003, Telex: 750120; Empl.: 8; *Sls. Mgr.:* Paul F. Fitts

INNOVATIVE DATA TECHNOLOGY, 5340 Eastgate Mall, San Diego, CA 92121, Tel: 619-587-0555, TWX: 910-335-1610 IDT SDG; Empl.: 80; *Sls. Mgr.:* Robert G. Christy

INNOVATIVE ELECTRONICS, INC., 4714 N.W. 165th St., Miami, FL 33014, Tel: 305-624-1644, Telex: 80-7121; Empl.: 28; *Sls. Mgr.:* Tom Wullen; *Dist. Mgr.:* Tom Wullen

INRECO, See Ransco Industries

INRESCO, INC., 654 Ocean Road, Pt. Pleasant, NJ 08742, Tel: 201-892-5881, Telex: WUD, TWX: 844228; Empl.: 16; *Sls. Mgr.:* G. L. Martin

INSERVCO, INC., Box 106, La Grange, OH 44050

INSTRON CORP., 100 Royall St., Canton, MA 02021, Tel: 617-828-2500, Telex: 924434; Empl.: 1000; *Sls. Mgr.:* S. J. Vinciguerra; *Dist. Mgr.:* Lawrence Frost

INSTRULAB, P.O. B. 98, Dayton, OH 45404, Tel: 513-223-2241; Empl.: 22; *Sls. Mgr.:* Philip C. Alderton

INSTRU-LEC, 44 Old State Rd, #18, New Milford, CT 06776, Tel: 203-355-3717; FSC No.: 13782; Empl.: 4

INSTRUMENTATION & CONTROL SYS., 520 Interstate Rd, Addison, IL 60101, Tel: 312-543-6200, TWX: 910-991-5945; Empl.: 50; *Sls. Mgr.:* Ken Horning ..... **B•1318-1319; D•1933**

Local Sales Offices & Reps

Industrial Control Component Reps.

CA	Arcadia, HMC, Inc.	818-447-0958
FL	Miami, Hummel Indl. Sls.	305-651-0196
IL	Elmhurst, Hill-Gray Assocs.	312-832-4101
NY	Rochester, J. G. Welch Assocs., Inc.	716-244-1100
IN	Indianapolis, Fred A. Dorsey & Assocs.	317-842-0060
KS	Shawnee Mission, Microtronics	913-262-1444
MI	Brooklyn, ECI	517-592-3236
MN	Minneapolis, R. W. Marshall Co.	612-929-0457
CO	Denver, West Incorporated	303-477-8180
NH	Durham, C. H. Burnham Assocs.	603-868-2282
NY	Plainview, R. Smith Assocs.	516-681-3155
NY	Tonwanda, Ronco Power Sys.	716-873-0760
VA	Warrenton, Mid-Atlantic Power Specialists	703-442-8249

Power Conditioning Reps.

AL	Birmingham, C. S. Phillips Co.	205-870-0640
CA	San Ramon, Synergy	415-838-8300
CO	Englewood, Data Specialties	303-761-5763
FL	Newport Richey, R. C. Todd	813-849-6067
GA	Atlanta, Fincannon Assocs.	404-451-7841
IL	Chicago, Ropek-Cahill & Vogt	312-631-0070
LA	Lake Charles, Devitt Pancoast Controls Co., Inc.	318-439-1255
LA	Baton Rouge, Devitt Pancoast Controls Co., Inc.	318-439-1255
NJ	Franklin Lakes, Lambert Assocs.	201-891-7154
NM	Albuquerque, E.E.R.	505-265-7148
LA	Metairie, Devitt Pancoast Controls Co., Inc.	504-835-1713
NY	Rochester, RG Engrg.	716-424-7492
TX	Houston, Gettys-Eads-Adair	713-781-3005

Local Distributors

CA	Canoga Park, C & A Elctrns.	818-340-6022
CA	Garden Grove, Allied Elctrns.	714-554-0731
CA	Hayward, Allied Elctrns.	415-487-5250
CA	San Jose, Allied Elctrns.	408-995-0470
CO	Denver, Colorado Bus.	303-759-4589
MA	Wilmington, Allied Elctrns.	617-942-0150
FL	Ft. Lauderdale, Allied Elctrns.	305-486-0500
FL	Miami, Hummel Indl. Sls.	305-651-0196
GA	Atlanta, Automatic Controls Co.	404-266-0130
IL	Berwyn, B-B & W, Inc.	312-749-1710
IL	Elgin, Allied Elctrns.	312-697-8200
IL	Rosemont, Advent Elctrns.	312-297-6200
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
IA	Indianapolis, Advent Elctrns.	317-872-4910
MD	Marlow Hgts., Allied Elctrns.	301-423-0161
MI	Farmington Hills, Advent Elctrns.	313-447-1650
MN	St. Paul, Powermation	612-645-0781
NY	Bay Shore, Soundview Instrs.	516-666-1000
NY	Mineola, Allied Elctrns.	516-248-2360
OH	Chagrin Falls, Neptune	216-247-7030
OH	Warren, REM Elctrn. Supp. Co., Inc.	216-373-1300
TX	Brownsville, Garden Indl. Grp.	512-546-1612
TX	Ft. Worth, Allied Elctrns.	817-336-5401, 214-265-9341
TX	Ft. Worth, Allied Export Svcs.	817-336-5401
TX	Garland, Powertronics	214-272-4640
WA	Seattle, Allied Elctrns.	206-767-2827
WI	Fond du Lac, Fedco Elctrns.	414-922-6490
WI	Waukesha, Powermation	414-542-2868

INSTRUMENTATION MEAS. LAB., Div. of Lockheed Electronics Co., Inc., 1501 Rt. 22, Plainfield, NJ 07061, Tel: 201-757-3730; *Sls. Mgr.:* P. Murray Grinnell

INSTRUMENTATION PRODS., 3M Co., 300 S. Lewis Rd., Camarillo, CA 93010, Tel: 805-482-1911, TWX: 910-336-1676; Empl.: 500

INSTRUMENTATION SERVICES, INC., 957 Winnetka Ave. N., Minneapolis, MN 55427, Tel: 612-544-8916, Telex: 29-0101; Empl.: 30; *Sls. Mgr.:* G. Ryan

INSTRUMENT ENCLOSURES, 9767 Glenoaks Blvd., Sun Valley, CA 91352, Tel: 818-768-4622, Telex: 66-2442; FSC No.: 62012; Empl.: 28; *Sls. Mgr.:* William B. Taylor

Distributor

THE INSTRUMENT MART, 295 Community Dr., Great Neck, NY 11021, Tel: 516-487-7430 ... **D•1246, 1364, 1389**

INSTRUMENT RESEARCH CO., Box 40207, Santa Barbara, CA 93103, Tel: 805-962-8336; Empl.: 6

INSTRUMENT RESISTOR CO., See INRESCO/Instr. Resistor

INSTRUMENTS, INC., 7263 Engineer Rd., San Diego, CA 92111, Tel: 619-571-1111, Telex: 695073, TWX: 910-335-1607; FSC No.: 34563; Empl.: 28; *Sls. Mgr.:* Ken Kalbfell

INSTRUMENTS AND CONTROLS DIV., Technology Inc., P.O. Box 3036, Overlook Branch, Dayton, OH 45431, Tel: 513-426-2405, TWX: 810-450-2620; FSC No.: 23978; Empl.: 100; *Sls. Mgr.:* Robert J. Papajcik

INSTRUMENTS FOR INDUSTRY, INC., 151 Toledo St., Farmingdale, NY 11735, Tel: 516-694-1414, TWX: 510-222-0876; Empl.: 25; *Sls. Mgr.:* Ron Richards ... **D•1010**

Local Sales Offices & Reps

AZ	Mesa, DJM Elctrns.	602-820-4030
CA	Mountain View, DJM Elctrns.	415-966-1680
CA	Newhall, DJM Elctrns.	805-254-2677
CA	Westlake Village	805-495-1006
CO	Englewood, R. A. Mayes Co.	303-761-9447
CA	San Diego, DJM Elctrns.	619-283-2955
MD	Laurel, CSDS, Inc.	301-490-3800
MN	Minneapolis, Deerland Distrs.	612-331-6433
MO	Kansas City, EIR Co.	816-452-7030
MO	Leasburg, EIR Co.	314-895-4100
NJ	N. Plainfield, Brady Co.	201-753-7988
NM	Albuquerque, R. A. Mayes Co. Southwest	505-292-2330
OH	Cincinnati, Bill Teplitz Assocs.	513-481-1648
OH	Cleveland, Bill Teplitz Assocs.	216-439-3265
TX	Austin, Scientific Dvcs.	512-442-6215
TX	Houston, Scientific Dvcs.	713-864-1711
TX	Richardson, Scientific Dvcs.	214-231-8106
WI	Milwaukee, Deerland Distrs.	414-784-1414

INSTRUMENT SPECIALTIES CO., P.O. Box A, Delaware Water Gap, PA 18327, Tel: 717-424-8510, TWX: 510-671-4526; Empl.: 300; *Sls. Mgr.:* James P. May ..... **C•1724-1725**

Local Sales Offices & Reps

AZ	Phoenix, O'Donnell Assocs.	602-944-9542
CA	San Jose, O'Donnell Assocs.	408-263-6500
CA	Torrance, O'Donnell Assocs.	213-539-9664
CO	Englewood, D. M. Harthun Assocs., Inc.	303-792-5050
MI	Brooklyn, Engineer Comps., Inc.	517-592-3236
MN	Eagan, J. Jorgenson & Assocs., Inc.	612-452-9541
OR	Hillsboro, Temco Northwest	503-648-8171
TX	Dallas, J. M. Spell	214-620-0040
WA	Kirkland, Temco Northwest	206-821-5434

INTECH, Instruments Div., 282 Brokaw Rd., Santa Clara, CA 95050, Tel: 408-727-0500, TWX: 910-338-0254; Empl.: 120; *Sls. Mgr.:* Howard Randall; *Dist. Mgr.:* Howard Randall

intech

INTECH, Microcircuits Div., 2270 Martin Ave., Santa Clara, CA 95050, Tel: 408-988-4930, TWX: 910-338-2213; FSC No.: 33967; Empl.: 150; *Sls. Mgr.:* D. Arnold ..... **A•1672**

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech	205-533-2100
AZ	Tucson, Clemick & Assocs.	602-749-4003
CA	San Diego, MESA Engrg. Sls.	619-278-8021
CO	Broomfield, Wescom Mktg.	303-465-2234
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Altamonte Springs, Semtronic Assocs.	305-831-8233
FL	Clearwater, Semtronic Assocs.	813-461-4675
FL	Largo, Electrocraft, Inc.	813-530-4749
FL	Winter Park, Electrocraft, Inc.	305-628-4705
GA	Norcross, Electro-Mech	404-447-6478
IL	Roselle, John Kennaugh Assocs.	312-980-7570
MD	Mt. Airey, Beacon North, Inc.	703-534-7200
MD	Randallstown, Beacon North, Inc.	301-655-2265
MA	Burlington, Kitchen & Kutchin	617-229-2660
MI	Birmingham, Favco Inc.	313-644-0173
MN	Minneapolis, Arjay Sls.	612-854-4972
NY	Huntington, Compar	516-423-5660
NJ	Marlton, BGR Assocs.	609-983-1020
NY	Rochester, Tae-Rep	716-586-8710
NY	Whitney Point, Tae-Rep, Inc.	607-692-3705
NC	Raleigh, Electro-Mech	919-851-8165
OH	Rocky River, Norm Case	216-333-0400
OK	Tulsa, Cunningham Comps.	918-492-0390
PA	Glenshaw, Nurm Case	
TN	Jonesboro, Electro-Mech	615-753-2964
TN	Largo, Electro-Mech	813-530-4749
TX	Austin, Cunningham Comps.	512-450-0637
TX	Dallas, Cunningham Comps.	214-669-9706
TX	Houston, Cunningham Comps.	713-461-4197
VA	Fairfax, Beacon North	703-591-1300
VA	Forest, Beacon North, Inc.	804-239-8486
Can	Calgary, Alb., Weber Elctrns.	403-264-5963
Can	Markham, Ont., Weber Elctrns.	416-475-8500
Can	Ottawa, Ont., Weber Elctrns.	613-728-2746

Local Distributors

TX	Houston, Quality Comps.	713-772-7100

INTEGRA, INC., 2368 Walsh Ave., Santa Clara, CA 95051, Tel: 408-727-9601, TWX: 910-338-0585; FSC No.: 51162; Empl.: 14; *Sls. Mgr.:* David Bradley

INTEGRAL DATA SYS., INC., Rte. 13 S, Milford, NH 03055, Tel: 603-673-9100, Telex: 95-3032; *Dist. Mgr.:* M. Dude

INTEGRATED CIRCUIT ENGRG. CORP. (ICE), 15022 N. 75th St., Scottsdale, AZ 85260, Tel: 602-998-9780, Telex: 165-755; Empl.: 45; *Sls. Mgr.:* Daniel J. Shelton

INTEGRATED CIRCUITS, INC., 10301 Willows Road, Redmond, WA 98052, Tel: 206-882-3100, TWX: 910-443-2302; FSC No.: 50821; Empl.: 228; *Sls. Mgr.:* B. W. Brugman ..... **A•1673; D•1661-1665**

Local Sales Offices & Reps

CA	El Toro, Martronix	714-855-6397
CA	Mountain View, Weseloh-Swanson Assocs.	415-961-0565
CO	Parker, Tech. Mktg. Assocs.	303-841-3435
FL	Melbourne, EMS, Inc.	305-724-1027
IL	Schaumburg, Gassner & Clark Co.	312-882-8608
IA	Des Moines, Beams Co.	515-255-1148
KS	Shawnee Mission, Beams Co.	913-631-0300
MD	Owings Mills, Neal Deoul Assocs.	301-363-4311
MA	Wakefield, Howard C. Jappe Co.	617-245-9359
MN	Minneapolis, Electromark	612-881-3306
MO	St. Louis, Beams Co.	314-569-1060
NJ	Flanders, K & R Engrg. Sls.	201-584-5235
NY	N. Syracuse, Advanced Comps. Corp.	315-699-2671
OH	Cleveland, Arthur H. Baier Co.	216-461-6161
PA	Newtown, Yax Assocs.	215-860-2540
TX	Irving, Kite Elctrn. Sls.	214-438-9336
Can	Scarborough, Ont., Bestec Elctrns., Ltd.	416-293-1391

INTEGRATED COMPUTER SYSTEMS, 6305 Arizona Pl., P.O. Box 45405, Los Angeles, CA 90045, Tel: 213-417-8888, Telex: 4995168 ICS LA; Empl.: 80; *Sls. Mgr.:* Ruth Dordick

INTEGRATED DEVICE TECHNLG., INC., 3236 Scott Blvd., Santa Clara, CA 95054-3090, Tel: 408-727-6116, TWX: 910-338-2070; FSC No.: 61772; Empl.: 450; *Sls. Mgr.:* Lanny Flessas; *Dist. Mgr.:* Sue Vasquez

INTEGRATED DIGITAL PRODUCTS, 4208 E. La Palma Ave., Anaheim, CA 92807, Tel: 714-793-5300; Empl.: 12; *Sls. Mgr.:* Patrick Goodrich

INTEGRATED MICROWAVE, 11526 Sorrento Valley Rd., San Diego, CA 92121, Tel: 619-457-0277, TWX: 910-335-2037; FSC No.: 60656; *Sls. Mgr.:* Art Brand

INTELLIGENT TECHNOLOGY, Logica PLC, 151 University Avenue, Palo Alto, CA 94301, Tel: 415-328-2411, TWX: 756175; Empl.: 30; *Sls. Mgr.:* Dennis Reardon

INTEL MEMORY SYSTEMS, 1302 N. Mathilda, Sunnyvale, CA 94086, Tel: 408-734-8102, TWX: 910-339-9361; FSC No.: 34649; Empl.: 600; *Sls. Mgr.:* G. Andersen, Mktg. Mgr.

INTERACTION SYSTEMS INC., 24 Munroe St, Newtonville, MA 02160, Tel: 617-964-5300, TWX: 753582; *Sls. Mgr.:* Jonathan J. Bloom

INTERACTIVE COMPUTER PRODUCTS, INC., 23591 El Toro Rd., Ste. 180, El Toro, CA 92630, Tel: 714-770-5332, Telex: 469459; *Sls. Mgr.:* Jim Bearden

INTERACTIVE MICRO SYS., INC., 644 Davisville Rd., Willow Grove, PA 19090

INTERCONICS, BMC Industries, Inc., 245 E. 6th St, 3rd Flr., St. Paul, MN 55101, Tel: 612-228-6512, Telex: 297080; *Sls. Mgr.:* Lee Jamison

INTERCONICS, BUSSING SYS. OPER., a unit of BMC Industries, Inc., 2525 E. Vista Industria, Compton, CA 90220, Tel: 213-639-2535, Telex: 316727; FSC No.: 55783; Empl.: 90; *Sls. Mgr.:* Robert J. Ferm

INTERCONNECT DEVICES, INC., 5101 Richland Ave., Kansas City, KS 66106, Tel: 913-342-5544, Telex: 437-262 IDI KSCK

INTERCONNECTION TECHNOLOGY, INC., 5542 Buckingham Drive, Huntington Beach, CA 92649, Tel: 714-891-5305, TWX: 910-596-1879; *Sls. Mgr.:* Jerry Hammel ..... **C•1711**

Local Sales Offices & Reps

AZ	Scottsdale, Semi-sys. Arizona, Inc.	602-991-1151
CA	San Diego, Joe Cetinske Sls. Co.	619-487-3335
FL	Melbourne, Al-Tech Assocs.	305-768-2184
IL	Rush & West Assocs.	314-394-7271
MD	Pasadena, Tytronics Tech. Sls.	301-471-0440
MA	Lexington, Jodan Technlg., Inc.	617-862-2354
NJ	Wayne, G. T. Assocs.	201-694-6040
NY	Fairport, Net Sls. Co.	716-467-4538
OH	Mansfield, Ralph Meckling Assocs.	419-756-4433
TX	Dallas, Allied Comps., Inc.	214-238-0408
WA	Edmonds, WA, Cunningham Sales, Inc.	206-771-4848

INTERDESIGN, INC., 1500 Green Hills Rd., Scotts Valley, CA 95066, Tel: 408-438-2900, TWX: 910-339-9374; Empl.: 230

INTERDYNE CO., 157 Topaz St., Milpitas, CA 95035, Tel: 408-943-9133; FSC No.: 31598; Empl.: 30

INTERELECTRONICS CORP., Interelectronics Park, 550 U.S. Rte. 303, Congers, NY 10920, Tel: 914-EL8-8000; Empl.: 82; *Sls. Mgr.:* M. H. Pintell; *Dist. Mgr.:* G. Sherwood ..... **D•1667**

INTERFACE, 7401 Butherus Dr., Scottsdale, AZ 85260, Tel: 602-948-5555, Telex: 668-394; FSC No.: 32311

INTERFACE ELECTRONICS INC., 21134 Bridge St., Southfield, MI 48034, Tel: 313-352-8820, Telex: 234004; Empl.: 21; *Sls. Mgr.:* Ketan Bakshi

INTERFACE ENGRG., 386 Lindelof Ave., Stoughton, MA 02072, Tel: 617-344-7383, Telex: 940-848; FSC No.: 14352; Empl.: 25; *Sls. Mgr.:* Thomas Scanlon ..... **D•1156-1157**

Local Sales Offices & Reps

NY	Great Neck, Industron Assoc.	516-487-2620
VA	Arlington, Gans & Pugh	703-527-3262

INTERFACE PRODUCTS, INC., 2185 S. Grand Ave., Santa Ana, CA 92705, Tel: 714-549-4977, TWX: 910-595-2569; FSC No.: 55300; Empl.: 50; *Sls. Mgr.:* William Lang

INTERFACE TECH. DYNATECH, 150 East Arrow Highway, San Dimas, CA 91773, Tel: 714-592-2971

INTERFACE TECHNOLOGY, 10500 Kahlmeyer Dr., St. Louis, MO 63132, Tel: 314-426-6880, TWX: 910-765-0916; Empl.: 50

INTERGALACTIC CORP., Box 7025, Salt Lake City, UT 84107, Tel: 801-262-0094

INTERLOK, 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-348-5625, TWX: 910-374-2353; FSC No.: 55951; Empl.: 30; *Sls. Mgr.:* Ray Vorce

INTER-MARKET, 1946 Lehigh Ave., Glenview, IL 60025, Tel: 312-729-5330, TWX: 910-651-1997; FSC No.: 34165; Empl.: 10; *Sls. Mgr.:* Phil Gardanier ..... **B•1082, 1597**

Local Sales Offices & Reps

MA	Braintree, Nova Assocs.	617-848-9330
MN	St. Paul, Kenco Tronics	612-645-7717
PA	Rydal, Espy Sls.	215-576-0780
TX	Irving, Kite Elctrn. Sls.	214-438-9336
WA	Redmond, Elctrn. Mktg.	206-882-0962
Can	Montreal, Que., Braydon Electro	514-332-5650

Local Distributors

CA	Chatsworth, Mil-Comm Distr.	818-998-3111
CO	Denver, Integrated Elctrns.	303-292-6121
ID	Spirit Lake, A-1 Elctrns.	800-635-1545
IL	Chicago, Newark Elctrns.	312-638-4411
MI	Grand Rapids, SF Elctrns.	616-459-0216
MN	St. Paul, K.D.I., Inc.	612-645-5090
NH	Hudson, C & H Elctrns.	603-882-1133
NJ	Fairlawn, Relay Specialties	201-797-3313
OH	Dayton, Stotts-Friedman	513-298-5555
PA	Willow Grove, Resco Elec.	215-659-4575
WI	Oshkosh, Electronic Inds.	414-235-8930
Can	Montreal, Que., Braydon Electro	514-332-5650

INTERMATIC, Intermatic Plaza, Spring Grove, IL 60081, Tel: 815-675-2321, Telex: 25-265; Empl.: 1000

INTER METRO INDUSTRIES CORP., North Washington St., Wilkes-Barre, PA 18705, Tel: 717-825-2741, Telex: 831-833; *Sls. Mgr.:* Richard Cross

INTERNATIONAL COMPS. CORP., 105 Maxess Rd., Melville, NY 11747, Tel: 516-293-1500, TWX: 510-224-6409; Empl.: 100; *Sls. Mgr.:* Irwin Okin; *Dist. Mgr.:* Irwin Okin ..... **A•1086, 1876, 2074; C•1273; D•1025**

Local Sales Offices & Reps

AL	Huntsville, EMA	205-830-4030
AZ	Phoenix, Jarko Assocs.	602-243-4387
CA	Anaheim, Impact Elctrns.	714-533-1351
CA	Redwood City, Hickey Inds.	415-368-3849
CT	Vernon, GM Assocs.	203-646-4443
FL	Orlando, EMA	305-299-8977
FL	Plantation, EMA	305-581-3251
FL	St. Petersburg, EMA	813-894-1171
GA	Roswell, EMA	404-992-7240
IL	Arlington Heights, MJ Petersen & Assoc.	312-577-8200
IN	Indianapolis, E. T. Kaul Assocs.	317-888-6187
IA	Cedar Rapids, IOWA Tech. Sls.	319-393-8644
MD	Baltimore, Espy Sls. Co.	301-444-6982
MA	Framingham, GM Assocs.	617-872-4871
MA	Stroughton, GM Assocs.	617-344-0116
MN	Minneapolis, PSI	612-944-8545
NJ	East Brunswick, Winch Sls. Assocs.	201-828-4615
NY	Jericho, Metro Tech. Sls.	516-935-3330
NY	Syracuse, Nycom	315-437-8343
NC	Pineville, EMA	704-541-2628
NC	Winston-Salem, EMA	919-784-7304
OH	Gahanna, Kemp Assocs.	614-476-5052
PA	Camp Hill, Espy Sls. Co.	717-763-9577
PA	Rydal, Espy Sls. Co.	215-576-0780
TN	Donnelson, EMA	615-883-1414
TX	Austin, Mech-tron Mktg.	512-459-0802
TX	Houston, Mech-tron Mktg.	713-462-1432
TX	Richardson, Mech-Tron Mktg.	214-437-4833
UT	Salt Lake City, Meridian Mktg.	801-968-4177
PR	Hato Rey, Casanova Indl. Sls. Corp.	809-753-8674

Local Distributors

AZ	Phoenix, ACC	602-269-5655
CA	Canoga Park, Myco Vickers	213-340-2025
CA	Redwood City, Hi-Cor	415-365-5087
CO	Denver, Integrated Elctrns.	303-623-8713
CT	East Haven, JV Elctrns.	203-469-2321
FL	Ft. Lauderdale, National Resistor Co.	305-772-4500
MN	Eden Prarie, Cassidy Elctrns.	612-944-0100
MN	Minneapolis, Cassidy Elctrns.	612-835-7746
PA	Philadelphia, Jan Indl. Elec.	215-WA 2-1321
PA	Philadelphia, Mur'Tronics	215-632-4330
TX	Ft. Worth, C & W Supp. Co.	817-831-0395

INTERNATIONAL CRYSTAL MFG., 10 N. Lee, P.O. Box 26330, Oklahoma City, OK 73126, Tel: 405-236-3741, Telex: 747-147, TWX: 910-831-3177; Empl.: 165; *Sls. Mgr.:* Paul E. Denwalt

INTERNATIONAL DATA SCIENCES, 7 Wellington Rd., Lincoln, RI 02865, Tel: 401-333-6200, TWX: 710-384-1911; Empl.: 125

INTERNATIONAL DEVICES INC., 3200 Pendleton, Santa Ana, CA 92704, Tel: 714-557-9394, 800-854-7651, Telex: 681387; FSC No.: 53763; *Sls. Mgr.:* Alan J. Vanek; *Dist. Mgr.:* Alan J. Vanek

INTERNATIONAL DIODE, 229 Cleveland Ave., Harrison, NJ 07029, Tel: 201-482-6518; Empl.: 9; *Sls. Mgr.:* Lee Toong

iem®

INTERNATIONAL ELECTRO MAGNETICS, INC., 350 N. Eric Dr., Palatine, IL 60067, Tel: 312-358-4622; Empl.: 15; *Sls. Mgr.:* T. Pretto ..... **D•1026**

Local Sales Offices & Reps

NY	New York, United Research Labs.	212-751-4660

Local Distributors

CA	Hollywood, Scottsound	213-462-6981
CA	Pleasant Hill, ALC	415-777-5525
NY	Morris, Boynton Studio	607-263-5695
NY	New York, United Research Labs.	212-751-4660

INTL. ELCTRN. RESCH., 135 W. Magnolia Blvd., Burbank, CA 91502, Tel: 213-849-2481, TWX: 910-498-2206; FSC No.: 98978; Empl.: 116; *Sls. Mgr.:* J.S. Smith

INTERNATIONAL HIGH VOLTAGE ELCTRNS., INC., 98 Mill Plain Rd., Danbury, CT 06811, Tel: 203-792-7820; *Sls. Mgr.:* A. Pellegrino ..... **D•1668-1669**

Local Sales Offices & Reps

CT	Waterbury, HLM Assocs.	203-753-9894
NJ	Parsippany, HLM Assocs.	201-263-1535
NY	Northport, HLM Assocs.	516-757-1606

INTERNATIONAL INSTRUMENTATION, 31131-602 Via Colinas, Westlake Vlg., CA 91362, Tel: 213-991-9614; *Sls. Mgr.:* C. D. Morrison; *Dist. Mgr.:* D. Casey

PoCo

We Stock

HEINEMANN
Circuit Breakers

SERIES
JA, AM, CF & KD
ONE, TWO & THREE POLES
MULTIPLES OF 5 AMPERES
60 Hz AND DC
SLOW AND FAST DELAY

POCO SALES
8925 Fullbright Street
Chatsworth, California 91311
(818) 700-8727
Serving Western Region

INTERNATIONAL INSTRUMENTS, General Resistance, Inc., Twin Lakes Rd, P.O. Box 185, N. Branford, CT 06471, Tel: 203-481-3450, TWX: 710-452-3092; Empl.: 150; *Dist. Mgr.:* J. Connolly ..... **D•1357**

Local Sales Offices & Reps

AL	Huntsville, Brandel-Stephens	205-883-0445
AZ	Tempe, Gassner & Clark	602-968-9037
CA	Burlingame, Engineering Reps. Co.	415-348-5042
CA	Burlingame, Engrg. Rep.	415-348-5042
CA	San Diego, Alturdyne Reps. Co.	619-565-6366
CO	Denver, Nelson	303-295-1017
FL	Deerfield Beach, Brandel-Stephens	305-427-8558
FL	Orlando, Brandel-Stephens	305-425-3202
GA	Atlanta, Brandel-Stephens	404-261-7579
IL	Elk Grove Village, Memeco Sls. & Svc. Corp.	312-228-9555
KS	Shawnee Mission, Tech. Sls. Assoc.	913-888-3330
MD	Gaithersburg, Pioneer Instrmn. Div.	301-921-0660
MD	Perry Hall, Electra-Tech	301-256-2723
MD	Sparks, E.I.L. Instrs., Inc.	301-771-4800
MA	Burlington, E.I.L. Instrs., Inc.	617-272-9450
MA	Hingham, Northeast Reps.	617-749-8700
MN	Eden Prairie, Yukon Sls. Assocs.	612-941-8155
MO	Ferguson, Tech. Sls. Assocs.	314-725-5361
NJ	Berkley Heights, NBS Assocs.	201-464-8500
NY	Rochester, H. C. Johnson Agys.	716-586-0777
NC	Charlotte, D.G.W.	704-334-7090
NC	Winston Salem, D.G.W.	919-768-7166
OH	Westlake, Advanced Tech. Assocs.	216-835-5050
OK	Tulsa, Telstar Instr.	918-628-1011
OR	Portland, Garland Affolter Engrg.	503-223-7349
PA	Glenshaw, H. C. Johnson Agys.	412-487-1246
PA	Malvern, Stitzer Assocs.	215-644-5500
PA	Pittsburgh, E.I.L. Instrs., Inc.	412-731-5230
TX	Houston, Wilson-Markham Assocs.	713-445-5780
VA	Dumfries, Electra-Tech	703-670-6962

Local Distributors

		619-565-6366
AZ	Phoenix, Metermaster	602-437-1425
CA	Los Angeles, E.I.L. Instrs., Inc.	213-685-7020
CA	Los Angeles, Metermaster	213-685-4340
CA	Palo Alto, Metermaster	415-968-0313
CA	San Diego, Metermaster	619-560-4841
CA	Santa Clara, Dynametron	408-727-6531
CA	Santa Clara, E.I.L. Instrs., Inc.	408-727-0396
CO	Denver, E.I.L. Instrs., Inc.	303-534-4160
CO	Denver, Metermaster Instr. Corp.	303-722-5766
CT	Middletown, E.I.L. Instrs., Inc.	203-346-6646
FL	Palm Bay, E.I.L. Instrs., Inc.	305-735-8300
GA	Norcross, Metermaster	404-446-0166
IL	Bridgeview, E.I.L. Instrs., Inc.	312-430-2292
IL	Elk Grove Village, Metermaster	312-593-8650
IN	Indianapolis, E.I.L. Instrs., Inc.	317-545-1373
KY	Louisville, E.I.L. Instrs., Inc.	502-454-3420
LA	New Orleans, Industrial Instr. Works	504-733-8355
MI	Ferndale, Ram Meter Inc.	313-398-6767
MN	Minneapolis, Process Meas. Co.	612-544-4035
NJ	Pensauken, E.I.L. Instrs., Inc.	609-488-0474
NY	Brooklyn, Metermod Instr. Corp.	718-726-4850
NY	Clarence, Trott Elctrns., Inc.	716-634-8500
NY	Hauppauge, E.I.L. Instrs., Inc.	516-231-6333
NY	Rochester, E.I.L. Instrs., Inc.	716-427-8000
OH	Cleveland, Metermaster	216-651-4100
OH	Cleveland, Pioneer/Instrmn. Div.	216-587-3600
OH	Dayton, E.I.L. Instrs., Inc.	513-435-2134
OR	Beaverton, Eicher-Richards	503-641-3300
PA	Philadelphia, Sunshine Scientific	215-673-5600
PA	Pittsburgh, CAM/RPC Instrmn.	412-782-3770
TX	Dallas, E.I.L. Instrs., Inc.	214-931-1236
TX	Garland, Metermaster	214-271-5671
TX	Houston, E.I.L. Instrs., Inc.	713-271-3100
TX	Houston, Meters & Instr. Corp.	713-644-1631
VA	Alexandria, E.I.L. Instrs., Inc.	703-354-4330
VA	Virginia Beach, E.I.L. Instrs., Inc.	804-499-3746
WA	Seattle, E.I.L. Instrs., Inc.	206-762-0800
WA	Seattle, Eicher Richards	206-523-7888

INTERNATIONAL LASER SYS., 3404 N. Orange Blossom Trail, Orlando, FL 32804, Tel: 305-295-4010, TWX: 810-850-0195; Empl.: 408; *Sls. Mgr.:* W. C. Hudson

INTERNATIONAL MFG. SVCS., 50 Schoolhouse La., Portsmouth, RI 02871, Tel: 401-683-9700; Empl.: 25; *Sls. Mgr.:* Jay Benson

INTERNATIONAL MICROELECTRONIC PRODS., 2830 North First Street, San Jose, CA 95134, Tel: 408-262-9100, Telex: 499-1041, TWX: 910-338-2274; FSC No.: 408-262-3981 (Manual); Empl.: 380; *Sls. Mgr.:* Robert Kromer ..... **A•1674-1676**

Local Sales Offices & Reps

AL	Huntsville, The Novus Grp.	205-881-2207
AZ	Scottsdale, Summit Sls.	602-998-4850
CA	Los Alamitos, Santana Sls.	213-431-3533
CA	San Diego, SR Elctrns.	619-560-8330
CA	San Jose, IMP West. Area Sls. Off.	408-262-9100
CA	San Jose, Quadrep	408-946-4000
CT	Orange, Access Sys. Corp.	203-795-0201
FL	Orlando, Perrott Assocs., Inc.	305-298-7748
GA	Norcross, The Novus Grp.	404-939-1135
IL	Schaumburg, Gassner & Clark	312-882-8608
IN	Indianapolis, CC Elctrns.	317-225-1508
MD	Towson, DG Reps.	301-583-1360
MN	St. Paul, Northport Engrg., Inc.	612-457-8000
NH	Nashua, Access Sys. Corp.	603-888-8160
NY	Melville, IMP East. Area Sls. Off.	516-752-1166
NC	Greensboro, United Sls.	919-674-9849
OH	Cincinnati, Applied Data Mgmt.	513-579-8108
TX	Plano, Texas Sls. Co.	214-867-0644
WA	Redmond, Quadra, Sls. Corp.	206-883-3550

INTERNATIONAL MICROSYSTEMS, 11554 C Ave., Auburn, CA 95603, Tel: 800-325-6028; Empl.: 12; *Sls. Mgr.:* Stan Burmich

INTERNATIONAL MICROTRONICS CORP., 4016 E. Tennessee St., Tucson, AZ 85714, Tel: 602-748-7900, TWX: 910-952-1170; Empl.: 30; *Sls. Mgr.:* Tommy Follis; *Dist. Mgr.:* Tommy Follis

INTERNATIONAL POWER, 350 N. Lantana, Ste. 710, Camarillo, CA 93010, Tel: 805-987-7900 ..... **D•1670-1675**

INTERNATIONAL POWER MACHINES, 11534 Pagemill Rd., Dallas, TX 75243, Tel: 214-343-6076; *Sls. Mgr.:* Jack Conn

INTERNATIONAL RECTIFIER' CORP., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245, Tel: 213-772-2000, Telex: 472-0403, TWX: 910-348-6291; Empl.: 1200; *Sls. Mgr.:* W. Lewis; *Dist. Mgr.:* D. Coppinger

INTERNATIONAL RESOURCE SVCS., 7343 N.W. 79th Terr., Miami, FL 33166, Tel: 305-884-2924, Telex: 522261 MIA DEPT 343; Empl.: 5; *Sls. Mgr.:* Richard L. Winn

INTERNATIONAL SENSOR SYSTEMS, INC., Aurora Industrial Pk., Box 345, Aurora, NE 68818, Tel: 402-694-6111; Empl.: 45; *Sls. Mgr.:* Michael E. Fattig ..... **A•1677**

Local Sales Offices & Reps

AZ	Tempe, Spectrum Assoc. SW	602-966-1788
CA	Palo Alto, Tri-Rep	415-965-1822
CT	Branford, LJM Assocs.	203-488-4244
IL	Chicago, Esco Assocs.	312-763-0800
MN	Minneapolis, R-J Inc.	612-866-3661
PA	Southampton, Campbell Assocs.	215-322-6630
TX	El Paso, Nokomis Consumer Prods.	915-778-2801
TX	Euless, Andy Byles Intl.	817-267-4099

Local Distributors

CA	Arcadia, Van Gott & Assocs. Inc.	818-445-9728
FL	Jupiter, Southern Elctrn. Sls., Inc.	305-744-0028
IL	Des Plaines, Esco Assocs., Inc.	312-298-5310
IN	Indianapolis, Electronic Sls. & Engrg., Inc.	317-849-4260
MD	Lutherville, Quarterback Sls., Inc.	301-252-6167
NE	Omaha, IONEB	402-895-4431
NJ	Wayne, Ramapo Mfrs. Agt., Inc.	201-839-6767
NY	Liverpool, Syronics, Inc.	315-451-0968
NC	Charlotte, Over and Over	704-527-3070
OH	Brecksville, WRR Assocs., Inc.	216-526-2023
TX	El Paso, Nokomis of El Paso, Inc.	925-778-2801

INTERNATIONAL TRANSDUCER CORP., Channel Technologies, Inc., 93 Castilian Dr., Goleta, CA 93117, Tel: 805-685-1441, Telex: 658 495; FSC No.: ID 532; Empl.: 65; *Sls. Mgr.:* Roland 'Fred' Dutton

INTERNATIONAL WIRE PRODUCTS CO., 500 W. Main St., Wyckoff, NJ 07481, Tel: 201-891-5800, Telex: 642580; Empl.: 700; *Sls. Mgr.:* C. D. Abbott

INTEROPTICS, Purdy Group, 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-347-7727

INTERPRETATION SYS., INC., A DBA Systems Company, 420 S. Fairview Ave., Goleta, CA 93117, Tel: 805-967-2383, Telex: 658336; *Sls. Mgr.:* Stan Schlosser

INTERSIL, 10710 N. Tantau Ave., Cupertino, CA 95014, Tel: 408-996-5000, TWX: 910-338-0583; FSC No.: 32293; Empl.: 4102; *Dist. Mgr.:* Bruce Mattern

INTERSTATE ELECTRONICS CORP., Box 3117, 1001 E. Ball Rd., Anaheim, CA 92803, Tel: 714-635-7210, Telex: 655443, TWX: 910-591-1197; FSC No.: 6625, 5985; Empl.: 1500; *Sls. Mgr.:* Darryl Watanabe; *Dist. Mgr.:* R. Sorenson

INTERSWITCH, 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-347-8217, TWX: 910-374-2353; Empl.: 30; *Sls. Mgr.:* Ray G. Vorce

The Inter-Technical Group Inc. WIMA Division

INTER-TECHNICAL GRP., Box 23, Irvington, NY 10533, Tel: 914-591-8822, TWX: 710-564-0802; Empl.: 21; *Sls. Mgr.:* T. A. Galgano ..... **A•1087-1092**

Local Sales Offices & Reps

AL	Huntsville, J. R. Assocs.	205-830-2130
AZ	Scottsdale, Semper Fi Sls., Inc.	602-991-4606
CA	Santa Clara, Engineering Assocs. Corp.	408-988-5001
CO	Lakewood, Palmer Assocs.	303-233-9423
CT	Colchester, Normell Assocs.	203-537-5555/3758
FL	Altamonte Springs, 'C' Assocs., Inc.	305-831-1717
GA	Dunwoody, J. R. Assocs.	404-399-1831
IL	Westchester, W. G. Brouilette & Assocs.	312-345-6500
IN	Noblesville, W. G. Brouillette & Assocs.	317-877-4508
MA	Newton, Normell Assocs.	617-969-5478
MN	Minneapolis, Intl. Sls. Co.	612-831-8423
NJ	Colonia, H. B. Heft Assocs.	201-381-5193
NJ	Colonia, Heft & Ficarra Assocs.	201-381-5193
NY	Lynbrook, H. B. Heft Assocs.	516-LY 9-3351
NY	Rochester, BKT Assocs., Inc.	716-586-5814
NC	Winston Salem, J. R. Assocs.	919-768-7738
OH	Dayton, Markus Barnett Assocs., Inc.	513-293-6778
OR	Portland, Harry Levinson Co.	503-245-1902
PA	King of Prussia, R. D. Freedman Assocs.	215-279-5767
PA	W. Conshohocken, Eastern Comps. Sls. Corp.	215-825-8610
TN	Chattanooga, J. R. Assocs.	615-892-7630
TX	Carrollton, Paulsen Elctrn. Sls.	214-386-4785
TX	Richardson, Lelko-Paulsen Sls.	214-475-8052
UT	Salt Lake City, Alpine Entprs.	801-278-5081
VA	Front Royal, Eltron Sls., Ltd.	703-635-7201
VA	Manassas, Eastern Comps. Sls.	800-223-3850
WA	Seattle, Harry Levinson Co.	206-382-1300
PR	Ponce, Burke Assocs., Inc.	809-840-2444

Local Distributors

CA	Santa Clara, ISC	408-496-0411
FL	Ft. Lauderdale, NRC Elctrns., Inc.	305-772-4500
FL	Indialantic, T. C. Pridmore Co.	305-727-2491
NJ	East Brunswick, Brothers Elctrns., Inc.	201-238-2200
NY	Port Chester, MKM Elctrn. Comps., Inc.	914-382-3940
PA	Exton, VSH Elctrns.	215-363-2250
TX	Allen, Prime Distrbg. Co.	214-231-0170
WA	Seattle, Kam Elctrns. Div.	206-382-1300

INTEX MICRO SYSTEMS CORP., 725 S. Adams Rd., Suite L-8, Birmingham, MI 48011, Tel: 313-540-7601, Telex: 230254 WUPUBTLX; *Sls. Mgr.:* R. Thielman

INTRA-COMPUTER, 101 W. 31st St., New York, NY 10001, Tel: 212-947-5533, Telex: 64-5067; Empl.: 9; *Sls. Mgr.:* Art Yaglian

INTRONICS, INC., 57 Chapel St., Newton, MA 02158, Tel: 617-964-4000, Telex: 200095, TWX: 710-335-6835; Empl.: 130; *Sls. Mgr.:* J. Swartz ..... **D•1676-1677**

Local Sales Offices & Reps

AL	Huntsville, Over & Over, Inc.	205-837-7105
AZ	Tempe, Delta Elctrns.	602-224-1601
CA	Los Alamitos, Power Specialists	213-594-9418
FL	Melbourne, Reynolds & Assocs.	305-259-7000
GA	Norcross, Over & Over, Inc.	404-449-6205
IL	Palatine, Kingston Comps.	312-359-7990
IN	Fort Wayne, Domino Unltd.	219-747-5621
IA	Cedar Rapids, Technical Elctrns.	319-362-4116
KS	De Soto, Midtec Assocs.	913-441-6565
MI	Grand Rapids, KRW Sls.	616-363-2925
MN	Minneapolis, Dan'l. Engrg.	612-854-7550
MO	Florissant, Midtec Assocs.	314-837-5200
NY	Canandaigua, Bensman/Upstate Assocs.	716-396-2498
NY	Hicksville, J-Square Mktg.	516-935-3200
NC	Raleigh, Over & Over, Inc.	919-872-2262
OH	Dayton, Del Steffen & Assocs.	513-293-3145
PA	Montgomeryville, Eastern Sci. Mktg.	215-368-4570
TX	Houston, Scientific Sls. Co.	713-460-9170
TX	Richardson, Scientific Sls. Co.	214-231-6541
UT	Bountiful, Anderson Assocs.	801-292-8991
WA	Seattle, Data Com. Assoc.	206-285-2525
Can	Mississauga, Ont., Giden-Morton Assocs.	416-671-8111

ION PHYSICS CO., 323 Andover St., Wilmington, MA 01887, Tel: 617-658-6030, Telex: 951733 ..... **D•1123**

IPAC GRP., 3047 Indl. Blvd., Bethel Pk., PA 15102, Tel: 412-831-9200, TWX: 510-697-3935; Empl.: 50; *Sls. Mgr.:* D. T. Cusack

IQ SYSTEMS, Applied Circuit Tech., 2931 La Jolla St., Anaheim, CA 92806, Tel: 714-630-6834; *Sls. Mgr.:* Jim Stedt

IR SCIENTIFIC, Box 110, Carlisle, MA 01741, Tel: 617-369-7118; Empl.: 10; *Sls. Mgr.:* S. J. Sommer

ISC MAGNETICS DIV., See Aeroflex Labs., Inc., Magnetic Prods. Div.

ISL PRODUCTS INT'L, LTD., 235 P Robbins Lane, Syosset, NY 11791-6093, Tel: 516-822-9601, TWX: 510-221-2109; Empl.: 25,000; *Sls. Mgr.:* Ken Kawaller ..... **A•1094-1095, 1877, 2075, 2159**

Local Sales Offices & Reps

IL	Chicago, Rendell Sls.	312-528-9025
IN	Noblesville, Newton & Assoc.	317-845-8157
MD	Pikesville, Muncy Sls.	301-484-6376
MA	Topsfield, RFC Assocs.	617-887-8545
MN	Edina, Components Rep. Grp.	612-944-1160

ISOCHEM PRODUCTS CO., A Sub. of Rohm and Haas Adv. Matls., 99 Cook St., Lincoln, RI 02865, Tel: 401-723-2100, Telex: 845-247, TWX: 710-670-5335; Empl.: 26; *Sls. Mgr.:* W. Lott

ISOLATION PRODUCTS, INC., 157 San Lazaro Ave., Sunnyvale, CA 94086, Tel: 408-730-4672; Empl.: 5

ISOREG CORP., 410 Great Rd., P.O. Box 486, Littleton, MA 01460, Tel: 617-486-9483, TWX: 710-347-6974 ISOREG LTTN; Empl.: 75; *Sls. Mgr.:* Paul Foss; *Dist. Mgr.:* Paul Foss

ISOTEMP RESEARCH, INC., Box 3389, Charlottesville, VA 22901, Tel: 804-295-3101; FSC No.: 031785; Empl.: 30 ..... **A•1374-1375**

Local Sales Offices & Reps

AZ	Scottsdale, Faser Technical Sls.	602-948-4404
CA	Fremont, Wm. Parks & Assocs.	415-796-0875
CA	Irvine, EBA Microwave	714-857-6079
CA	San Diego, Qualtronics	619-695-0118
IL	Woodridge, Trend-Tronics	312-985-0626
IN	Fort Wayne, Given Corp.	219-432-5585
NC	Raleigh, Godwin Assocs.	919-847-3006

ISOTRONICS, Industrial Park, New Bedford, MA 02745, Tel: 617-998-2000, TWX: 710-344-1961; *Sls. Mgr.:* Dennis T. Hanley

I² INTERFACE, INC., 21101 Osborne St., Canoga Park, CA 91304, Tel: 818-341-7014, TWX: 662 949 CNPK; Empl.: 40; *Sls. Mgr.:* Gilbert Gautereaux

ITC SYSTEMS, INC., 3739 Meru Lane, Santa Barbara, CA 93105, Tel: 805-682-8122, Telex: 295-298 INTERTEL SNC; *Sls. Mgr.:* W. Schulz

ITEK MEASUREMENT SYS., Div. Litton Inds., 27 Christina St., Newton, MA 02161, Tel: 617-969-7300, TWX: 710-335-6783; Empl.: 100 ..... **B•1797**

Local Sales Offices & Reps

CA	Los Angeles, Measurement Sys. Div.	213-641-0476
FL	Orlando, K. S. Chaney	305-293-5656
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-293-5437
IA	Cedar Rapids, Marsland Assocs.	319-396-8030
MN	Minneapolis, Marsland Assocs.	612-545-4481
NJ	Metuchen, Measurement Sys. Div.	201-548-1500
NM	Las Cruces, BFA Corp.	505-524-9693

Local Distributors

FL	Orlando, Kenneth S. Chaney	305-423-9465
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-293-5437
MN	Minneapolis, Marsland Assocs.	612-545-4481
NM	Las Cruces, BFA Corp.	505-524-9693
Intl	England, Tadley, Hampshire, Hightech Comps., Ltd.	07356-3922
Intl	France, Paris, Sedeme	580.72.000
Intl	Germany, Munich, Weltronic GmbH	089-49 20 66
Intl	Holland, Rotterdam, Anru	010-137395
Intl	India, Bombay, Echbee Corp.	253489
Intl	Israel, Tel-Aviv, Airtronic Engrg., Ltd.	45 48 71
Intl	Italy, La Spezia, Motordiesel Elec. Instr. & Comp.	36.232
Intl	Japan, Tokyo, Nippon Engrg. Sys.	494-4045
Intl	Norway, Oslo, Ole A. Nordby A/S	02 55 07 50
Intl	Sweden, Waxholm, Saven AB	764-315 80
Intl	Switz., Zurich, Litton Prec. Prods. Intl.	01/48 35 44

ITHACO, INC., Meas. & Control Instrs. Div., 735 W. Clinton St., P.O. Box 6437, Ithaca, NY 14851-6437, Tel: 607-272-7640, TWX: 510-255-9307; Empl.: 120; *Sls. Mgr.:* E. W. Seymour

ITOH ELECTRONICS, INC. (C.), 5301 Beethoven St., Los Angeles, CA 90066, Tel: 212-682-0420, Telex: 12-5059; Empl.: 100; *Sls. Mgr.:* F.I. Makstein, VP Mktg.

ITT CANNON, 666 E. Dyer Road, Santa Ana, CA 92705-5684, Tel: 714-557-4700, Telex: 75-3917, TWX: 910-997-0523; FSC No.: 71468;Multiple; Empl.: 2500; *Sls. Mgr.:* Joel Urban; *Dist. Mgr.:* Richard Torson ..... **C•1274-1288**

Local Sales Offices & Reps

AL	Huntsville, Brandel-Stephens & Co.	205-833-0445
AZ	Phoenix, ITT Cannon	602-275-4792
CA	Campbell (San Jose), ITT Cannon	408-559-1777
CA	Fountain Valley, ITT Cannon	714-964-7400
CA	San Diego, ITT Cannon	619-560-0917
CA	Santa Ana, ITT Cannon	714-557-4700
CO	Franktown, ITT Cannon	505-293-0457
CO	Littleton, ITT Cannon	303-973-8766
CT	New Fairfied, ITT Cannon	203-746-7160
FL	Deerfield Beach, Brandel-Stephens & Co.	305-427-8558
FL	Orlando, Brandel-Stephens & Co.	305-425-3202
IL	Des Plaines, ITT Cannon	312-297-3150
IN	Fort Wayne, ITT Cannon	219-484-6447
IA	Swisher, ITT Cannon	319-369-9107
KS	Wichita, ITT Cannon	316-681-2029
MD	Baltimore, ITT Cannon	301-882-4760
MD	Baltimore, ITT Cannon	301-254-3707
MA	Wakefield, ITT Cannon	617-246-2510
MI	Sterling Heights, ITT Cannon	313-643-4620
MN	Minneapolis, ITT Cannon	612-854-1973
MO	Bridgeton, ITT Cannon	314-739-6040
NM	Albuquerque, ITT Cannon	505-293-0457
NH	Henniker, ITT Cannon	603-428-3883
NY	Holbrook, ITT Cannon	215-646-2801
NY	Poughkeepsie, ITT Cannon	914-473-3314
NY	Rochester, L-Mar Assocs.	716-323-1000
NC	Greensboro, Brandel-Stephens & Co.	919-274-6952
OH	Kettering, ITT Cannon	513-434-8181
OH	Uniontown, ITT Cannon	216-494-6749
OR	Beaverton, ITT Cannon	503-626-4394
PA	Blue Bell, ITT Cannon	215-646-2801
PA	Trevose, P.S.A., Inc.	215-245-0513
TX	Dallas, ITT Cannon	214-661-0302
TX	Houston, ITT Cannon	713-777-1177
WA	Bellevue, ITT Cannon	206-454-3903
WI	Waukesha, ITT Cannon	414-544-1018

Local Distributors

AZ	Tempe, Arrow Elctrns., Inc.	602-986-4800
AZ	Tempe, Time Elctrns.	602-967-2000
CA	Anaheim, Time Elctrns.	714-937-0911
CA	Chatsworth, Arrow Elctrns., Inc.	818-701-7500
CA	Chatsworth, Time Elctrns.	818-998-7200
CA	Hayward, Arrow Elctrns., Inc.	415-487-4600
CA	Orange, Richey/Western Elec., Inc.	714-634-2811
CA	Sacramento, Arrow Elctrns., Inc.	916-925-7456
CA	San Diego, Arrow Elctrns., Inc.	619-565-4800
CA	San Diego, Richey/Western	619-271-4511
CA	San Diego, Time Elctrns.	619-586-1331
CA	Santa Clara, Richey/Western Elec., Inc.	408-727-7411
CA	Sun Valley, Richey Elctrns.	213-875-2862
CA	Sunnyvale, Arrow Elctrns., Inc.	408-745-6600
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Torrance, Time Elctrns.	213-320-0880
CA	Tustin, Arrow Elctrns., Inc.	714-838-5422
CO	Denver, Arrow Elctrns.	303-758-4585
CO	Englewood, Time Elctrns. of CO	303-850-7701
CT	Cheshire, Time Elctrns., Inc.	203-271-3200
CT	Hamden, A.S.I. Connector Corp.	203-288-0044
CT	Wallingford, Arrow Elctrns., Inc.	203-265-7741
FL	Deerfield Beach, Arrow Elctrns., Inc.	305-429-8200
FL	Ft. Lauderdale, Time Elctrns.	305-974-4800
FL	Orlando, Time Elctrns.	305-841-6565
FL	Palm Bay, Arrow Elctrns., Inc.	305-725-1480
GA	Atlanta, Electro Air	404-351-3545
GA	Norcross, Arrow Elctrns., Inc.	404-449-8252
GA	Norcross, Time Elctrns.	404-448-4448
IL	Elmhurst, P.E.I./Genesis	312-530-2272
IL	Schaumburg, Arrow Elctrns., Inc.	312-397-3440
IN	Indianapolis, Arrow Elctrns., Inc.	317-243-9353
IN	Indianapolis, P.E.I./Genesis	317-637-5571
IN	South Bend, P.E.I./Genesis	219-287-2911
MD	Baltimore, A.S.I. Elecrrns. Co.	301-265-5100
MD	Columbia, Arrow Elctrns., Inc.	301-995-0003
MD	Columbia, Time Elctrns.	310-964-3090
MD	Timonium, P.E.I./Genesis	301-561-5235
MA	Woburn, Arrow Elctrns., Inc.	617-933-8130
MA	Woburn, Time Elctrns.	617-935-8080
MI	Ann Arbor, Arrow Elctrns., Inc.	313-971-8220
MI	Bloomington, Time Elctrns., Inc.	612-944-9192
MN	Edina, Arrow Elctrns., Inc.	612-830-1800
MO	St. Louis, Arrow Elctrns., Inc.	314-567-6888
MO	St. Louis, Time Elctrns.	314-391-6444
NH	Manchester, Arrow Elctrns., Inc.	603-668-6968
NH	Manchester, Arrow Elctrns., Inc.	603-688-6968
NJ	Fairfield, Arrow Elctrns., Inc.	210-575-5300
NJ	Marlton, Arrow Elctrns., Inc.	609-596-8000
NM	Albuquerque, Arrow Elctrns., Inc.	505-243-4566
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Hauppauge, Arrow Elctrns., Inc.	516-231-1000
NY	Hauppauge, Time Elctrn. Sls.	516-273-0100
NY	Liverpool, Arrow Elctrns., Inc.	315-652-1000
NY	Plainview, Progress Elctrns. Co., Inc.	516-433-1700
NY	Rochester, Arrow Elctrns., Inc.	716-427-0300
NC	Raleigh, Arrow Elctrns., Inc.	919-876-3132
NC	Winston-Salem, Arrow Elctrns., Inc.	919-725-8711
OH	Centerville, Arrow Elctrns., Inc.	513-435-5563
OH	Cleveland, P.E.I./Genesis	216-662-0737
OH	Dayton, P.E.I./Genesis	513-258-0040
OH	Solon, Arrow Elctrns., Inc.	216-248-3990
OK	Tulsa, Arrow Elctrns., Inc.	918-665-7700
OK	Tulsa, P.E.I./Genesis	918-622-8520
OR	Beaverton, Almac Elctrns.	503-629-8090
OR	Portland, Time Elctrns.	503-684-3780
OR	Tigard, Arrow Elctrns., Inc.	503-684-1690
PA	Monroeville, Arrow Elctrns., Inc.	412-856-7000
PA	Philadelphia, P.E.I./Genesis	215-568-7400
PA	Warminster, Henwarr	215-675-4104
TX	Austin, Arrow Elctrns., Inc.	512-835-4180
TX	Austin, Harrison Equip. Co., Inc.	512-458-3555

TX Carrollton, Arrow Elctrns., Inc. 214-380-6464
TX Dallas, Harrison Equip. Co., Inc. 214-239-2750
TX Dallas, Time Elctrns. 214-385-0566
TX Houston, Arrow Elctrns., Inc. 713-530-4700
TX Stafford, Harrison Equip. 713-879-2600
UT Salt Lake City, Arrow Elctrns., Inc. 801-972-0404
WA Bellevue, Almac Elctrns. 206-643-9992
WA Bellevue, Arrow Elctrns., Inc. 206-643-4800
WA Bellevue, Time Elctrns. 206-641-3640
WA Spokane, Almac Elctrns. 509-924-9500
WI Oak Creek, Arrow Elctrns., Inc. 414-764-6600

ITT CANNON ELECTRIC, 666 East Dyer Rd., Santa Ana, CA 92702, Tel: 714-557-4700

ITT Components
A unit of ITT Corporation
Electromechanical Group

ITT COMPONENTS ELECTROMECHANICAL GRP., 1201 E. McFadden Ave., Santa Ana, CA 92705, Tel: 714-836-0351, Telex: 681-389, TWX: 910-595-1744; FSC No.: 61725; Empl.: 40; *Sls. Mgr.:* T. Beaumont; *Dist. Mgr.:* B. Holter ..... **B•1414-1417, 1419, 1422, 1471**

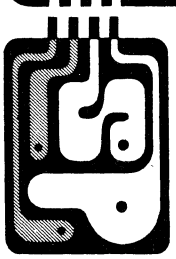
Local Sales Offices & Reps

AL Huntsville, Brandel-Stephens & Co. ... 205-883-0445
AZ Scottsdale, Semi-Systems 602-991-1151
CA Laguna Hills, English Damco 714-837-3801
CA Los Angeles, English Damco 213-598-6146
CA Mountain View, Caltron Comps. Corp. 415-964-3244
CA San Diego, English Damco 619-942-8282
CO Denver, I. W. Strong & Assocs. 303-292-6900
CT Guilford, Data Mark, Inc. 203-453-0575
FL Deerfield Beach, Brandel-Stephens & Co. 305-427-8558
FL Orlando, Brandel-Stephens & Co. 305-425-3202
GA Atlanta, Brandel-Stephens & Co. 404-261-7579
IL Rolling Meadows, Heartland Tech. Sls. 312-577-9222
IN Fort Wayne, M/S Sls. 219-484-1904
IN Indianapolis, M/S Sls. 317-257-8916
KS Leawood, Thunderbird Tech. Sls. 913-642-7220

the connection for...

ITT Components

"The relay for you"



distributor specialists
632 Santa Monica Blvd.
Santa Monica,
California 90401

(213) 393-9666

A regional distributor of quality electronic components

KS Wichita, Thunderbird Tech. Sls. 316-684-3941
MD Millersville, Trimark 301-987-9103
MA Southboro, KSA of New England 617-485-9432
MI Brighton, SAI Mktg. 313-227-1786
MN Minneapolis, SAI Mktg. 612-935-0777
MN Minnetonka, SAI Mktg. Corp. 612-935-0777
MO Maryland Heights, Thunderbird Tech. Sls. 314-567-6488
NM Albuquerque, Syntech 505-266-7951
NY Manhasset, Win Cor Elctrns. 516-627-9474
NY Rochester, D. L. Eiss Assocs. 716-328-3000
NC Greensboro, Brandel-Stephens & Co. 919-274-6952
OH Beachwood, Thompson & Assocs. 216-831-6277
OH Dayton, Thompson & Assocs. 513-435-7733
OK Tulsa, Norcom 918-832-7747
OR Portland, Jas. J. Backer Co. 503-297-8744
PA Prospect Park, Elf Sls. 215-534-3340
TN San Antonio, Norcom 512-680-4513
TX Austin, Norcom 512-451-2757
TX Dallas, Norcom 214-386-4888
TX Houston, Norcom 713-778-0392
UT Salt Lake City, I. W. Strong & Assocs. 810-942-6998
VA Lynchburg, Trimark 804-528-0681
WA Seattle, Jas. J. Backer Co. 206-285-1300
WI Milwaukee, Heartland Tech. Mktg. 414-931-0606

Local Distributors

AL Huntsville, RM Elctrns. 205-852-1550
AZ Tempe, Richey Western Elctrns. 602-894-9251
AZ Tempe, TIME Elctrns. 602-967-2000
CA Anaheim, TIME Elctrns. 714-937-0911
CA Chatsworth, Integrated Elctrns. 818-998-2200
CA Chatsworth, Q.C. Comps. 818-700-2622
CA Chatsworth, Time Elctrns. 818-998-7200
CA Irvine, Integrated Elctrns. 714-660-1055
CA Los Angeles, Master Distrs. 213-452-1229
CA Los Angeles, Richey Western Elctrns. 213-820-3777
CA Los Angeles, Time Elctrns. 213-477-1251
CA Orange, Richey Western Elctrns. 714-634-2811
CA Sacramento, Integrated Elctrns. 916-424-5297
CA San Diego, Richey Western Elctrns. ... 619-271-4511
CA San Diego, Time Elctrns. 619-586-1331
CA San Jose, Integrated Elctrns. 408-263-1100
CA Santa Ana, ITT Multi Comps. 714-835-9019
CA Santa Clara, Richey Western Elctrns. 408-727-7411
CA Santa Clara, RM Elctrns. 408-496-0411
CA Santa Monica, Distr. Specialists 213-393-9666
CA Sunnyvale, TIME Elctrns. 408-734-9888
CA Torrance, TIME Elctrns. 213-320-0880
CO Denver, Integrated Elctrns. 303-292-6121
CO Englewood, NEP Elctrns. 303-799-9898
CO Englewood, TIME Elctrns. 303-850-7701
CT East Haven, J.V. Elctrns. 203-469-2321
CT New Haven, Greene Shaw Co. 203-397-0710
FL Davie, ARCO Distrs. 305-473-2550
FL Fort Lauderdale, NRC 305-772-4500
FL Fort Lauderdale, TIME Elctrns. 305-974-4800
FL Orlando, Time Elctrns. 305-841-6565
FL Tampa, Reptron 810-876-0671
GA Atlanta, Prehler Elctrns. 404-447-5540
GA Norcross, Time Elctrns. 404-448-4448
IL Arlington Heights, Reptron Elctrns. 312-593-7070
IL Chicago, NEP Elctrns. 312-625-8400
IL Chicago, Prehler Elctrns. 312-384-6100
IL Hoffman Estates, Integrated Elctrns. .. 312-843-2040
IL Lombard, RM Elctrns. 312-932-5150
IN Indianapolis, RM Elctrns. 317-291-7110
MD Baltimore, Resco 301-529-0500
MD Beltsville, RESCO-Washington 301-937-9100
MD Beltsville, TREEKO Sls. 301-792-0112
MD Columbia, TIME Elctrns. 301-964-3090
MA Newton, Greene-Shaw Co. 617-969-8900
MA Wilmington, R. C. Comps. 617-273-1860
MA Woburn, TIME Elctrns. 617-935-8080
MI Farmington Hills, Prehler Elctrns. 313-473-7200
MI Grand Rapids, RM Elctrns. 616-531-9300
MI Livonia, Reptron Elctrns. 313-525-2700
MN Bloomington, Time Elctrns. 612-944-9192
MN Minneapolis, Industrial Comps. 612-831-2666
MO St. Louis, TIME Elctrns. 314-391-6444
NV Las Vegas, Kiesub Elctrns. 702-733-3888
NJ Whippany, Tonar Inds. 201-586-9000
NM Albuquerque, Betatron Elctrns. 505-344-2381
NM Albuquerque, International Elctrns. 505-345-8127
NY Hauppauge, TIME Elctrns. 516-273-0100
NC Raleigh, Prehler Elctrns. 919-876-9111
OH Columbus, Reptron 614-436-6675
OH Middleburg Hts., Prehler Elctrns. 216-243-5510
OK Tulsa, Quality Comps. 918-664-8812
OR Portland, Time Elctrns. 503-684-3780
PA Broomall, TIME Elctrns. 215-337-0900
PA Essington, Tri-Com 215-521-3080
PA Horsham, RM Elctrns. 215-674-1181
TX Addison, Quality Comps. 214-733-4300
TX Austin, Quality Comps. 512-835-0220
TX Dallas, RM Elctrns. 214-263-8361
TX Dallas, Time Elctrns. 214-385-0566
TX El Paso, ERA Elctrns. 915-592-4126
TX El Paso, International Elctrns. 915-598-3406
TX Sugarland, Quality Comps. 713-491-2255
UT North Salt Lake, Integrated Elctrns. ... 801-298-1869
WA Bellevue, Integrated Elctrns. 206-455-2727
WA Bellevue, Time Elctrns. 206-641-3640
WA Seattle, Richey Western Elctrns. 206-575-1910
WI New Berlin, NEP Elctrns. 414-785-9100
WI New Berlin, RM Elctrns. 414-784-4420

ITT Components
A unit of ITT Corporation
Passive Group

ITT COMPONENTS PASSIVE GRP., 1201 E. McFadden Ave., Santa Ana, CA 92705, Tel: 714-836-0351, Telex: 68-1389, TWX: 910-595-1744; FSC No.: 61725; Empl.: 35; *Sls. Mgr.:* Nigel Stevens; *Dist. Mgr.:* Bret Holter ..... **A•1096-1101, 1377; B•1418-1423**

Local Sales Offices & Reps

AL Huntsville, Brandel-Stephens & Co. ... 205-833-0445
AZ Scottsdale, Semi-Systems Arizona 602-991-1151
CA Laguna Hills, English Damco 714-837-3801
CA Mountain View, Caltron Comp. Corp. .. 415-964-3244
CO Denver, T. W. Strong & Assoc. 303-292-6900
CT Guilford, Data Mark 203-453-0575
GA Atlanta, Brandel-Stephens & Co. 404-261-7579
IL Rolling Meadows, Heartland Tech. Mktg., Inc. 312-577-9222
IN Fort Wayne, M/S Sls. & Assoc. 219-483-4520
IN Indianapolis, SAI Mktg. 317-241-9276
KS Leawood, Thunderbird Tech. Sls. 913-642-7220
MD Millerville, Tri-Mark 301-761-6000
MA Southboro, KSA of New England 617-485-9432
MI Brighton, SAI Mktg. 313-227-1786
MN Minneapolis, SAT Mktg. 612-935-0777
MO Maryland Hts., Thunderbird Tech. Sls. 314-567-6488
NM Albuquerque, Syntech 505-266-7951
NY Manhasset, Win-Cor Elctrn. Sls. 516-627-9474
NY Rochester, D. L. Eiss Assoc. 716-328-3000
NY Syracuse, D. L. Eiss Assoc. 315-457-0492
NC Greensboro, Brandel-Stephens & Co. 919-274-6952
OH Beachwood, Thompson Assoc. 216-831-6277
OH Dayton, Thompson Assoc. 513-435-7733
OR Portland, Jas J. Backer Co. 503-297-3777
OR Salem, Jas J. Backer Co. 503-362-0717
TX Austin, Norcom 512-451-2757
TX Dallas, Norcom 214-386-4888
VA Lynchburg, Tri-Mark 804-528-0681
WA Seattle, Jas J. Backer Co. 206-285-1300

Local Distributors

AL Huntsville, RM Elctrns. 205-852-1550
AZ Phoenix, Kachina Elctrn. Distrs. 602-269-6201
AZ Tempe, Richey Western Elctrns. 602-894-9251
AZ Tempe, Time Elctrns. 602-967-2000
CA Anaheim, Time Elctrns. 714-937-0911
CA Chatsworth, Integrated Elctrns. 213-998-2200
CA Chatsworth, Shelley Elctrns. 619-453-7133
CA Chatsworth, Shelley Elctrns. 213-998-3333
CA Irvine, Integrated Elctrns. 714-660-1055
CA Los Angeles, Richey Western Elctrns. 213-820-3777
CA San Diego, Richey Western Elctrns. ... 619-271-4511
CA San Diego, Shelly Elctrns. 619-453-7133
CA San Jose, Integrated 408-263-1100
CA San Jose, Shelley Elctrns. 408-942-9111
CA Santa Clara, Richey Western Elctrns. 408-727-7411
CA Sun Valley, G. C. Comps. 213-768-6111
CA Sunnyvale, Capsco Sls. 408-734-3020
CA Sunnyvale, Time Elctrns. 408-734-9888
CA Torrance, Time Elctrns. 213-320-0880
CA Van Nuys, Nesco 213-781-0505
CO Denver, Integrated Elctrns. 303-292-6121
CO Englewood, Time Elctrns. 303-850-7701
CT East Haven, J.V. Elctrns. 203-469-2321
CT New Haven, Greene Shaw Co. 203-397-0710
FL Dania, Arco Distrs. 305-462-3370
FL Fort Lauderdale, NRC 305-772-4500
FL Fort Lauderdale, Time Elctrns. 305-974-4800
GA Atlanta, Prehler Elctrns. 404-447-5540
GA Atlanta, Time Elctrns. 404-351-3545
IL Arlington Hgts., Reptron Elctrns. 312-593-7070
IL Chicago, Integrated 312-625-8400
IL Chicago, NEP Elctrns. 312-625-8400
IL Chicago, Prehler 312-384-6100

IL Lombard, RM Elctrns. 312-932-5150
IN Indianapolis, RM Elctrns. 317-247-9701
MD Baltimore, Resco-Baltimore 301-823-0700
MD Beltsville, Resco, Washington 301-937-9100
MD Columbia, Time Elctrns. 301-964-3090
MA Burlington, TLC 617-273-0140
MA Newton, Greene-Shaw Co. 617-969-8900
MA Wilmington, R.C. Comps. 617-273-1860
MA Woburn, Time Elctrns. 617-935-8080
MI Farmington Hills, Prehler elctrns. 313-473-7200
MI Grand Rapids, RM Elctrns. 616-531-9300
MI Livonia, Reptron Elctrns. 313-525-2700
MN Bloomington, Time Elctrns. 612-944-9192
MN Eden Prairie, Cassidy Elctrns. 612-944-0100
MN Edina, Cassidy Elctrns. 612-835-7747
MN Minneapolis, Industrial Comps. 612-831-2666
MO St. Louis, Time Elctrns. 314-391-6444
NV Las Vegas, Klesub Elctrns. 702-733-3888
NJ Whippany, TONAR Inds. 201-884-1400
NM Albuquerque, Betatron Elctrns. 505-344-2381
NM Albuquerque, Intl. Elctrns. 505-345-8127
NY Fairport, Pioneer Elctrns. 716-381-7070
NY Hauppauge, Time Elctrns. 516-273-0100
OH Columbus, Reptron 614-436-6675
OH Middleburg Hieghts, Prehler Elctrns. .. 216-243-5510
OK Tulsa, The Altair Co. 918-252-5781
OR Portland, Time Elctrns. 503-684-3780
PA Broomall, Time Elctrns. 215-359-1200
PA Essington, Tri-Com 215-521-3080
PA Horsham, RM Elctrns. 215-674-1181
TX Addison, Quality Comps. 214-387-4949
TX Austin, Quality Comps. 512-835-0220
TX Dallas, Captronics 214-340-3592
TX Dallas, RM Elctrns. 214-263-8361
TX El Paso, International Elctrns. 915-598-3406
TX Ft. Worth, TTI, Inc. 817-831-0441
TX Houston, The Altair Co. 713-462-3029
TX Richardson, The Altair Co. 214-231-5166
UT Salt Lake City, Integrated Elctrns. 801-298-1869
WA Bellevue, Time Elctrns. 206-641-3640
WA Seattle, Richey Western Elctrns. 206-575-1910
WI Maguon, Taylor Elec. Co. 414-241-4321
WI New Berlin, NEP Elctrns. 414-785-9100
WI New Berlin, RM Elctrns. 414-784-4420

ITT ELECTRON TUBE, ITT Corp., Box 100, Easton, PA 18042, Tel: 215-252-7331, Telex: 847494; FSC No.: 20948; Empl.: 550

ITT ELECTRO-OPTICAL PRODS., 7635 Plantation Rd., Roanoke, VA 24019, Tel: 703-563-0371, Telex: 829458; Empl.: 1000; *Sls. Mgr.:* R. Moore; *Dist. Mgr.:* P. Williams

ITT GENERAL CONTROLS DIV., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201, Tel: 213-842-6131, Telex: 673147, TWX: 910-498-2225; Empl.: 1545; *Sls. Mgr.:* Phillip Vaughn

ITT GILFILLAN, 7821 Orion Ave., Van Nuys, CA 91409, Tel: 818-988-2600, Telex: 651421, TWX: 910-495-1787; FSC No.: 24930; Empl.: 2000; *Sls. Mgr.:* Robert McBride

ITT-HIGBIE MFG., Wagner Rd., Rochester, MI 48063, Tel: 313-651-5300, TWX: 810-232-1592; Empl.: 1500; *Sls. Mgr.:* C. J. Clemens

ITT POMONA ELECTRONICS, 1500 E. 9th St., P.O. Box 2767, Pomona, CA 91766, Tel: 714-623-3463, TWX: 910-581-3822; FSC No.: 05276; Empl.: 170; *Sls. Mgr.:* Carl Wm. Musarra; *Dist. Mgr.:* Carl Wm. Musarra ... **C•1289-1407**

Local Sales Offices & Reps

AL Madison, South Eastern Assocs. 205-772-9616
AZ Phoenix, More Sls. 602-274-4558,602-265-9201
CA Burlingame, Carelli/EMA 415-342-4514
CA Culver City, DeAngelo, Rothman & Co. 213-827-2202
CA Pasadena, Paul Nurches Co. 818-681-8957, 818-796-5844
CA Santa Clara, Engrg. Assocs. Corp. 408-988-5001
CO Denver, A-E-S Inc. 303-777-8733
FL Hialeah, L. Haas Co. 305-822-2300
IL Northbrook, W. M. Linz 312-498-9600
IN Indianapolis, Blind Elctrn. Sls. Co. 317-241-3742, 317-293-6205
IN Indianapolis, Blind Elctrns. Sls. Co. 317-241-3742
IA West Des Moines, Nevco 515-225-9866
MA Sharon, A Appell Assoc. 617-784-3439
MI Kentwood, C. Geer 616-534-9449,616-243-2746
MN Minneapolis, Hei-lite Sls. 612-861-6051
MO Kansas City, Nevco 816-421-1751
OH Mentor, Perry Lohse & Co., Inc. 216-255-1992
MO North Kansas City, Nevco, Inc. 816-421-1751
NJ Belleville, D. F. Tobias & Co. 201-751-8680
OH Dayton, Lessis Assocs. 513-294-1551
OR Beaverton, Eclipse Mktg. Grp. 503-642-1661
OR Beaverton, Eclipse Mktg. Grp. Ltd. 503-642-1661
OR Portland, Eclipse Mktg. Grp. 503-644-2550
PA Philadelphia, David S. Linz 215-379-0734
SC Greenville, H. C. Norman 803-244-6254
TX Dallas, Techno Assocs. 214-357-9212
WA Redmond, Eclipse Mktg. Grp. 206-885-6991
Can Whitby, ITT Canon Elec. Canada 416-668-8881

ITT POWER SYSTEMS CORP., Box 688, Galion, OH 44833-0688, Tel: 419-468-8100, Telex: 24-1401, TWX: 810-248-2907; Empl.: 800; *Dist. Mgr.:* W. E. Fox

ITT ITT Schadow inc

ITT SCHADOW, 8081 Wallace Rd., Eden Prairie, MN 55344, Tel: 612-934-4400, Telex: 29-0556, TWX: 910-576-2469; Empl.: 170; *Sls. Mgr.:* Darrell Wilk; *Dist. Mgr.:* Darrell Wilk ..... **B•1598-1602**

Local Sales Offices & Reps

AL Huntsville, Brandel-Stephens 205-883-0445
CA Los Angeles, Landa/Minyard 213-879-0770
CA Mountain View, Caltron Comps. 415-964-3244
CA San Diego, Landa/Minyard 619-942-1086
CO Boulder, Component Prod. Sls. 303-530-2800
CT Farmington, R. Perron & Co. 203-673-4825
FL Deerfield Beach, Brandel-Stephens ... 305-427-8558
FL Orlando, Brandel-Stephens 305-425-3202
GA Atlanta, Brandel-Stephens 404-261-7579
IL Chicago, IRI 312-647-7755
KS Wichita, PMR 316-684-4141
MA Newton, R. Perron & Co. 617-449-6162
MI Lathrup Village, R. C. Nordstrom Co. .. 313-559-7373
MN Edina, Monroe Hanna 612-925-5700
MO Maryland Heights, PMR 314-569-1220
NH Bedford, Ray Perron & Co. 603-472-3030
NH Dover, Ray Perron & Co. 603-742-2321
NM Albuquerque, Thorson Desert States .. 505-265-5655
NY Albany, Regan-Compar, Inc. 518-489-4777
NC Greensboro, Brandel-Stephens 919-274-6952
OH Columbus, K. W. Elctrns. 614-888-0483
OH Dayton, K. W. Elctrns. 513-890-2150
PA Philadelphia, P.S.A., Inc. 215-245-0513
TX Arlington, W. Pat Fralia Co. 817-267-3577
TX Houston, W. Pat Fralia Co. 713-772-1572
UT Salt Lake City, Comp. Prods. 801-262-0000
WA Seattle, Jas. J. Backer Co. 206-285-1300

Local Distributors

AL Huntsville, Hallmark 205-837-8700
CA Cerritos, El-Com, Inc. 213-404-2961
CA Gardena, Cal-Switch 213-770-2330
CA Los Angeles, Richey Western 213-820-3777
CA San Diego, El-Com, Inc. 619-272-4511
CA Sunnyvale, Time Elctrns. Nor/Cal 408-734-9888
CO Denver, Integrated Elctrns. 303-292-6121
FL Miami, Hallmark 305-971-9280
FL Orlando, Hallmark 305-855-4020
IL Bensenville, Hallmark 312-860-3800
IL Wheeling, Hawk Elctrns. 312-459-4030
KS Kansas City, Hallmark 913-888-4747
KS Wichita, R.S.C. Elctrns. 316-267-5213
MD Beltsville, Treeko Sls. 301-937-8260
MD Columbia, Hallmark 301-988-9800
MA Canton, Impact Sls. Co. 617-444-3971
MA Hingham, Sager Elec. 617-749-6700
MI Kentwood, R.M. Elctrns. 616-531-9300
MN Bloomington, Hallmark 612-854-2223
MN Minneapolis, Berquist Co. 612-835-2322
MO Maryland Heights, Hallmark 314-291-5350
NY Buffalo, Summit Distr. 716-884-3450
NY Lynbrook, Peerless Radio 516-593-2121
NY Rochester, Modutex, Inc. 716-647-9700
NC Raleigh, Hallmark 919-872-0712
OH Cincinnati, Schuster Elec. 313-489-1400
OH Twinsburg, Schuster/Cleveland 216-425-8134
OH Westerville, Hallmark 614-891-4555
OK Tulsa, Hallmark 918-665-3200
PA Philadelphia, Hallmark 215-355-7300
PA Philadelphia, Phila. Elctrns. 215-568-7400
TX Austin, Hallmark 512-258-8848
TX Dallas, Hall-Mark 214-343-5000
TX Houston, Hall-Mark 713-781-6100
TX Stafford, SW Elctrns. 713-491-4900
WI Milwaukee, Hallmark 414-761-3000

ITT SEMICONDUCTORS, 500 Broadway, Lawrence, MA 01841, Tel: 617-688-1881, Telex: 947413, TWX: 710-342-1357; *Sls. Mgr.:* Ed Burgess; *Dist. Mgr.:* John Flannery

ITT SURPRENANT DIVISION, 172 Sterling St., Clinton, MA 01510, Tel: 617-368-1401, Telex: 920451, TWX: 710-347-1736; Empl.: 500; *Sls. Mgr.:* I. W. Forrest; *Dist. Mgr.:* E. Michaud

ITT TELECOMMUNICATIONS, Apparatus Dept., Fulton Dr., Corinth, MS 38834, Tel: 601-287-3771, TWX: 510-984-0211; Empl.: 2000; *Sls. Mgr.:* Charles Yancey

ITT THERMOTECH, Div. IT & T, 1203 S. 5th St., Hopkins, MN 55343, Tel: 612-933-9400, Telex: 29-0414; Empl.: 605; *Sls. Mgr.:* Gene Christiansen

ITW, Cortron Div., 400 W. Grand, Elmhurst, IL 60126, Tel: 312-279-9110

ITW SWITCHES, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634, Tel: 312-282-4040, Telex: 4330130, TWX: 910-221-0275; Empl.: 500; *Sls. Mgr.:* A. Steiner; *Dist. Mgr.:* A. Steiner

IVEK CORP., 43 School St., N. Springfield, VT 05150, Tel: 802-886-8278; Empl.: 4; *Sls. Mgr.:* Gene Williams

IVERON PACIFIC, 1150 Morena Boulevard, San Diego, CA 92110-3899, Tel: 619-275-1500; Empl.: 16; *Sls. Mgr.:* Lee Kerl

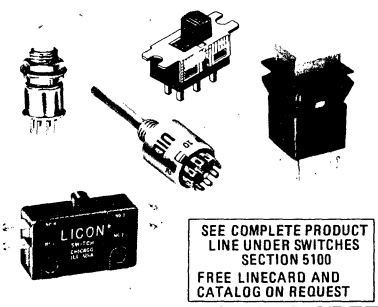
IVO INDS., INC., 201 Industrial Way W., P.O. Drawer 917, Eatontown, NJ 07724, Tel: 201-542-5151, Telex: 132-414; Empl.: 10; *Sls. Mgr.:* Tom Jones ..... **B•1603**

Local Sales Offices & Reps

CA Los Altos, J. W. Wilhoit, Inc. 415-961-3660
CA Tustin, Sierra-Pacific Engrg. 714-731-3411
IL Buffalo Grove, Jim Laganowski & Assocs. 312-520-0130
NY Buffalo, Rudell-Merrifield Assoc. 716-634-4300
OH Beachwood, Elctrn. Salesmasters 216-831-9555
PA Willow Grove, Indl. Mktg. Specialists .. 215-659-0444

Local Distributors

..... 818-991-3864
CA Agoura, Sibbald Instrs. 213-991-3864
CA San Carlos, Logan Elctrns. 415-594-0700
CA San Diego, Electric Power & Controls 619-483-1126
CA San Jose, Consolidated Parts 408-263-9521
CA Santa Monica, Master Distr. 213-452-1229
CT New Preston, AALE Equip. 203-868-0501
FL Lakeland, A A Electric 813-665-6941

ITW SWITCHES
LICON • CHICAGO SWITCH • UID • RCL
MILITARY SPECIFICATION
INDUSTRIAL AND COMMERCIAL
AUTHORIZED DISTRIBUTOR
E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE.
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

GA Norcross, A A Electric 404-449-8670
IL Arlington Heights, Martec Assocs. 312-956-8090
MD Towson, Kraft Indl. 301-828-5838
MI Detroit, E & E Engrg. 313-371-2000
MN St. Paul, Power/Mation Div. 612-645-0781
NJ E. Rutherford, A A Electric 201-777-5477, 800-223-0119
NY Clarence, Trott Elctrns. 716-634-8500
NC Charlotte, Trott Elctrns. 704-376-2237
NC Huntersville, Scott Equip. 704-875-1611
SC Greenville, Automation Supp. Co. 800-845-5274
TX Dallas, Dallas Meter Tek 214-349-6044
WI Green Bay, Control Speciality 414-468-1967
WI Waukesha, Power/Mation Div. 414-542-2868
WI Wausau, Control Speciality 715-359-9122

IWATSU INSTRUMENTS, INC., 430 Commerce Blvd., Carlstadt, NJ 07072, Tel: 201-935-5220, TWX: 710-989-0255; Empl.: 8; *Sls. Mgr.:* Alex Orloff ..... **D•1390-1392**

Local Sales Offices & Reps

CA Garden Grove, Advanced Digital Grp. 213-598-9645
CA Sunnyvale, ICHIREP 408-249-2585
CT Old Saybrook, MJT Assocs. 203-38-5890
FL Sarasota, Ram-Z Assocs. 813-921-5561
IL Rolling Meadows, Commodore 1 312-394-5441
MN Minneapolis, Kodo Assocs. 612-881-1255
NH Nashua, MJT Assocs. 603-889-5373
NJ Parlin, J.M.R. Sls., Inc. 201-254-8484
NY Rochester, Harmony Labs. 716-458-3376
NC Pineville, TESTREPS 704-588-4624
OH North Ridgeville, TMS 216-327-3527
OK Tulsa, Spectra Sls. Corp. 918-663-7188
TX Houston, Spectra Sls. Corp. 713-747-2798

Local Distributors

CA Anaheim, R & D Elctrn. Supp. 714-773-0240
CA Burbank, U.S. Instr. Rentals 213-849-5861
CA Canoga Park, Rag Elctrns. 213-998-6500
CA Freemont, Rep Inc. 415-651-4131
CA Lakewood, R. D. Technology 213-595-9468
CA Oceanside, Palomar Elctrn. Prods. 619-439-7541
CA San Diego, Instrument Engrs. 619-268-8344
CA San Mateo, U.S. Instr. Rentals 415-572-6686
CA Van Nuys, Testek Corp. 213-786-6890
CO Boulder, Instr. Repair Labs 303-449-2721
CT Monroe, Connecticut Calibration 203-261-9518
FL South Daytona, Kapital Instr. Sls. 904-257-4334

IWATSU®

Oscilloscopes

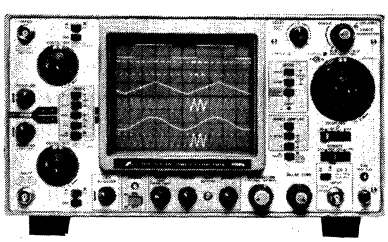
Authorized Distributors

R A G ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



Model 5705

FL St. Petersburg, H. J. Knapp 813-392-0406
FL W. Palm Beach, Nurmi Elctrn. Supp. 305-686-8553
IL Downers Grove, Ames Supply Co. 800-942-1596
MA Billerica, Hayes Instr. Svc. 617-663-4800
MA N. Billerica, A.S.T./Servo Sys. 617-667-8541
MA Newton, Interfax Sys., Ltd. 617-332-4621
MA Waltham, Calibron Instrs. 617-894-6440
MI Royal Oak, Programmed Learning Measures 313-549-3936
MN Minneapolis, Tonka Tech. Labs 612-593-1770
MO St. Louis, Indl. Svc. Lab. Corp. 314-535-5760
NJ North Caldwell, Hosica 201-256-7724
NM Albuquerque, Electronic Parts Co. 505-293-6161
NY Frankfort, Kapital Instr. Sls. 315-894-4245
NY Great Neck, Instrument Mart 516-487-7430
NY Melville, Exphil Calibration 516-694-5755
NY Morrisville, D.F.I. Entprs. 315-684-9693
NY Poughquag, Schmidt Elctrns. 914-724-3400
NY Rochester, Caltronix, Inc. 716-359-3780
NC Pineville, Elctrn. Measuring Instr. Svc. 704-588-4624
OK Oklahoma City, Houston De Pue Labs. 404-235-5469
OK Tulsa, Tri-State Instrs. 918-836-0286
PA Philadelphia, Jan Ind. Elctrns. 215-922-1321
PA Philadelphia, Sunshine Instrs. 215-673-5600
PA York, Y.I.S., Inc. 717-854-7804
TX Austin, Galtronics, Inc. 512-837-7470
TX Austin, Tinkertronics 512-926-4420
TX Dallas, Hutton Co. 214-484-0580
TX Garland, Tucker Elctrns. 214-348-8800
TX Houston, Houston Whls. Elctrns. 713-644-8320
TX Houston, Meters & Instrs. 713-644-1631
VA Chesterfield, Chesapeake Sys. 804-271-7725
VA Vienna, Electronic Equip. Bank 703-938-3350
WA Seattle, Vanguard Elctrn. Tool 206-284-6186
WI Madison, Schrenk Sls. 603-255-7400

IXYS CORP., 142 Charcot Ave., San Jose, CA 95131, Tel: 408-262-8800, Telex: 384928 SNJ SU; FSC No.: 408-435-1033; *Sls. Mgr.:* Yoram Hirsch

JACO MFG. CO., 468 Geiger St., Berea, OH 44017, Tel: 216-234-4000

JAE
JAE Electronics, Inc.

JAE, 1901A E. Carnegie Ave., Santa Ana, CA 92705, Tel: 714-250-8770, TWX: 681-438 ZEMCO SNA; Empl.: 20; *Sls. Mgr.:* James R. Clark ..... **B•1604-1607**

Local Sales Offices & Reps

CA Irvine, Angle Assocs. 714-833-0692
CA Santa Clara, M2 Mktg. Grp. 408-986-0676
FL Miami, Intro Corp. 305-387-1176
IL Downers Grove, Momak Sls. 312-963-6400
IN Indianapolis, Frank J. Campisano Co. 317-253-7651
MA Wakefield, Kentronics, Inc. 617-246-0245
MO St. Louis, Abrams & Assocs. 314-569-0447
NJ Wayne, G. T. Assocs. 201-694-6040
OH Cincinnati, Frank J. Campisano Co. 513-574-1111
OR Hillsbore, Rhodes Sls. Corp. 503-640-6666
PA Coraopolis, Frank J. Campisano Co. 412-264-5151

JAIDINGER MFG., 1921 W. Hubbard St., Chicago, IL 60622, Tel: 312-421-1090; Empl.: 35; *Sls. Mgr.:* John S. Jaidinger

JAMB INDS., Box 281, Rockaway Valley Rd., Boonton, NJ 07005, Tel: 201-263-9295; Empl.: 3

JAMESBURY CORP., Div. of Combustion Engineering, Inc., 640 Lincoln St., Worcester, MA 01605, Tel: 617-852-0200, Telex: 92-0448, TWX: 710-240-1268; Empl.: 1000; *Sls. Mgr.:* C. A. Richardson

JAMES ELECTRONICS, 4050 N. Rockwell, Chicago, IL 60618, Tel: 312-463-6500, TWX: 910-221-5034; *Sls. Mgr.:* J. R. Ther; *Dist. Mgr.:* J. R. Ther

Janco
AN ESOP CORP.

JANCO CORP., Box 3038-Glenoaks Sta., Burbank, CA 91504, Tel: 818-846-1800, TWX: 910-498-2701; FSC No.: 91812; Empl.: 185; *Sls. Mgr.:* Sam Kay, Jr. ..... **B•1608-1609**

Local Sales Offices & Reps

AZ Tempe, Piper Sls. 602-949-0048
AR Dallas, Kruvand Assocs. 214-437-3355
CA Cupertino, Codella 408-257-2561
CA San Diego, Qualtronics 619-695-0118
CO Longmont, Piper Sls. 303-651-2378
FL Orlando, MacKay, Smith & Assocs. 305-423-4353
GA Atlanta, MacKay, Smith & Assocs. 404-449-7444
IL Addison, Engineered Sls. 312-832-8425
IN Ft. Wayne, Aktron Corp. 219-747-3650
KS Wichita, T-Bird Tech. Sls. & Svc. 316-684-3941
MD Silver Spring, H.R. Sieber 301-589-9110
MA Mendon, B. Caron Assocs. 617-478-4519
MN St. Paul, Cahill, Schmitz & Cahill 612-646-7217
MO Maryland Heights, T-Bird Sls. & Svc. 314-567-6488
NJ Cherry Hill, Quality Comps. 609-428-6266
NY Albertson, C.F. Ward 516-742-5561
NC Charlotte, MacKay, Smith & Assocs. 704-372-1188
OH Columbus, Tom Mulligan Company 614-457-2242
TX Dallas, Kruvand Assocs. 214-437-3355
WA Seattle, Norwest 206-827-9562

Local Distributors

CA Burbank, Merit Comp. Supp. 818-842-8162
CA Westlake Village, Tech-Cable Prods. 818-991-4697

J. & S TOOL, 70 Okner Pkwy., Livingston, NJ 07039, Tel: 201-533-0700, Telex: 139229; Empl.: 50; *Sls. Mgr.:* K.F. Swenson

JAN HARDWARE MFG. CO., 47-27 36th St., Long Island City, NY 11101, Tel: 212-361-0800; FSC No.: 99813; Empl.: 60; *Sls. Mgr.:* Irwin E. Wasserman; *Dist. Mgr.:* Bob Anzalone ..... **C•1588, 1591-1611**

Local Sales Offices & Reps

AZ Phoenix, Steve Fisher Assocs. 602-247-7865
CA Menlo Park, Long Assocs. 415-327-1300
CA San Diego, Robert Scott Co. 619-420-6446
CA Thousand Oaks, S.A.R.G.E. 213-991-6706
FL Seminole, Custom Assembly 813-397-8302
IL Woodale, Croydon Elec. 312-595-2300
MD Woodbine, Naudain Assocs. South. 301-442-2270
MA Brookline, Harman Assocs., Inc. 617-232-6687
MA Lee, Harman Assocs., Inc. 413-243-1158
MN Golden Valley, A.I.M. 612-542-8437
MO Crestwood, Nevco 314-843-7406
MO Kansas City, Nevco 816-421-1751
NJ Englewood, H. Gray Assocs. 201-894-0894
NJ Marlton, Naudain Assocs. 609-983-5808
OH Dayton, F. L. Ohmer & Assocs. 513-434-1454
TX Richardson, AGM Sls. 214-644-1475

JAPANESE PRODS. CORP., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362, Tel: 818-991-6111

JARO COMPONENTS, INC., 5549 Powerline Rd., Ft. Lauderdale, FL 33309-2883, Tel: 305-771-7000, Telex: 522-334; Empl.: 30; *Sls. Mgr.:* Robert C. Flipse; *Dist. Mgr.:* Floyd Burwell

JAY CONTROL CO., 21 Sequin Dr., Glastonbury, CT 06033, Tel: 203-633-5294; Empl.: 40; *Sls. Mgr.:* Mike Colomonico

JAYCOR, P.O. Box 85154, San Diego, CA 92138, Tel: 619-453-6580, TWX: 910-322-1064; Empl.: 300; *Sls. Mgr.:* Steven Lutjens

JAY-EL PRODS., Sub. Ducommun Inc., 1859 W. 169th St., Gardena, CA 90247, Tel: 213-323-7130, TWX: 910-346-7633; FSC No.: 08719;Multiple; Empl.: 310

JB ELCTRN. TRANSFORMERS, 2300 W. Armitage Ave., Chicago, IL 60647, Tel: 312-342-0080, TWX: 910-221-1283; FSC No.: 11700; Empl.: 150; *Sls. Mgr.:* J. M. Blacklidge

JBM ELECTRONICS, INC., 531 Front St., Manchester, NH 03102, Tel: 603-623-0222, Telex: 953134, TWX: 710-220-8978; FSC No.: 62694; Empl.: Approx. 100; *Sls. Mgr.:* Mr. Steve Glorioso; *Dist. Mgr.:* Mr. Steve Glorioso ..... **A•1528-1529**

J-B-T INSTRS., Box 1818, New Haven, CT 06508, Tel: 203-776-1111; Empl.: 25; *Sls. Mgr.:* Virginia Devitt ..... **D•1358**

Local Sales Offices & Reps

MN	Minneapolis, Hei-Lite Sls.	612-861-6051
TX	Dallas, Elcom Mktg., Inc.	214-241-2166
Can	Thornhill, Ont., R. C. Kahnert Sls., Ltd.	416-221-7755
Can	Winnipeg, Vancouver, Smith-Paterson & Assocs.	604-681-0743

Local Distributors

AL	Montgomery, Southern Controls	205-277-5030
CA	Glendale, Western Elctrns.	213-246-4861
CA	Los Angeles, Metermaster	213-685-4340
CA	San Francisco, Pacific Elctrns.	415-543-3104
CA	Wilmington, Wilmington Instrs.	213-834-1133
CO	Denver, E.I.L. Instrs.	303-534-4160
CT	New Haven, Hatry Elctrns.	203-787-5921
FL	Miami, Florida Precision	305-324-1731
GA	Augusta, Speciality Distributing	404-873-2521
IL	Bridgeview, E.I.L. Instrs.	312-430-2292
IL	Elk Grove Village, Metermaster	312-593-8650
LA	Lafayette, Ralph's Elctrns.	318-234-4507
MD	Sparks, E.I.L. Instrs.	301-771-4800
MA	Hingham, Sager Elec.	617-749-6700
MN	Minneapolis, Instrument Controls	612-871-2514
MS	Jackson, Ellington Elctrn. Supp.	601-355-0561
NJ	Belleville, Miscorp	201-751-8680
NJ	North Caldwell, Hosica Labs	201-256-7724
NY	Long Island City, Metermod	718-726-4850
NY	Lynbrook, Peerless Radio	516-593-2121
NY	Maspeth, Harry Alter	718-366-0123
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Bluffton, Bluffton Prods.	419-358-7891
OH	Cleveland, Weschler Elec.	216-238-2550
OH	Dayton, Scott-Friedman	513-298-5555
OK	Oklahoma City, Trice Wholesale	405-524-4411
PA	Reading, Barbey Elctrns.	215-376-7451
RI	Providence, William Dandreta	401-861-2800
TN	Nashville, Electra Distributing	615-329-3971
TX	Ft. Worth, Swieco	817-335-6521
TX	Garland, Metermaster	214-271-5671
TX	Houston, Harrison Equip.	713-879-2600
TX	Houston, Quality Instrs.	713-524-0528
WA	Seattle, Eicher-Richards	206-523-7888
WV	St. Albans, Preiser Scientific	304-727-2902

J-B-T SWITCHES, CUTLER-HAMMER PRODS., EATON CORP., Box 1904, New Haven, CT 06509, Tel: 203-772-2220; FSC No.: 55459; Empl.: 160; *Sls. Mgr.:* C. A. Peffer

Refer to Eaton Corp./Cutler-Hammer Prods., Areospace/Commercial Controls Div. for distributor information.

JDK CONTROLS, INC., 2630 Lavery Ct., Suite F, Newbury Park, CA 91320-1593, Tel: 805-499-7779; *Sls. Mgr.:* Reece Kendall ..... **A•2021**

JEFFERS ELCTRNS., Grand Plaza, 945 Grand Ave., Nogales, AZ 85621, Tel: 602-287-5851, TWX: 910-973-9794; FSC No.: 59474; Empl.: 400; *Sls. Mgr.:* Ken Shobert; *Dist. Mgr.:* Steve Morris

Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean	205-830-1540
AZ	Phoenix, O'Donnell Assoc.	602-944-9542
CA	Garden Grove, Elsco	714-891-4621
CA	Santa Clara, I Squared	408-988-3400
CO	Boulder, R.G. Entprs.	303-447-9211
CT	Middletown, Gerber Sls.	203-347-3000
FL	Tampa, APM Assoc.	813-886-2457
GA	Atlanta, Cartwright & Bean	404-233-2939
IL	Arlington Hgts., C.L. Greenslade Sls.	312-593-3450
IN	Ft. Wayne, J.F. Kilfoil	219-436-7233
KS	Overland Park, Advanced Techn. Sls.	913-642-6675
LA	Covington, Cartwright & Bean	504-892-1780
MA	Newton Upper Falls, Gerber Sls.	617-969-2620
MI	Lathrup Village, R. C. Nordstrom	313-559-7373
MN	Edina, Grayden & Flemmer	612-941-1120
NM	Albuquerque, Power Entprs.	505-298-1918
NY	E. Rochester, Tri-Tech Elctrns.	716-385-6500
NY	Great Neck, MOS Assoc.	516-487-3966
NC	Raleigh, Cartwright & Bean	919-876-4130
OH	Cincinnati, J.F. Kilfoil Co.	513-791-6150
OR	Beaverton, Eclipse Mktg.	503-642-1661
PA	Ardmore, Wm. K. Metz	215-896-7300
TX	Lewisville, Jim Hughes	214-221-1536
WA	Puerto Rico, Hato Rey, M. Anderson Co.	809-751-2026
WA	Redmond, Eclipse Mrktg.	206-885-6991

JEFFERSON ELEC., MagneTek, Inc., 1400 Center Circle Drive, Downers Grove, IL 60515-1021, Tel: 312-691-2400, Telex: 72-8408; Empl.: 1200; *Sls. Mgr.:* Tom Hull; *Dist. Mgr.:* Frank Michalik

Local Sales Offices & Reps

AZ	Phoenix, Ross-Bloom & Assoc.	602-955-5024
CA	Los Angeles, J. G. Pomeroy	213-263-9381
CA	San Francisco, Black & Egbert Assocs.	415-282-0840
CO	Denver, Electra-Tech Sls.	303-778-1900
FL	Tampa, Clement-Kinzel, Inc.	813-839-4470
GA	Atlanta, Berry-Elsberry Co.	404-355-9296
IL	Hillside, Archibald & Hamel	312-449-0202
IL	Wood Dale, Power Prods. Co.	312-595-1142
MD	Annapolis, Peter Straaten	301-261-2831
MA	Framingham, Gerald Rosen Co.	617-879-5505
MA	Stoughton, North Coast Sls.	617-344-1007
MI	Livonia, Electric Sls. Co.	313-464-1800
MN	Minneapolis, G. L. Brusacorm	612-872-8222
MS	Jackson, Welch & Doby	601-932-5534
MO	Kansas City, Mid-States Elec. Sls.	913-621-6161
MO	St. Louis, Schaeffer Sls.	314-647-1000
NE	Omaha, Boyle & Williamson	402-553-1666
NJ	Edison, Bizzarro Elec. Sls.	201-757-7010
NJ	Gloucester City, ESA Mfgrs. Rep.	609-456-7110
OH	Westlake, Associated Elec. Comps.	216-835-9960
NY	New Hartford, F. W. Laver & Son	315-724-2304
NC	Charlotte, W. H. Lassister Sls.	704-523-2736
OH	Cincinnati, Bryan, Haley & Cunningham	513-561-0500
PA	Pittsburgh, Robert Colley Assocs.	412-331-3121
TX	Dallas, The Rich Co.	214-742-1758
TX	Houston, Gulf Elec. Mktg.	713-868-2517
WA	Seattle, Bangs Assocs.	206-762-0262
WI	Butler, J. F. Nolan & Assocs.	414-781-1140

JENNINGS, 970 McLaughlin Ave., San Jose, CA 95122, Tel: 408-292-4025, Telex: 34-6311, TWX: 910-338-0159; FSC No.: 73905; Empl.: 370; *Sls. Mgr.:* E. V. Valehrach ..... **A•1102-1103; B•1424-1425, 1610; D•1251**

Local Sales Offices & Reps

AL	Huntsville, Brandel-Stephens	205-883-0445
AZ	Phoenix, Crown Systems	602-274-3180
CA	Granada Hills, C & W Comps.	213-368-4032
CA	Santa Clara, Silicon Valley Sls.	408-371-8814
CO	Denver, Lindberg Co.	303-758-9033
FL	Deerfield Beach, Brandel-Stephens	305-427-8558
FL	Orlando, Brandel-Stephens	305-425-3202
GA	Atlanta, Brandel-Stephens	404-261-7579
IL	Chicago, Berndt Assocs.	312-283-0713
IN	Carmel, Berndt Assocs.	317-844-0114
KS	Shawnee Mission, Lowell-Kangas & Assoc.	913-631-3515
MD	Silver Spring, Marktron	301-460-6100
MD	Timonium, Marktron	301-252-7111
MA	Haverhill, L. K. Harman, Inc.	617-373-1313
MN	Minneapolis, Berndt Assocs.	612-546-2021
MO	St. Louis, Lowell-Kangas & Assoc.	314-821-4050
NJ	Englewood, Cooper Assocs.	201-871-4985
NM	Albuquerque, Lindberg Co.	505-881-1006
NC	Greensboro, Brandel-Stephens	919-274-6952
OH	Westlake, Harry W. Applegate Co.	216-331-2960
PA	Huntingdon Valley, Omega Elctrns.	215-947-4135
PA	Pittsburgh, Covert & Newman & Co.	412-531-2022
TX	Houston, Barry Sales	713-784-5860
TX	Richardson, Barry Sales	214-234-0255
UT	Salt Lake City, Lindberg Co.	801-969-2400
VA	Charlottesville, Marktron	804-973-5874
WI	Milwaukee, Berndt Assocs.	414-545-8400

Local Distributors

CA	Oceanside, Surcom Assocs.	619-722-6162
IL	Franklin Park, Richardson Elctrns., Ltd.	312-456-0600

JENSEN TOOLS, INC., Axia, Inc., 7815 S. 46th St., Phoenix, AZ 85040, Tel: 602-968-6241, TWX: 910-950-0115; Empl.: 100; *Sls. Mgr.:* Tom Fenzel

JEROME INDUSTRIES CORP., B 730 Division St., Elizabeth, NJ 07201, Tel: 201-353-5700, Telex: 132001-JEROME, ELIZ; Empl.: 150; *Sls. Mgr.:* Anthony Di Girolamo ..... **D•1678-1679**

Local Sales Offices & Reps

MN	St. Paul, Countrymen Assocs.	612-645-9151

JEROME INDUSTRIES CORP., Transformer Div., 730 Division St., Elizabeth, NJ 07201, Tel: 201-353-5700, Telex: 132001-JEROME, ELIZ; *Sls. Mgr.:* Anthony Di Girolamo

JERSEY SPECIALTY CO., See JSC Wire & Cable

JERSEYSWITCH, INC., 129A Gaither Dr., Mt. Laurel, NJ 08054, Tel: 609-778-8190

JETTRON PRODS., P.O. Box 337, E. Hanover, NJ 07936, Tel: 201-887-0571; FSC No.: 04435; Empl.: 30; *Sls. Mgr.:* J. M. Schill ..... **C•1408-1410**

Local Sales Offices & Reps

CA	El Cajon, A-Tronics	619-444-1501
CA	Woodland Hills, A-Tronics	818-703-7212
NY	New York, Eltron Export Co.	212-944-7635

Local Distributors

Intl	England, Slough, Berks, LPPI	44-753-77788
Intl	France, Le Chesnay, LPPI	33 3 955 2104
Intl	Italy, Cinisello Balsamo (Mila, LPPI	2-6127821
Intl	Netherland, Krimpen a.d. Yssel, LPPI	31-1807-1 8555
Intl	Sweden, Stockholm, LPPI	46-8-132030
Intl	Switzerland, Zurich, Litton Precision Prods. Intl. (LPPI)	1 312 35 44

J-B-T

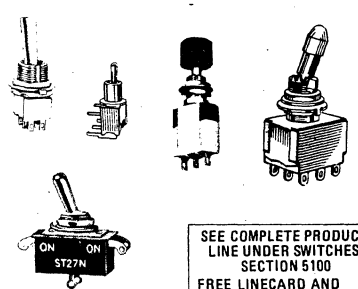
Division of CUTLER-HAMMER
AUTHORIZED DISTRIBUTOR

E S I

ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

JEWELL ELECTRICAL INSTRS., Grenier Field, Manchester, NH 03108, Tel: 603-669-6400, Telex: 943435 JEWELL MAN; Empl.: 400; *Sls. Mgr.:* W. P. Bolia ..... **D•1359**

Local Sales Offices & Reps

AL	Huntsville, Currie, Peak & Frazier	205-536-1506
AZ	Phoenix, The Knight Co.	602-582-8506
AR	Little Rock, J. Y. Schoonmaker	501-375-2168
CA	Fremont, William Parks Assocs.	415-796-0875
CA	Los Angeles, Knight Co.	213-670-2833
CA	San Diego, Knight Co.	619-571-7903
CT	Middletown, Gerber Sls.	203-347-3000
GA	Norcross, Currie, Peak & Frazier, Inc.	404-449-7662
IL	Chicago, Berndt Assocs.	312-283-0713
IN	Carmel, Berndt Assocs.	317-844-0114
IA	Cedar Rapids, Gassner & Clark Co.	319-393-5763
MA	Monson, Gerber Sls.	413-267-5051
MA	Newton Upper Falls, Gerber Sls.	617-969-2620
MI	Troy, C. B. Jensen	313-643-0506
MN	Edina, M. Foster Co.	612-941-9790
NJ	Cherry Hill, Trinkle Sls.	609-795-4200
NM	Albuquerque, C. T. Carlberg	505-888-3883
NY	Buffalo, Rudell-Merrifield Assocs.	716-634-4300
NY	Melville, Comtronics Assocs.	516-249-0505
NC	Greensboro, Currie, Peak & Frazier, Inc.	919-373-0380
NC	Raleigh, Currie, Peak & Frazier, Inc.	919-787-0808
OH	Cleveland, Marlow Assocs.	216-991-6500
OH	Columbus, Marlow Assocs.	614-885-7643
OH	Dayton, Marlow Assocs., Inc.	513-275-4147
OK	Oklahoma City, J. Y. Schoonmaker	405-685-4477
OR	Portland, Frank Jackson	503-292-2638
TX	Austin, J. Y. Schoonmaker	512-480-9257
TX	Dallas, J. Y. Schoonmaker	214-349-1650
TX	Houston, J. Y. Schoonmaker	713-738-2427
WA	Redmond, F. Jackson	206-881-7277
WI	Milwaukee, Berndt Assocs.	414-545-8400

Local Distributors

AL	Birmingham, Brownell Electro, Inc.	205-322-3374
AL	Mobile, Brownell Electro, Inc.	205-479-5404
AZ	Phoenix, Metermaster, Inc.	602-437-1425
AR	Little Rock, Brownell Electro, Inc.	501-562-2061
CA	Lamirada, Stevens Instr. Co.	714-994-5111
CA	Los Angeles, E.I.L. Instrs., Inc.	213-685-7020
CA	Los Angeles, Metermaster, Inc.	213-685-4340
CA	Palo Alto, Metermaster, Inc.	415-968-0313
CA	San Diego, Metermaster, Inc.	619-560-4844
CA	Santa Clara, Dynametron, Inc.	408-727-6531
CA	Santa Clara, E.I.L. Instrs., Inc.	408-727-0396
CA	Santa Clara, Fisher-Brownell	408-988-6041
CO	Denver, E.I.L. Instrs., Inc.	303-534-4160
CO	Denver, Metermaster Instr., Inc.	303-722-5766
CT	Middletown, E.I.L. Instrs., Inc.	203-346-6646
FL	Miami, Brownell Electro, Inc.	305-592-2636
FL	Orlando, Brownell Electro, Inc.	305-843-6770
FL	Palm Bay, E.I.L. Instrs., Inc.	305-725-8300
GA	Atlanta, Brownell Electro, Inc.	404-762-5181
IL	Bridgeview, E.I.L. Instrs., Inc.	312-430-2292
IL	Countryside, Pacific Indicator Co.	312-352-3500
IL	Itasca, Metermaster, Inc.	312-250-0606
IN	Evansville, Electro-Lab Svcs., Inc.	812-423-5211
IN	Indianapolis, E.I.L. Instrs., Inc.	317-545-1373
KY	Louisville, E.I.L. Instrs., Inc.	502-454-3420
LA	Kenner, Breard-Gardner	504-466-3401
MD	Baltimore, Sunshine Sci. Instr., Inc.	301-661-5900
MD	Gaithersburg, Pioneer/Instrmn.	301-921-0660
MD	Sparks, E.I.L. Instrs., Inc.	301-771-4800
MA	Burlington, E.I.L. Instrs., Inc.	617-272-9450
MA	Waltham, Calibron Corp.	617-894-6440
MA	Woburn, Brownell Electro, Inc.	617-935-7820
MI	Ferndale, Ram Meter, Inc.	313-398-6767
MN	Minneapolis, Instrumentation Svcs., Inc.	612-544-8916
MN	Minneapolis, Process Measurement Co.	612-544-4035
MO	St. Louis, Industrial Svc. Labs	314-535-5760
NJ	Belleville, Miscorp	201-751-1190
NJ	Edison, Brownell Electro, Inc.	201-287-2030
NJ	Pennsauken, E.I.L. Instrs., Inc.	609-488-0474
NM	Albuquerque, Walker Elctrn. Supp. Co.	505-883-2992
NY	Clarence, Trott Elctrns., Inc.	716-634-8500
NY	Hauppauge, E.I.L. Instrs., Inc.	516-231-6333
NY	New York, Brownell Electro, Inc.	212-924-6000
NY	Rochester, E.I.L. Instrs., Inc.	716-427-8000
NC	Charlotte, Brownell Electro, Inc.	704-597-1270
NC	Charlotte, Trott Electronics, Inc.	704-376-2237
NC	Raleigh, Brownell Electro, Inc.	919-876-6524
OH	Cleveland, Pioneer Instrmn.	216-587-3600
OH	Cleveland, Weschler Elec. Co.	216-237-2550
OH	Dayton, E.I.L. Instrs., Inc.	513-435-2134
OH	Dayton, Pioneer Std. Elctrn.	513-236-9900
OK	Tulsa, Combined Technlg. Co.	918-665-3002
OK	Tulsa, Genesis Elctrns. Corp.	918-622-8520
OR	Portland, Branom Instr. Co.	503-283-2555
PA	Philadelphia, Sunshine Sci. Instr.	215-673-5600
PA	Pittsburgh, C.A.M. Inst.	412-963-1885
PA	Pittsburgh, E.I.L. Instrs., Inc.	412-731-5230
SC	Columbia, Brownell Electro, Inc.	803-772-6111
TN	Knoxville, Brownell Electro, Inc.	615-966-3441
TN	Memphis, Brownell Electro, Inc.	901-795-8483
TN	Nashville, Brownell Electro, Inc.	615-885-1302
TX	Dallas, Dallas Meter-Tek Supp.	214-349-6044
TX	Dallas, E.I.L. Instrs., Inc.	214-931-1236
TX	Dallas, Ultra Instr. Lab, Inc.	214-357-0297
TX	El Paso, McNicol Elctrns.	915-566-2936
TX	Garland, Metermaster, Inc.	214-271-5671
TX	Houston, E.I.L. Instrs., Inc.	713-271-3100
TX	Houston, Quality Instr. Lab	713-524-0528
VA	Richmond, Meter Metrics	804-275-1431
WA	Richland, Branom Instr. Co.	509-943-6664
WA	Seattle, Branom Instr. Co.	206-762-6050
WA	Seattle, E.I.L. Instrs., Inc.	206-762-0880
VA	Alexandria, E.I.L. Instrs., Inc.	703-354-4330
VA	Virginia Beach, E.I.L. Instrs., Inc.	804-499-3746
WI	Milwaukee, E-M Instrs., Inc.	414-272-7799

JFD ELCTRNS., See Murata Erie No. Amer., Inc.

JF MICROSYSTEMS, 3641 Frontier Road, Pasco, WA 99301, Tel: 509-297-4294, 800-JF-CARDS; Empl.: 2; *Sls. Mgr.:* Jim Follansbee

JFW INDS., INC., 2719 E. Troy Ave., Indianapolis, IN 46203, Tel: 317-783-9875; Empl.: 30; *Sls. Mgr.:* Joetta Walker; *Dist. Mgr.:* Joetta Walker

JKL COMPS., 13343 Paxton St., Pacoima, CA 91331, Tel: 818-896-0019, Telex: 910-496-1504; FSC No.: 55335; Empl.: 18; *Sls. Mgr.:* Bob Brandt

JMJ TECHNICAL PRODS., 50 Wheeler Point Rd., Newark, NJ 07105, Tel: 201-589-4257; Empl.: 8; *Sls. Mgr.:* Kevin Kolenut ..... **C•1613**

JMK, INC., 15 Caldwell Dr., Amherst, NH 03060, Tel: 603-886-4100, Telex: 955329; Empl.: 200; *Sls. Mgr.:* J. Kennedy ..... **A•1611**

Local Sales Offices & Reps

AL	Huntsville, JWL Assocs.	205-881-0413
CA	Santa Clara, Cummings & Assocs.	408-247-8656
CA	Woodland Hills, Cummings & Assocs.	213-340-6035
CO	Denver, Arkco Sls.	303-758-1151
FL	Lantana, Burke Assocs.	305-585-3238
FL	Largo, Burke Assocs.	813-584-5699
FL	Orlando, Burke Assocs.	305-298-4783
IL	Downers Grove, Momak Sls.	312-963-6400
IN	Indianapolis, Gorny Sls.	317-271-7504
MD	Riderwood, W.S. Warrington & Assocs.	301-823-8759
MA	Framingham, STS	617-620-0195
MI	Novi, Lektronics	313-349-3304
MN	St. Paul, Arkco Sls.	612-777-7454
NJ	Haddonfield, Gray Assocs.	609-429-5300
NJ	Ridgewood, Ballou Assocs.	201-444-6990
NY	Rochester, Elcom Sls.	716-385-1400
NY	Syracuse, Elcom Sls.	315-685-8245
NC	Charlotte, JWL Assocs.	704-523-3001
OK	Tulsa, Barry Sls.	918-749-7775
OR	Hillsboro, Temco NW	503-648-8171
OR	Portland, Cummings & Assocs.	503-761-4411
TX	Austin, Barry Sls.	512-837-3616
TX	Houston, Barry Sls.	713-784-5860
TX	Richardson, Barry Sls.	214-234-0255
WA	Bothell, Temco NW	206-821-5434
WA	Edmonds, Cummings & Assocs.	206-775-1421
WI	Muskego, Momak Sls.	414-363-7744

Local Distributors

CA	Woodland Hills, C & A Elctrns.	213-340-6022
MN	St. Paul, Voyager Elctrns.	612-571-7766
NH	Hudson, C & H Elctrns.	603-882-1133
Can	Toronto, Ont., RAE Elctrns.	416-736-1744

JM TRANSFORMER CO., INC., 112 Florida St., Farmingdale, NY 11735, Tel: 516-293-0475; Empl.: 13; *Sls. Mgr.:* J. Millman ..... **A•2160-2163**

JOBMASTER CORP., 9008 Liberty Rd., Randallstown, MD 21133, Tel: 301-655-1400; Empl.: 16; *Sls. Mgr.:* Wendy Goldman ..... **A•1303**

JOHANSON DIELECTRICS

JOHANSON DIELECTRICS, 2220 Screenland Dr., Burbank, CA 91505, Tel: 818-848-4465, TWX: 910-498-2735; Empl.: 154 ..... **A•1104**

Local Sales Offices & Reps

AZ	Phoenix, Compass Mktg. & Sls.	602-266-5400
CA	Glendale, Mission Mktg.	818-247-9110
CA	Mountain View, Straube Assocs.	415-969-6060
CO	Westminster, Straube Assocs.	303-426-0890
FL	Boca Raton, Lawrence Assocs	305-368-7373
IL	Northfield, Johanson Dielectrics	312-446-8425
IL	Park Ridge, Metcom Assocs.	312-696-1490
IN	Kokomo, Schillinger Assocs.	317-452-4057
KS	Shawnee Mission, Florence & Meyer	913-722-5210
MA	Wethersfield, Compac Sls.	203-563-4784
MN	Minneapolis, Bill Deming & Assocs.	612-888-5000
NY	Bablyon, Astro Rep.	516-422-2500
NY	Syracuse, Pitroncis	315-455-7346
NC	Greensboro, L & D Inc.	919-292-3201
OH	Breckville, WRR Assocs.	216-526-2023
PA	Trevose, PSA Co.	215-245-0513
TX	Arlington, W. Pat Fralia Co.	817-640-9101
WA	Seattle, Northmar Inc.	206-524-5170
Can	Hamilton, Ont., Cartwright/Southhall	416-528-0294

Local Distributors

CA	Los Alamitos, SEMI DICE	213-594-4631
CA	Santa Clara, SEMI DICE	408-980-9777
NJ	Fairfield, CHPS Inc.	201-882-0997

JOHANSON MFG. CORP., 400 Rockaway Valley Rd., Boonton, NJ 07005, Tel: 201-334-2676, TWX: 710-987-8367; FSC No.: 91293; Empl.: 200 ..... **A•1105**

Local Sales Offices & Reps

AZ	Phoenix, Compass Mktg. & Sls.	602-996-0635
CA	Los Angeles, Knight Co.	213-670-2833
CA	Mountain View, Straube Assocs.	415-969-6060
CO	Westminster, Straube Assoc., Mt. States	303-426-0890
FL	Orlando, Perrott Assocs.	305-298-7748
IL	Northfield, Johanson Mfg.	312-446-4021
IN	Kokana, Schillinger Assocs.	317-452-4057
IA	Cedar Rapids, ARD Sales Co.	319-393-6392
MA	Seekonk, J. Murphy Assocs.	617-761-7153
MN	Bloomington, Bill Deming & Assoc.	612-888-5000
NJ	Boonton, Johanson Mfg. Corp.	201-334-2676
NY	Mount Vernon, Friedman-Smith Elctrn. Sls.	914-664-4866
NY	Pittsford, NHA, Inc.	716-586-9002
NC	Winston-Salem, Murcota Corp.	919-722-9445
OH	Cleveland, Baehr, Greenleaf & Assoc.	216-221-9030
PA	Trevose, P.S.A.	215-245-0513
TX	Bedford, W. Pat Fralia Co.	817-267-3577
WA	Seattle, Northmar	206-524-5170

Local Distributors

AZ	Tempe, Bell Inds.	602-267-7774
AZ	Tempe, Shelley Elctrns.	602-894-2058
CA	Chatsworth, Shelley Elctrns.	213-998-3333
CA	Chatsworth, Shelley Elctrns.	818-998-3333
CA	Gardena, Bell Inds.	213-515-1800
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	San Jose, Integrated Electronics	408-263-1100
CA	San Jose, Shelley Elctrns.	408-942-9111
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Van Nuys, CW Swift & Assocs.	818-989-1133
CO	Boulder, Shelley Elctrns.	303-442-2718
CO	Wheatridge, Bell Inds.	303-424-1985
FL	Orlando, Pelcor Co.	305-299-1541
IL	Chicago, Bell Inds.	312-982-9210
IL	Chicago, Newark Elctrns.	312-784-5100
MD	Baltimore, Radio Elec. Svc.	301-823-0070
MD	Beltsville, Radio Elec. Svc.	301-937-9100
MA	Medford, Blake Assocs.	617-391-7890
NM	Albuquerque, Bell Inds.	505-292-2700
NY	Hauppauge, Jaco Elctrns.	516-273-5500
NY	Mt. Vernon, ASAP Elctrns.	914-699-2727
NY	Syracuse, Newark Elctrns.	315-437-6611
OR	Lake Oswego, Bell Inds.	503-241-4115
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
TX	Ft. Worth, PATCO Supplies	817-429-8596
UT	Salt Lake City, Bell Inds.	801-972-6969
WA	Bellevue, Bell Inds.	206-747-1515

JOHNSON, E. F., CO., 299 Johnson Ave., Waseca, MN 56093, Tel: 507-835-6222, Telex: 290470, TWX: 910-565-2161; Empl.: 1400; *Sls. Mgr.:* G. Mena

JOHNSON CONTROLS, Battery Div., 5757 N. Green Bay Ave., Milwaukee, WI 53201, Tel: 414-228-2581, Telex: 026-650; Empl.: 20,000

JOLO INDS., 13921 Nautilus Dr., Garden Grove, CA 92643, Tel: 714-554-6840, TWX: 910-595-1138; Empl.: 20; *Sls. Mgr.:* J.S. Giampiccolo, Jr.

JONARD INDUSTRIES CORP., 134 Marbledale Rd., Tuckahoe, NY 10707, Tel: 914-793-0700, Telex: 996570, TWX: 710-562-0107; Empl.: 65; *Sls. Mgr.:* R. Fersen

JONATHAN MFG., 1101 So. Acacia Ave., Fullerton, CA 92631, Tel: 714-526-4651, Telex: 910 592-1241; Empl.: 375

JONES, HIRAM, ELCTRNS. INC., See Hiram Jones Elctrns. Inc.

JORDAN ELEC., See Vishey Resistance Sys. Grp.

JORI RESOURCES, 2128 Knoll Dr., Ventura, CA 93003, Tel: 805-642-2266; Empl.: 4

JOSLYN ELCTRN. SYS., P.O. Box 817, Goleta, CA 93116, Tel: 805-968-3551, TWX: 910-334-3464; FSC No.: 23663; Empl.: 210; *Sls. Mgr.:* A. deSouza

JRW INDS., INC., 2312 N Second St., Harrisburg, PA 17110, Tel: 717-236-1418; Empl.: 4; *Sls. Mgr.:* James Thorbahn

JSC WIRE & CABLE
QUALITY WIRE AT THE RIGHT PRICE

JSC WIRE & CABLE, Box 248, Burgess Pl., Wayne, NJ 07470, Tel: 201-694-6200; Empl.: 40; *Sls. Mgr.:* R. Dulude ..... **C•1841**

Local Sales Offices & Reps

CA Van Nuys, Art Szerlip Sls. Co. 818-782-1765
CO Colorado Springs, Norris & Warren Assocs. 303-576-8697
CO Denver, Norris & Warren Assocs. 303-579-1676
DE Newark, Carmine Assocs. 302-731-0697
FL Crystal River, Foster Sls. 904-795-7831
IL Chicago, Ken Levy Assocs. 312-763-5000
IA Burlington, J. S. Ridge Entprs. 319-754-8745
KY Louisville, Mid Central Sls. Co. 502-239-5614
MA Lynn, Keene Sls. Co. 617-595-2300
MI Livonia, Harvey Sls. 313-591-1975
NJ Teaneck, Steve Fisher Sls. 201-837-1200
NY Rochester, Warren Kaufman 716-266-2728
NC Charlotte, D. Austin Co. 704-334-0174
OH Columbus, Benchmark 614-861-2070
OR Portland, R. M. Minthorne 503-246-4556
TX Dallas, Crockett Sls. Co. 214-350-3377
MN Minneapolis, John E. M. Anderson 612-823-6459
EXP NY, New York, Roburn Agencies 212-989-5939

J. TRONICS, Apollo Magnetics, 2720 W. Beverly Rd., Los Angeles, CA 90057, Tel: 213-381-2500, TWX: 910-321-4348; *Sls. Mgr.:* Michael Ronzon

JUDCO MFG. INC., P.O. Box 487-E84, 24030 Frampton Ave., Harbor City, CA 90710, Tel: 213-534-0959 ..... **B•1611**

Judd Wire
DIVISION OF
HIGH VOLTAGE ENGINEERING

JUDD WIRE, High Voltage Engrg., 57 Turnpike Rd., Turners Falls, MA 01376, Tel: 413-863-4357, TWX: 510-290-2147; FSC No.: 3357; Empl.: 148; *Sls. Mgr.:* Jack Allen ..... **C•1842-1843**

Local Sales Offices & Reps

AL Huntsville, Hughes Assocs. 205-533-9108
CA Los Altos, Ewing Foley 415-941-4525
CO Denver, Duffy Assocs. 303-595-4244
FL Coral Springs, HAI Elctrns. 305-752-7520
GA Atlanta, Hughes Assocs. 404-252-7486
IL Arlington Heights, Rozner Sls. Co. 312-577-0067
MA Marlborough, O.K. Engrg. 617-481-6400
MI Southfield, C. H. Schmidt Co. 313-353-6000
MN Brooklyn Center, Willman Assocs. 612-566-5010
MS Corinth, Hughes Assocs. 601-287-2915
NJ Haddonfield, Mesa Tech. Assocs. 609-429-9531
NY Attica, B. H. Tollefson Assocs. 716-591-1219
NY Auburn, B. H. Tollefson Assocs. 315-253-4109
NY Rochester, B. H. Tollefson Assocs. 716-271-4141
NC Research Triangle Park, Naylor Assocs. 919-836-0478
OH Worthington, Simcox Assocs. 614-885-8995
OR Portland, Jas. J. Backer Co. 503-297-8744
SC Greenville, Naylor Assocs. 803-297-9969
TN Morristown, Hughes Assocs. 615-587-2433
TX Dallas, Stevens Sls. Co. 214-350-2476
UT Salt Lake City, Electrodyne 801-486-3801
WA Seattle, Jas. J. Backer Co. 206-285-1300

Local Distributors

AL Madison, Sea Wire & Cable 205-772-9616
AZ Tempe, Pacer Elctrns. 602-267-0299
CA Anaheim, Innovative Sys. 714-632-8800
CA Concord, Control Master 415-939-3600
CA Irvine, Republic Elctrns. 714-855-2222
CA Mountain View, Sonic Wire 415-965-4646
CA San Leandro, Anixter 415-352-3100
CA Torrance, Blake Wire & Cable 213-515-0561
CA Valencia, Wirenetics Co. 805-257-2400
CT East Hartford, E. J. Stephens Co. 203-568-1927
CT Manchester, I.M.S. 203-649-4415
FL Altamonte Springs, Royce Elctrns. 305-869-4700
FL Ft. Lauderdale, Pacer Elctrns. 305-462-0902
FL Ft. Lauderdale, Simcona Elctrn. 305-485-4455
GA Clarkston, Lance Engrg. 404-292-4404
MA Burlington, QPL Elctrn. Dist. 617-229-2424
MA Woburn, Pacer Elctrns. 617-935-8330
MN Bloomington, K. L. Tannehill 612-881-6700
NH Amherst, North Country Wire & Cable 603-889-0063
NH Manchester, Yankee Elctrn. 603-625-9746
NJ Dover, Electro Spec. 201-361-5079
NJ Fairfield, Olympic Wire & Cable 201-227-7996
NJ Red Bank, Freedom Elctrns. 201-747-4666
NY Fairport, Pacer Elctrns. 716-377-0462
NY Farmingdale, Weico Elctrns. 516-293-0050
NY Rochester, Simcona Elctrn. 716-328-3230
NY Ronkonkoma, Zenith Wire 516-585-1444
OH Dayton, Astro Inds. 513-429-5900
PA Harleysville, Omega Wire & Cable 215-256-6577
PA Montgomeryville, Pyttronic Ind. 215-242-6700
TX Dallas, Interstate Wire 214-553-1311
WA Seattle, Anixter 206-251-5287
WI New Berlin, Indl. Elec. Wire & Cable ... 414-782-2323

JUDD WIRE, High Voltage Engrg., 870 Los Vallecitos Blvd., San Marcos, CA 92069, Tel: 619-744-7720, TWX: 910-322-1149; FSC No.: 3357 ..... **C•1842-1843**

Refer to Judd Wire, Turners Falls, MA for sales office and distributor information.

JRL JULIE RESEARCH

JULIE RESCH. LABS., 211 West 61st St., New York, NY 10023, Tel: 212-245-2727, TWX: 710-581-5138; Empl.: 45; *Sls. Mgr.:* Pamela Spencer ..... **A•1878; D•1252-1256**

Local Sales Offices & Reps

Resistors

CA Northridge, Craig Assocs. 213-993-4060

JUMBO PROCESS CONTROL, INC., 410 Garibaldi Ave., Lodi, NJ 07644, Tel: 201-779-7744, Telex: 642-406; *Sls. Mgr.:* W. F. Feiler

JUNCTION DEVICES, INC., 2488-A Townsgate Rd., Westlake Village, CA 91361-2594, Tel: 818-889-4030, 805-497-4421, TWX: 910-336-1293; FSC No.: 60858; Empl.: 70; *Sls. Mgr.:* N. Pena

JUPITER SYSTEMS, 1100 Marina Village Parkway, Alameda, CA 94501, Tel: 415-523-9000; *Sls. Mgr.:* Richard MacElhiney

KAHGAN ELCTRNS. CORP., 605 Peninsula Blvd., Hempstead, NY 11550, Tel: 516-538-2300, TWX: 510-222-4347; Empl.: 39; *Sls. Mgr.:* Fred Strauss; *Dist. Mgr.:* Carl Clemente

Local Sales Offices & Reps

AL Huntsville, BCI, Inc. 205-539-4411
CA Los Angeles, Corcoran Assocs. 213-823-4589
CA Santa Clara, Maxim Elctrn. Sls. 408-946-6001
CO Aurora, High Tech Assocs. 303-695-1990
FL Casselberry, Southern Elctrn. Mktg. (A/K/A Semi) 305-831-2822
IL Palatine, Technology Sls. 312-991-6600
KS Overland Park, J. F. Guernsey Co. 913-381-2225
MA Lexington, Del-Con Sls. 617-938-1929
MI Southfield, Gehrke, Fred & Assocs. ... 313-559-5363
MN Minneapolis, Smiley-Scott Assocs. 612-888-5551
NY N. Syracuse, R. F. Roux Co. 315-458-6576
OH Cincinnati, Gilbert, Bob & Assocs. 513-574-1932
PA King of Prussia, Emerald Elctrns. 215-265-1360
SC Easley, RA Sls. 803-859-1859
TX Dallas, Marcom 214-351-4532
TX El Paso, Aztec Microelectronics 915-581-6130
VA Reston, Tytronics Tech. Sls. 703-471-0440
WA Vancouver, Ray Over Sls. 206-695-6179
WI Wauseka, Techn. Sls. 414-787-5015

KAHLE ENGRG., Div. Joule Machinery Grp., 3344 Hudson Ave., P.O. Box 877, Union City, NJ 07087, Tel: 201-867-6500, Telex: 42-7757, TWX: 710-992-8835; Empl.: 50; *Sls. Mgr.:* Carl A. Napor

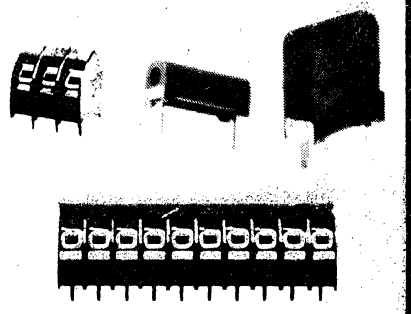
KAISER ELCTRNS., Kaiser Aerospace & Elctrns., 2701 Orchard Pkwy., San Jose, CA 95134, Tel: 408-946-3000, TWX: 910-338-0196; Empl.: 1200

KAISER ELECTROPRECISION, Kaiser Aerospace & Elctrns., 1700 S. Redhill Ave., Irvine, CA 92714, Tel: 714-250-1015, Telex: 678467; FSC No.: 86831; Empl.: 387; *Sls. Mgr.:* Gerald W. Allen

KSI Kaiser Systems, Inc.

KAISER SYSTEMS, INC., 126 Sohier Road, Beverly, MA 01915, Tel: 617-922-9300, Telex: 887159; FSC No.: 3698; Empl.: 100 ..... **D•1680-1683**

JOLO INDUSTRIES, INC
INTERCONNECTION HARDWARE



AUTHORIZED & STOCKING DISTRIBUTOR

ALPHA DISTRIBUTOR CORP
550 E. ROYALTON ROAD
CLEVELAND, OHIO 44147
PHONE 216/526-3716

teclab®

KALAMAZOO TECHNICAL FURNITURE, P.O. Box 1165, Kalamazoo, MI 49005, Tel: 616-385-2255; Empl.: 42; *Sls. Mgr.:* B. Smith ..... **C•1068**

KALART VICTOR CORP., Hultenius St., Plainville, CT 06062, Tel: 203-747-1663; *Sls. Mgr.:* J. J. Costag

KALGLO ELCTRNS. CO., INC., 6584 Ruch Rd., E. Allen Twp., Bethlehem, PA 18017, Tel: 215-837-0700; FSC No.: 64521; *Sls. Mgr.:* Joe H. Ungerer

KALMUS & ASSOCS., INC., 2424 S. 25th Ave., Box 525, Broadview, IL 60153, Tel: 312-343-7004, TWX: 910-226-0713; Empl.: 346; *Sls. Mgr.:* William R. Blinn

Local Sales Offices & Reps

AL	Huntsville, L & D, Inc.	205-837-1469
CA	Pasadena, Black & White, Inc.	818-792-2133
CA	San Diego, Varigon Assocs.	619-576-0100
CA	San Jose, Class One Elctrns. Corp.	408-297-8666
CO	Boulder, Comp. Product Sls.	303-530-2800
FL	Plantation, Gallagher & Assocs.	305-473-2101
GA	Atlanta, L & D, Inc.	404-395-7079
IL	Arlington Heights, M. J. Petersen & Assocs.	312-577-8200
IL	Chicago, W. F. Hamilton Co.	312-867-5030
IN	Ft. Wayne, F. J. Campisano Co.	219-747-2633
IN	Indianapolis, F. J. Campisano Co.	317-253-7651
MA	Braintree, Nova Assocs.	617-848-9330
MI	Jackson, Jim Jordan Assocs.	517-750-2677
MN	Minneapolis, Northstar Comps.	612-553-1888
MS	Meridian, Alpha Mktg.	601-483-9306
MO	Independence, Engrg. Svcs. Co.	816-254-3600
MO	St. Louis, Engrg. Svcs. Co.	314-997-1515
NJ	Mountainside, Henry G. Richter Co.	201-233-4615
NY	Fayetteville, Henry G. Richter Co.	315-637-6713
NC	Greensboro, L & D, Inc.	919-292-3201
OH	Cincinnati, F. J. Campisano Co.	513-574-7111
OH	Cleveland, F. J. Campisano Co.	216-749-5550
PA	Corapolis, F. J. Campisano Co.	412-264-5151
TN	Austin, C. R. Colvin Assocs.	512-474-8698
TN	Houston, C. R. Colvin Assocs.	713-961-1262
TX	Richardson, McCoy Assocs. Co.	214-238-1017

K&L MICROWAVE, INC., 408 Coles Circle, Salisbury, MD 21801, Tel: 301-749-2424, TWX: 710-864-9683; FSC No.: 50140; Empl.: 320; *Sls. Mgr.:* Paul J. Leo

K & L QUARTZTEK, K & L Microwave, 20 S. 48th Ave., Phoenix, AZ 85043, Tel: 602-272-7944, TWX: 910-951-1305; FSC No.: 59492; *Sls. Mgr.:* Mark H. Story

K & M ELCTRNS., 123 Interstate Dr., W. Springfield, MA 01089, Tel: 413-781-1350, TWX: 710-350-6463; FSC No.: 6M312; Empl.: 500; *Sls. Mgr.:* Allan Mallanik ... **A•1879**

Local Sales Offices & Reps

CT	Marlborough, Precision Sls., Inc.	203-295-0580
OH	Akron, Augnat Assocs.	216-273-1211

Local Distributors

MA	West Springfield, Moldcon	413-736-0371

KANTZ ELCTRN. IND., 1804 Wall Church Rd., Wall Township, NJ 07719, Tel: 201-974-0090; Empl.: 12; *Sls. Mgr.:* L. Herold

KAPPA NETWORKS INC

KAPPA NETWORKS, INC., 1443 Pinewood St., Rahway, NJ 07065, Tel: 201-541-1600, Telex: 130081 Kappa Rhwy; FSC No.: 20933; Empl.: 237; *Sls. Mgr.:* D. Pearl ..... **A•1530-1545**

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech Sls. Engrg. Co.	205-533-2100
CA	Alhambra, Kappa Networks	213-283-2048
CA	Alhambra, M. W. Riedel & Co.	213-283-7694
CA	Santa Clara, Emerging Tech. Sls.	408-727-1771
CO	Englewood, White Sls. Co.	303-694-9555
CT	Cheshire, Selmark Assocs.	203-573-9088
FL	Altamonte Springs, 'C' Assocs., Inc.	305-831-1717
GA	Norcross, Electro-Mech Sls. Engrg. Co.	404-447-6478
IA	Grandview, R.R. Burton & Assocs.	816-763-5385
MD	Columbia, Eastern Tech. Corp.	301-995-0202
MA	Millis, Selmark Assocs.	617-376-2914
MN	Osseo, Gaffney Sls. Co.	612-425-5484
MO	Grandview, R.R. Burton & Assocs.	816-763-5385
NH	Hopkinton, Selmark Assocs.	603-746-3299
NJ	Madison, Livera-Polk Assocs.	201-377-3220
NY	Glen Head, Livera-Polk Assocs.	516-759-9300
NC	Raleigh, Electro-Mech Sls. Engrg. Co.	919-851-8165
PA	Wynnewood, Metz-Benham Assocs.	215-896-7300
TN	Jonesboro, Electro-Mech Sls. Engrg. Co.	615-753-2964
TX	Dallas, Technlg. Sls.	214-380-0200
TX	Houston, Technlg. Sls.	713-266-2473
EXP	Carteret NJ, Kappa Networks	800-223-0603

Local Distributors

CA	Sherman Oaks, Delay Line Distrs. Co.	800-624-2617

KAPPA SCIENTIFIC CORP., Box 30585, Santa Barbara, CA 93105, Tel: 805-687-9648; Empl.: 4

KARKAR ELECTRONICS, INC., 245 Eleventh St., San Francisco, CA 94103, Tel: 415-552-1247, TWX: 910-372-7754 or 650-157-2515 MCI; FSC No.: 017857; *Sls. Mgr.:* A. Slikkerveer

KARL HOPT CO, See Hopt, Karl, Co.

KATES SCI. INSTRS., 142 Adam St., Newton, MA 02158, Tel: 614-527-2711; Empl.: 28; *Sls. Mgr.:* D. Kates

KATO ENGINEERING, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199, Tel: 800-245-4501, in OH 800-245-4497

KAUFMAN DATA COMMS., INC., Orange Nassau Elctrns. Co., 145 E. Dana St., Mountain View, CA 94041, Tel: 415-962-8811, TWX: 910-379-5021

KAVLICO CORPORATION

KAVLICO CORP., 20869 Plummer St., Chatsworth, CA 91311-5096, Tel: 818-882-2400, FAX 818-998-2050, Telex: 65-1481; Empl.: 250; *Dist. Mgr.:* Rudi Kettler ..... **B•1798**

Local Sales Offices & Reps

AL	Adamsville, SouthRep	205-674-3056
CA	Dana Point, Avia-Tech	714-661-1914
CO	Lakewood, Loritz Controls	303-232-7803
IL	Lansing, Van Meter Instr.	312-474-3580
KS	Desoto, Midtec Assocs.	913-441-6565
MA	Lexington, Jodan Tech.	617-863-8898, 617-862-2354
MI	Taylor, Source Elctrns.	313-295-7790
MN	Minneapolis, Industra Co.	612-835-5535
NM	Albuquerque, Indl. Prods. Corp. (IPC)	505-256-3561
NJ	Haledon, E. A. Oliva Co.	914-457-9209
OH	Middleburgh Hgts., J. L. Finnicum	216-234-2323
PA	King of Prussia, FLW of PA	215-337-4343
SC	Greenville, E. C. Capell & Assocs.	803-297-6550
TX	Ft. Worth, UTM Engineering	817-429-2456
TX	Houston, Collinsystems Pro-Quip	713-464-9428

KAYE INSTRUMENTS, 15 De Angelo Dr., Bedford, MA 01730, Tel: 617-275-0300, Telex: 6817183; Empl.: 170

KAY ELEMETRICS CORP., 12 Maple Ave., Pine Brook, NJ 07058-9797, Tel: 201-227-2000, TWX: 710-734-4347; FSC No.: 80138; Empl.: 70; *Sls. Mgr.:* Stephen P. Crump ..... **A•1713**

KAY-TOWNES ANTENNA, P.O. Box 593, Rome, GA 30161, Tel: 404-291-9871, TWX: 810-764-4809; Empl.: 85; *Sls. Mgr.:* Charles S. Ford; *Dist. Mgr.:* James A. Sheffiled

KB ELCTRNS., 73 Wortman Ave., Brooklyn, NY 11207, Tel: 718-257-3300, TWX: 710 584 2308; Empl.: 125; *Sls. Mgr.:* A Bueller

KBI, A Div. of Cabot Corp., PO Box 1462, Reading, PA 19603, Tel: 215-371-3600, Telex: 902251, TWX: 510-651-0106; Empl.: 600; *Sls. Mgr.:* Robert J. Longenecker

KCK AMERICA INC., 1245 Forest Ave., Ste. 10, Des Plaines, IL 60018, Tel: 312-297-5435, Telex: 726481; *Sls. Mgr.:* Carl Bronder; *Dist. Mgr.:* Carl Bronder

KD COMPONENTS, INC., 3016 S. Orange Ave., Santa Ana, CA 92707, Tel: 714-545-7108, TWX: 910-595-2678; Empl.: 25

KDI ELECTRONICS, INC., Engelmann & Pyrofilm Divisions, 60 S. Jefferson Rd., Whippany, NJ 07981, Tel: 201-887-8100, TWX: 710-986-8220; FSC No.: 64537; Empl.: 300; *Sls. Mgr.:* Carl Schraufnagl; *Dist. Mgr.:* Carl Schraufnagl ..... **A•1881**

Local Sales Offices & Reps

AZ	Phoenix, Toward Engrg. Assocs.	602-955-3193
CA	Los Angeles, Elsco	714-891-4621
CA	Mountain View, Gene Woempner	415-964-5454
CA	Mountain View, Gene Woempner Co., Inc.	415-964-5454
CA	Mountain View, J.L. Tech. Sls.	415-969-5552
CO	Englewood, High Plains Mktg.	303-792-2020
FL	PalmBay, Spartech Assocs., Inc.	305-727-8045
GA	Norcross, Spartech Assocs., Inc.	404-446-7300
IL	Northfield, Imex Ltd.	312-446-8934
IL	Park Ridge, Probe Elctrns.	312-698-2044
MD	Owings Mills, Neal Deoul Assocs.	301-363-4311
MA	Ashland, John O'Donnell	617-881-1380
MA	N. Andover, Torrey Assocs.	617-687-0099
MN	New Brighton, TWC Sls.	612-636-1770
MO	Grandview, Harris - Hanson	816-763-6200
MO	St. Louis, Harris - Hanson	314-432-3611
NJ	Madison, Livera-Polk Assocs.	201-377-3220
NY	Glen Head, Livera-Polk Assocs.	516-759-9300
NY	Huntington, CDB Entrps., Inc.	516-692-5200
NY	Syracuse, T-Squared Elctrns.	315-463-8592
OH	Dayton, Frederick L. Ohmer & Assocs.	513-434-1454
PA	Doylestown, Lou Adezio	215-249-9729
TX	Garland, Carey, McMahill & Zerbe Co., Inc.	214-681-1414
WA	Vancouver, Ray Over Sls.	206-695-4697

Local Distributors

CA	Chatsworth, MIL-COMM Distrs.	213-998-3111
CA	Mountain View, Target Elctrns.	415-961-1170
NJ	Englewood, Tech. Elctrn. Distrs.	201-894-0800
NY	Farmingdale, Command Elctrns.	516-293-1212
TX	Houston, Lenert Co.	713-225-1465

KEARNEY MAGNETICS, 150 Charcot Ave., San Jose, CA 95131, Tel: 408-262-4136, Telex: 910-338-2108; Empl.: 150; *Sls. Mgr.:* Carolyn Morton; *Dist. Mgr.:* Aki Fusimoto

KEC ELCTRNS., INC., 20817 Western Ave., Torrance, CA 90501, Tel: 213-320-3902, TWX: 910-349-6962; FSC No.: 213-618-1197; Empl.: 8; *Sls. Mgr.:* Frank Chase ..... **D•1685-1687**

Local Sales Offices & Reps

AZ	Tempe, Quatra	602-894-2802
CA	Cupertino, Costar	408-446-9339
CA	Los Alamitos, Power Specialists	213-594-9418
CO	Fort Collins, Vic Myers Assocs.	303-223-8907
FL	Cocoa Beach, Teqspec	305-748-9292
FL	Hobe Sound, Teqspec	305-746-4987
FL	Palm Harbor, Teqspec	813-785-2276
GA	Atlanta, Teqspec	404-455-7222
IL	Elk Grove Village, Loren Green Assocs.	312-593-0282
IN	Indianapolis, Loren Green Assocs.	317-293-9827
MA	Danvers, C. H. Burnham Assocs.	617-774-0111
MI	Jenison, R. C. Nordstrom & Co.	616-457-5762
MI	Southfield, R. C. Nordstrom & Co.	313-559-7373
MN	Minnetonka, Chris-Tek	612-934-1334
NH	Durham, C. H. Burnham Assocs.	603-868-2282
NJ	Springlake, Neville & Vespo	201-974-1520
NM	Albuquerque, Quatra Assoc. Inc.	505-821-1355
NY	Binghamton, TAE-Rep.	607-772-6952
NY	Rochester, TAE-Rep.	716-586-8710
NY	Thompson Ridge, Neville & Vespo	914-457-9209
NC	Winston Salem, Teqspec	919-723-8102
OH	Chesterland, KT/DEPCO	216-729-3588
PA	Erdenheim, Omni Sls.	215-233-4600
PA	Pittsburg, KT/Depco	412-487-8777
RI	Johnston, C. H. Burnham Assocs.	401-231-7475
TN	Morristown, Teqspec	615-587-0980
VA	Fairfax, Nine Assocs.	703-273-1803
WA	Bellevue, Elctrn. Mktg. Grp.	206-746-5915

KEENE LAMINATES, Keene Corp., 199 Amaral St., E. Providence, RI 02914, Tel: 800-556-7683, Telex: 927524; Empl.: 75

KEDMAN CO., Box 25667, Salt Lake City, UT 84125, Tel: 801-973-9112, TWX: 910-925-4116; Empl.: 100

KEENE RAY PROOF, Keene Corp., 50 Keeler Ave., Norwalk, CT 06878, Tel: 203-838-4555, Telex: 96-5812; *Sls. Mgr.:* Robert C. Barbour; *Dist. Mgr.:* Ken Makowski

KEITHLEY INSTRS., 28775 Aurora Rd., Cleveland, OH 44139, Tel: 216-248-0400, Telex: 98-5469; Empl.: 461; *Sls. Mgr.:* Ron Ruiz; *Dist. Mgr.:* T. A. Hayden

KEL-AM INCORPORATED

KEL-AM, 308 E. 5th, P.O. Box 313, Eldon, MO 65026, Tel: 314-392-7174, Telex: 42-301; FSC No.: 57856; Empl.: 67; *Sls. Mgr.:* Mark Hayes ..... **C•1412-1423**

Local Sales Offices & Reps

AZ Scottsdale, BH&B Sls. 602-994-4455
CA El Toro, Kel-Am Pacific 714-859-2093
CA San Jose, Pilgrim Elctrns. 408-249-7500
CO Boulder, Component Prod. Sls. 303-530-2800
CT North Haven, Kitchen & Kutchin 203-239-0212
FL Sarasota, Phoenix Comps. 813-371-1163
GA Atlanta, Electro Sls. 404-394-1122
IN Fort Wayne, CC Elctrns. 317-255-1508
IA Davenport, Electro Tech. 319-386-1134
MD Baltimore, Faion Lott, Inc. 301-744-4611
MA Lexington, & 617-862-8230
MA Wakefield, Kentronics 617-246-0245
MI Ypsilanti, Tamco, Inc. 313-572-1950
MN Minneapolis, Electro-Tech 612-927-5878
MO N. Kansas City, Weisler & Assocs. 314-394-4543
MO St. Louis, Weisler & Assocs. 314-394-4543
NJ Clark, R. E. Breuer Co. 201-388-5045
NM Albuquerque, Nelco Elctrns. 505-293-1399
NY Port Washington, R. E. Breuer Co. 516-883-7810
NY Rochester, Tech. Comps. 716-342-2406
OR Portland, SPS Engrg. 503-297-6919
PA McKean, & 814-476-1376
PA Willow Grove, Meldena Sls. 215-657-7760
NC Matthews, RG Sls. 704-847-0049
TN Chattonooga, Electro Sls. 615-267-4260
TX Grapevine, Elctrn. Mktg. Assoc. 817-481-7502
TX Houston, Elctrn. Mktg. Assoc. 713-498-8120
WA Redmond, SPS Elctrns. 206-392-5264

Local Distributors

AZ Tempe, Anjon 602-894-1332
AZ Tucson, Southwest Sls. 602-628-1613
CA Belmont, LO-DAN Elctrns. 415-592-4600
CA Corona, Konex Corp. 714-371-1200
CA Costa Mesa, Ascot 714-557-3252
CA Glendale, Remco 714-558-3202
CA Mountain View, Cornett Elctrns. 415-969-5420
CA San Diego, Mann 619-578-1550
CA San Diego, R. David Miner, Inc. 619-566-9891
CA San Fernando, REMCO 213-365-1176
CA Santa Ana, Mann S.W. 714-558-3202
CA Santa Clara, Ascot 408-988-4991
CA Santa Clara, Mann Elctrns. 408-988-6061
CO Broomfield, Ascot 303-465-2346
CO Denver, CSID Intergrated Elctrns. 303-893-9594
FL Ft. Lauderdale, Intertec Comps. 305-975-8644
FL Largo, Lo Dan Elctrns. 813-586-2851
FL Longwood, Intertec Comps. 305-834-7777
IL Arlington Hgts., Lo Dan Elctrns. 312-398-5311
IL Hoffman Estates, Intercomp 312-843-2040
IL Wheeling, Ascot 312-459-5750
KS Shawnee, Besco Elctrns. 913-631-3882
KS Wichita, Radio, Inc. 316-264-2798
MA Canton, Elctrn. Packaging Comps. 617-821-2111
MA Lowell, Bay State Wire & Cable 617-454-2444
MI Southfield, LSI Mktg. 313-356-7002
MN Farmington, Tel-Tek, Inc. 612-460-6299
MN Farmington Hills, Advent Elctrns. 313-477-1650
MN Minneapolis, Glenmark 612-941-4825
MO Independence, H.F. Signalling 816-833-4448
NE Lincoln, Scott Elctrns. 402-466-8221
NE North Platte, Scott Elctrns. 308-532-9260
NE Omaha, Scott Elctrns. 402-734-6750
NH Hampstead, Astrum Elctrns. 603-329-5656
NH Manchester, Components North 603-624-4661
NJ Roselle, Lectron Inds. 201-245-5858
NM Albuquerque, Connecting Comps. 505-345-8921
NM Albuquerque, Elctrn. Devices 505-293-1935
NY Ithaca, OHM Elctrns. 602-273-8406
NY Port Washington, Connector Concepts 516-883-3800
NY Rochester, E.I.C. Elctrns. 716-544-4392
OK Oklahoma City, Radio, Inc. 405-789-0741
OK Tulsa, Radio, Inc. 918-587-9123
OR Beaverton, Zepher Elctrns. 503-643-1980
PA McKean, Advacom 814-476-7774
PA Montgomeryville, Pyttronics 215-643-2850
TX Addison, Connec/Tek 214-239-7552
WA Seattle, Zepher Elctrns. 206-241-1980

KELTEC FLORIDA, P.O. Box 2917, Ft. Walton Bch., FL 32549, Tel: 904-651-9749, TWX: 510-730-7654; FSC No.: 09062; Empl.: 400 ..... **D•1688**

Local Sales Offices & Reps

AZ Phoenix, J. Smith Assoc. 602-267-0981
CA Los Altos, Stout Inds. 415-949-0440
CA Los Angeles, Cain Technology 213-477-9054
CA Orange, Cain Technology 714-997-7311
CO Colorado Springs, J. Smith Assoc. 303-597-5343
FL Melbourne, V.P.I. 305-727-3305
FL Tampa, V.P.I. 813-832-2041
IN Ossian, Science Sls. 219-622-7383
IA Cedar Rapids, Palatine Sls. 319-365-8071
KS Goddard, Palatine Engrg. & Sls. 316-788-5521
KS Mission, Palatine Sls. 913-831-0555
MD Ellicott City, VPI 301-461-2525
MA Needham Hgts., O'Sullivan & Murphy 617-449-4141/4142/4144
MO Hazelwood, Palatine Sls. 314-839-0800
NJ Danville, Metro-MICS 201-625-5959
NM Albuquerque, J. Smith Assoc. 505-265-3406
NY Melville, Metro MICS 516-271-6677
OH Brunswick, Science Sls. 216-273-4429
PA Montgomerysville, VPI 215-474-3200
TX Richardson, Lear Assocs. 214-231-5388

KELTLON CORP., Viking Modules Div., 225 Crescent St., Waltham, MA 02154, Tel: 617-894-8700, Telex: 948197; Empl.: 75; *Sls. Mgr.:* T. Chadurjian

KELTRON CORP., 225 Crescent St., Waltham, MA 02154, Tel: 617-894-8700, Telex: 948197; Empl.: 270; *Sls. Mgr.:* Scott J. Shrier; *Dist. Mgr.:* Scott J. Shrier

KELTRON CORP., Walden Div., 225 Crescent St., Waltham, MA 02154, Tel: 617-894-8700, Telex: 948197; Empl.: 225; *Sls. Mgr.:* T. Chadurjian

KELVIN, 5919 Noble Ave., Van Nuys, CA 91411, Tel: 818-782-6662, Telex: 65-1417; FSC No.: 19587; Empl.: 250; *Sls. Mgr.:* R. A. Featherston ..... **A•1882-1883**

Local Sales Offices & Reps

AL Huntsville, Macro Mktg. 205-883-9630
AZ Tempe, Sunwest Mktg. 602-838-7586
CA Mountain View, G. C. Woempner Co. 415-964-5454
CA San Diego, Wes-K Assoc. 619-578-2040
CA Van Nuys, Wes-K Assocs. 213-989-3070
CO Boulder, R-G Entprs. 303-447-9211
CT Milford, Todino Engrg. Sls. 203-874-6643
FL Lighthouse Point, R. C. Simon & Co. 305-941-2757
IL Deerfield, Walt Krueger 312-945-3720
MD Reisterstown, Massey Assocs. 301-833-2039
MA Needham Hgts., Todino Engrg. 617-444-7925
MI Birmingham, Forand Sls. 313-644-0087
MN Minneapolis, Parker Shoap 612-934-5812
NJ Medford, Jack McCoy Inc. 609-953-0770
NY Fayetteville, Foster & Wager 315-637-5427
NY Great Neck, Trionic 516-466-2300
NY Webster, Foster & Wager 716-265-2072
OH New Lebanon, J. N. Bailey & Assocs. 513-687-1325
OR Beaverton, General Elctrns. 503-641-5288
TX Austin, C. R. Colvin Assocs. 512-474-8698
TX Dallas, Stasco 214-239-4517
TX Houston, C. R. Colvin Assocs. 713-961-1262
WA Renton, General Elctrns. 206-228-9505

KEMET®

KEMET, UNION CARBIDE CORPORATION, ELCTRNS. DIV., Components Dept., Box 5928, Greenville, SC 29606, Tel: 803-963-6348, Telex: 57-0496, TWX: 810-287-2536; FSC No.: 31433;multiple; *Sls. Mgr.:* C. E. Volpe; *Dist. Mgr.:* J. A. Bruorton ..... **A•1106-1107**

Local Sales Offices & Reps

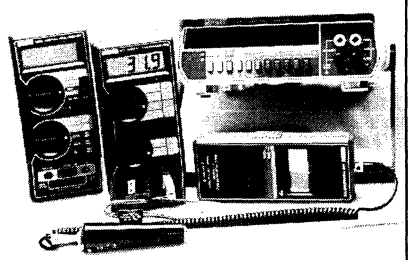
AL Huntsville, Union Carbide 205-830-1090
AZ Tempe, Union Carbide 602-831-2151
CA Culver City, Union Carbide 213-568-8384
CA Newport Beach, Union Carbide 714-640-9320
CA San Diego, Union Carbide 619-560-0768
CA Santa Clara, Union Carbide Elctrns. Div. 408-986-0424
CO Englewood, Union Carbide 303-773-0494
FL Ft. Lauderdale, Union Carbide 305-731-2187

KEITHLEY

AUTHORIZED DISTRIBUTOR

SUNSHINE

THE SOURCE FOR METERS & TEST EQUIPMENT



Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT
(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area
(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

KEITHLEY

DMM's and Temperature Meters

Authorized Distributors

RAG ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225

Model 130a

FL Orlando, Union Carbide 305-855-8886
FL Tampa, Union Carbide 813-872-1861
GA Norcross, Union Carbide Elctrns. Div. 404-441-7701
IL Schaumburg, Union Carbide 312-843-1030
IN Carmel, Union Carbide 317-844-7756
IA Ceder Rapids, Seltec Sls. 319-393-1114
KS Shawnee Mission, Union Carbide Elctrns. Div. 913-362-8004
MD Columbia, Union Carbide 301-992-5600
MA Stoneham, Union Carbide 617-279-0400
MI Livonia, Union Carbide 313-591-0555
MN Edina, Union Carbide 612-929-4642
NY Liverpool, Union Carbide 315-451-0720
NY Tarrytown, Union Carbide 914-332-4000
NC Raleigh, Union Carbide 919-872-2877
OH Westerville, Union Carbide 614-890-8688
OK Tulsa, Union Carbide 918-664-8592
PA Exton, Union Carbide 215-363-8310
SC Greenville, Union Carbide 803-242-5789
TX Austin, Union Carbide 512-458-3181
TX Houston, Union Carbide Elctrns. Div. .. 713-890-0106
TX Irving, Union Carbide 214-556-0009
WA Kirkland, Union Carbide 206-828-4853
WA Vancouver, Union Carbide Elctrns. Div. 206-695-1500
PR Guaynabo, ISLA CARIBE Electro Sls. 809-720-4430/5
Can Edmonton, Alb., Deskin Sls. Corp. 403-466-2106
Can Markham, Ont., Deskin Sls. Corp. 416-475-1412
Can Montreal, Que., Deskin Sls. Corp. 514-331-2860
Can Ottawa, Ont., Deskin Sls. Corp. 613-729-1099
Can Richmond, B.C., Deskin Sls. Corp. 604-273-4963

Local Distributors

AL Huntsville, Hall-Mark Elctrns. Corp. 205-837-8700
AL Huntsville, Hamilton/Avnet Elctrns. ... 205-837-7210
AL Huntsville, Schweber Elctrns. 205-882-2200
AZ Phoenix, Hall-Mark Elctrns. Corp. 602-437-1200
AZ Phoenix, Schweber 602-997-4874
AZ Tempe, Bell Inds. 602-966-7800
AZ Tempe, Fisher-Brownell 602-967-1464
AZ Tempe, Hamilton/Avnet Elctrns. 602-231-5100
CA Alhambra, Fisher-Brownell 818-289-0255
CA Anaheim, Time 714-937-0911
CA Canoga Park, Hall-Mark 818-716-7300
CA Canoga Park, Schweber Elctrns. 213-999-4702
CA Chatsworth, Avnet 818-700-2600
CA Chatsworth, Hamilton Electro Sls. 818-700-6500
CA Chatsworth, Integrated Elctrns. 213-998-2200
CA Chatsworth, Time 818-998-7200
CA Citrus Heights, Hall-Mark 916-772-8600
CA Costa Mesa, Avnet Elctrns. 714-754-6111
CA Costa Mesa, Hamilton/Avnet Elctrns. 714-641-4112
CA Culver City, Hamilton Electro Sls. 213-558-2662
CA Culver City, Hamilton Electro Sls. (Corp. Off.) 213-558-2662
CA Culver City, Hamilton/Avnet 214-558-2883
CA El Segundo, Hall-Mark 213-643-9101
CA Garden Grove, Bell Inds. 714-220-0681
CA Gardena, Bell Inds. 213-515-1800
CA Irvine, Integrated 714-660-1055
CA Irvine, Schweber Elctrns. 714-863-0256
CA Ontario, Hamilton/Avnet 714-989-8801
CA Roseville, Bell Inds. 916-969-3100
CA Sacramento, Hamilton/Avnet Elctrns. 916-648-3227
CA Sacramento, Integrated 916-424-5297
CA Sacramento, Schweber Elctrns. 916-929-9732
CA San Diego, Bell Inds. 619-268-1277
CA San Diego, Fisher-Brownell 619-560-8545
CA San Diego, Hall-Mark Elctrns. Corp. ... 619-268-1201
CA San Diego, Hamilton/Avnet Elctrns. ... 619-571-7500
CA San Diego, Schweber 619-450-0454
CA San Diego, Time 619-586-1331
CA San Jose, Hall-Mark 408-946-0900
CA San Jose, Integrated 408-263-1100
CA San Jose, Schweber Elctrns. 408-748-4700
CA Santa Clara, Fisher-Brownell 408-988-6041
CA Sunnyvale, Bell Inds. (Corp. Off.) 408-734-8570
CA Sunnyvale, Hamilton/Avnet Elctrns. ... 408-743-3355
CA Sunnyvale, Time 408-734-9888
CA Thousand Oaks, Bell Inds. 805-499-6821
CA Torrance, Time 213-320-0880
CA Tustin, Hall-Mark 714-669-4700
CO Denver, Integrated 303-292-6121
CO Englewood, Hall-Mark Elctrns. Corp. .. 303-694-1662
CO Englewood, Hamilton/Avnet Elctrns. .. 303-740-1000
CO Englewood, Schweber 303-799-0258
CO Englewood, Time 303-799-8851
CO Wheatridge, Bell Inds. 303-424-1985
CT Cheshire, Time 203-271-3200
CT Danbury, Hamilton/Avnet Elctrns. 203-797-1100
CT Danbury, Schweber Elctrns. 203-748-7080
CT Wallingford, Hall-Mark 203-269-0100
FL Altamonte Springs, Schweber Elctrns. 305-331-7555
FL Clearwater, Hall-Mark 815-530-4543
FL Ft. Lauderdale, Hamilton/Avnet Elctrns. 305-971-2900
FL Ft. Lauderdale, Time 305-974-4800
FL Hollywood, Schweber Elctrns. 305-927-0511
FL Largo, Bell/Graham 813-541-4434
FL Orlando, Hall-Mark Elctrns. Corp. 305-855-4020
FL Orlando, Time 305-841-6565
FL Pompano Beach, Hall-Mark 305-971-9280
FL St. Petersburg, Hamilton/Avnet 813-576-3930
FL Winter Park, Hamilton/Avnet 305-628-3888
GA Norcross, Bell/Graham 404-662-0923
GA Norcross, Hall-Mark Elctrns. Corp. 404-447-8000
GA Norcross, Hamilton/Avnet Elctrns. 404-447-7500
GA Norcross, Schweber Elctrns. 404-449-9170
GA Norcross, Time 404-448-4448
IL Bensenville, Hamilton/Avnet 312-860-8524
IL Elk Grove, Pioneer/Chicago Elctrns. .. 312-437-9680
IL Elk Grove Village, Bell Inds. 312-640-1910
IL Elk Grove Village, Schweber Elctrns. .. 312-364-3750
IL Hoffman Estates, Integrated 312-843-2040
IL Wooddale, Hall-Mark 312-860-3800
IN Carmel, Hamilton/Avnet Elctrns. 317-844-9333
IN Fort Wayne, Bell/Graham 219-423-3422
IN Indianapolis, Graham Elctrns. 317-634-8202
IN Indianapolis, Pioneer/Indianapolis 317-849-7300
IN Lafayette, Bell/Graham 317-423-5564
IA Cedar Rapids, Bell Inds. 319-395-0730
IA Cedar Rapids, Hamilton/Avnet 319-362-4757
IA Cedar Rapids, Schweber Elctrns. 319-373-1417
KS Lenexa, Hall-Mark Elctrns. Corp. 913-888-4747
KS Overland Park, Hamilton/Avnet Elctrns. 913-541-7922
KS Overland Pk., Schweber Elctrns. 913-492-2921
KY Lexington, Hamilton/Avnet 606-259-1475
MD Columbia, Hall-Mark Elctrns. Corp. 301-988-9800
MD Columbia, Hamilton/Avnet Elctrns. 301-995-3526
MD Columbia, Time 301-964-3090
MD Gaithersburg, Schweber Elctrns. 301-840-5900
MA Bedford, Schweber Elctrns. 617-275-5100
MA Billercia, Hall-Mark 617-935-9777
MA Burlington, J. V. Elctrns. of Boston 617-273-4300
MA Lexington, Pioneer/Harvey Elctrns. ... 617-861-9200
MA Woburn, Hamilton/Avnet Elctrns. 617-935-9700
MA Woburn, Time 617-935-8080
MI Ann Arbor, Bell/Graham 313-971-9093
MI Grand Rapids, Hamilton/Avnet Elctrns. 616-243-8805
MI Livonia, Hamilton/Avnet Elctrns. 313-522-4700
MI Livonia, Pioneer/Michigan Elctrns. 313-525-1800
MI Livonia, Schweber Elctrns. 313-525-8100
MN Bloomington, Hall-Mark Elctrns. Corp. 612-854-3223
MN Bloomington, Time 612-944-9192
MN Edina, Schweber Elctrns. 612-941-5280
MN Minneapolis, Merit Elctrns. Corp. 612-546-5383
MN Minnetonka, Hamilton/Avnet Elctrns. .. 612-932-0600
MN Minnetonka, Pioneer/Twin Cities Elctrns. 612-935-5444
MO Earth City, Hamilton/Avnet Elctrns. ... 314-344-1200
MO Earth City, Schweber Elctrns. 314-739-0526
MO Maryland Hgts., Hall-Mark Elctrns. Corp. 314-291-5350
MO St. Louis, Time 314-391-6444
NH Manchester, Hamilton/Avnet 603-624-9400
NH Manchester, Schweber 603-625-2250
NJ Cherry Hill, Hamilton/Avnet Elctrns. ... 609-424-0100
NJ Fairfield, Hall-Mark Elctrns. Corp. 201-575-4415
NJ Fairfield, Hamilton/Avnet Elctrns. 201-575-3390
NJ Fairfield, Schweber Elctrns. 201-227-7880
NJ Mt. Laurel, Hall-Mark Electrns. 609-235-1900
NJ Perth Amboy, Arm Bar Inds. 201-442-0990
NJ Pine Brook, Pioneer/Harvey Elctrns. .. 201-227-1262
NM Albuquerque, Alliance Elctrns. 505-292-3360
NM Albuquerque, Bell Inds. 505-292-2700
NM Albuquerque, Hamilton/Avnet Elctrns. 505-765-1500
NY Buffalo, Summit Distrs. 716-884-3450
NY Central Islip, Semi Cap 516-582-4400
NY E. Syracuse, Hamilton/Avnet Elctrns. 315-437-2642
NY Hauppauge, Jaco Elctrns. 516-273-5500
NY Hauppauge, Time 516-273-0100
NY Rochester, Hamilton/Avnet Elctrns. ... 716-475-9130
NY Rochester, Schweber Elctrns. 716-424-2222
NY Rochester, Summit Distrs. 716-334-8110
NY Ronkonkoma, Hall-Mark 516-737-0600
NY Westbury, Schweber Elctrns. 516-334-7474
NY Westbury, Schweber Elctrns. (Corp. Off.) 516-334-7474
NC Greensboro, Golden 919-373-0038
NC Raleigh, Hall-Mark Elctrns. Corp. 919-872-0712
NC Raleigh, Hamilton/Avnet Elctrns 919-878-0819
NC Raleigh, Schweber Elctrns. 919-876-0000
OH Beachwood, Schweber Elctrns. 216-464-2970
OH Cincinnati, Bell/Graham 513-772-1661
OH Cincinnati, Hall-Mark 513-563-5980
OH Cleveland, Pioneer/Cleveland Elctrns. 216-587-3600
OH Columbus, Bell/Graham 614-895-1590
OH Dayton, Bell Inds. 513-434-8231
OH Dayton, Hamilton/Avnet Elctrns. 513-433-0610
OH Dayton, Pioneer/Dayton Elctrns. 513-236-9900
OH Dayton, Schweber Elctrns. 513-439-1800
OH Solon, Hall-Mark Elctrns. Corp. 216-349-4632
OH Warrensville, Hamilton/Avnet 216-831-3500
OH Westerville, Hall-Mark Elctrns. Corp. ... 614-891-4555
OH Westerville, Hamilton/Avnet 614-436-5851
OK Tulsa, Hall-Mark Elctrns. Corp. 918-665-3200
OK Tulsa, Schweber Elctrns. 918-622-8000
OR Lake Oswego, Bell Inds. 503-241-4115
OR Lake Oswego, Hamilton/Avnet Elctrns. 503-635-7850
OR Portland, Time 503-684-3780
PA Horsham, Schweber Elctrns. 215-441-0600
PA King of Prussia, Time 215-337-0900
PA Pittsburgh, Hamilton/Avnet 412-281-4150
PA Pittsburgh, Pioneer/Pittsburgh Elctrns. 412-782-2300
PA Pittsburgh, Schweber Elctrns. 412-782-1600
TN Nashville, Bell/Graham 615-242-2682
TX Austin, Hall-Mark Elctrns. Corp. 512-258-8848
TX Austin, Hamilton/Avnet Elctrns. 512-837-8911
TX Austin, Schweber Elctrns. 512-458-8253
TX Carrollton, Time 214-241-7441
TX Dallas, Hall-Mark 214-341-1147
TX Dallas, Hall-Mark Elctrns. Corp. (Corp. Off.) 214-343-5000
TX Dallas, Pioneer/Dallas Elctrns. 214-386-7300
TX Dallas, Schweber Elctrns. 214-661-5010
TX Houston, Hall-Mark Elctrns. Corp. 713-781-6100
TX Houston, Hamilton/Avnet Elctrns. 713-975-3516
TX Houston, Schweber Elctrns. 713-784-3600
TX Irving, Hamilton/Avnet Elctrns. 214-659-4111
TX Richardson, Fisher-Brownell 214-235-3177
TX Richardson, Jaco Elctrns. 214-235-9575
UT Salt Lake City, Bell Inds. 801-972-6969
UT Salt Lake City, Hamilton/Avnet Elctrns. 801-972-2800
UT Salt Lake City, Integrated 801-298-1869
WA Bellevue, Bell Inds. 206-747-1515
WA Bellevue, Hamilton/Avnet Elctrns. 206-453-5845
WA Bellevue, Integrated Elctrns. 206-455-2727
WA Redmond, Time 206-882-1600
WI Brookfield, Schweber Elctrns. 414-784-9020
WI New Berlin, Hall-Mark Elctrns. Corp. .. 414-797-7844
WI New Berlin, Hamilton/Avnet Elctrns. .. 414-784-4510
WI Waukesha, Bell Inds. 414-547-8879
Can Calgary, Hamilton/Avnet 403-230-3586
Can Montreal, Hamilton/Avnet 514-331-6443
Can Ottowa, Hamilton/Avnet 613-226-1700
Can Toronto, Hamilton/Avnet 416-677-7432

KEMLITE LABS., INC., 1819 W. Grand Ave., Chicago, IL 60622, Tel: 312-829-6050; Empl.: 65; *Sls. Mgr.:* J.V. Daniels

KEMTRON CIRCUITS & ELCTRNS. CORP., 48 Merrick Rd., Rockville Centre, NY 11570, Tel: 516-766-2772; Empl.: 7; *Sls. Mgr.:* Walter Carlock

KENCO INDUSTRIES, INC., Elctrn. Chemicals Div., P.O. Box 88500, Atlanta, GA 30338, Tel: 404-475-6100, Telex: 297114; Empl.: 25; *Sls. Mgr.:* J. Rothenbach

M.S. KENNEDY CORP., Sub of Hybrilonics, Inc., 8170 Thompson Rd., Clay, NY 13041, Tel: 315-699-9201, TWX: 710-541-0465; FSC No.: 51651; Empl.: 41; *Sls. Mgr.:* Greg Overend

Local Sales Offices & Reps

NJ Hasbrouck Heights, Comp-Tech Sls. .. 201-288-7400
NY Long Island, Comp-Tech Sls. 516-593-2628

KENSOL WIRE MARKING, Kensol Olsenmark Inc., 40 Melville Park Road, Melville, NY 11747, Tel: 516-694-7773, Telex: 510-224-6418; *Sls. Mgr.:* Tony Fiorey

KEN-TRON MFG., INC., 1204 Industrial Dr., Owensboro, KY 42301, Tel: 502-684-0431, Telex: 20-4305; Empl.: 100; *Sls. Mgr.:* J. Douglas

KENYON MAGNETICS, 1040 Grand St, Hoboken, NJ 07030, Tel: 201-798-6511; FSC No.: 54194; Empl.: 47; *Sls. Mgr.:* J. R. Siegel

KEPCO, INC., 131-38 Sanford Ave., Flushing, NY 11352, Tel: 718-461-7000, TWX: 710-582-2631; Empl.: 250; *Sls. Mgr.:* Paul Birman; *Dist. Mgr.:* Paul Birman ..... **D•1689-1714**

Local Sales Offices & Reps

AL Huntsville, J. L. Highsmith Co. 205-536-6666
AZ Phoenix, J. F. Hurlbut Co. 602-952-2079
CA Los Angeles, Windsor Dynamics 818-990-4173
CA San Diego, Windsor Dynamics 619-452-1891
CA San Francisco, N-S Assocs. 415-851-2703
CO Denver, J. F. Hurlbut Co. 303-279-7796
CT Farmington, R. Perron Co. 203-673-4825
FL Boca Raton, J. L. Highsmith Co. 305-368-9194
FL Orlando, J. L. Highsmith Co. 305-422-5794
GA Tucker, J. L. Highsmith Co. 404-493-1055
IL Chicago, Century Elctrns. 312-777-9700
IN Noblesville, Century Elctrns. 317-849-2026
KS Shawnee, ATECH 913-268-9644
MD Burtonsville, Eastern Instrmn. 301-384-8500
MA Needham, R. Perron Co. 617-449-6162
MI Detroit, Carter McCormic & Peirce 313-477-7700
MN Minneapolis, E.C. Elctrn. Sls. 612-831-0229
MO St. Louis, ATECH 314-576-2884
NH Dover, R. Perron & Co. 603-742-2321
NJ Woodcliff Lake, Eastern Instrmn. 201-664-0907
NM Albuquerque, Techn. Mktg. Assoc. 505-345-8921
NY Rochester, NACO Elctrns. Corp. 716-223-4490
NY Syracuse, NACO Elctrns. Corp. 315-699-2651
NY Utica, NACO Elctrns. Corp. 315-732-1801
NC Charlotte, J. L. Highsmith Co. 704-527-2382
OH Cleveland, Carter McCormic & Peirce 216-779-5100
OH Dayton, Carter McCormic & Peirce 513-836-0951
OR Portland, H. Levinson 503-245-1902
PA Bensalem, Eastern Instrmn. 215-245-6660
PA Pittsburgh, Carter McCormic & Peirce 412-372-4415
TX Austin, Airep Elctrns. 512-327-0778
TX Dallas, Airep Elctrns. 214-349-4360
TX Houston, Airep Elctrns. 713-944-2055
UT Salt Lake City, J. F. Hurlbut Co. 801-531-7472
VA Richmond, J. L. Highsmith Co. 804-745-5555
WA Seattle, H. Levinson Co. 206-382-1300
WI Milwaukee, Century Elctrns. Sls. 414-645-3680

KEPRO CIRCUIT SYS., 630 Axminister Dr., Fenton, MO 63026, Tel: 314-343-1630; Empl.: 15; *Sls. Mgr.:* Jeff R. Keil; *Dist. Mgr.:* Jeff R. Keil

KESSLER-ELLIS PRODS., 120 1st Ave., Atlantic Highlands, NJ 07716, Tel: 201-291-0500, 800-631-2165, Telex: 13-2496; FSC No.: 28222; Empl.: 85; *Sls. Mgr.:* Frank Vogt; *Dist. Mgr.:* Debbie Santelli ... **D•1124-1125**

Local Distributors

MO St. Louis, ISL 314-535-5760
AL Birmingham, Industrial Elctrl. Supp. 205-956-8504
AL Dothan, All-Phase Elec. Supp. Co. 205-793-2313
AZ Phoenix, Graybar Elec. Co., Inc 602-269-2131
AZ Phoenix, Keystone Electro Sls. 602-995-3005
AZ Phoenix, Metermaster 602-437-1425
AZ Tucson, Trident Instr. Svcs. 602-790-0343
AR Little Rock, Drives and Elec. 501-568-8800
CA Burbank, All-Phase Elec. Supp. Co. ... 213-843-4111
CA Dublin, Standard Meter Lab, Inc. 415-828-4837
CA Fresno, Allied Elec. Motor Svc. 209-486-4222
CA Irvine, Metercraft 714-261-7135
CA Los Angeles, E.I.L. Instrs. 213-685-7020
CA Los Angeles, Graybar Elec. Co., Inc ... 213-265-7000
CA Los Angeles, Metermaster 213-685-4340
CA Oakland, Western Electro-Mechanical 415-452-1936
CA Palo Alto, Metermaster 415-968-0313
CA Riverside, California Whls. 213-268-0550
CA San Diego, Metermaster 619-560-4841
CA Santa Clara, E.I.L. Instrs. 408-727-0396
CA Santa Monica, Master Distrs. 213-452-1229
CA South San Francisco, Graybar Elec. Supp., Inc. 415-871-7000
CO Denver, E.I.L. Insco 303-534-4160
CO Denver, Graybar Elec. Co., Inc. 303-458-7770
CT Middletown, E.I.L. Instrs. 203-346-6646
CT Southington, Electro Mech. Drives, Inc. 203-621-7335
FL Cantonment, C.B. Metcalf 904-968-5500
FL Ft. Lauderdale, Electronic Dvcs. & Controls 305-974-2500
FL Ft. Lauderdale, McDonald Distr. of Fla. 305-563-1255
FL Ft. Lauderdale, Power & Pumps 305-566-3261
FL Jacksonville, Graybar Elec. Co., Inc. ... 904-356-7611
FL Jacksonville, Power & Pumps 904-356-5881
FL Orlando, Power & Pumps 305-843-7400
FL Palm Bay, E.I.L. Instrs. 305-725-8300
FL Perrine, Graybar Elec. Co., Inc. 305-232-1530
FL Tampa, Chemco Elec. Supp. 813-621-8611
FL Tampa, Graybar Elec. Co., Inc. 813-253-8881
GA Albany, Weatherbee Elec. Supp. Co. .. 912-883-2034
GA Atlanta, Graybar Elec. Co., Inc. 404-892-6950
GA Columbus, Weatherbee Inds. Elec. Supp. 404-568-0157
GA Norcross, AA Elec. 404-449-8670
GA Norcross, Metermaster 404-446-0166
HI Honolulu, Process Valve & Control ... 808-848-0337
ID Pocatello, Consolidated Elec. Distrs. .. 208-232-2585
IL Aurora, Englewood Elec. Supp. 312-897-9296
IL Berkeley, Tara Prods. 312-449-6436
IL Bridgeview, E.I.L. Instrs. 312-430-2292
IL Chicago, Englewood Elec. Supp. 312-376-8750
IL Chicago, Newark Elctrns. 312-638-4411
IL Crystal Lake, Englewood Elec. Supp. .. 815-459-6500
IL Decatur, Englewood Elec. Supp. 217-875-7300
IL Des Plaines, Englewood Elec. Supp. .. 312-299-3300
IL Downers Grove, Neuco, Inc. 312-960-3800
IL Hoffman Estates, Englewood Elec. Supp. 312-882-2424
IL Itasca, Metermaster 312-251-0606
IL Joliet, Englewood Elec. Supp. 815-725-3900
IL Kankakee, Blitz Elec. Supp. Co. 815-933-5536
IL LaSalle, Complete Indl. Entprs. 815-244-1485
IL Markham, Englewood Elec. Supp. 312-596-3440
IL Melrose Park, Graybar Elec. Co., Inc. .. 312-287-7700
IL Oak Brook, Englewood Elec. Supp. ... 312-626-3232
IL Peoria, Tecco, Inc. 309-692-2312
IL Peru, Englewood Elec. Supp. 815-223-2650
IL Rockford, Englewood Elec. Supp. 815-226-8750
IL Wood Dale, Electro-Kinetics 312-595-6700
IN Columbus, Kirby Risk Supp. Co. 812-372-8431
IN East Chicago, Englewood Elec. Supp. 219-398-6800
IN Evansville, Hutch & Sons, Inc. 812-425-7201
IN Indianapolis, Bryat Controls 317-784-0261
IN Indianapolis, E.I.L. Instrs. 317-545-1373
IN Indianapolis, Englewood Elec. Supp. .. 317-638-6421
IN Indianapolis, Neff Elctrn. Technlgs. 317-872-3116
IN South Bend, Englewood Elec. Supp. .. 219-233-8233
KY Edgewood, AC/DC 606-341-0330
KY Louisville, E.I.L. Instrs. 502-454-3420
LA Baton Rouge, Nunn-IC Elec. Supp. Co. 504-927-6470
LA Harvey, Nunn-IC Elec. Supp. Co. 504-341-4281
LA New Orleans, Industrial Instr. Works .. 504-733-8355
LA West Monroe, Brooks Elctrns. 318-323-0344
LA West Monroe, Weaks Supp. Co. 318-323-8831
MD Baltimore, Dorman Elec. Supp. Co., Inc. 301-727-0710
MD Gaithersburg, Pioneer Gaithersburg ... 301-921-0660
MD Glen Burnie, EJ Varholy Sons, Inc. 301-760-3344
MD Sparks, E.I.L. Instrs. 301-771-4800
MA Billerica, Metermaster 617-523-2580
MA Boston, Graybar Elec. Co., Inc. 617-482-9320
MA Burlington, E.I.L. Instrs. 617-272-9450
MA W. Springfield, Control Engrg. 413-781-1330
MI Adrian, Englewood Elec. Supp. 517-265-5148
MI Battle Creek, Englewood Elec. Supp. .. 616-968-3336
MI Cadillac, Ackerman Elctrl. Supp. 616-775-9734
MI Clio, Control Dvcs. 313-686-2410
MI Coldwater, Englewood Elec. Supp. 517-278-7395
MI Grand Rapids, Ackerman Elctrl. Supp. 616-459-8327
MI Jackson, Englewood Elec. Supp. 517-782-7121
MI Negaunee, Northwest Elec. Supp. 906-228-9050
MI Sterling Heights, Esco Svcs. 313-254-3367
MN Bloomington, NWR 612-854-7329
MN Hibbing, NWR 218-262-5228
MN Minneapolis, DOT Elctrns. 612-861-3343
MN Minneapolis, Graybar Elec. Co., Inc. ... 612-721-3545
MO Fenton, Hi-Tech Elec., Inc. 314-343-6060
MO Joplin, Covert Elec. Machinery, Inc. ... 417-623-4827
MO Kansas City, Graybar Elec. Co., Inc. ... 816-221-1644
MO Kansas City, ISL 818-333-6569
MO St. Louis, Graybar Elec. Co., Inc. 314-531-4700
NJ Green Brook, Apparatus Elctrl. Supp. .. 201-752-8400
NJ Paterson, Feldman Bros. 201-742-7329
NJ Pennsauken, E. I. L. Instrs. 609-488-0474
NY Albany, Niagara Elec. Sls. Co. 518-869-0130
NY Bohemia, In-Control 516-567-6800
NY Buffalo, Niagara Elec. Sls. Co. 716-886-4000
NY East Syracuse, Niagara Elec. Sls. Co. 315-437-1656
NY Elmira, Brady Supp. 607-733-6591
NY Floral Park, Elemco Indl. Svc. Corp. ... 718-343-8166
NY Hauppauge, E.I.L. Instrs. 516-231-6333
NY Long Island City, Graybar Elec. Co., Inc. 212-392-2000
NY Maspeth, Babco, Inc. 212-446-5120
NY Rochester, E.I.C. 716-544-4392
NY Rochester, E.I.L. Instrs. 716-427-8000
NY Rochester, Niagara Elec. Sls. Co. 716-271-1223
NY Rockaway Park, Metropolitan Sls. 212-634-3100
NY Walworth, Elemco Indl. Svc. Corp. 315-986-4268
NC Ashville, Electrical Supp. Co. of NC ... 704-255-8899
NC Charlotte, Carolina Elec. Supp. Co. 704-333-7526
NC Charlotte, Count, Inc. 704-392-7496
NC Gastonia, J.M.T. Elctrns. 704-867-4401
OH Akron, Saks Elec. 216-253-2141
OH Chagrin Falls, RPM Sls. 216-247-3295
OH Cincinnati, Graybar Elec. Co., Inc. 513-621-0600
OH Cleveland, Metermaster 216-651-4100
OH Cleveland, Pioneer Std. 216-587-3600
OH Dayton, E.I.L. Instrs. 513-435-2134
OH Dayton, Pioneer Dayton 513-236-9900
OH Dayton, Pioneer Std. 513-236-9900
OH Defiance, Northwest Elec. Controls ... 216-253-2141
OH Media, Reeves Assocs., Inc. 215-566-6709
OH Sandusky, Sandusky Elec., Inc. 419-625-4915
OH Solon, Midland Elec. 216-248-3800
OK Tulsa, Tri-State Instr. Labs, Inc. 918-836-0286
OR Portland, Westcon, Inc. 503-283-0132
PA Easton, Strokes Elec. Supp. Co., Inc. .. 215-258-7206
PA Exton, Valley Assocs. 215-363-8979
PA Havertown, Quarracino Distrs. 215-449-7500
PA Philadelphia, Graybar Elec. Co., Inc. ... 215-336-2211
PA Pittsburgh, C.A.M. Instrmn. 412-782-3770
PA Pittsburgh, E.I.L. Instrs. 412-731-5230
PA Pittsburgh, Graybar Elec. Co., Inc. 412-323-0600
PA Upper Darby, Electro-Pak Co. 215-789-3150
SC Columbia, Control Specialist 803-254-8087
TN Chattanooga, Engineering Grp., Inc. ... 615-757-7781
TN Jackson, L & H Elec. Supp. 901-423-0136
TN Memphis, Graybar Elec. Co., Inc. 901-274-7150
TN Nashville, A A Elec. 615-832-6632
TX Beaumont, Nunn Elec. Supp. Co. 409-842-5600
TX Corpus Christie, Nunn Elec. Supp. Co. 512-884-0311
TX Dallas, E.I.L. Instrs. 214-931-1236
TX Dallas, Graybar Elec. Co., Inc. 214-744-1421
TX Freeport, Nunn-Reichardt Elec. Supp. 713-233-0221
TX Garland, Metermaster 214-271-5671
TX Houston, E.I.L. Instrs. 713-271-3100
TX Houston, Force Elctrns. 713-561-8644
TX Houston, Nunn Elec. Supp. Co. 713-676-0100
TX Houston, Quality Instrs. 713-524-0528
TX Irving, Force Elctrns. 214-438-5700
UT Drem, Amfac Elec. Supp. Co. 801-224-5555
UT Fillmore, Stuart Elec. Supp. 801-743-5861
UT Salt Lake City, Stuart Elec. Supp. 801-466-8603
VA Alexandria, E.I.L. Instrs. 703-569-2611
VA Harrisonburg, Electrical Whlsrs. 703-434-1751
VA Richmond, Graybar Elec. Co., Inc. 804-359-1381
VA Richmond, GE Supp. 804-358-4941
VA Virginia Beach, E.I.L. Instrs. 804-499-3746
WA Kent, C. B. Parsons 206-762-7373
WA Seattle, E.I.L. Instrs. 206-762-0880
WA Seattle, Graybar Elec. Co., Inc. 206-292-4848
WI Fond du Lac, Englewood Elec. Supp. 414-922-4240
WI Green Bay, Englewood Elec. Supp. ... 414-336-8002
WI Manitowoc, Englewood Elec. Supp. ... 414-684-6653
WI New Berlin, G. S. Hydraulic Sls., Inc. ... 414-786-0100
WI Oconomowoc, Atlas Instrs. 414-367-8759
WI Schofield, Englewood Elec. Supp. 715-359-0454

KESTER SOLDER DIV., 4201 Wrightwood Ave., Chicago, IL 60639, Tel: 312-235-1600; Empl.: 350; *Sls. Mgr.:* Mack J. Haraburd ..... **C•1096, 1740**

Local Sales Offices & Reps

CA Anaheim 714-871-0280
NJ Newark 201-589-0246

KEUFFEL & ESSER CO., 900 Lanidex Plaza, Parsippany, NJ 07054, Tel: 201-428-7000, Telex: 136425; Empl.: 1800

WE SHIP PRODUCTS...NOT PROMISES

DESIGNER MANUFACTURERS KEYSTONE ELECTRONICS CORP.
49 Bleecker Street, New York, NY 10012
Tel: (212) 475-4600 TLX: 35-3700

(800) 421-5334

FOR:

Scopes
- — General Purpose
- — Engineering
- — Field Service
- — Analog & Digital Storage

Lab Supplies

Programmable System Supplies

X-Y Video Displays

Hi Pots

Electronic Loads

National Sales and Service

Kik INTERNATIONAL CORP.
Kikusui International
17819 S. Figueroa
Gardena, CA 90248
(213) 515-6432
In CA, AK and HI

KEVLIN MICROWAVE CORP., 26 Conn St., Woburn, MA 01801, Tel: 617-935-4800, TWX: 710-393-1239; FSC No.: 25634; *Sls. Mgr.:* James E. Riley

KEYAN INDS., INC., P.O. Box 1228, Middleboro, MA 02346, Tel: 617-947-7719; Empl.: 11; *Sls. Mgr.:* Bob Oldro; *Dist. Mgr.:* Dan Curran

KEYEX, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074, Tel: 301-239-6777; *Sls. Mgr.:* Karl M. Yatovitz; *Dist. Mgr.:* Karl M. Yatovitz

Keystone CARBON COMPANY

KEYSTONE CARBON, Thermistor Div., St. Marys, PA 15857, Tel: 814-781-1591, Telex: 91-4517; FSC No.: 75-263; Empl.: 1200; *Sls. Mgr.:* John A. Brock; *Dist. Mgr.:* John A. Brock ..... **B•1752-1755**

Local Sales Offices & Reps

NC	NCRaleigh, DHR Mktg.	919-781-1961
CA	Redwood City, Hickey Inds. Sls.	415-368-3849
CA	San Diego, El Dorado Sls.	619-565-9112
CA	Santa Ana, El Dorado Sls.	714-954-0285
CO	Colorado Springs, Omega Ltd.	303-598-6845
CO	Englewood, Omega Ltd.	303-762-8061
CT	Wethersfield, L.J. Labant	203-529-0048
GA	Marietta, J.J. Arnold	404-427-1062
IL	West Dundee, W. S. Heffron	312-426-6472
IN	Fort Wayne, R.O. Whitesell & Assocs.	219-432-5591
IN	Indianapolis, R.O. Whitesell & Assocs.	317-359-9283
IN	Kokomo, R.O. Whitesell & Assocs.	317-457-9127
KS	Shawnee, Benson Engrg.	913-491-4446
KY	Louisville, R.O. Whitesell & Assocs.	502-426-7696
MI	Southfield, J.L. Montgomery Assocs.	313-358-2616
MN	Minneapolis, Dave Marrone	612-920-9042
NY	Fayetteville, Foster & Wager	315-637-5427
NY	Webster, Foster & Wager	716-265-2072
OH	Cincinnati, R.O. Whitesell & Assocs.	513-521-2290
OH	Cleveland, R.O. Whitesell & Assocs.	216-447-9020
OH	Columbus, R.O. Whitesell & Assocs.	614-888-9396
OH	Dayton, R.O. Whitesell & Assocs.	513-298-9546
PA	Pittsburgh, R.O. Whitesell & Assocs.	412-963-6161
PA	Plymouth Meeting, R.O. Whitesell & Assocs.	215-825-2046
SC	Greenville, DHR Mktg.	803-235-3594
TN	Greenville, R.O. Whitesell & Assocs.	615-639-6154
TX	Dallas, Benson Engrg.	214-352-7541
TX	Houston, Benson Engrg.	713-672-2194
WA	Seattle, Northmar, Inc.	206-524-5170
WI	New Berlin, T. L. Labant	414-425-7157
EXP	NY, Freeport, Minthorne Int'l.	516-546-4700

Local Distributors

AZ	Scottsdale, Allied Elctrns.	602-990-9549
CA	Garden Grove, Allied Elctrns.	714-554-0731
CA	Inglewood, Newark Elctrns.	213-671-7066
CA	Santa Clara, Allied Elctrns.	408-727-1690
CO	Wheatridge, Allied Elctrns.	303-425-7144
FL	Ft. Lauderdale, Allied Elctrns.	305-486-0500
GA	Atlanta, Allied Elctrns.	404-237-3366
IL	Elgin, Allied Elctrns.	312-697-8200
MA	Wilmington, Allied Elctrns.	617-942-0150
MI	Westland, Allied Elctrns.	313-595-6565
MN	Minneapolis, Allied Elctrns.	612-559-9545
MO	Maryland Hgts., Newark Elctrns.	314-739-0133
MO	St. Louis, Allied Elctrns.	314-878-1229
NJ	Springfield, Newark Elctrns.	212-349-7087
NY	Mineola, Allied Elctrns.	516-248-2360
NC	Cary, Allied Elctrns.	919-467-0720
OH	Willoughby, Allied Elctrns.	216-951-0908
OK	Tulsa, Allied Elctrns.	918-663-7630
PA	Bala Cynwyd, Allied Elctrns.	215-667-6940
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Houston, Allied Elctrns.	713-445-7123
VA	Alexandria, Allied Elctrns.	703-836-5002
WA	Seattle, Allied Elctrns.	206-767-5772
WI	Brookfield, Newark Elctrns.	414-781-2450
WI	Milwaukee, Allied Elctrns.	414-463-2662

DESIGNER MANUFACTURERS KEYSTONE ELECTRONICS CORP

KEYSTONE ELCTRNS. CORP., 49 Bleecker St., New York, NY 10012, Tel: 212-475-4600, Telex: 35-3700; FSC No.: 91833; Empl.: 80; *Sls. Mgr.:* J. Magnuson; *Dist. Mgr.:* Charles Gold

Local Sales Offices & Reps

IL	Wilmette, Joel Wasserman Assoc.	312-256-3566
MA	Needham Heights, The Newscott Co., Inc.	617-444-1923
MI	Ferndale, Hilltronics, Inc.	313-398-5556
MN	Minneapolis, Donald Luger & Assocs.	612-553-1122
NC	Raleigh, DHR Mktg.	919-781-1961
OR	Beaverton, William J. Purdy Co.	503-641-9373
PA	Broomall, L. D. Lowery, Inc.	215-356-5300
TX	Dallas, SW Mktg. Assocs.	214-341-8631

KEYTEK DIV., 6424 Warren Dr., Norcross, GA 30093, Tel: 404-449-6040, Telex: 810-766-4529; Empl.: 50; *Sls. Mgr.:* Ron Inneckin

KEYTEK INSTR. CORP., 12 Cambridge St., Burlington, MA 01803, Tel: 617-272-5170, Telex: 951389 KEYTEK BURL; *Sls. Mgr.:* Michael J. Hopkins

KEY TRONIC, P.O. Box 14687, Spokane, WA 99214, Tel: 509-928-8000, TWX: 510-773-1885; FSC No.: 52833; Empl.: 1350

KGS ELECTRONICS, INC., GAR Entprs., 2029 N. Lincoln Ave., Pasadena, CA 91103, Tel: 818-798-0786; Empl.: 50 ..... **D•1715, 1942-1943**

Local Sales Offices & Reps

TX	Hurst, McGarrah & Assocs.	817-268-3557
EXP	NJ, Rahway, REA Intl.	201-382-7100

Local Distributors

TN	Memphis, Memphis Grp.	901-362-8600
TX	Dallas, Foxtronics	214-358-4425

WALTER KIDDE, Div. of Kidde, Inc., Fire Sys. Operations, P.O. Box 1147, Wake Forest, NC 27587, Tel: 919-556-6811, Telex: 802569 WALTKIDDE; Empl.: 250; *Sls. Mgr.:* Frank Lindsey

KIK®

KIKUSUI INTL. CORP., 17819 S. Figueroa St., Gardena, CA 90248, Tel: 213-515-6432, 800-421-5334, TWX: 910-346-7648; *Sls. Mgr.:* Bill White ..... **D•1393, 1652**

Local Sales Offices & Reps

AL	Huntsville, Morard & Co.(MOCO)	205-881-5968
AZ	Phoenix, Cherry Assocs. (Scopes)	602-242-1922
AZ	Scottsdale, Power Specialist (Power Supp.)	602-996-4100
CA	Carson, Amasco South	213-516-8561
CA	Sunnyvale, Amasco North	408-733-8690
CO	Aurora, R & R Instrmn.	303-340-8728
CT	Madison, Eastronix, Inc.	203-421-4514
FL	Melbourne, EMS, Inc.	305-724-1027
HI	Honolulu, Hawaiian Ind. Instr.	808-533-4232
IL	Elmhurst, Sector Engrg. Sls.	312-530-7850
IN	Indianapolis, Sector Engrg. Sls.	317-842-1120
KS	Olathe, Rush & West Assocs. (Power Supp.)	913-764-2700
KS	Overland Park, Ramsey Assocs. (Scopes)	913-649-6996
MD	Burtonsville, Eastern Instrmn.	301-384-8500
MD	Wheaton, Brimberg Sls. (Power Supp.)	301-946-2670
MA	Bedford, Eastronix	617-275-5775
MI	Warren, Dietrich & Assocs.	313-751-4990
MN	Minneapolis, Sector Engrg. Sls.	612-593-1809
MO	Ballwin, Rush & West Assocs. (Power Supp.)	314-394-7271
MO	Maryland Hgts., Ramsey Assocs. (Scopes)	314-878-5042
NJ	Teaneck, Scientific Dvcs. East	201-837-1004
NM	Albuquerque, Cleveland Entprs.	505-265-7893
NY	Rochester, EIC Elctrns.	716-544-4392
OH	Cleveland, Dietrich & Assocs.	216-781-1855

OH	Dayton, Dietrich & Assocs.	513-223-6042
OR	Portland, Westcon	503-283-0132
PA	Pittsburgh, Dietrich & Assocs.	412-892-2992
PA	Springhouse, Scientific Dvcs. East	215-643-3335
TX	Austin, Scientific Dvcs. SW	512-442-6215
TX	Houston, Scientific Dvcs. SW	713-864-1711
TX	Richardson, Scientific Dvcs. SW	214-231-8106
VT	Shelburne, Eastronix	802-985-3743
WI	Milwaukee, Sector Engrg. Sls.	414-352-8280
PR	San Juan, David S. Ternent	809-762-2688
Can	St. Laurent, Que., Interfax Sys., Inc.	514-336-0392

Kilovac®
Corporation

KILOVAC CORP., Box 4422-EM, Santa Barbara, CA 93140, Tel: 805-684-4560, TWX: 910-336-1141; FSC No.: 18741; Empl.: 130; *Sls. Mgr.:* Jerry L. Dysart; *Dist. Mgr.:* Robert C. Argabright **B•1426-1427**

Local Sales Offices & Reps

AZ	Tempe, Gassner & Clark	602-968-9037
CA	Campbell, Kottmeier Assocs.	408-371-8700
CA	Tarzana, High Voltage Sls.	818-881-9194
CO	Denver, Quorum 3: Sls. Grp., Inc.	303-696-8480
CT	Brookfield, Kanan Assocs.	203-775-0494
FL	St. Petersburg, K-Square	813-381-1893
GA	Atlanta, Electro Tech	404-262-1522
IL	Schaumburg, Gassner & Clark	312-882-8608
IA	Cedar Rapids, H. R. Brown Sls. Co.	319-366-0635
KS	Olathe, M. E. Bettis Co.	913-764-0621
KS	Wichita, M. E. Bettis Co.	316-265-8250
MD	Columbia, Tyler Griffin Co.	301-995-1215
MA	Needham Heights, Kanan Assocs.	617-449-7400
MN	Minneapolis, DeBeck-Hays	612-835-4649
MO	St. Louis, Abrams & Assocs.	314-569-0447
NJ	Colts Neck, Trionic Assocs.	201-431-0415
NM	Albuquerque, Cleveland Entprs., Inc.	505-265-7893
NY	Cazenovia, S. T. Woolard Co., Inc.	315-655-8145
NY	Great Neck, Trionic Assocs.	516-466-2300
NY	Rochester, Lamb Comp., Inc.	716-323-1250
NC	Winston-Salem, DGW, Inc.	919-768-7166
OH	Euclid, Electronic Comp., Inc.	216-261-7057
OH	Miamisburgh, Electronic Comps., Inc.	513-866-3340
OR	Tigard, Components West, Inc.	503-684-1671
PA	Paoli, Tyler Griffin Co.	215-647-1550
SC	Greenville, DWG, Inc.	803-288-0019
TX	Dallas, Edward F. Aymond Co.	214-826-7620
UT	Sandy, Quorum 3: Sls. Grp., Inc.	801-943-9227
WA	Liberty Lake, Components West, Inc.	206-885-5880
WA	Redmond, Components West, Inc.	206-885-5880
Can	Kamata, Ont., Vitel Elctrns.-Ottawa	613-592-0090
Can	Mississauga, Ont., Vitel Elctrns.-Toronto	416-676-9720
Can	St. Lawrence, Que., Vitel Elctrns.-Montreal	514-331-7393
Can	Vancouver, B.C., Macom Agencies Ltd.	604-271-2661

KINEMETRICS, INC., 222 Vista Ave., Pasadena, CA 91107, Tel: 818-795-2220, Telex: 67-5402; Empl.: 110; *Sls. Mgr.:* David Hopps

KINEMETRICS/TRUETIME, 3243 Santa Rose Ave, Santa Rosa, CA 95407, Tel: 707-528-1230, Telex: 176687 (TRUETIME SARO); Empl.: 30; *Sls. Mgr.:* R. J. Dielman

KINETIC SYS., 11 Maryknoll Dr., Lockport, IL 60441, Tel: 815-838-0005, TWX: 910-638-2831; Empl.: 160; *Sls. Mgr.:* Pat Kirby

KINEX CORP., Sub. of the Nokia Corp. - Helsinki, 6950 Bryan Dairy Rd., Largo, FL 33543, Tel: 813-541-6404, TWX: 810-863-0362; Empl.: 100; *Sls. Mgr.:* W. L. Huston (Vice President); *Dist. Mgr.:* Steve Ridge

KINGS ELCTRNS., 40 Marbledale Rd., Tuckahoe, NY 10707, Tel: 914-793-5000, Telex: 13-7449, TWX: 710-562-0110; FSC No.: 91836; Empl.: 465; *Sls. Mgr.:* F. Pack; *Dist. Mgr.:* Fred Della Iacono

KINGSLEY MACHINE CO., 850 Cahuenga Blvd., Hollywood, CA 90038, Tel: 213-469-7243, Telex: 910-3214581; *Sls. Mgr.:* Gloria Cirac

KING-WAY ASSOC., 16400 Ventura Blvd., Encino, CA 91316, Tel: 213-788-4124

KING WIRE & CABLE CORP., 179-45 110 Ave., Jamaica, NY 11433, Tel: 212-657-4422, 800-221-0144, Telex: 96-8858; FSC No.: 06145; *Sls. Mgr.:* Ira M. Lash; *Dist. Mgr.:* Ira M. Lash

KIPP & ZONEN, 390 Central Ave., Bohemia, NY 11716, Tel: 516-589-2885, Telex: 0960250; Empl.: 25; *Sls. Mgr.:* Wm. Novack; *Dist. Mgr.:* Wm. Novack

KISTLER-MORSE, 10201 Willows Road NE, Redmond, WA 98052, Tel: 206-881-8000, Telex: 15-2223; *Sls. Mgr.:* Jim Beaton

KLC CORP., 2234 East Colorado, Pasadena, CA 91107, Tel: 818-796-0525; Empl.: 6; *Sls. Mgr.:* Chris Connelly

KLC/KARL LAMBRECHT CORP., 4204 N. Lincoln Ave., Chicago, IL 60618, Tel: 312-472-5442, Telex: 759819; Empl.: 37

KLM ELECTRONICS, 16890 Church St., P.O. Box 816, Morgan Hill, CA 95037, Tel: 408-779-7363, TWX: 910-590-4468; Empl.: 250; *Sls. Mgr.:* Chuck McKinney

KLOCKNER MOELLER, 4 Strathmore Rd., Natick, MA 01760, Tel: 617-655-1910, Telex: 94-8434; Empl.: 250; *Sls. Mgr.:* George Tamer

KMC SYSTEMS, INC., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432, Tel: 201-447-0007, Telex: 642-374; Empl.: 120; *Sls. Mgr.:* E. Verder

Local Sales Offices & Reps

NJ	Marlton, Control Equip., Inc.	215-676-1460
TX	Irving, DACO	216-986-1506
UT	Bountiful, Lectrol, Inc.	801-292-7674
Can	Downsview, Ont., Displayco, Ltd	416-663-6405

KNOL ENTERPRISES, 3468 Sacramento Dr., San Luis Obispo, CA 93401, Tel: 805-544-4881; Empl.: 6; *Sls. Mgr.:* Dave Bone

KNOWLES ELCTRNS., INC., 3100 N. Mannheim Rd., Franklin Park, IL 60131, Tel: 312-455-3600, Telex: 72-8397; *Sls. Mgr.:* Reginald G. Garratt, VP-Mktg.

KOA

KOA SPEER ELCTRNS., Bolivar Dr., P.O. Box 547, Bradford, PA 16701, Tel: 814-362-5536, Telex: 91-4404, TWX: 510-695-5921; FSC No.: 09021; Empl.: 3000; *Sls. Mgr.:* L. G. Holzwarth; *Dist. Mgr.:* L. Rice **A•1108, 1884-1886**

Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean	205-830-1540
AZ	Phoenix, O'Donnell Assocs.	602-944-9542
CA	Anaheim, Westrep	213-404-3881
CA	San Diego, Westrep	619-566-6580
CA	Santa Clara, Westrep	408-988-8833
CO	Boulder, R. G. Entprs.	303-447-9211
CT	Middletown, Gerber Sls.	203-347-3000
FL	Altamonte Springs, APM Assocs.	305-869-6831
FL	Ft. Lauderdale, APM Assocs.	305-565-0056
FL	Tampa, APM Assocs.	813-886-2457
GA	Atlanta, Cartwright & Bean	404-233-2939
IL	Arlington Hgts., C. L. Greenslade Sls.	312-593-3450
IN	Fort Wayne, John F. Kilfoil	219-436-7233
KS	Overland Park, Advanced Techn. Sls.	913-642-6675
LA	Covington, Cartwright & Bean	504-892-1780
MA	Monson, Gerber Sls.	413-267-5051
MA	Newton Upper Falls, Gerber Sls.	617-969-2620
MI	Troy, C. B. Jensen & Assocs.	313-643-0506
MN	Edina, Grayden & Flemmer	612-941-1120
MS	Jackson, Cartwright & Bean	601-981-1170
MO	St. Louis, Advanced Techn. Sls.	314-878-2921
NM	Albuquerque, Power Entprs.	505-298-1918
NY	East Rochester, Tri-Tech Elctrns.	716-385-6500
NY	Endwell, Tri-Tech Elctrns.	607-754-1094
NY	Fayetteville, Tri-Tech Elctrns.	315-446-2881
NY	Fishkill, Tri-Tech Elctrns.	914-897-5611
NY	Great Neck, MOS Assocs.	516-487-3966
NC	Charlotte, Cartwright & Bean	704-377-5673
NC	Raleigh, Cartwright & Bean	919-876-4130
OH	Cincinnati, John F. Kilfoil	513-791-6150
OR	Beaverton, Eclipse Mktg. Grp.	503-642-1661
PA	Wynnewood, Metz-Benham Assocs.	215-896-7300
TN	Knoxville, Cartwright & Bean	615-693-7450
TN	Memphis, Cartwright & Bean	901-276-4442
TX	Lewisville, Jim Hughes	214-221-1536
TX	Stafford, Jim Hughes	713-343-0673
WA	Redmond, Eclipse Mktg. Grp.	206-885-6991
PR	Hato Rey, M. Anderson	809-751-2026
Can	Ontario, Cantronics Ltd.	416-665-8020

Local Distributors

AZ	Phoenix, Kachina	602-269-6201
AZ	Phoenix, Sterling Elctrns.	602-258-4531
AR	Little Rock, Carlton-Bates	501-562-9100
CA	Chatsworth, QC Comps.	818-700-2622
CA	Chatsworth, T.T.I.	818-709-1010
CA	Fountain Valley, Comps. Ctr.	714-979-0433
CA	Irvine, KELEX	714-957-3247
CA	Irvine, Ryno Elctrns.	714-557-5021
CA	San Diego, Ryno Elctrns.	619-453-8430
CA	San Jose, Eric Elctrns.	408-262-1111
CA	Santa Clara, Components Ctr.	408-988-3751
CO	Boulder, R. G. Entprs.	303-447-9211
CO	Denver, Ragon Elec. Parts	303-744-3601
CT	Stratford, Utronics	203-378-4201
CT	Wallingford, Midstate Elctrns.	203-265-9900
FL	Orlando, TTI	305-859-1000
FL	W. Palm Beach, Nurmi Elctrn. Supp.	305-684-0320
GA	Atlanta, Prehler Elctrns.	404-447-5540
GA	Roswell, Quality Comps.	404-993-8146
IL	Elk Grove Village, GBL/Goold Elctrns.	312-593-3220
IL	Elk Grove Village, Ragon Elctrns.	319-373-0525
IL	Northbrook, Classic Comp. Supp.	312-272-9650
IL	Rosemont, Advent Elctrns.	312-298-4210
IN	Indianapolis, Advent Elctrns.	317-872-4910
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
LA	Baton Rouge, Indl. Elctrn. Supp.	504-357-4249
LA	Shreveport, Indl. Elctrn. Supp.	318-222-9459
MD	Beltsville, Radio Elec. Svc.	301-937-9100
MD	White Marsh, Radio Elec. Svc. Co.	301-529-0500
MA	Billerica, Baldwin Comp. Ctr.	617-667-6710
MA	Hingham, Sager Elec. Supp.	617-749-6700
MA	Norwood, Gerber Elctrns.	617-769-6000
MA	Waltham, Sterling Elctrns.	617-894-6200
MA	Westford, Electronic Specialties	617-486-8495
MA	Woburn, T.T.I	617-938-8800
MI	Ann Arbor, Wedemeyer	313-665-8611
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MI	Farmington Hills, Prehler Elctrns.	313-476-7084
MI	Livonia, Reptron	313-525-2700
MN	St. Paul, Ragon Elctrns.	612-642-2828
MO	Independence, Ragon Elctrns.	816-254-3410
NE	Lincoln, Scott Elctrns.	402-466-8221
NH	Nashua, Brevan Elctrns.	603-889-7230
NJ	Mountainside, Enox Resistor Co.	201-654-7600

KLOCKNER-MOELLER

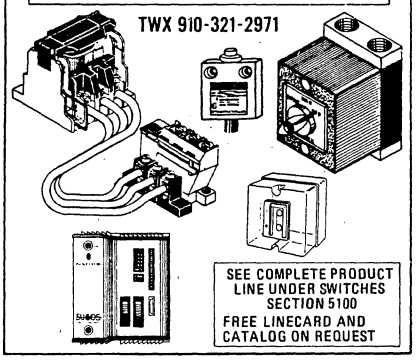
FULL LINE
AUTHORIZED DISTRIBUTOR

E S I

ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

NY Amherst, Standard Elctrns. 716-691-3801
NY Bohemia, Justin Elctrns. 516-589-4000
NY Buffalo, Summit Distrs. 716-884-3450
NY Farmingdale, SAI 516-293-2710
NY Hauppauge, Fairmont Elctrn. Sls. 516-231-3313
NY Hauppauge, Jaco 516-273-5500
NY Hauppauge, Sherburn Elctrns. 516-231-4300
NY Rochester, Summit Distrs. 716-334-8110
NY Ronkonkoma, Baldwin Comp. Ctr. 516-588-5700
NY Ronkonkoma, Prime Comps. 516-737-1730
NC Greensboro, Golden Elctrns. 919-373-0038
NC Raleigh, Southeastern Radio 919-828-2311
OH Cleveland, Roberts Elect. Corp. 216-238-1711
OH Dayton, Stotts-Friedman Elctrns. 513-298-5555
OH Worthington, Reptron/Ohio 614-436-6675
OK Tulsa, Altair Co. 918-252-5781
OR Beaverton, Murphy Elctrns. 503-642-2001
PA Allentown, Lehigh Elctrn. Comp. 215-433-3045
PA Drexel Hill, Kass Elctrns. Dist. 215-449-2300
PA Erie, Rem Elctrns. 814-453-5626
PA Harrisburg, Cumberland Elctrns. 717-233-5883
PA Philadelphia, Philadelphia Elctrns. 215-568-7400
RI Providence, Wm. Dandreta Co. 401-861-2800
TN Knoxville, Bondurant Bros. Co. 615-573-9151
TN Memphis, Bluff City Elctrns. 901-345-9500
TN Nashville, Bluff City Elctrns. 615-242-8000
TX Ft. Worth, Allied Elctrns. 817-336-5401
TX Ft. Worth, T.T.I. Inc. 817-429-1440
TX Houston, Altair Co. 713-462-3029
TX Richardson, Altair Co. 214-231-5166
TX Richardson, CCI 214-644-3444
WA Kent, Shannon Ltd. 206-763-0545
WA Redmond, Murphy Elctrns. 206-881-1234
WI Hartland, G W Elctrns. 414-367-6003
WI New Berlin, Classic Comp. 414-786-5300
Can Mississauga, Ont., Prelco 416-678-0401
Can Montreal, Que., Prelco 514-389-8051

KODE, 1515 S. Manchester Ave., Anaheim, CA 92802, Tel: 714-758-0400, TWX: 910-595-2680; FSC No.: 62767; Empl.: 40; *Sls. Mgr.:* LeRoy Koonsman

KOEP PRECISION STANDARDS, INC., P. O. Box 191, So. Plainfield, NJ 07080, Tel: 201-549-9280, TWX: 710-998-0503; Empl.: 6; *Sls. Mgr.:* Dennis M. Koep; *Dist. Mgr.:* Dennis M. Koep ..... **D•1257**

Local Sales Offices & Reps

AZ Scottsdale, Williams Assocs. 602-947-4297
CA Torrance, Cutlas Elctrns. 213-324-7360
CO Commerce City, Williams Assocs. 303-289-5647
FL Winter Haven, Lee Assocs. 813-294-5815
IL Des Plaines, Marsland Assocs. 312-298-2620
IN Indianapolis, Marsland Assocs. 317-924-3568
IA Cedar Rapids, Marsland Assocs. 319-296-8030
MN Minneapolis, Marsland Assocs. 612-545-4481
MO St. Louis, Marsland Assocs. 314-878-2404
NM Albuquerque, Williams Assocs. 505-255-1638
NY Binghamton, Tae-Rep 607-722-9265
NY Rochester, Tae-Rep 716-586-8710
UT Salt Lake City, Williams Assocs. 801-532-7701
WA Portland, Westcon 503-283-0132
WI New Berlin, Marsland Assocs. 414-786-6611

KOGYOSHA, 179 Riveredge Rd., Tenafly, NJ 07670, Tel: 201-569-8769; Empl.: 3; *Sls. Mgr.:* Mark Nakanishi; *Dist. Mgr.:* Mark Nakanishi

KOLE IND., 3553 N.W. 50th St., Miami, FL 33102-0152, Tel: 305-633-2556, 800-327-6085; Empl.: 45; *Sls. Mgr.:* B. J. Neelands

KOLIN INDS., Box 300, Pound Ridge, NY 10576, Tel: 914-764-5775, Telex: 137453; Empl.: 30; *Sls. Mgr.:* J. Kolinsky

KOLLMORGEN
INDUSTRIAL DRIVES

KOLLMORGEN CORP., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141, Tel: 703-639-2495, TWX: 710-875-3743; FSC No.: 11384; Empl.: 343; *Sls. Mgr.:* Sandor L. Tako/G. Wayne Coleman ..... **B•1163-1165; C•1483**

Local Sales Offices & Reps

AL Huntsville, Techn. Mktg. Assoc. 205-883-7893
AZ Phoenix, Thor Engr. 602-437-1463
CA Alhambra, Thorson 818-281-2280
CA Goleta, Thorson 805-964-8751
CA Mountain View, Thorson 415-964-9300
CA Signal Hill, Thorson 213-595-0361
CT Meriden, Whitehead Assocs., Inc. 203-634-1280
CT Tolland, Whitehead Assocs., Inc.
FL Melbourne, Technlg. Mktg. Assocs. ... 305-676-3776
FL Orlando, Techn. Mktg. Assoc. 305-857-3760
FL Pompano Beach, Techn. Mktg. Assoc. 305-942-0774
GA Atlanta, Technlg. Mktg. Assocs. 404-257-0374
IL Schaumburg, Industrial Drives 312-893-8886
MA Wakefield, Whitehead Assocs., Inc. ... 617-246-5155
MI Farmington Hills, Electro-Matics Prods., Inc. 313-478-1182
MN St. Paul, John J. Exon Co. 612-636-5533
MO Raytown, Cadon Techn. Sls. 816-356-7685
MO St. Louis, Cadon Techn. Sls. 314-645-8670
NJ Wayne, S. Howard Lagerveld & Assocs. 201-790-1714
NY Rochester, A & D Devices 716-385-2778
NY Sydney, A & D Dvcs. 607-563-8488
NC Matthews, Industrial Drives Div. 704-821-9875
OH Chagrin Falls, Jerry Kilroy Corp. 216-543-3370
OH Kettering, Kilroy Corp. 513-294-1235
OR Beaverton, Thorson NW 503-644-5900
PA Downingtown, Homersmith, Inc. 215-269-3637
PA Media, Homer Smith Engr. Prods. Rep. 215-543-2434
TX Austin, P.J. Scanlon Co. 512-255-2664
TX Dallas, P. J. Scanlon Co., Inc. 214-231-4661
VA Salem, Homersmith, Inc. 703-774-7411
WA Bellevue, Thorson 206-455-9180
WI Wauwatosa, Industrial Drives 414-475-5985

KOLLSMAN INSTR., 220 Daniel Webster Hwy., Merrimack, NH 03054, Tel: 603-889-2500, Telex: 94-3537, TWX: 710-366-6883; Empl.: 2200

KONTES, Kimble Div. of Owens/IL, 1001 Spruce St., Vineland, NJ 08360, Tel: 609-692-8500, TWX: 510-687-8967; *Sls. Mgr.:* Peter Davenport

KONTRON ELCTRNS., 1230 Charleston Rd., Mountain View, CA 94039-7230, Tel: 415-965-7020, TWX: 910-378-5207; Empl.: 200; *Sls. Mgr.:* Dick Ridas

KOOLTRONIC, Hamilton Ave., Hopewell, NJ 08525, Tel: 609-466-3400, Telex: 84-3345; Empl.: 150; *Sls. Mgr.:* Gerald H. Freedman

KORRY ELECTRONICS, INC., 223 8th Ave. N., Seattle, WA 98109, Tel: 206-223-5400, TWX: 910-444-2295; Empl.: 410; *Sls. Mgr.:* Woody Hertzog

KRECKMAN, HERB, CO., Cresco, PA 18326, Tel: 717-595-2212; Empl.: 4

KR ELECTRONICS, INC., 91 Avenel St., Avenel, NJ 07001, Tel: 201-636-1900; Empl.: 15 ..... **A•1613**

KRL ELCTRNS., 160 Bouchard St., Manchester, NH 03103, Tel: 603-668-3210, 800-257-3300, TWX: 710-220-1662; Empl.: 65; *Sls. Mgr.:* Bert A. Spiller

KROHN CERAMICS, INC, See Centerflex Techn.

KROHN-HITE CORP., Avon Indl. Pk., Bodwell St., Avon, MA 02322, Tel: 617-580-1660, TWX: 710-345-0831; Empl.: 100; *Sls. Mgr.:* Craig S. Dunbar ..... **D•1258-1259**

Local Sales Offices & Reps

AL Huntsville, Gentry Assocs. 205-837-0692
AZ Phoenix, Odyssey 1 602-246-8846
AR Eldorado, Kemp Engrg. 501-826-5869
CA Inglewood, L & M Engrg. Assocs. 213-674-6850
CA San Jose, MCH Assocs. 408-246-7330
CO Englewood, Odyssey 1 303-773-8176
CT New Haven, McBar Assocs. 203-865-4376
FL Ft. Lauderdale, Gentry Assocs. 305-791-8405
FL Orlando, Gentry Assocs. 305-859-7450
FL Tampa, Gentry Assocs. 813-886-0720
GA Atlanta, Gentry Assocs. 404-998-2828
IL Chicago, Berndt Assocs. 312-283-0713
IN Carmel, Berndt Assocs. 317-844-0114
KS Overland Park, Ramsey Assocs. 913-649-6996
LA Gretna, Gentry Assocs. 504-367-3975
MD Baltimore, Sci-Rep 703-385-0600
MA Waltham, McBar 617-890-0233
MI Detroit, EQS Sys. 313-961-3042
MN Minneapolis, Berndt Assocs. 612-546-2021
MO St. Louis, Ramsey Assocs. 314-878-5042
NJ Englewood, Sci. Devices E. 201-871-3916
NM Albuquerque, Odyssey 1 505-265-6645
NY Syracuse, Labtronics 315-455-7314
OH Chesterland, EQS Sys. 216-729-2222
OH Columbus, EQS Sys. 614-228-3453
OK Tulsa, Kemp Engrg. 918-663-4501
OR Portland, McLaren 503-297-2248
PA Pittsburgh, EQS Sys. 216-729-2222
PA Spring House, Scientific Devices East 215-643-3335
SC Columbia, Gentry Assocs. 803-772-6786
TN Knoxville, Gentry Assocs. 615-584-0281
TX Dallas, Kemp Engrg. 214-931-7100
TX Houston, Kemp Engrg. 713-466-1465
VA Fairfax, Sci-Rep 703-385-0600
WA Bellevue, McLaren 206-454-3400
WI Milwaukee, Berndt Assocs. 414-545-8400

KRYSTINEL CORP., 126 Pennsylvania Ave., Paterson, NJ 07503, Tel: 201-345-8900, TWX: 710-988-5931; Empl.: 200; *Sls. Mgr.:* Joseph Barreca ..... **A•1304-1306**

Local Sales Offices & Reps

AZ Phoenix, Charles T. Fink & Assoc. 602-992-9884

Local Distributors

CA Los Alamitos, Permag Pacific Corp. ... 213-594-6515
CA Sunnyvale, Permag Sierra Corp. 408-738-1080
CO Aurora, Permag Corp. 303-693-6612
GA Norcross, Permag Dixie Corp. 404-448-5661
IL Elk Grove Vl., Permag Cen. Corp. 312-956-1140
MA Billerica, Permag NE Corp. 617-273-2890
MN Eden Prairie, Permag Minn. Corp. 612-934-4635
NY Hicksville, Permag Corp. 516-822-3311
OH Toledo, Permag Magnetics Corp. 419-385-4621
OR Portland, Permag Corp, Sierra Div. 503-252-9610
TX Richardson, Permag S.W. Corp. 214-699-1121

KSI, See Kaiser Systems, Inc.

KSW ELCTRNS. CORP., See Frequency Sources, KSW Semicond. Div.

K-SYSTEMS, INC., 3902 Lilac, Las Cruces, NM 88005, Tel: 505-526-3209, Telex: 910-380-3378; Empl.: 2; *Sls. Mgr.:* Alice Furphy

H. KUHNKE, INC., 26 W. Highland Ave., Atlantic Highlands, NJ 07716, Tel: 201-291-3334, 800-221-0714, Telex: 854041; Empl.: 12; *Sls. Mgr.:* John Chapski

kulite

KULITE SEMICONDUCTOR PRODS., INC., 1039 Hoyt Ave., Ridgefield, NJ 07657, Tel: 201-945-3000, Telex: 13-5458; Empl.: 300 ..... **B•1799**

Local Sales Offices & Reps

AL Huntsville, Lee Assocs. 205-533-5896
AZ Scottsdale, Dave Menegey Assocs. ... 602-994-9519
CA Hollywood, B. J. Wolfe Entprs. 213-877-5518
CA Walnut Creek, Dale-Dahl Assocs. 415-933-9595
CO Boulder, Measurement Cnslts. 303-449-7506
DC Baltimore, Reptron, Inc. 301-799-7490
FL Osprey, Dick Ridgewell Co. 813-484-2020
IN Indianapolis, EIA, Inc. 317-257-7231
MD Baltimore, Reptron 301-799-7490
MA Wayland, Daner-Hayes 617-655-0888
MI Madison Heights, WKM Assocs. 313-588-2300
MN Minneapolis, Trask Engrg. 612-537-2434
MO St. Louis, Ozark Elctrn. Mktg. 314-423-7200
NH Wilton, Daner-Hayes, Inc. 800-225-8760
NJ Glen Gardner, Daner-Hayes, Inc. 800-225-8760
NM Albuquerque, Amonette Entprs. 505-344-4143
NY Brewster, Daner-Hayes, Inc. 800-225-8760
NY Rochester, Daner-Hayes, Inc. 800-225-8760
OH Dayton, WKM Assocs 513-434-7500
OH Pittsburgh, WKM Assocs. 412-892-2953
OK Edmond, Data Aids Assocs. 405-478-5000/01
PA Doylestown, Daner-Hayes, Inc. 800-225-8760
PA Pittsburgh, WKM Assocs. 412-892-2953
TX Austin, Data Aids 512-327-8600/01
TX Dallas, Data Aids 214-620-1551
UT Salt Lake City, Measurement Cnslts. .. 801-364-3174
VT White River Junction, Daner-Hayes, Inc. 800-225-8760
WA Seattle, Brett Assocs. 206-431-8090

Kulka Smith
A NORTH AMERICAN PHILIPS COMPANY

KULKA SMITH, INC., 1913 Atlantic Ave., Manasquan, NJ 08736, Tel: 201-223-9400, TWX: 244536; Empl.: 500; *Sls. Mgr.:* John Chirico ..... **C•1424-1429**

Local Sales Offices & Reps

AZ Phoenix, Shefler-Kahn Co. 602-257-9015
CA Los Angeles, E E Strassner 818-242-8823
CA Santa Clara, Ross Mktg. Assocs. 408-988-8111
CO Denver, Lindberg Co. 303-758-9033
CT North Haven, Coakley, Boyd & Abbett 800-225-8402
FL Orlando, Hollingsworth & Still, Inc. 305-859-9423
GA Norcross, Hollingsworth & Still, Inc. ... 404-447-1700
IL Lombard, RMP/McBride Corp. 312-932-9090
IL Northbrook, Dolin Sls. 312-498-6770
IN Indianapolis, Electronic Reps., Inc. 317-894-7414
KS Shawnee Mission, Lowell-Kangas & Assocs. 913-631-3515
MA Needham Hgts., Coakley, Boyd & Abbett 617-444-5470
MI Southfield, R. C. Nordstrom & Co. 313-559-7373
MN Minneapolis, Electronic Comp. Sls. 612-933-2594
MO St. Louis, Lowell-Kangas & Assocs. ... 314-821-4050
NH Plaistow, Coakley, Boyd & Abbett 617-444-5470
NJ Clifton, R.O.I. Sls. Co. 201-340-1515
NY Syracuse, Allen, Leonard D., Inc. 315-437-8387
NC Kenersville, Hollingsworth & Still, Inc. 800-241-5712
OH Richfield, Bear Mktg. 216-659-3131
OR Portland, Dale J Weber Co. 503-234-7671
PA Trevose, P.S.A., Inc. 215-245-0513
TX Dallas, Schoonmaker, J. Y. Co. 214-349-1650
WI Milwaukee, D. Dolin Sls. 414-482-1111
Can Rexdale, Ont., Frank Eakin Sls. 416-245-3600

Local Distributors

AZ Tempe, Fisher/Brownell 602-967-1464
CA Alhambra, Fisher/Brownell 818-289-0255
CA Buena Park, Control Design 213-802-1371
CA Buena Park, RPS Elctrns. 714-521-5040
CA Mountain View, Cornett Elctrns. 415-969-5420
CA San Carlos, Control Design 415-592-4808
CA San Diego, Fisher/Brownell 619-560-8545
CA Santa Clara, El-Com Comps. 408-496-0880
CA Santa Clara, Fisher/Brownell 408-988-6041
CO Arvada, Denver Wintronics 303-431-7161
CO Englewood, Industrial Elctrns. 303-694-9444
CT Stratford, Utronics 203-378-4201
CT Wallingford, Midan 203-265-2077
FL Altamonte Springs, Control Design Supp. 305-788-3220
FL Clearwater, Electronic Precepts 813-530-9781
FL Ft. Lauderdale, Peerless Radio/Fla. ... 305-973-4141
FL Miami, Electronic Equip. Co. 305-871-3500
GA Stone Mountain, Control Design Supp., Inc. 404-979-3500
IL Addison, Lectro Comps. 312-543-1680
IL Chicago, Newark Elctrns. 312-784-5100
IL Genoa, Control Design Supp., Inc. 815-784-6515
IL Palatine, OHM Elctrns. 312-359-5500
IL Peoria, Klaus Radio 309-691-4840
IN Indianapolis, Control Design 317-788-4559
IN Indianapolis, Graham Elctrn. Supp. 317-634-8202
IA Cedar Rapids, Deeco, Inc. 319-365-7551
IA Cedar Rapids, Vrbik-Berquist 319-366-8733
IA Marion, Control Design 313-373-2923
KS Wichita, RSC Elctrns. 316-267-5213
KY Louisville, Peerless Elctrn. Equip. 502-637-7677
LA New Orleans, Radio Parts 504-581-5959
LA New Orleans, W. B. Allen Supp. 504-525-8222
MD Baltimore, Resco/Baltimore 301-529-0500
MA Newton, Greene Shaw Co. 617-969-8900
MA Norwood, Gerber Elctrns. 617-769-6000
MI Battle Creek, Great Lakes Elctrns. 616-731-4156
MI Grand Rapids, S. F. Elctrns. 616-459-0216
MN Minneapolis, Control Design 612-721-6555
MN St. Paul, Ragon Elctrns. 612-642-2828
MO Kansas City, Walter Radio Supp. Co. .. 816-531-7015
MO Maryland Hgts., L-Comp., Inc. 314-291-6200
MO St. Louis, Control Design Supp. 314-426-3150
NE Lincoln, Scott Elctrns. Supp. 402-466-8221
NJ Prospect Park, Kappe Electrical Distrs. 201-790-1999
NM Albuquerque, Walker Elctrl. 505-883-2992
NY Bohemia, Key Comps., Inc. 516-567-7500
NY Buffalo, Summit Distrs. 716-884-3450
NY Elmsford, Ancar Elctrns. 914-592-7100
NY Lynbrook, Peerless Radio 516-593-2121
NY Mt. Vernon, Qar Indl. Elctrns. 914-699-2224
NY Rochester, Simcona Elctrns. 716-328-3230
NY Rochester, Summit Distrs. 716-334-8110
NY Rockville Center, Midway Indl. 516-293-6800
NC Charlotte, Control Design Supp. 704-588-4410
NC Raleigh, Southeastern Radio Supp. ... 919-828-2311
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
OH Cincinnati, URI Elctrns. 513-761-4030
OH Cleveland, Roberts Elctrns. 216-238-1711
OH Cleveland, W. M. Pattison Supp. 216-441-3000
OH Columbus, Electronics Mktg. 614-299-4161
OH Dayton, John A. Becker Co. 513-226-1341
OH Dayton, Stotts-Friedman 513-298-5555
OH Warren, Rem Elctrns. 800-262-9050
OK Oklahoma City, Electro Entprs. 405-427-6591
OR Portland, Radar Elec. 503-232-3404
PA Altoona, Allegheny Elctrns. 814-946-0871
PA Harrisburg, Pyttronics 215-643-2850
PA Malverne, Control Design 215-296-0150
PA McKean, Advacom 814-476-7774
PA Philadelphia, Almo Elctrns. 215-698-4000
PA Philadelphia, Shap Elctrns. 215-969-3300
PA Pittsburgh, CAM/RPC Co. 412-782-3770
PA Reading, Barbey Elctrns. 215-376-1451
TN Knoxville, Industrial Elctrns. 615-573-7135
TX Dallas, Force Elctrns. 214-438-5700
TX Fort Worth, Allied Elctrns. 817-336-5401
TX Ft. Worth, Industrial Elctrns. 817-731-7321
TX Houston, Altair Corp. 214-231-5176
TX Houston, Sterling Elctrns. 713-627-9800
TX Richardson, Altair Corp. 214-231-5166
UT Salt Lake City, Ra-Elco 801-487-7749
VA Charlottesville, Virginia Radio Supp. 804-296-4184
WA Seattle, Pacific Elctrns. 206-575-1050
WA Seattle, Radar Elec. 206-282-2515
WI New Berlin, Control Design 414-784-1015
WI New Berlin, RM Wisconsin 414-784-4420
Can Pte. Claire, Que., Future Elctrns. 514-694-7710

KURZ INSTRUMENTS INC.

KURZ INSTRUMENTS, INC., P.O. Box 849, Carmel Valley, CA 93924, Tel: 800-424-7356, Telex: 172275; FSC No.: 94-24-11681; Empl.: 45; *Sls. Mgr.:* Phil Hickerson ..... **B•1800**

Local Sales Offices & Reps

FL Jacksonville, Hile Controls Of Florida 904-268-4880
GA Woodstock, Hile Controls Of Georgia 404-928-6844
IL South Holland, Carrier-Oehler Co. 312-339-8200
KS Mission, Vertec Assocs. 913-677-3200
KY Ft. Mitchell, Giangarlo Sci. Co. 606-341-9570
LA Baton Rouge, Desselle-Maggard Corp. 504-293-3290
MA Newton, ETA Assocs. 617-527-4544
MI Kalamazoo, Giangarlo Sci. Co. 616-345-9182
MN Cedar, Bican Co. 612-434-7733
MO Manchester, Vertec Assocs. 314-394-6242
NJ Clifton, I.R.I. 201-471-2614
NM Albuquerque, A-Tek Co. 505-265-8325
NY Hamilton, Giangarlo Sci. Co. 315-824-1883
NC Matthews, W. K. Hile Co. 704-847-9125
OR Portland, Extech, LTD. 503-292-9219
PA Pittsburgh, Giancarlo Sci., Co. 412-584-0208
TX Houston, Stringer Assocs. 713-469-9209
TN Knoxville, Hile Controls of Tennessee 615-584-0208
UT Salt Lake City, MC2 801-364-3174
VA Chester, Hile Controls Of Virginia 804-796-3001
WA Enumclaw, Extech, LTD. 206-825-2308
WI Milwaukee, Jensen Reynolds Corp. ... 414-351-1100
Can Toronto, Safety Supply Canada 416-364-3234

KURZ-KASCH, Knob Div., 711 Hunter Dr., Wilmington, OH 45177, Tel: 513-382-0966; Empl.: 250; *Sls. Mgr.:* J. McGeady, M. Krystofik

KYOCERA INTL., INC., Elctrn. Comps. Grp., 11425 Sorrento Valley Rd., San Diego, CA 92138, Tel: 619-454-1800, TWX: 910-322-1130; *Sls. Mgr.:* Clif Nehlsen; *Dist. Mgr.:* Bill McKelvy

LAAKMANN ELECTRO-OPTICS, INC., 33052 Calle Aviador, San Juan Capistrano, CA 92675, Tel: 714-493-6624, Telex: 681335; *Sls. Mgr.:* John Wheeler

LAB-LINE INSTRS., 15th & Bloomingdale, Melrose Park, IL 60160, Tel: 312-450-2600, Telex: 270-312; Empl.: 225

LABORATORY PRODUCTS, INC., 57 Cornwall St, P. O. Box 1750, Jamaica Plain, MA 02130, Tel: 617-522-7800; FSC No.: 04-2593524; Empl.: 9; *Sls. Mgr.:* R. J. Toronto

LAFRANCE CORP., Entprs & Exec Aves, Philadelphia, PA 19153, Tel: 215-365-8000, Telex: 83-1732; *Sls. Mgr.:* James Craig

LAFRANCE CORP., PACTEC DIV., See PacTec Div., LaFrance Corp.

LA MARCHE MFG., 106 Bradrock Dr., Des Plaines, IL 60018, Tel: 312-299-1188, Telex: 28-2526; FSC No.: ;15736; Empl.: 225

LAMBDA ELECTRONICS, Veeco Instr., Inc., 515 Broad Hollow Rd., Melville, NY 11747, Tel: 516-694-4200, TWX: 510-224-6484; Empl.: 1200; *Sls. Mgr.:* R. Koslow

LAMBDA SEMICONDUCTORS, Veeco Instr., 121 International Dr., Corpus Christi, TX 78410, Tel: 512-289-0403, 800-255-9606, TWX: 910-876-1404; Empl.: 200; *Sls. Mgr.:* Derek Roberts

LAMP TECHNOLOGY, INC., 141A Central Ave., Farmingdale, NY 11735, Tel: 516-454-6464, Telex: 645543; Empl.: 10; *Sls. Mgr.:* Edith Reuter

LAMPTRONIX CO., LTD., 85 N. Williams St., Crystal Lake, IL 60014, Tel: 815-455-0400, Telex: 280191; FSC No.: 61342; *Sls. Mgr.:* Nancy E. Towe

Local Sales Offices & Reps

FL Orlando, Over & Over Florida, Inc. 305-857-4057
IL Addison, Engineered Sls. 312-832-8425
IN Noblesville, W.G. Brouillette & Assocs. 317-345-6500
KS Wichita, D & O Engrg. 316-686-2802
NJ Haddonfield, Gray Assocs. 609-429-5300
TN Antioch, Over & Over, Inc. 615-834-0140
WA Lynwood, Blum & Assocs. 206-775-6656

LAMTECH ELECTRONICS, 620 Easy Street, Garland, TX 75042, Tel: 214-272-3504; Empl.: 100; *Sls. Mgr.:* Phillip Rasor; *Dist. Mgr.:* Phillip Rasor ..... **C•1845**

Local Sales Offices & Reps

TX Dallas, Zonk & Assocs. 214-238-7651
TX Houston, Zonk & Assocs. 713-895-9131

LANCE INDS., P.O. Box 4156, Sylmar, CA 91342-0156, Tel: 818-367-1811, Telex: 66-2443; *Sls. Mgr.:* Jerry Updyke; *Dist. Mgr.:* Joe Barris

LANCE WIRE & CABLE, INC., 1010 Sherman Ave., Hamden, CT 06514, Tel: 203-288-5571; Empl.: 50; *Sls. Mgr.:* Bill Kahler

LANCORE TECHNOLOGIES, INC., 31324 Via Colinas, Westlake Village, CA 91362, Tel: 818-991-5100, Telex: 532044

LANDIS & GYR, INC., 4 Westchester Plaza, Elmsford, NY 10523, Tel: 914-592-4400, Telex: 137345; FSC No.: 914-592-1179; Empl.: 65; *Sls. Mgr.:* Joe Depaola; *Dist. Mgr.:* R. W. Strohm

L & L SPECIAL FURNACE, 166 Kent Rd., Aston, PA 19014, Tel: 215-459-9216, Telex: 753264; Empl.: 20; *Sls. Mgr.:* Greg Lewicki; *Dist. Mgr.:* Stephen Lewicki

L & R MFG. CO., 577 Elm St., Kearny, NJ 07032, Tel: 201-991-5330, Telex: 642078 Ellanar Krny.; Empl.: 220; *Sls. Mgr.:* Bruce Bernardo

LANGLEY, P.O. Box 2911, San Diego, CA 92112, Tel: 619-264-3181; FSC No.: 83549; Empl.: 140; *Sls. Mgr.:* A. Kremm

LANSING

LANSING RESEARCH CORP., 705 Willow Ave., Ithaca, NY 14850, Tel: 607-272-3265, 800-847-3535; *Sls. Mgr.:* Fred B. Widding ..... **C•1069**

LA POINTE INDUSTRIES, INC., Electronics Products Div., 155 W. Main St., Rockville, CT 06066, Tel: 203-872-8581, TWX: 710-435-1663; FSC No.: 70117; Empl.: 650

LARK ELECTRONICS, INC., Box 390, New York, NY 10040, Tel: 212-569-0430; FSC No.: 52682

LARK ENGINEERING CO., 26401 Calle Rolando, San Juan Capistrano, CA 92675, Tel: 714-493-9501, TWX: 910-596-1411; FSC No.: 33175; Empl.: 40

LARSON INSTR., Greenbush Rd., Orangeburg, NY 10962, Tel: 914-359-3800; Empl.: 18; *Sls. Mgr.:* A. D. Stephens

LASER APPLICATIONS, 91 Carver Ave., Westwood, NJ 07675, Tel: 201-664-7636; Empl.: 5

LASER CONCEPTS, Omega Organization Intl., P.O. Box 687, Mercer Island, WA 98040, Tel: 206-232-6256; *Sls. Mgr.:* Sheila Chatelaine

LASER DIODE LABS, 1130 Somerset St., New Brunswick, NJ 08901, Tel: 201-249-7000, TWX: 710-998-0597; *Sls. Mgr.:* Steve Klunk

LASER INC., Laser Lane, Box 537, Sturbridge, MA 01566, Tel: 617-347-7314, Telex: 95-1806; Empl.: 110; *Sls. Mgr.:* William H. Shiner

LASER PRECISION CORP., 1231 Hart St., Utica, NY 13502, Tel: 315-797-4449, Telex: 646803; Empl.: 110; *Sls. Mgr.:* Don Sypek

LASERSONICS POWER SUPPLY OPERATION, 177 N. Wolfe Rd., Sunnyvale, CA 94086, Tel: 408-732-9880 ..... **D•1719**

LASER TECHN., 10624 Ventura Blvd., N. Hollywood, CA 91604, Tel: 818-763-7091; Empl.: 18; *Sls. Mgr.:* H. B. McLaughlin

LATTIN RADIO LABS., 1431 Sweeney, P.O. Box 44, Owensboro, KY 42302, Tel: 502-683-2868; Empl.: 3; *Sls. Mgr.:* Wm J. Lattin

LAWRENCE-CROW ELCTRNS. INC., 2100 Stemmons, Dallas, TX 75207, Tel: 214-749-5440, Telex: 730213; *Sls. Mgr.:* Jesse Hall; *Dist. Mgr.:* Michael T. McAndrews

L-COM INC., 1755 Osgood St., Unit 11EM, N. Andover, MA 01845, Tel: 617-682-6936, Telex: 882157; Empl.: 14; *Sls. Mgr.:* Mark W. Tomkins; *Dist. Mgr.:* Mark W. Tomkins ..... **C•1846-1847**

Local Sales Offices & Reps

CA	Anaheim, Galaxie Sls. Intl.	714-937-5622
CT	Middletown, Gerber Sls.	203-347-3000
FL	Apopka, G. F. Bohman Assoc., Inc.	305-886-1882
IL	Chicago, Ed Joyner & Co.	512-320-1200
KS	Kansas City, BC Elctrns. Sls.	913-342-1211
MA	Newton Upper Falls, Gerber Sls.	617-969-2620
MO	Bridgeton, BC Elctrns. Sls.	314-291-1101
NJ	Marlton, Naudain Assoc.	609-983-5300
NY	Great Neck, F & F Metro, Inc.	516-482-4080
NY	Rochester, Lamb Comps., Inc.	716-323-1250
NY	Syracuse, Lamb Comps., Inc.	315-455-2469
TX	Houston, Repmasters-Houston	713-692-8204
TX	Sherman, Repmasters-Dallas	214-247-6236

Local Distributors

CA	Los Angeles, Electric Switches	213-660-1310
GA	Atlanta, A.P. Sales	800-624-5496
IL	Chicago, Classic Comp. Supp.	800-842-5149
MA	Canton, Impact Sls.	617-821-1500
MA	Newton Upper Falls, In-Stock Prods.	617-964-6200
MI	Brighton, A.P. Sls.	313-229-6550
NY	Victor, Add Elctrns.	716-924-4760
OH	Dayton, Televox	513-294-4499
TN	Knoxville, Mac-One	615-690-6221

LDJ INCORPORATED, 2200 Stephenson Hwy., P.O. Box 219, Troy, MI 48099-0219, Tel: 313-528-2202, TWX: 810-232-1509 LDJ TRMI; Empl.: 63; *Sls. Mgr.:* Jim Ling ..... **D•1260**

LEACH®
CONTROL PRODUCTS DIVISION

LEACH CORP., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, Tel: 714-739-0770, TWX: 910-596-2867; Empl.: 220; *Sls. Mgr.:* Ron Zimmerman; *Dist. Mgr.:* Ron Zimmerman ..... **A•1378-1379, 1678-1679; B•1428-1429**

Local Sales Offices & Reps

AL	Huntsville, Brandel-Stephens & Co., Inc.	205-883-0445
AZ	Tempe, ELEC-COM Assocs.	602-967-8644
CA	Granada Hills, C & W Comps. Sls.	213-368-4032
CA	San Mateo, Halbar Assocs.	415-349-4700
FL	Orlando, Donato & Assocs.	305-352-0727
GA	Atlanta, Brandel-Stephens & Co., Inc.	404-261-7579
IN	Carmel, Giesting & Assocs.	317-844-5222
KS	Wichita, BAKA Corp.	316-682-8411
MD	Hunt Valley, Marktron	301-628-1111
MD	Rockville, Marktron	301-251-8990
MA	Woburn, Comp. Techn.	617-933-5390
MI	Farmington Hills, Giesting & Assocs.	313-478-8106
MN	Minneapolis, Comprehensive Tech. Sls.	612-888-7011
NJ	Englewood Cliffs, Leach Corp.	201-567-6795
NY	Fayetteville, R. D. Sherman	315-637-9861
NC	Greensboro, Brandel-Stephens & Co., Inc.	919-275-9059
OH	Cincinnati, Giesting & Assocs.	513-521-8800
PA	Trevose, PSA, Inc.	215-245-0513
TX	Dallas, Caton Sls.	214-661-5792
VA	Charlottesville, Marktron	804-973-5874
VA	Charlottesville, Marktron	301-251-8990
WA	Bellevue, Leach Corp.	206-746-7263
Can	Kirkland, Que., Robin Aerospace Prods., Ltd.	514-694-1315

Local Distributors

AZ	Tempe, Time Elctrns.	602-967-2000
CA	Anaheim, Time Elctrns.	714-937-0911
CA	Sunnyvale, Time/Nor-Cal.	408-734-9888
CA	Torrance, Time Elctrns. West	213-320-0880
FL	Ft. Lauderdale, Time Elctrns. - FL	305-974-4800
GA	Atlanta, Electro Air Corp.	404-351-3545
MD	Columbia, Time Elctrns.	301-964-3090
MA	Woburn, Time/New Eng.	617-935-8080
MO	St. Louis, Time Midwest	314-391-6444
NY	Hauppauge, Time Elctrn. Sls.	516-273-0100
PA	Broomall, Time/Mid-Atlantic	215-359-1200
TX	Dallas, Electro Air Corp.	214-385-0566
WA	Bellevue, Electro-Air/NW	206-641-3640
WA	Redmond, Pan Pacific Elctrns.	206-881-7252

LEACH®
RELAY DIVISION

LEACH CORP., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003, Tel: 213-232-8221, TWX: 910-321-2303; FSC No.: 35344; Empl.: 630; *Sls. Mgr.:* S. Whitcomb; *Dist. Mgr.:* D. Robinson ..... **B•1430-1435**

Local Sales Offices & Reps

AZ	Tempe, Elec-Com Assocs.	602-967-8644
CA	San Mateo, Halbar Assocs.	415-349-4700
CO	Denver, Quorum 3	303-696-8480
FL	Orlando, Donato & Assocs.	305-352-0727
FL	Palm Harbor, Donato & Assocs., Inc.	813-785-3327
GA	Atlanta, Craft Assocs.	404-256-0420
IN	Fort Wayne, Denton Mktg.	219-627-5525
KS	Wichita, BAKA Corp.	316-682-8411
MD	Hunt Valley, Marktron	301-628-1111
MD	Rockville, Marktron	301-251-8990
MA	Woburn, Comp. Techn.	617-933-5390
MN	Minneapolis, Comprehensive Tech. Sls.	612-888-7011
MO	Ferguson, Leach Corp.	314-524-2880
NJ	Englewood Cliffs, Leach Corp.	201-567-6795
NY	Fayetteville, R. D. Sherman	315-637-9861
OH	Dayton, Leach Corp.	513-434-8151
PA	Trevose, PSA, Inc.	215-245-0513
TX	Dallas, Caton Sls.	214-243-4716
UT	Sandy, Quorum 3: Sls. Grp., Inc.	801-943-9227
VA	Charlottesville, Marktron	804-973-5874
WA	Bellevue, Leach Corp.	206-746-7263
Can	Kirkland, Que., Robin Aerospace Prods.	514-694-1315
Can	Mississauga, Ont., Robin Aerospace Prods.	416-673-1666

Local Distributors

AZ	Tempe, Time Elctrns.	602-967-2000
CA	Anaheim, Time Elctrns.	714-937-0911
CA	Chatsworth, Time Elctrns.	818-998-7200
CA	San Diego, Time Elctrns.	619-586-1331
CA	Sunnyvale, Time/Nor-Cal	408-734-9888
CA	Torrance, Time Elctrns. West	213-320-0880
CO	Englewood, Time Elctrns.	303-850-7701
CT	Cheshire, Time Elctrns.	203-271-3200
FL	Ft. Lauderdale, Time Elctrns.-Fla.	305-974-4800
FL	Orlando, Time Elctrns.	305-841-6565
GA	Atlanta, Electro Air Corp.	404-351-3545
MD	Columbia, Time Elctrns.	301-964-3090
MA	Woburn, Time/New Eng.	617-935-8080
MN	Bloomington, Time Elctrns.	612-944-9192
MO	St. Louis, Time/Midwest	314-391-6444
NY	Hauppauge, Time Elctrn. Sls.	516-273-0100
OR	Portland, Time Elctrns.	503-664-3780
PA	King of Prussia, Time/Mid-Atlantic	215-337-0900
TX	Dallas, Time Elctrns.	214-385-0566
WA	Bellevue, Time Elctrns.	206-641-3640
WA	Redmond, Pan Pacific	206-881-7252

LEADER INSTRS. CORP., 380 Oser Ave., Hauppauge, NY 11788-3694, Tel: 516-231-6900, TWX: 510-227-9669; Empl.: 42; *Sls. Mgr.:* B. Storch; *Dist. Mgr.:* A. Ambrosio

LEA DYNATECH, INC., 12516 Lakeland Rd., Santa Fe Springs, CA 90670-9990, Tel: 213-944-0916, TWX: 910-586-1381; FSC No.: 57499; Empl.: 35

Local Sales Offices & Reps

AL	Huntsville, FM Assocs. Ltd.	205-882-0689
AZ	Phoenix, Indl. Prods. Corp.	602-954-7300
CA	Burbank, Biztek Co., Inc.	213-766-4890
CA	Mountain View, Leddy Assocs.	415-969-6313
CO	Boulder, Abco, Inc.	303-444-1173
CT	Hamden, Applied Meas.	203-288-5288
DC	Washington, Instrucom	202-223-1759
FL	Jupiter, FM Assocs. Ltd.	305-746-2996
GA	Atlanta, FM Assocs. Ltd.	404-451-2293
HI	Honolulu, Nustate Aircon	808-839-1212
IN	Fort Wayne, Century Dynamics, Inc.	219-486-2681
KS	Lenexa, C & C Sls.	913-888-6200
LA	Baton Rouge, Fogarty Engrg. Co.	504-928-3372
ME	Waterville, Kentrol	207-873-7741
MI	Birmingham, Thibodeau Engrg.	313-642-6620
MN	St. Paul, Knox Assocs.	612-488-5402
MO	Bridgeton, Electro Mech. Assocs.	314-291-7661
NM	Albuquerque, Industrial Prods. Corp.	505-256-3561
NY	Lynbrook, Puleo Elctrns., Inc.	516-599-4875
NC	Ramseur, FM Assocs., Ltd.	919-824-2196
OH	Wickliffe, Walter J. Brauer & Assocs.	216-943-0601
PA	Warminster, Multi-Meas., Inc.	25-675-3082
TX	Houston, Texas Tech. Prods. Co.	713-526-0656
TX	Midland, Total Flow Meas.	915-694-1567
VT	Bennington, Applied Meas., Inc.	802-422-2222
WA	Seattle, R. W. Campbell, Inc.	206-622-3403
WY	Casper, ABCO, Inc.	307-577-1851

LEAR SIEGLER, INC., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406, Tel: 213-452-5444, TWX: 910-343-6463; Empl.: 30,860

LEAR SIEGLER, INC., Elctrn. Instr. Div., 714 N. Brookhurst St., Anaheim, CA 92803, Tel: 714-774-1010, TWX: 910-591-1157; Empl.: 256; *Sls. Mgr.:* J. Horgan ..... **C•1430**

Local Sales Offices & Reps

CA	San Diego, Qualtronics	619-695-0118
GA	Atlanta, Grady Duckett	404-451-3529
IL	Chicago, Mauer Co.	312-677-4771
IN	Indianapolis, Elctrn. Sls. & Engrg.	317-849-4260
MA	Haverhill, L.K. Harmon	617-373-1313
MI	Detroit, Hummon Assocs.	313-474-0661
MN	Minneapolis, Paul Ericson & Assocs., Inc.	612-884-1969
NJ	Bellmawr, Mid Atlantic Corp.	609-931-5303
NY	Syracuse, C. W. Floring & Assocs.	315-478-2149
NY	Williston Park, ABC Elec.	516-747-6610
OH	Cleveland, Geotronix	216-526-2535
TX	Austin, Alphatech, Inc.	512-458-9179

Local Distributors

CA	Placentia, Local Sls., Inc.	714-993-1800
IL	Evanston, Mauer Co.	312-677-4771
Intl	Eng., Eastleigh Hants, BICC Vero Elctrns.	TWX 851-47-551
Intl	Japan, Tokyo, Hakuto Co.	TWX 78-12-2912
Can	Kingston, Ont., Elctrn. Pkg. Sys.	613-549-5152

LEASAMETRIC, INC., 1164 Triton Dr., Foster City, CA 94404, Tel: 415-574-4441; *Sls. Mgr.:* David Sobo

LEBOW CO., 5960 Mandarin Ave., Goleta, CA 93117, Tel: 805-964-7117; *Sls. Mgr.:* Sharon J. Neiman

LEBOW PRODUCTS, Eaton Corp., 1728 Maplelawn Rd., Troy, MI 48084, Tel: 313-643-0220, TWX: 810-232-4818; Empl.: 110; *Sls. Mgr.:* Michael J. Parker

LECROY RESCH. SYS. CORP., 700 S. Main St., Spring Vly., NY 10977, Tel: 914-425-2000, TWX: 710-577-2832; Empl.: 300; *Sls. Mgr.:* Henry Bickel

LECROY RESCH. SYS. CORP. (CAL.), 1806 Embarcadero Rd., Palo Alto, CA 94303, Tel: 415-856-1800, TWX: 910-373-1791; *Sls. Mgr.:* Andy Keyser

LECTROHM DIV. OF CAPCO, INC., Box 1028, Grand Junction, CO 81502, Tel: 303-243-8480, TWX: 910-929-6989; Empl.: 110

LECTRO MAGNETICS, INC., 6056 W. Jefferson Blvd., Los Angeles, CA 90016, Tel: 800-325-9814, 213-870-9383; FSC No.: 29098; Empl.: 60; *Sls. Mgr.:* Bill DeSalle

LECTROTECH, INC., 5810 N. Western Ave., Chicago, IL 60659, Tel: 312-769-6262; Empl.: 42

LEDCO DIV., 240 Plato Blvd., St. Paul, MN 55107, Tel: 612-222-2791, TWX: 910-563-3679; FSC No.: 55292; Empl.: 300; *Sls. Mgr.:* Laurie Wilbrecht

LEDEX INC., P.O. Box 427, Vandalia, OH 45377, Tel: 513-898-3621, Telex: 28-8228, TWX: 810-450-2526; FSC No.: 81840; Empl.: 500; *Sls. Mgr.:* T. C. Ristoff ..... **B•1462, 1468-1470, 1612-1614**

Local Sales Offices & Reps

AL	Huntsville, A. B. Andrews & Co.	205-539-6817
AZ	Scottsdale, Arcom Sls.	602-947-5745
CA	San Diego, Interstate Mktg. Assoc.	619-292-8117
CA	Saratoga, Testco Co.	408-253-1900
CA	Woodland Hills, Interstate Mktg. Assocs.	818-883-7606
CO	Boulder, Front Range Mktg.	303-443-4780
CT	Bloomfield, SIR Assoc.	203-243-9343
FL	Largo, Techn. Mktg. Assocs.	813-536-3796
FL	Melbourne, Techn. Mktg. Assocs.	305-676-3776
FL	Orlando, Techn. Mktg. Assocs.	305-857-3760
FL	Pompano Beach, Techn. Mktg. Assocs.	305-942-0774
IL	Elk Grove Village, Control Sls.	312-595-2110
IN	Greenwood, Valentine & Assoc.	317-888-2260
IN	South Bend, Valentine & Assoc.	219-288-7070
KS	Leawood, Thunderbird Tech. Sls. & Svcs.	913-642-7220
KS	Wichita, Thunderbird Tech. Sls. & Svcs.	316-684-3941
MA	Bedford, SIR Assocs.	617-275-5550
MN	Bloomington, Merrill Franklin Co.	612-854-9446
MO	Maryland Heights, Thunderbird Tech. Sls. & Svcs.	314-567-6488
NY	Clark Mills, KLM-Garner Co.	315-853-6126
NY	N. Syracuse, KLM-Garner Co.	315-458-6214
NY	Oceanside, Bittan Assocs.	516-678-6222
NY	Pittsford, KLM-Garner Co.	716-381-8350
NC	Research Triangle Park, A. B. Andrews & Co.	919-544-1762
OH	Cleveland, Del Steffen & Assoc.	216-461-8333
OH	Dayton, Del Steffen & Assoc.	513-293-3145
OH	Lexington, Del Steffen & Assoc.	419-884-2313
OK	Tulsa, ION Assocs., Inc.	918-664-0186
PA	Carnegie, Del Steffen & Assocs., Inc.	412-276-7366
PA	King of Prussia, Freedman-Malta Assoc.	215-337-9211
PA	Pittsburgh, Del Steffen & Assoc.	412-276-7366
TX	Austin, ION Assocs., Inc.	512-331-7251
TX	Grand Prairie, ION Assocs., Inc.	214-647-8225
TX	Houston, ION Assocs., Inc.	713-977-4354
UT	Salt Lake City, Front Range Mktg.	801-364-6481
VA	Vinton, A. B. Andrews & Co.	703-890-1128
WA	Bellevue, Testco	206-454-7422
WI	Thiensville, Control Sls.	414-242-4580

LLED T.M.

LEDTRONICS, INC., 4009 Pacific Coast Hwy., Torrance, CA 90505, Tel: 213-534-1505, Telex: 4945454; FSC No.: 8Z410; Empl.: 10; *Sls. Mgr.:* Pervaiz Lodhie .... **B•1083**

Local Sales Offices & Reps

CA	Santa Clara, Cummings & Assocs.	408-247-8656
CA	Woodland Hills, Cummings & Assocs.	818-340-6035
CO	Aurora, Butler Tech. Sls.	303-842-3787
IN	Indianapolis, Shank Elctrn. Mktg. Assocs.	317-842-6204
NE	Lincoln, Creative Concepts	402-474-2033
WI	Brookfield, Electro Tech. Mktg. Assocs.	414-785-9554

LEECRAFT MFG., 21-02 44th Rd., Long Island City, NY 11101, Tel: 718-392-8800, TWX: 710-582-2897; Empl.: 250; *Sls. Mgr.:* Jeff Heller; *Dist. Mgr.:* Harvey Shankman ..... **B•1085-1087**

Local Sales Offices & Reps

AL	Huntsville, Ultra Sls.	205-539-7911
AZ	Phoenix, Dodds & Co., Inc.	602-482-9330
CA	Freemont, Hartfield, Kennan, Freytag	415-863-2200
CA	Los Angeles, Hartfield-Kennan-Freytag	213-225-1318
CA	Union City, Hartfield, Kennan, Freytag	415-471-2493
CT	Ansonia, Zaslow Sls. Co.	203-735-9851
CT	Bloomfield, Zaslow Sls.	203-242-7781
DE	Washington, Dus Co.	215-493-4642
FL	Maitland, D.J. Ellis & Assocs., Inc.	305-645-1101
GA	Decatur, Tenn Tech, Inc.	205-350-0630
IL	Naperville, Electra Sls. Assocs.	312-369-8240
IN	Fort Wayne, Needler Sls. Co., Inc.	219-447-2123
IN	Indianapolis, Needler Sls. Co.	317-255-8056
IA	Cedar Rapids, PMR Corp.	319-362-9177
KS	Overland Park, PMR Corp.	913-381-0004
KS	Wichita, PMR	316-684-4141
KY	Nicholasville, Summers & Mathews	606-885-4943
MA	Westboro, Zaslow Sls.	617-393-8150
MI	Livonia, Electronic Salesmasters	313-591-2433
MN	Minneapolis, Boerger & Assocs.	612-560-3425
MO	St. Louis, PMR Corp.	314-569-1220
NH	Londonderry, Zaslow Sls.	603-432-8907
NY	New York, T.J. Marine	718-392-8800
NC	Charlotte, Robert W. Chapman Co.	704-525-2421
OH	Beachwood, Elctrn. Sls. Masters	216-831-9555
OR	Forest Grove, Doran Sls. Assocs.	503-357-3333
PA	Philadelphia, Naudain Assocs.	609-235-1801
PA	Pittsburgh, Covert & Newman	412-531-2002
RI	Providence, Zaslow Sls.	401-351-0070
TN	Hixson, Shiles & Assocs.	615-877-7725
TX	Bedford, Fralia & Assocs.	817-354-1144
TX	Houston, Fralia & Assocs.	713-772-1572
WA	Redmond, Doran Sls. Assocs.	206-885-1885
WI	Milwaukee, R.F. Kitchern Co., Inc.	414-327-7300
EXP	NY, Long Island City, Leecraft Intl. Corp.	718-392-8800
Can	Scarborough, Leecraft Inds., Ltd.	416-439-6320

Local Distributors

AZ	Phoenix, Aero-Space Southwest, Inc.	602-861-1785
CA	Alhambra, Fisher Brownell	213-289-0255
CA	El Monte, Kimball & Stark	213-444-2594
CA	Los Angeles, Richey Western Elctrns.	213-820-3777
CA	Sacramento, Sacramento Elec.	916-441-4821
CA	San Diego, Richey Western Elctrns.	714-271-4511
CA	Santa Ana, Sunray Lighting, Inc.	714-556-3630
CA	Santa Clara, Fisher Brownell	408-988-6041
CO	Arvada, Denver Wintronics	303-431-7161
CT	Shelton, Century Elec. Supp.	203-736-2684
FL	Miami, Electronic Equip.	305-871-3500
GA	Atlanta, Specialty Dist.	404-873-2521
IL	Champaign, Klaus Radio	217-356-1896
IL	Chicago, Newark Elctrns.	312-784-5100
IL	Niles, Industribution	312-966-5630
IL	Northbrook, Classic Comps.	312-272-9650
IN	Fort Wayne, Graham Elect.	219-423-3422
KS	Wichita, RSC Electronics	316-267-5213
KY	Louisville, P. I. Burks	502-589-3960
LA	New Orleans, Southern Radio	504-524-2343
MI	Ann Arbor, Wedemeyer Elect. Supp.	313-665-8611
MI	Grand Rapids, SF Elctrns.	616-459-0216
MI	Livonia, LWC Distrs.	313-464-7700
MI	Livonia, RS Elctrns.	313-525-1155
MN	Minneapolis, Aero-Space Computer Supps.	612-884-4725
MN	Minneapolis, Newark Elect.	612-331-6350
MO	Kansas City, Electronics Supp.	816-931-0250
MO	Maryland Hgts., LCOMP	314-291-6200
NH	Hudson, C & H Elect.	603-882-1133
NJ	E. Hanover, State Elctrn. Parts	201-887-2550
NJ	Kenilworth, Federated Purchasers	201-272-0505
NJ	Pennsauken, Resco Elctrns.	609-662-4000
NY	Buffalo, Genesee Radio	716-873-9661
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Elmsford, Ancar Elctrns.	914-592-7100
NY	Endwell, ASI Electronics	607-754-3823
NY	Farmingdale, Midway Ind. Elctrns.	516-293-6800
NY	Hempstead, Electronic Equip.	516-538-5510
NY	New York, City Elec.	212-564-5454
NC	Greensboro, Hammond Elctrns.	919-275-6391
OH	Akron, Akron Elctrn. Supp.	216-762-8818
OH	Akron, Sun Radio	216-434-2171
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cincinnati, United Radio	513-761-4030
OH	Cincinnatti, Stotts-Friedman	513-574-7701
OH	Cleveland, Roberts Elctrns.	216-238-1711
OH	Solon, Repco Elctrns.	216-248-8900
OH	Warren, REM Elect.	216-373-1300
PA	McKeesport, Barno Radio	412-462-7574
PA	Philadelphia, Herbach & Rademan	215-426-1700
PA	Philadelphia, PEI/Genesis	215-568-7400
PA	Reading, Barbey Elctrns.	215-376-7451
RI	Providence, Wm. Dandreta	401-861-2800
TN	Kingsport, Radio Elec. Supp.	615-247-8111
TN	Nashville, Electra Distributing	615-329-3971
TX	McKinney, Prime Distributing	214-231-0170
TX	Richardson, Fisher Brownell	214-235-3177
WA	Seattle, Pacific Elctrns.	206-575-1050
WI	Milwaukee, Indl. Elctrns.	414-276-1212

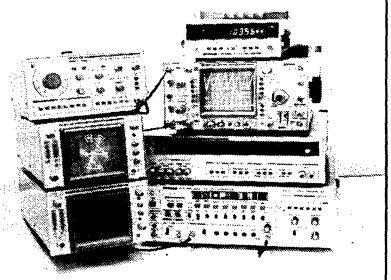
When Quality Counts

LEADER Instruments Corporation

AUTHORIZED DISTRIBUTOR

SUNSHINE

THE SOURCE FOR METERS & TEST EQUIPMENT



Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT
(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area
(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

LEADER Instruments Corporation

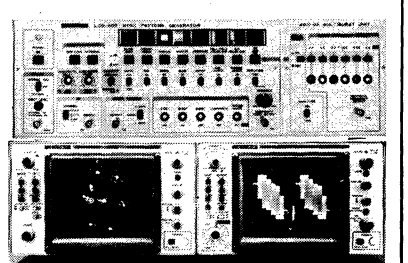
Authorized Distributors

RAG ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



LEE DATA CORPORATION, 7075 Flying Cloud Drive, Minneapolis, MN 55344, Tel: 612-828-0300, TWX: 910-576-1690; Empl.: Approx. 1025; *Sls. Mgr.:* Frederic H. Sweeny

LEEDS & NORTHRUP INSTRS., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454, Tel: 215-643-2000; Empl.: 4800; *Sls. Mgr.:* R. L. Snyder

Local Sales Offices & Reps

AL	Birmingham, Leeds & Northrup	205-823-2610
AL	Mobile, Leeds & Northrup	205-342-8929
AK	Anchorage, Artic Techology, Inc.	907-276-7110
CA	Orange, Leeds & Northrup	714-937-1647
CA	San Francisco, Leeds & Northrup	415-349-6656
CO	Denver, Leeds & Northrup	303-759-2701
CT	Avon, Leeds & Northrup	203-678-0270
FL	Lakeland, Leeds & Northrup	813-646-5014
GA	Atlanta, Leeds & Northrup	404-938-8946
HI	Honolulu, Applied Tech. Svcs.	808-261-4000
IL	Chicago, Leeds & Northrup	312-430-1130
IL	South Holland, Leeds & Northrup	312-596-8480
IN	Indianapolis, Leeds & Northrup	317-259-7161
IA	Bettandorf, Leeds & Northrup	319-355-6481
KY	Louisville, Leeds & Northrup	502-897-0631
LA	Baton Rouge, Leeds & Northrup	504-292-6606
ME	Portland, Leen Co.	207-774-6266
MD	Columbia, Leeds & Northrup	301-995-0494
MA	Boston, Leeds & Northrup	617-326-8816
MA	Dedham, Leeds & Northrup	617-326-8816
MI	Farmington Hills, Leeds & Northrup	313-851-7171
MI	Grand Rapids, Leeds & Northrup	313-455-7070
MN	Minneapolis, Leeds & Northrup	612-933-7372
MO	St. Louis, Leeds & Northrup	314-965-9200
NJ	Union, Leeds & Northrup	201-686-5200
NM	Albuquerque, Trembly Assocs.	504-266-8616
NY	Amherst, Leeds & Northrup	716-834-5547
NY	Lathan, Leeds & Northrup	518-785-1354
NC	Winston-Salem, Leeds & Northrup	919-765-6580
OH	Beachwood, Leeds & Northrup	216-292-0020
OH	Cincinnati, Leeds & Northrup	513-791-2274
OH	Columbus, Leeds & Northrup	614-891-1615
OK	Tulsa, Leeds & Northrup	918-622-4515
PA	Horsham, Leeds & Northrup	215-441-5600
PA	Pittsburgh, Leeds & Northrup	412-561-7808
SC	Columbia, Leeds & Northrup	803-891-1615
TN	Knoxville, Leeds & Northrup	615-693-1838
TX	Dallas, Leeds & Northrup	214-234-3363
TX	Houston, Leeds & Northrup	713-590-1777
TX	Richardson, Leeds & Northrup	214-234-3363
TX	Stafford, Leeds & Northrup	713-491-6000
UT	Salt Lake City, Leeds & Northrup	801-266-6931
VA	Richmond, Leeds & Northrup	804-276-9720
WA	Seattle, Leeds & Northrup	206-451-9028
WV	Charleston, Cavalier Controls, Inc.	304-342-0385
WI	Milwaukee, Leeds & Northrup	414-786-7788
Can	Calgary, Leeds & Northrup	403-290-0951
Can	Montreal, Leeds & Northrup	514-861-2815
Can	Toronto, Leeds & Northrup	416-675-7700

LEEPOXY PLASTICS, 3324 Ferguson Rd., Ft. Wayne, IN 46809, Tel: 219-747-7411; Empl.: 15

LEHIGHTON ELCTRNS., INC., Box 328, Dept M, Lehighton, PA 18235, Tel: 717-386-4156, 215-377-5990; Empl.: 55; *Sls. Mgr.:* George White; *Dist. Mgr.:* George White

LEIGH INSTRS. LTD., Frequency Control Div., C. R. Snelgrove Co., 141 Bond Ave., Don Mills, ON, Canada M3B 1M2, Tel: 416-447-8531, Telex: 06-966626; FSC No.: 02533; Empl.: 158; *Sls. Mgr.:* R. W. Parkins

Local Sales Offices & Reps

AL	Huntsville, A. B. Andrews & Co.	205-539-6817
CA	La Canada, Adanac Co.	213-780-8154
FL	Pompano Beach, V. G. Sls. Co.	305-971-0900
IN	Fort Wayne, Frank Campisano Co.	219-747-2633
MA	Woburn, Radian Assocs.	617-933-7386
NY	Cazenovia, Naylor Elctrns.	315-655-8174
NC	Research Triangle Pk., A. B. Andrews & Co.	919-549-0563
OH	Cincinnati, Frank Campisano & Co.	513-574-7111
VA	Vinton, A. B. Andrews & Co.	703-890-1128

LEKTRALAB TECHNOLOGIES, INC., 129-07 18th Ave., P.O. Box 222, College Point, NY 11356, Tel: 718-939-7171; Empl.: 45; *Sls. Mgr.:* Frank L. Chilton

LEL CO., 5 Burns Pl., Cresskill, NJ 07626, Tel: 201-569-8641; Empl.: 10

LEMO U.S.A., INC., P.O. Box 11488M, Santa Rosa, CA 95406, Tel: 707-578-8811, Telex: 340-933; FSC No.: 2P953; Empl.: 15; *Sls. Mgr.:* David A. Battaglia **C•1431-1439**

Local Sales Offices & Reps

AL	Mobile, Hollingsworth & Still, Inc.	800-241-5712
AZ	Tempe, Trembly Assocs.	602-967-2058
CA	Moraga, Ruppert Sls. & Engrg.	415-376-8040
CA	San Jose, Ruppert Sls. & Engrg.	408-998-8717
CO	Littleton, Omega Ltd.	303-798-7040
FL	Tampa/Ft. Lauderdale, Hollingsworth & Still, Inc.	800-241-5712
GA	Norcross, Hollingsworth & Still, Inc.	404-447-1700
IL	Northbrook, Raines & Assocs.	312-498-0890
IA	Marion, M-S-B Assoc., Inc.	319-377-6261
KS	Shawnee Mission, M-S-B Assoc., Inc.	913-432-2131
MA	Lexington, Zieco	617-861-8300
MI	Detroit, Jack M. Thorpe Co.	313-779-6363
MN	Edina, Electro-Tech	612-927-5878
MO	St. Charles, M-S-B Assoc., Inc.	314-946-5577
NV	Las Vegas, Trembly Assocs.	702-739-9770
NJ	Ho-Ho-Kus, Don J. Fisher Co.	201-652-0090
NM	Albuquerque, Trembly Assocs.	505-266-8616
NY	Cooperstown, Lloyd Hart Assoc.	607-547-9333
NY	Rochester, Lloyd Hart Assocs.	716-244-3253
NC	Charlotte/Kernersville, Hollingsworth & Still, Inc.	800-241-5712
ND	Edina, Electro-Tech	612-927-5878
OH	Chesterland, K/T Depco	216-729-3588
OH	Troy, K/T Depco	513-335-3914
OR	Portland, Earl & Brown Co.	503-245-2283
PA	Doylestown, T.O.E. Sls.	215-348-2212
PA	Pittsburgh, K/T Depco	412-487-8777
SD	Edina, Electro-Tech	612-927-5878
TX	Lewisville, Jim Hughes Co.	214-221-1536
TX	Stafford, Jesse B. Simms - Jim Hughes Co.	713-343-0673
VA	Fairfax, Beacon North, Inc.	703-591-1300
VA	Forest, Beacon North, Inc.	804-239-8486
WA	Seattle, Earl & Brown Co.	206-284-1121
Can	Oakville, Ont., Paltronics, Ltd.	416-844-2233, 800-387-7969

LENCO ELCTRNS., INC., 1330 Belden St., McHenry, IL 60050, Tel: 815-344-2900; *Sls. Mgr.:* Lenard J. Duncan **A•2164-2165**

Local Sales Offices & Reps

AZ	Phoenix, Vari Tron Sls. Co.	602-992-3438
CA	Northridge, Myco Sls.	818-886-7101
CA	Palo Alto, TriRep	415-965-1822
FL	Lighthouse Point, NPM Assocs.	305-941-4586
IL	McHenry, Mesa Inc.	815-344-2820
KS	Mission, McAllister Assocs.	913-262-5500
MA	Framingham, Stone Comps.	617-875-3266
MI	Farmington Hills, KRW Sls.	313-476-6090
MI	Grand Rapids, KRW Sls.	616-363-2925
NJ	Oak Ridge, P.G. Assocs.	201-697-0128
NC	Fripp Island, NPM Assocs.	803-838-4438
OH	Columbus, KRW Sls.	614-464-1861
OH	Westlake, KRW Sls.	216-871-7521
PA	Oakmont, KRW Sls.	412-261-1323
TX	Dallas, Seaton Corp.	214-380-0414

LENCO ELCTRNS., INC., 300 N. Maryland St., Jackson, MO 63755, Tel: 314-243-3147, TWX: 910-760-1382; Empl.: 70; *Sls. Mgr.:* Robert N. Henson; *Dist. Mgr.:* Mark A. Hill

LENOX-FUGLE ELCTRNS., 100 Sylvania Pl., S. Plainfield, NJ 07080, Tel: 201-756-1164; Empl.: 25; *Sls. Mgr.:* Henry J. Lenox

LENOX INSTR., 265 Andrews Rd., Trevose, PA 19047, Tel: 215-322-9990, TWX: 710-670-1440; Empl.: 40; *Sls. Mgr.:* William Lang

LENOX LASER, 504 Pittsfield Rd., Lenox, MA 01240, Tel: 413-637-0444; *Sls. Mgr.:* Joe D'Entremont; *Dist. Mgr.:* Joe D'Entremont

LENZ ELECTRIC MFG. CO., 1751 N. Western Ave., Chicago, IL 60647, Tel: 312-276-4454

LEONARD ELEC. PRODS., 85 Industrial Dr., Brownsville, TX 78521, Tel: 512-546-1625; Empl.: 150; *Sls. Mgr.:* Andrew C. Smith

Local Sales Offices & Reps

IL	Arlington Heights, The Russell Co.	312-394-5560
MA	Andover, Crawford Assoc.	617-470-2122
NC	Raleigh, J & B Sls.	919-878-8600
TN	Tullahoma, J & B Sls.	615-455-7487
TX	Dallas, Russell Parrott Sls.	214-827-9456

LEPCO, See Leonard Elec. Prods.

LEPEL, 59-21 Queens-Midtown Expwy., Maspeth, NY 11378, Tel: 718-426-4580, Telex: 12303; Empl.: 200; *Sls. Mgr.:* Richard Sutton

LESTRONICS, INC., 1840 Industrial Circle, Longmont, CO 80501, Tel: 303-443-6250, 800-525-6478, TWX: 910-320-0786; *Sls. Mgr.:* Ed Lippert

LEXICON CORP. OF MIAMI, 1541 N. W. 65th Ave., Ft. Lauderdale, FL 33313, Tel: 305-792-4400, TWX: 510-955-4130; FSC No.: 7025-0011; Empl.: 68; *Sls. Mgr.:* Barry Sleight

LEXIDATA CORP., 755 Middlesex Tpke., Billerica, MA 01865, Tel: 617-663-8550, 800-472-4747, TWX: 710-347-1574; Empl.: 30; *Sls. Mgr.:* Lou Gennaro

LFE, Process Control Div., 55 Green St., Clinton, MA 01510, Tel: 617-835-1000, Telex: 20-0156, TWX: 710-347-1734; FSC No.: 20905; Empl.: 1500; *Sls. Mgr.:* Ray Grande; *Dist. Mgr.:* B. Pugsley (East.)E. Stuart (West.)

LH RESEARCH, INC., 14402 Franklin Ave., Tustin, CA 92680, Tel: 714-730-0162, TWX: 910-595-2540; Empl.: 620; *Sls. Mgr.:* Dennis Pouliot

LIBBY OWENS-FORD, 811 Madison Ave., Toledo, OH 43695, Tel: 419-247-4797; Empl.: 225

LIBERTY CONTROLS, 500 Brookforest Ave., Shorewood, IL 60435, Tel: 815-725-2241, TWX: 910-633-1557; Empl.: 60; *Sls. Mgr.:* Cliff Strain **B•1472-1473**

Local Sales Offices & Reps

AL	Huntsville, R. W. Mitscher Co.	205-852-7676
CA	Arcadia, H.M.C. Inc.	818-447-0958
CA	Redwood City, Ault Assocs.	415-367-1710
CO	Englewood, Dynatech, Inc.	303-773-2830
CT	Guilford, A & M Elctrns., Inc.	203-453-1612
MA	Needham Hgts., A & M Elctrn.	617-444-8170
FL	Pompano Beach, Bolton Assocs.	305-781-8887
GA	Lawrence, R. W. Mitscher Co.	404-923-3239
IL	Downers Grove, Splon Assocs.	312-963-7011
IN	Ft. Wayne, Menze Sls., Inc.	219-747-5616
IA	Cedar Rapids, Dy-Tronix, Inc.	319-377-8275
KS	Witchita, Dy-Tronix, Inc.	316-838-0884
MI	Grand Rapids, R. P. Urban & Assocs.	616-245-0511
MN	St. Paul, Countryman Assocs.	612-645-9151
MO	Bridgeton, Dy-Tronix, Inc.	314-291-4777
MO	Raytown, Dy-Tronix, Inc.	816-356-6340
PA	Blue Bell, Tech-Parts	215-628-3200
NY	Buffalo, R. W. Mitscher Co., Inc.	716-633-7970
NY	Lynbrook, H. L. J. Comptech, Inc.	516-599-2999
NY	Pittsford, R. W. Mitscher Co.	716-586-4012
OR	Portland, SPS Elctrns., Inc.	503-297-6919
NC	Raleigh, R. W. Mitscher Co.	919-848-0941
TN	Johnson City, R. W. Mitscher Co.	615-282-6240
TX	Dallas, Reese & Assocs.	214-351-0703
UT	Layton, Dynatech, Inc.	801-546-4837
VA	Midlothian, R. W. Mitscher Co.	804-744-4676
WA	Redmond, SPS Elctrns., Inc.	206-323-4140

LIBERTY INTL. CORP., 2539 237th St., Suite F, Torrance, CA 90505, Tel: 213-539-6452, Telex: 182421 LIBERTY TRNC; Empl.: 5; *Sls. Mgr.:* Gary Lee

Local Sales Offices & Reps

CA	San Diego, A & D Sys., Inc.	619-485-7600
CO	Parker, The Remington Grp.	303-690-1760
MA	Waltham, Del Tech Sls.	617-894-4550
PA	Doylestown, Monteiro Assocs., Inc.	215-345-5855
MD	Ocean Pines, Monteiro Assocs., Inc.	301-289-2015

LIBERTY MIRROR, Libbey-Owens-Ford Co., 851 Third Ave., Brackenridge, PA 15014, Tel: 412-224-1800; *Sls. Mgr.:* Martin F. Wenzler **B•1212**

LICON DIV., Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634, Tel: 312-282-4040, Telex: 4330130, TWX: 910-221-0275; Empl.: 350; *Sls. Mgr.:* A. Steiner; *Dist. Mgr.:* A. Steiner

LIEBERT CORP., Programmed Power Div., 995 Benicia Ave., Sunnyvale, CA 94086, Tel: 408-245-8900, Telex: 499-1039; Empl.: 200; *Sls. Mgr.:* C. R. Harris

LIGHTNING PROTECTION CORP., Box 6086, Santa Barbara, CA 93160, Tel: 805-967-5089/4577; FSC No.: 56618; Empl.: 25; *Sls. Mgr.:* Chester J. Kawiecki

Advertisement

LIGHTNING PROTECTION CORPORATION designs and manufactures lightning and surge (including EMP) arresters, protectors, suppressors, and gas tube spark gaps for protection of electronic and electrical equipment against damaging voltage spikes and surge currents. AC and DC Power Arresters, Gas Tube Protectors, Co-Ax Arresters, special and unusual Hybrid Protectors.

LIGHTWAVE COMMUNICATIONS, INC., Sub. of Harbor Electrns., 650 Danbury Rd., Ridgefield, CT 06877, Tel: 203-438-3591, TWX: 710-467-0699; *Sls. Mgr.:* Timothy C. Gressett

LINCOLN INSTRS., 456 W. Montana St., Pasadena, CA 91103, Tel: 818-798-0733; Empl.: 11; *Sls. Mgr.:* Barbara J. Burchette ..... **D•1361**

Local Sales Offices & Reps

CA	Pasadena, Lincoln Instrs.	818-798-0733
CA	Westminster, Transducer Systems Co.	714-840-5357
MA	Burlington, Intersell	617-273-3844
OH	Cleveland, Tiby Co.	216-371-5335

LINCOLN LASER CO., 234 East Mohave, Phoenix, AZ 85004, Tel: 602-257-0407, Telex: 165-718; FSC No.: 602-257-0728; *Sls. Mgr.:* Robert S. Nehrbas, Jr.

LINDEN ULTRANSONICS, INC., 55 Harvey Rd., Londonderry, NH 03053, Tel: 603-434-4323; *Sls. Mgr.:* Forest Kimball

LINDGREN RF ENCLOSURES, INC., 1228 Capitol Drive, Addison, IL 60101, Tel: 312-628-9100, Telex: 254708 dfld; FSC No.: 18234; Empl.: 52; *Sls. Mgr.:* Dennis Wallach ..... **C•1726**

Local Sales Offices & Reps

CA	Santa Fe Springs, Wallace & Wallace	213-945-2908
CO	Wheatridge, Westek Data Prods., Inc.	303-431-9876
FL	Clearwater, Brennan Assocs., Inc.	813-446-5006
FL	Melbourne Beach, Brennan Assocs., Inc.	305-724-0854
FL	Sunrise, Brennan Assocs., Inc.	305-741-1245
ID	Boise, Alster Comms.	208-362-1272
IL	Park Ridge, Electronic Instr. Assocs., Inc.	312-298-2290
IN	Indianapolis, Electronic Instr. Assocs., Inc.	317-257-7231
MN	Stillwater, Ned Gordon & Assocs.	612-430-1572
NJ	Ocean, Gordon & Wallach	201-922-3014
NM	Albuquerque, Industrial Prods. Corp.	505-256-3561
NY	Ocean, Gordon & Wallach, Inc.	201-922-3014
OH	St. Marys, Thomas Shelby & Co., Inc.	419-394-3377
OR	Hillsboro, Alster Comms.	503-640-4819
TX	Dallas, Tech Rep Mktg.	214-241-2434
UT	Salt Lake City, Westek Data Prods., Inc.	801-261-0999
VA	Springfield, Tech Reps, Inc.	703-569-6868
WA	Olympia, Alster Comms.	206-754-7965
EXP	Durham, Sequence, (USA) Co., Ltd.	919-489-1146

LINEAR INSTRS., 500 Edison Way, Reno, NV 89502, Tel: 702-786-3636, Telex: 170044; Empl.: 75; *Sls. Mgr.:* Don Hobbs

LINEAR MOTIONS CO., 17025 Dubesor St., Valinda, CA 91744, Tel: 818-918-7806; FSC No.: 5945; Empl.: 6; *Sls. Mgr.:* L. Wolby

LINEAR TECHNOLOGY CORP., 1630 McCarthy Blvd., Milpitas, CA 95035, Tel: 408-942-0810, Telex: 499-3977; *Sls. Mgr.:* Steve Pass

LINEAR TECHNLG., P.O. Box 489, Sta. "A", Burlington, ON, Canada L7R 3Y3, Tel: 416-632-2996, Telex: 061-8525; Empl.: 105; *Sls. Mgr.:* D. F. Clifton

LINE ELEC. PRODS., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033, Tel: 203-659-3573, Telex: 643-067; FSC No.: 07065; Empl.: 100; *Sls. Mgr.:* Teo Babun; *Dist. Mgr.:* Roland Dombroski

Advertisement

Complete line of standard relays, solenoids, time delay relays, buzzers and accessories. We're specialists in custom relays and solenoids to meet your specific needs. All manufacturing done in USA. World's smallest solenoid in TO-5 transistor package, U-frame and cylindrical solenoids. Plug-in, power, sealed, latching relays and many more.

Local Sales Offices & Reps

CO	Denver, Quorum 3: Sls. Grp., Inc.	303-696-8480
FL	Tampa, G. F. Electro-mechanical	813-962-3671
GA	Marietta, Levine Lectronics & Lectric	404-956-8148
MA	Andover, Crawford Assocs.	617-470-2122
MI	Brighton, Elctrn. Sources, Inc.	313-227-3598
MN	Minneapolis, A. J. Warner Co., Inc.	612-729-7371
MT	Bigfork, B. L. Peck & Assocs.	406-837-5092
NJ	Wayne, Ramapo Mfr's. Agt.	201-839-6767
UT	Sandy, Quorum 3: Sls. Grp., Inc.	801-943-9227
VA	Front Royal, Electron Sls., Ltd.	703-635-7201
WI	Elm Grove, Key Entprs., Inc.	414-784-3390
Intl	Philadelphia, EMSI	215-925-3910

Local Distributors

AZ	Phoenix, Electro Comps. Distrs, Inc.	602-258-2665
CA	Los Angeles, Master Distrs.	213-452-1229
CA	San Leandro, Electro Comps. Distrs, Inc.	415-352-5210
CO	Denver, Mundix Control	303-296-1790
CT	Hartford, Hatry Elctrns.	203-527-1881
CT	New Haven, Hatry Elctrns.	203-787-5921
FL	Miami, ESL Elctrn. Distrs.	305-633-6973
GA	Norcross, A-A Elec Co.	404-449-8670
IN	Indianapolis, Graham Elctrns.	317-634-8202
MA	Lynn, Land Elctrns. Supp., Inc.	617-592-2220
NY	Baldwinsville, Scibetta Distrs.	315-622-3993
OH	Cincinnati, Cincinnati Controls, Inc.	513-421-4460
OH	Cincinnati, Graham Elctrns.	513-772-1661
OH	Cleveland, Specialized Comp. Sls. Co., Inc.	216-464-0405
OR	Portland, P&R Inds.	503-641-9525
TX	Dallas, Wilkinson Brothers, Co.	214-941-9963
WI	Green Bay, Beemster Elec. Co.	414-437-3238
EXP	Philadelphia, Electro-Mechanical Sys. Int.	215-925-3910

LINEMASTER SWITCH, Box 52, Woodstock, CT 06281, Tel: 203-974-1000, TWX: 710-434-7412; FSC No.: 979180; Empl.: 190

LINSEIS
MEASUREMENT INSTRUMENTATION

LINSEIS, INC., P.O. Box 666, Princeton Junction, NJ 08550, Tel: 609-799-6282 (in N.J.), Toll Free 1-800-RECORDER, Telex: 843-360; *Sls. Mgr.:* Andreas Sasinski ... **D•1405**

Local Sales Offices & Reps

AL	Birmingham, Gaines & Co.	205-822-3010
AZ	Phoenix, Scientific Dvcs. West	602-957-0401
CA	Huntington Beach, Scientific Dvcs. West	714-840-3501
CA	Los Angeles, Elotek Sys.	213-416-9190
CA	Marina Del Rey, LINSEIS CORP.	213-306-3112
CA	Orange County, Elotek Sys.	714-830-4856
CA	San Diego, Elotek Sys.	714-830-4856
CA	Santa Clara, Johnson Assocs.	408-984-4626
CO	Bloomfield, Scientific Dvcs. West	303-469-5145
IL	Northfield, Nomad	312-446-2725
NM	Albuquerque, Scientific Dvcs. West	505-293-3494
NY	Frankfort, Kapital Instr. Sls.	315-894-4245
NC	Burlington, P. J. Nahser Co.	919-226-8053
OH	Dayton, Hocker Assocs.	513-253-3642
OR	Portland, Extech, Ltd.	503-292-9219
TX	Lewisville, Milestek, Inc.	214-436-1597
UT	Scientific Dvcs. West	801-966-0105
VA	Fairfax, Scientific Assocs.	703-385-0600
WA	Bellevue, Extech, Ltd.	206-454-7628
Can	Calgary, Alb., AIM Instrs. Ltd.	403-230-2721

LION PRECISION, 60 Bridge St., Newton, MA 02195, Tel: 617-969-4710, TWX: 710-335-1280; FSC No.: 25404; Empl.: 30; *Sls. Mgr.:* R. A. Reichstein

LISK, G. W., CO., 2 South St., Clifton Springs, NY 14432, Tel: 315-462-2611, Telex: 685-4113; Empl.: 200; *Sls. Mgr.:* R. A. Nelson; *Dist. Mgr.:* R. A. Nelson

LITE-ON CORP., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248, TWX: 910-860-9316; FSC No.: 214-385-0145; Empl.: 1100; *Sls. Mgr.:* Jack P. Haesly; *Dist. Mgr.:* R. W. Morrison

Littelfuse®

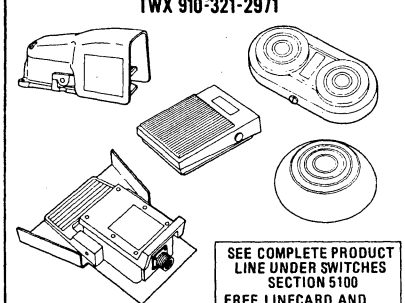
LITTELFUSE, INC., Sub. of Tracor, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, Tel: 312-824-1188, Telex: 910-233-4977, TWX: 310-433-0250; Empl.: 2500; *Sls. Mgr.:* Milan Bagel; *Dist. Mgr.:* Michael Budde ..... **B•1088, 1224, 1240-1246, 1616-1617**

Local Sales Offices & Reps

AL	Mobile, Hollingsworth & Still	800-241-5712
AZ	Tempe, Clemick & Assocs.	602-820-0297
AZ	Tucson, Clemick & Assocs.	602-749-4003
AR	Little Rock, Erickson Sls.	501-225-7379
CA	Burlingame, Wm. J. Purdy	415-347-7701
CA	Carmichael, Wm. J. Purdy	916-484-1565
CA	Costa Mesa, Berman-Gravley	714-549-2122
CO	Denver, Wm. J. Purdy	303-753-6800
CT	Cheshire, C. Segel	203-272-6497
FL	Clearwater, Hutto-Hawkins-Pereqoy	813-797-4447
FL	Maitland, Hutto-Hawkins-Pereqoy	305-831-2474
FL	Pompano Beach, Hutto-Hawkins-Pereqoy	305-971-5750
GA	Norcross, Hollingsworth & Still	404-447-1700
IL	Mt. Prospect, C. P. Dombrow	312-253-3326
IN	Indianapolis, L. M. DeVoe	317-842-3245
KS	Overland Park, T. L. Dowell & Assocs.	913-648-7373
LA	Chalmette, Erickson Sls.	504-271-1976

LINEMASTER
Footswitch
AUTHORIZED DISTRIBUTOR

E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

MD Laurel, RW Mitscher 301-498-6090
MD Rockville, Mid-Atlantic Sls. 301-279-0684
MD Silver Spring, Mid-Atlantic Sls. 301-593-7749
MA Newtonville, C. Segel 617-969-6900
MI Farmington Hills, RC Merchant 313-476-4600
MI St. Joseph, R. C. Merchant 616-983-7378
MN Edina, M. Foster Tech. Sls. 612-941-9790
MO St. Louis, T. L. Dowell & Assocs. 314-849-4234
NJ Englewood, Baum & Epstein 201-569-7600
NM Albuquerque, Wm. J. Purdy 505-266-7959
NY Buffalo, R. W. Mitscher 716-633-7970
NY New York, Baum & Epstein 212-564-4105
NY Pittsford, R. W. Mitscher 716-586-4012
NY Rochester, R. W. Mitscher 716-227-0839
NC Charlotte, Hollingsworth & Still 800-241-5712
NC Kernersville, Hollingsworth & Still 800-241-5712
OH Richfield, Bear Mktg. 216-659-3131
OR Portland, J. V. Belusko 503-222-4279
PA Harrisburg, Beil & Whitaker 717-564-6900
PA Narberth, Bresson Assocs. 215-664-6460
PA Orefield, Beil & Whitaker 215-395-0150
TX Dallas, Elcom Mktg. 214-241-2166
TX Dallas, Erickson Sls. 214-739-5833
UT Salt Lake City, Wm. J. Purdy 801-486-8557
VA Midlothian, R. W. Mitscher 804-744-4676

LITTON APPLIED TECHNOLOGY, 645 Almanor Ave., P.O. Box 3478, Sunnyvale, CA 94088-3478, Tel: 408-773-0777, TWX: 910-339-9271; Empl.: 1700; *Sls. Mgr.:* J. Timm

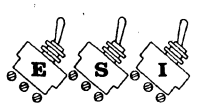
LITTON ENCODER DIV., 20745 Nordhoff St., Chatsworth, CA 91311, Tel: 818-341-6161, TWX: 910-494-1229; FSC No.: 17080; Empl.: 350 ..... **B•1801**

Local Sales Offices & Reps
AZ Phoenix, Clifton Precision 602-242-0910
CA Cupertino, Clifton Precision 408-996-7507
CA Los Angeles, Clifton Precision 818-347-0603
CO Aurora, Midwest Meridian Corp. 303-341-7550
FL Longwood, Boetto Corp. 305-331-1771
IL Elk Grove Village, Midwest Meridian Corp. 312-640-9540
IA Cedar Rapids, Midwest Meridian Corp. 319-365-6561
MN Prior Lake, Midwest Meridian 612-447-8222
MO Maryland Heights, Midwest Meridian Corp. 314-878-4441
NY Chappaqua, R. M. Glueck Assocs. 914-238-3233

LITTELFUSE

MILITARY SPECIFICATION
INDUSTRIAL AND COMMERCIAL

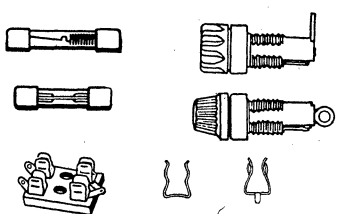
FULL LINE
AUTHORIZED DISTRIBUTOR



ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

OH Fairborn, Midwest Meridian Corp. 513-879-7100
OR Beaverton, Ravencraft 503-646-9261
PA Clifton Heights, Clifton Precision 215-622-1000
TX Fort Worth, Midwest Meridian Corp. ... 817-654-2132

LITTON INDUSTRIES, Electron Tube Div., 1035 Westminster Dr., Williamsport, PA 17701, Tel: 717-326-3561

LITTON POTENTIOMETER DIV., 750 So. Fulton Ave., Mt. Vernon, NY 10551, Tel: 914-664-7733, TWX: 710-562-0129; FSC No.: 04454;Multiple; Empl.: 300; *Sls. Mgr.:* E. R. Cubbin

LITTON SYSTEMS, INC., Electron Dvcs. Div., 960 Industrial Rd., San Carlos, CA 94070, Tel: 415-591-8411, Telex: 910-376-4900

LITTON SYS. INC., Winchester Elecs/Use Co, 13536 G Saticoy St., Van Nuys, CA 91409, Tel: 213-786-9381, Telex: 67-4088, TWX: 910-495-1700; FSC No.: 88245; Empl.: 250; *Sls. Mgr.:* E. Wallen

LIXI, INC., 1438 Brook Dr., Downers Grove, IL 60515, Tel: 312-620-4646, Telex: 6871077, TWX: 910-991-3903; *Sls. Mgr.:* Joseph Plevak

LMB HEEGER, INC., 2946 E. 11th St., Los Angeles, CA 90023, Tel: 213-261-0382; *Sls. Mgr.:* Robert Heeger

LNR COMMUNICATIONS, INC., 180 Marcus Blvd., Hauppauge, NY 11788, Tel: 516-273-7111, TWX: 510-227-9871; FSC No.: 51049; Empl.: 200

LOCKHEED ELECTRONICS, 1830 NASA - RD1, Houston, TX 77058, Tel: 713-483-3471

LOCUS, Box 740, State College, PA 16804, Tel: 814-466-6275; Empl.: 260; *Sls. Mgr.:* J. E. Hess

LODE SYSTEMS, 3501 Ryder St., Santa Clara, CA 95051, Tel: 408-732-5110; *Sls. Mgr.:* Douglas Cox

LOGICAL DESIGN GROUP, INC., 541 Pylon Dr., Raleigh, NC 27606, Tel: 919-834-8827; Empl.: 7; *Sls. Mgr.:* Linda Thacker; *Dist. Mgr.:* Linda Thacker

LOGICAL TECHNICAL SVCS., Instr. Div., 675 Prospect St., Trenton, NJ 08618, Tel: 609-393-2222

Distributor

LOGICOMP ELECTRONICS, INC., 895 Mamaroneck Ave., Mamaroneck, NY 10543, Tel: 914-698-9332, 800-431-2625 .....pgs. **614, 635, 651, 661, 684, 702, 736, 761, 789,**

LOGICOMP ELCTRNS., INC., See Pres-Air-Trol Corp.

LOGIC TECHNOLOGY, INC., 2452 Charleston Rd., Mtn. View, CA 94043, Tel: 415-967-1007; FSC No.: 51019

LOGIMETRICS, 121-03 Dupont St., Plainview, NY 11803, Tel: 516-349-1700, TWX: 510-221-1833; FSC No.: 33013; Empl.: 65; *Sls. Mgr.:* Eugene Blum

LOGITEK, INC., 101 Christopher St., Ronkonkoma, NY 11779, Tel: 516-467-4200, TWX: 510-224-6253; FSC No.: 15420; Empl.: 55; *Sls. Mgr.:* David Fischer ..... **B•1436-1437**

Local Sales Offices & Reps
AL Huntsville, Remco 205-533-3763
AZ Scottsdale, Faser Technical Sls. 602-948-4404
CA Woodlands Hills, Craig Assoc. 818-887-2444
CT Hartford, Dynamic Sls. of New England 203-693-6567
FL Coral Springs, HAI Elctrns. 305-752-7520
GA Atlanta, Remco 404-447-6937
KS Wichita, D&O Engrg. Co. 316-686-2808
MA Burlington, Dynamic Sls. of New England 617-272-5676
MI Union Lake, G. L. Ashby Assoc. Inc. ... 313-363-1100
NC Raleigh, Remco 919-847-5079
OH Cleveland, G. L. Ashby Assoc. Inc. 216-461-0826
OH Dayton, G. L. Ashby Assoc. Inc. 513-252-5627
PA Churchville, Dynamic Elctrn. Sls. 215-322-2611
TX Dallas, D&O Engrg. Co. 214-241-3099
VT Burlington, Dynamic Sls. of New England 802-863-6665
WA Seattle, Rep-West 206-283-8351

LONDON CO., See Radiometer Elctrns., U.S.

LORAIN PRODS., 1122 F St., Lorain, OH 44052, Tel: 216-288-1122, Telex: 98-0505, TWX: 810-246-2130; Empl.: 900; *Sls. Mgr.:* M. G. McGuire

LORAL TERRACOM, Div. of Loral Corp., 9020 Balboa Ave., San Diego, CA 92123, Tel: 619-278-4100, Telex: TERRACOM A SDG 18-2774, TWX: TERRACOM SDG 910-335-1202; *Sls. Mgr.:* Michael A. Lapadula

LORANGER MFG., Box 948, Warren, PA 16365, Tel: 814-723-2250, Telex: 914542; Empl.: 350; *Sls. Mgr.:* R. N. Ehrman

LORCH ELCTRNS., 105 Cedar La., Englewood, NJ 07631, Tel: 201-569-8282, TWX: 710-991-9718; FSC No.: 29971; Empl.: 50

LORTEC POWER SYS., INC., 145 Keep Court, Elyria, OH 44035-2214, Tel: 216-327-5050, Telex: 384-868; Empl.: 50; *Sls. Mgr.:* Dale I. Lamirand

LOVE CONTROLS, 1475 S. Wheeling Rd., Wheeling, IL 60090, Tel: 312-541-3232, Telex: 297115; FSC No.: 8L919; Empl.: 120; *Sls. Mgr.:* Harold B. Koenen

LOYOLA CONTROLS INC., 1099 N. Batavia St., Orange, CA 92667, Tel: 714-639-0526

Advertisement

Loyola Controls, Inc. is a leader in the field of Solid State Power Controllers. Units manufactured from 10 amps. to 2000 amps. at 120 to 600 VAC. On/off or time proportioning control, with zero crossover or phase angle firing is featured. Some devices have UL Listing or Recognition. Write/Call for complete catalog.

LPKF PACIFIC INC., LPKF Pacific Gesellschaft fuer internationalen Maschinenhandel m.b.h., 20C Pamaron Way, Novato, CA 94947, Tel: 415-883-1717, Telex: 470875; *Sls. Mgr.:* Juergen Seebach; *Dist. Mgr.:* Juergen Seebach

LPS CHEMICAL PRODUCTS, Holt Lloyd Corp., 4647 Hugh Howell Rd., P. O. Box 3050, Tucker, GA 30084, Tel: 404-934-7800, 800-241-8334, TWX: 810-766-4920; *Sls. Mgr.:* Les Gable

LPS RESCH. LABS, See Holt Lloyd

LSI COMPUTER SYS., 1235 Walt Whitrhan Rd., Melville, NY 11747, Tel: 516-271-0400, TWX: 510-226-7833; FSC No.: 55261; Empl.: 30; *Sls. Mgr.:* Martin J. Essenburg

LTX, LTX Pk. @ University Ave., Westwood, MA 02090, Tel: 617-329-7550, Telex: 4430108, TWX: 710-348-6621; *Sls. Mgr.:* Nick Stadtfeld

LUFF RESEARCH, Box 449, Jackson Hgts., NY 11372, Tel: 718-429-5900; Empl.: 4; *Sls. Mgr.:* R. Scheer

LUFT INSTRS., Hillside Rd., P.O. Box 214, Lincoln, MA 01773, Tel: 617-259-9215, Telex: 247316 RCA; Empl.: 12

LUMITRON, P.O. Box 12, Summit, NJ 07901, Tel: 201-273-8998; FSC No.: 6240; Empl.: 20; *Sls. Mgr.:* Gil Chassie

LUNDY ELCTRNS. & SYSTEMS, INC., 1 Robert La., Glen Head, NY 11545, Tel: 516-671-9000, Telex: 12-6929, TWX: 510-223-0605; FSC No.: 93712; Empl.: 700

LUTECHNOLOGY, INC., 3516 Breakwater Ct., Hayward, CA 94545, Tel: 415-887-1955; *Sls. Mgr.:* James Riggs

LUTRON ELCTRNS., Box 205, Suter Rd., Coopersburg, PA 18036, Tel: 215-282-3800, Telex: 847475, TWX: 510-651-3755; Empl.: 200; *Dist. Mgr.:* D. Savage

LUXO LAMP, Jac Jacobsen Industries, Inc., P.O. Box 951, Port Chester, NY 10573, Tel: 914-937-4433, Telex: 137-336; Empl.: 150; *Sls. Mgr.:* Robert H. Newton

LVC INDS., INC., CO-ORD Switch Div., 23 Hanse Ave., Freeport, NY 11520, Tel: 516-868-1900; FSC No.: 32759; *Sls. Mgr.:* Adam Kiecun ..... **B•1619-1621**

Local Sales Offices & Reps

CA Los Angeles, Dynasales Co. 213-268-1175
MA Ashland, Polytek Assocs. 617-881-4741

Local Distributors

NY Floral Park, Arason's Assocs. 212-343-3339

LWFW, INC. GROUP, 12700 Park Central, Suite 1805, Dallas, TX 75251, Tel: 214-233-5561; Empl.: 38; *Sls. Mgr.:* Bill Lloyd

LXD, INC., 24500 Highpoint Road, Beachwood, OH 44122, Tel: 216-292-3300, Telex: 98-5442 LXD BCWD; Empl.: 100; *Sls. Mgr.:* Gerald G. Gross; *Dist. Mgr.:* Gerald G. Gross

LYNN ELCTRNS., 915 Pennsylvania Blvd., Feasterville, PA 19047, Tel: 215-677-6700, TWX: 510-667-1988; FSC No.: 19151; Empl.: 125; *Sls. Mgr.:* D. Giacomarra

LYN-TRON, INC., 3150 Damon Way, Burbank, CA 91505, Tel: 213-849-6211, 800-423-2734, Telex: 662729; FSC No.: 05791; *Sls. Mgr.:* Alfred C. Redlitz; *Dist. Mgr.:* Alfred C. Redlitz

LYON METAL PRODS., 47 Railroad Ave., Aurora, IL 60507, Tel: 312-892-8941, TWX: 910-232-3132; Empl.: 600; *Sls. Mgr.:* R. R. Bodlund

LZR ELECTRONICS, INC., 8174 Beechcraft Ave., Gaithersburg, MD 20879, Tel: 301-921-9440, Telex: 371-9700 (Plinc); Empl.: 20; *Sls. Mgr.:* Aviva Kelly ..... **D•1716-1718**

Local Sales Offices & Reps

CA Anaheim, Impact Elctrns., Inc. 714-533-1351
CA City of Industry, Pillage Inds., Inc. 818-333-8803
CA Santa Cruz, Le Rep 408-458-0667
CO Englewood, Frontier Rep., Inc. 303-799-6063
CT Guilford, Data Mark, Inc. 203-453-0575
FL Melbourne, Kennedy Assocs. 305-676-6875
IL Chicago, Gaertner & Assocs. 312-593-2332
OH Cleveland, Emil F. Kirik 216-581-7722
OR Portland, Power Sources Unlimited ... 503-292-0820
WA Lynnwood, Power Sources Unlimited 206-784-3336

MABUCHI MOTOR AMERICA CORP., 475 Park Ave. South, New York, NY 10016, Tel: 212-686-3622, Telex: 23-4374, TWX: 968209 MABU UR NYK; Empl.: 6000 ..... **B•1167**

PANAFAX: 212-532-4263

MACHINE COMPONENTS CORP., 70 Newtown Rd., Plainview, NY 11803, Tel: 516-694-7222; FSC No.: 15531; Empl.: 45; *Sls. Mgr.:* D. L. Dubov

Local Sales Offices & Reps

CA N. Hollywood, Crown Elctrns. 213-877-3550
CA San Jose, McFarland Assoc. 408-286-9333
IL Northbrook, Robert Hunter Co. 312-272-6490
IN Indianapolis, Pacer Sls. & Engrg. 317-849-1481
MA Salem, Forbes Eng. 617-744-1693
NY Penfield, W. E. Jordan Technical Assoc. 716-385-4240

MACHLETT LABS., INC., 1063 Hope St., Stamford, CT 06907, Tel: 203-348-7511

MACNEAL-SCHWENDLER CORP., 815 Colorado Blvd., Los Angeles, CA 90041, Tel: 213-258-9111, Telex: 4720462 MSC, TWX: 910-321-2492 MACN SCHW LSA

MACOM INDS., 8230 Haskell Ave., Van Nuys, CA 91406, Telex: 69-1192; Empl.: 31

M/A-COM. CABLE/HOME COMMUNICATIOS COMM/SCOPE COAXIAL CABLE, M/A-Com Inc., P.O. Box 1729, Hickory, NC 28603, Tel: 704-324-2200, 800-438-3331; *Sls. Mgr.:* Stan Lindsay ..... **C•1849-1857**

Local Sales Offices & Reps

CA Merced, Sarah Hanks 209-722-8542
CA Rancho Cucamonga, Mark Manning .. 714-989-7700
CO Aurora, Stan Von Feldt 303-368-8577
GA Lawrenceville, Bob Loveless 404-923-0920
GA Stone Mountain, Tom McMinn 404-294-0161
IL Lake Zurich, Jeff Bixler 312-540-0850
KS Overland Park, Jerry Smith 913-432-8084
MA Worcester, Van Costa 617-756-2333
MN Cottage Grove, Bill Kohrt 612-458-1747
NJ Oakhurst, George Voehl 201-222-6712
NC Rural Hall, Mickey Smith 919-377-9814
OH Dublin, Tony Finger 614-889-6608
PA Warriors Mark, Dave Herrmann 814-692-7212
TX Dallas, Ernie Massei 214-556-0755
WA Bothell, Rich Merel 206-486-8480
WA Edmonds, Ed Foust 206-775-4803

MACOM
CABLE HOME GROUP

M/A-COM CABLE/HOME COMMUNICATION PRODELIN SATELLITE ANTENNA SYSTEMS, M/A-Com, Inc., P.O. Box 468, Newton, NC 28658, Tel: 800-222-1195, 704-464-4141, Telex: 704-830; *Sls. Mgr.:* Dale Sherrill; *Dist. Mgr.:* Phil Cox

M/A-COM LAND MOBILE COMMUNICATIONS, INC., 21 Continental Blvd., Merrimack, NH 03054, Tel: 603-424-3400, TWX: 710-334-3400; Empl.: 44; *Sls. Mgr.:* Jim Flowers

M/A-COM LASER DIODE, INC., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901, Tel: 201-249-7000, TWX: 710-998-0597; *Sls. Mgr.:* Stephen Klunk; *Dist. Mgr.:* Stephen Klunk

M/A-COM MICROWAVE CIRCUITS, INC., South Ave., Burlington, MA 01803, Tel: 617-272-3000, Telex: 94-9464, TWX: 710-332-6789; *Sls. Mgr.:* Norm Brown

M/A-COM MICROWAVE COMPONENTS, INC., M/A-Com, South Avenue, Burlington, MA 01803, Tel: 617-272-3000, Telex: 94-9464, TWX: 710-332-6789; Empl.: 500; *Sls. Mgr.:* Rich Beeber

M/A-COM MICROWAVE POWER DVCS., 330 Oser Ave., Hauppauge, NY 11788, Tel: 516-231-1400, TWX: 510-227-6239; FSC No.: 34874; Empl.: 385

M/A-COM MILLIMETER PRODUCTS, M/A-Com, Inc., Second Avenue, Burlington, MA 01803, Tel: 617-272-3000, Telex: 94-9464; Empl.: 300; *Sls. Mgr.:* A. Carlson

M/A-COM MDM, INC., M/A-Com, 9000 Fullbright Ave., Chatsworth, CA 91311, Tel: 818-700-8400, TWX: 910-494-8400; Empl.: 40; *Sls. Mgr.:* Roger Davidson

M/A-COM OMNI SPECTRA, INC., 21 Continental Blvd., Merrimack, NH 03054, Tel: 603-424-4111, Telex: 6817280, TWX: 710-366-0674; FSC No.: 16179; Empl.: 750; *Sls. Mgr.:* Ernest DeVita; *Dist. Mgr.:* Terri Hastings

M/A-COM OSW, INC., 2626 S. Hardy Dr., Tempe, AZ 85282, Tel: 602-966-1471, Telex: 668-332, TWX: 910-950-1296; *Sls. Mgr.:* David Emerick

M/A-COM PHI, INC., M/A-Com, 1742 Crenshaw Blvd, Torrance, CA 90501, Tel: 213-320-6160, TWX: 910-349-6651; Empl.: 260; *Sls. Mgr.:* Fred McAdara

MAC PANEL

MAC PANEL CO., Box 5027, 216 Pine St., High Point, NC 27262, Tel: 919-884-8111, Telex: 510-926-1542; FSC No.: 16654; Empl.: 80; *Sls. Mgr.:* J. E. Craycroft ..... **C•1712-1713; D•1411**

MACPOWER, 9115 26th Ave., Kenosha, WI 53140, Tel: 414-694-8866; *Sls. Mgr.:* Edward A. Joyner

MACRODYNE, 1004 Princetown Rd., Schenectady, NY 12301, Tel: 518-356-3500; Empl.: 22

MACRO ELECTRONICS CORP., 23 Royalston Lane, So. Setauket, NY 11720, Tel: 516-698-3357; *Sls. Mgr.:* N. Blumenthal; *Dist. Mgr.:* T. Shlisky

MACROLINK, 1500 N. Kellogg Drive, Anaheim, CA 92807, Tel: 714-777-8800, TWX: 910-591-1671; Empl.: 25; *Sls. Mgr.:* Bill Goodale

MACRONETICS, See Veeco Instrs. Inc.

MACROTRONIX, INC., 4016 N. Home St., Mishawaka, IN 46545, Tel: 219-256-5503; *Sls. Mgr.:* Alan S. Benevich

MAG-CON, 1626 Terrace Dr., St. Paul, MN 55113, Tel: 612-633-8820; Empl.: 30; *Sls. Mgr.:* M. Crellin

MAGNATROL VALVE CORP., 67 Fifth Ave., Hawthorne, NJ 07507, Tel: 201-427-4341, Telex: 130357; *Sls. Mgr.:* R. Kretschmer

MAGNAVOX ADVANCED PRODS. & SYS. CO., Magnavox Govt. Indl. Elctrns. Co., 2829 Maricopa St., Torrance, CA 90503, Tel: 213-618-1200, Telex: 674-373, TWX: 910-349-6657

MAGNECRAFT ELEC. CO., 1910 Techny Road, Northbrook, IL 60062-5376, Tel: 312-282-5500, TWX: 910-221-5221; FSC No.: 94696; Empl.: 700; *Sls. Mgr.:* M. A. Steinback; *Dist. Mgr.:* M. A. Steinback ..... **B•1438**

Local Sales Offices & Reps

AL Huntsville, Electronic Mktg. Assocs. ... 205-837-7363
AZ Tempe, Foley, Tallent & Lee 602-438-1564
CA Campbell, Kottmeier Assocs. 408-866-5153
CA Los Angeles, Universal Comp. Corp. .. 213-641-4255
CO Parker, Technology Mktg. Assocs. 303-841-3435
CT Farmington, R. Perron & Co. 203-673-4825
FL Altamonte Springs, Semtronic Assocs. 305-831-8233
FL Clearwater, Semtronic Assocs. 813-461-4675
GA Atlanta, Electrn. Mktg. Assocs. 404-448-1215
IN Carmel, Mktg. Engrs. 312-282-5500
KS Overland Park, Advanced Techn. Sls. 913-642-6675
LA Folsom, McKinney Sls. 504-796-5861
MD Lutherville, Walker-Houck Assocs. 301-296-6021
MA Needham, R. Perron & Co. 617-449-6162
MI Ferndale, Hilltronics 313-398-5556
MN Minneapolis, Elec. Comps. Sls. 612-933-2594
MO St. Louis, Advanced Techn. Sls. 314-227-4448
NH Dover, R. Perron & Co. 603-742-2321
NJ Marlton, B.G.R. Assocs. 609-940-1358
NY Pittsford, W. A. Franklin Sls 716-248-8251
NY West Hempstead, Schmitt Ind. Mkt. ... 516-486-3510
NC Raleigh, Electrn. Mktg. Assocs. 919-847-8800
OH Cleveland, Scott Elec., Inc. 216-473-5050
OH Kettering, Scott Elec., Inc. 513-294-0539
PA Pittsburg, Scott Elec., Inc. 412-963-6116
SC Greenville, Electrn. Mktg. Assocs. 803-233-4637
TX Dallas, McKinney Sls. 214-631-9450
UT Salt Lake City, Techn. Mktg. & Assocs. 801-483-1009
WA Redmond, Quadra Sls. 206-883-3550

MAGNETEK, 7315 Red Deer Dr., Boulder, CO 80301-4696, Tel: 303-442-6700; FSC No.: 58439; Empl.: 36; *Sls. Mgr.:* Ruth E. Forsberg

Local Sales Offices & Reps

CA San Diego, Mesa Engrg. & Sls. Assocs. 619-278-8021
KS Shawnee Mission, Robinson & Assoc. 913-262-1374

MAGNETIC AUDIO/VIDEO PRODUCTS DIV., 3M Co., 3M Center, Bldg. 223-5 South, St. Paul, MN 55101, Tel: 612-733-1110, TWX: 910-563-3712; Empl.: 38,351

MAGNETIC CIRCUIT ELEMENTS, 1540 Moffett St., Salinas, CA 93905, Tel: 408-757-8752; FSC No.: 09349; Empl.: 24

Local Sales Offices & Reps

CA Saratoga, Testco,Inc. 408-253-1900
OR Portland, RTS, Inc. 503-638-5670
WA Vashon, RTS, Inc. 206-285-1363

MAGNETIC COILS, INC., See MCI Transformer Corporation

MAGNETIC DEVICES INC., 5575 Kearny Villa Rd., San Diego, CA 92123, Tel: 619-279-7054; FSC No.: 13786; *Sls. Mgr.:* Dave Loughlin

MAGNETIC INSTRUMENTATION, 8350 E. 48TH ST., Indianapolis, IN 46226, Tel: 317-545-2102, Telex: 27-2111; Empl.: 23 ..... **D•1261**

Local Sales Offices & Reps

CA Aptos, Wasson & Assocs. 408-496-6011
EXP NY, Irvington, Inter Technical Export Corp. 914-591-8822

MAGNETIC METALS CO., Hayes Ave. at 21st St., Camden, NJ 08105, Tel: 609-964-7842, TWX: 710-891-7054; Empl.: 500; *Sls. Mgr.:* Harry Shepherd

MAGNETICO INC., 182 Morris Ave., Holtsville, NY 11742, Tel: 516-654-1166; Empl.: 45 ..... **A•2167**

Local Sales Offices & Reps

CA Woodland Hills, Interstate Mktg. Assoc. 213-883-7606

MAGNETICS, Box 391, Butler, PA 16003-0391, Tel: 412-282-8282, TWX: 710-373-3821; Empl.: 650; *Sls. Mgr.:* J. F. Huth

MAGNETIC SHIELD DIV., Perfection Mica Co., 750 North Thomas Dr., Bensenville, IL 60106, Tel: 312-766-7800, TWX: 910-256-4815; Empl.: 43 ..... **C•1727-1729**

Local Sales Offices & Reps

AZ Phoenix, Howe & Howe Sls., Inc. 602-264-7971
CA Redwood City, Ault Assocs. 415-367-1710
CA Woodland Hills, Cal-Ward Sls. Co. 213-883-2202
CO Thornton, E & C Johnson 303-457-2247
FL Miami, Ludlum Assoc. Co. 305-592-6523
MD Baltimore, Bernard White & Co. 301-484-5400
MA Milton, Naton Assocs. 617-698-0607
MI Farmington, Amtech Reps. 313-474-8300
MN Minneapolis, Josco-Meluis & Assocs. 612-861-3343
NM Albuquerque, IMEC 505-883-9010
NY New York, Kenneth L. Love Assocs. .. 212-541-4885
NY Syracuse, Canavan-Scanlon Assocs. 315-437-1271
OH Cleveland, Bill Teplitz & Co. 216-439-3265
PA Havertown, QRM, Inc. 215-566-6709
TX Bedford, De Armond Ent. 817-268-6821
TX Bedford, De Armond Entprs. 817-268-6821

MAGNETIC SPECS., 10 Albemarle Ave., Trenton, NJ 08638, Tel: 609-883-3150; Empl.: 23

MAGNETIC SYSTEMS, 1021 Pecten Ct., Milpitas, CA 95035, Tel: 408-263-6680

MAGNETIC SYSTEMS, 770 Linden Avenue, Rochester, NY 14625, Tel: 716-385-9010, Telex: 978324; Empl.: 50; *Sls. Mgr.:* Ronald T. Kosmider

MAGNETIC TECHNOLOGY, 21001 Kittridge St., Canoga Pk., CA 91303, Tel: 818-887-7700, TWX: 910-494-1217; Empl.: 150; *Sls. Mgr.:* David Mighdoll ..... **B•1168-1169**

Local Sales Offices & Reps

AZ Fountain Hills, Halbar Assocs. 602-837-2464
AZ Sun Lake, Kachina Assocs. 602-253-7086
CA Los Altos, Servo Data 415-964-1325
CA Los Angeles, Halbar Assocs. 818-246-8263
CT Stratford, Gerald Rosen Co. 203-375-5456
FL Orlando, MacKay, Smith & Assocs. ... 305-277-1513
GA Atlanta, MacKay, Smith & Assocs. 404-449-7444
IL Glencoe, Howard Benjamin Assocs. .. 312-835-0150
MA Framingham, Gerald Rosen Co. 617-879-5505
MN Edina, Techo, Ltd. 612-929-9497
NJ Pennsauken, Vantage Sls. Co. 609-663-6660
OK Tulsa, Norcom 918-832-7747
TX Dallas, Norcom 214-386-4888
TX Houston, Norcom 713-933-6021
WA Redmond, Halber Assocs. 206-882-0990

MAGNETIKA, INC., 4254 Glencoe Ave., Venice, CA 90292, Tel: 213-391-0391

MAGNETOELASTIC DEVICES, 326 Springside Ave., Box 625, Pittsfield, MA 01201, Tel: 413-445-5608

MAGNETRAN CORP., 5701 Savoy Lane, Houston, TX 77036, Tel: 713-785-4202; Empl.: 15

MAGNET SALES & MFG. CO. INC., 11250 Playa Court, Culver City, CA 90230-6127, Tel: 213-391-7213, 800-421-6692; FSC No.: 95-2916141; Empl.: 25; *Sls. Mgr.:* Anil Nanji; *Dist. Mgr.:* Anil Nanji ..... **A•1307**

MAGNOS, Old School House Rd., Harvard, MA 01451, Tel: 617-456-8880; Empl.: 5

MAGNUM ELEC., 6385 Dixie Hwy., Erie, MI 48133, Tel: 313-848-2555, TWX: 810-231-7160; Empl.: 150; *Sls. Mgr.:* Ronald Pitchford; *Dist. Mgr.:* Ronald Pitchford ..... **C•1440-1444**

Local Sales Offices & Reps

AZ Tempe, Delta Elctrns. 602-224-1601
CA Pleasanton, Moulthrop Sls. 415-463-0450
CA Westminster, West Elctrn. Sls. 714-898-0120
CO Englewood, Frontier Representatives 303-799-6063
CT North Haven, Kitchen & Kutchin 203-239-0212
FL Pompano Beach, Hutto-Hawkins-Peregoy 305-971-5750
GA Atlanta, Effective Mktg. Force 404-948-6023
IL Elk Grove Village, Control Sls. 312-595-2110
IN Indianapolis, Marketing Engrs. 317-872-5665
KS Overland Park, Thomas L. Dowell & Assocs. 913-648-7373
MD Pikesville, Imagitron Sls. Co. 301-521-2020
MA Burlington, Kitchen & Kutchin 617-229-2660
MN Brooklyn Center, Willman Assocs. 612-566-5010
MO St. Louis, Thomas L. Dowell & Assocs. 314-849-4234
NJ Perth Amboy, Astrorep, Inc. 201-826-8050
NY Babylon, Astrorep 516-422-2500
NY Rochester, Marchese Marsey & Barden 716-544-4300
OH Beachwood, ESI 216-831-9555
OH Cleveland, Baehr, Greenleaf & Assocs. 216-221-9030
OH Columbus, Baehr, Greenleaf & Assocs. 614-486-4046
OH Dayton, Baehr, Greenleaf & Assocs. .. 513-439-0724
OR Portland, Jos. V. Belusko Co. 503-222-4279
PA Huntingdon Valley, Inacker Sls. 215-947-5660
TX Richardson, Barry Sls. 214-234-0255
WI Thiensville, Control Sls. 414-242-4580

MAGNUM MICROWAVE CORP., 365 Ravendale Dr., Mountain View, CA 94043, Tel: 415-968-9281, Telex: 171596; FSC No.: 59277; *Sls. Mgr.:* David N. Fealkoff

MAGNUM OPUS CUSTOM ELCTRN. ENGRG., 284 Kennedy St., Iselin, NJ 08830, Tel: 201-283-4925; *Sls. Mgr.:* R. Galanty ..... **D•1093**

MAGNUSONIC DEVICES, 290 Duffy Ave., Hicksville, NY 11801, Tel: 516-938-4700, TWX: 510-221-1850; Empl.: 275; *Sls. Mgr.:* M. Stamouli

MAIDA DEVELOPMENT CO., 20 Libby St., Hampton, VA 23663, Tel: 804-723-0785, Telex: 82-3443; Empl.: 299; *Sls. Mgr.:* Edward T. Maida, Frank Thompson ..... **A•1109-1113**

Local Sales Offices & Reps

CA Los Angeles, High Voltage Sls. 213-881-9194
CA Mountain View, West/Mark Assocs. .. 415-969-1700
FL Vero Beach, John Hansen & Assocs. 305-562-2328
MA Burlington, Conti-Younger 617-273-1582
NC Cary, FBD Sls. 919-467-7595
SC Mauldin, FBD Sls. 803-828-2323
VA Portsmouth, FBD Sls. 804-484-3162
WA Seattle, ECCO Mktg. 206-364-0200

MALCO, Div. Microdot Electronic Components Group, 12 Progress Dr., Montgomeryville, PA 18936, Tel: 215-699-5373, Telex: 510-661-8260, TWX: 910-588-3768; *Dist. Mgr.:* J. McLaughlin ..... **C•1446-1449, 1859**

Local Sales Offices & Reps

AL Huntsville, Montgomery Mktg. 205-830-0498
AZ Mesa, Sedco Sls. 602-835-6281
CA Anaheim, Libratronix 714-534-7073
CA Santa Clara, Thresum Assocs. 408-249-7400
CO Longmont, Todd & Fry Assocs. 303-776-7331
CT West Hartford, Pettigrew Co. 203-236-5891
FL Clearwater, WMM Assocs. 813-461-7074
GA Norcross, Montgomery Mktg. 404-447-6124
IL Elk Grove Village, John G. Twist Co. .. 312-593-0222
IN Greenwood, Valentine & Assocs. 317-888-2260
IA Cedar Rapids, S & O Sls. 319-393-1845
MA Woburn, Component Tech. 617-933-5390
MN Bloomington, John G. Twist 612-835-2120
NM Albuquerque, Reptronix 505-292-1718
NY Rochester, Ossman Comps. 716-424-4460
NY Yonkers, Sonkin Assocs. 914-968-8282
NC Cary, Montgomery Mktg. 919-467-6319
OR Beaverton, Blair Hirsch Co. 503-641-1875
PA Hatboro, Jacobsen Assocs. 215-674-2937
TX Dallas, Kruvand Assocs. 214-437-3355
VA Fairfax, Beacon North 703-591-1300
WA Lynwood, Blair Hirsh Co. 206-774-8151
WI Brookfield, John G. Twist Co. 414-782-2670
Can Montreal, Que., Kaytronics, Ltd. 514-367-0101

Local Distributors

AL Huntsville, Hamilton Avnet 205-837-7210
AZ Tempe, Hamilton Avnet 602-231-5100
CA Casta Mesa, Hamilton Avnet 714-754-6111
CA Santa Clara, Pyramid Elctrns. 408-727-9810
CA Sunnyvale, Hamilton Avnet 408-743-3355
CT Danbury, Hamilton Avnet 203-797-2800
GA Norcross, Hamilton Avnet 404-447-7507
IL Bensenville, Hamilton Avnet 312-860-7700
MD Columbia, Hamilton Avnet 301-995-3500
MA Woburn, Hamilton Avnet 617-273-7500
MI Livonia, Hamilton Avnet 313-522-4700
MO Earth City, Hamilton Avnet 314-344-1200
NH Manchester, Yankee Elctrn. Supp. 603-625-9746
NJ Fairfield, Hamilton Avnet 201-575-3390
NJ Old Bridge, BTC Elctrn. Comps. 800-526-2828
NY Hauppauge, Hamilton Avnet 516-231-9800
NY Plainview, Progress Elctrns. 516-443-1700
NY Rochester, Hamilton Avnet 716-474-9130
NY Syracuse, Hamilton Avnet 315-437-2641
OH Cleveland, Hamilton Avnet 216-831-3500
PA Wayne, Peak Elctrn. Corp. 215-293-9000
TX Irving, Hamilton Avnet 214-659-4111
TX Richardson, Southwest Elctrns. 214-234-3050
UT Salt Lake City, Hamilton Avnet 801-972-2800
WA Bellevue, Hamilton Avnet 206-643-3950

MALLORY BATTERY, See Duracell Intl.

MALLORY CAPACITOR CO., Mallory Comps. Grp., 3029 E. Washington St., Indianapolis, IN 46201, Tel: 317-636-5353, Telex: 27-2155, TWX: 687-6015; FSC No.: 317-261-1581; Empl.: 1900; *Sls. Mgr.:* A. E. Irwin; *Dist. Mgr.:* Frank Vendely ..... **A•1114-1115**

Local Sales Offices & Reps

AZ Scottsdale 602-949-7788
CA Los Angeles 714-523-7992
CA San Francisco 415-856-1136
CO Denver 303-457-9373
FL Orlando 305-855-6353
IL Chicago 312-364-5750
IN Indianapolis 317-636-5353
KS Shawnee Mission 913-362-7099
MA Boston 617-872-7776
MI Detroit 313-524-0015
MN Minneapolis 612-884-2881
MO St. Louis 314-291-8223
NJ Hillsdale 201-666-3600
NY Syracuse 315-425-9800
NC Raleigh 919-836-0401
OH Dayton 513-299-5505
OR Portland 503-643-1203
PA Carnegie 412-279-4248
PA Willow Grove 215-657-4250
TN Nashville 615-889-1174
TX Dallas 214-324-2448

MALLORY COMPONENTS DIVISION, Emhart Elec./Elctrn. Grp., 3029 E. Washington St., Indianapolis, IN 46201, Tel: 317-261-1361, Telex: 27-2155; *Sls. Mgr.:* Steve Leykauf; *Dist. Mgr.:* Mike Bland ..... **A•2022**

MALLORY TIMERS, Emhart Elec./Elctrn. Grp., 3029 E. Washington St, Indianapolis, IN 46201, Tel: 317-636-5353, TWX: 317-634-4214; Empl.: 2,000; *Sls. Mgr.:* Bill Miller

MANAGE, INC., Fibre Optics Elctrns. Sys. Grp., P.O. Box 175, 40 Nichols Rd., Chicopee, MA 01014, Tel: 413-598-8204, 592-3834; Empl.: 30; *Sls. Mgr.:* David Menard

M&T CHEMICALS, INC., Woodbridge Rd. & Randolph Ave., Rahway, NJ 07065, Tel: 201-499-0200, Telex: 710-996-5841, TWX: 710-996-5842; Empl.: 1650

MANGER ELEC. CO., INC., W. Henry St, Stamford, CT 06902, Tel: 203-348-7761; Empl.: 100; *Sls. Mgr.:* J. V. Judge

MANHATTAN ELECTRIC CABLE, 225 Passaic St, Passaic, NJ 07055, Tel: 201-779-8900, Telex: 137-387; Empl.: 125; *Sls. Mgr.:* Ed Harvey; *Dist. Mgr.:* Allan Marconi

MANHATTAN ELEC. CABLE CORP., 1 Station Plaza, Rye, NY 10580, Tel: 914-967-8000, Telex: 137-387; Empl.: 125; *Sls. Mgr.:* Edward J. Harvey

MANN, HENRY, INC., 3983 Mann Road, Huntingdon Valley, PA 19006, Tel: 215-355-7200, Telex: 6851160; FSC No.: 215-355-5134; Empl.: 105; *Sls. Mgr.:* Carol Mann; *Dist. Mgr.:* James P. Massi

MANNESMANN TALLY CORP., 8301 S. 180th St., Kent, WA 98032, Tel: 206-251-5500, Telex: 32-0200; Empl.: 450; *Sls. Mgr.:* John Cooper

MANTEX CORP., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051, Tel: 313-628-9711; Empl.: 100; *Sls. Mgr.:* Dennis J. Stepien ..... **B•1727**

Local Sales Offices & Reps

AZ	Phoenix, Cristee-Meade Co.	602-267-7197
CA	Glendale, Halbar Assocs.	213-246-8263
CA	San Diego, Mesa Engr. Sls. Assoc.	619-278-8021
CA	San Mateo, Halbar Assocs.	415-349-4700
CO	Lakewood, Christee-Meade Co.	303-232-0287
IL	Highland Park, Thomas B. Hunter Assoc.	312-433-7000
IN	Indianapolis, S.A.I. Mktg. Corp.	317-241-9276
KS	Leawood, Thunderbird	913-642-7220
KS	Wichita, Thunderbird	316-684-3941
MD	Baltimore, Muncy Sls. Assocs.	301-484-6376
MI	Brighton, S.A.I. Mktg. Corp.	313-227-1786
MN	St. Louis Park, Lestronix	612-926-8466
MO	Leawood, Thunderbird	913-642-7220
MO	Maryland Hgts., Thunderbird	314-567-6488
NH	Salem, Sales Engrg.	603-893-5521
OH	Columbus, S.A.I. Mktg. Corp.	614-454-8942
OH	Dayton, S.A.I. Mktg. Corp.	513-435-3181
OH	Shaker Hgts., S.A.I. Mktg. Corp.	216-751-3633
PA	Pittsburgh, S.A.I. Mktg. Corp.	412-261-0482
TX	Richardson, Thunderbird	214-690-0763
VA	Richmond, Muncy Sales Assoc.	804-288-5720

MANUFACTURING SYS., Div. LeDoux Inds., Inc., 2022-C S. Grand Ave., Santa Ana, CA 92705, Tel: 714-540-6630; Empl.: 6; *Sls. Mgr.:* Larry LeDoux

MARATHON BATTERY CO., 8301 Imperial Dr., Waco, TX 76714, Tel: 817-776-0650, TWX: 910-894-5203 MARATHON WAC; *Sls. Mgr.:* Walter H. Harder

MARATHON FLITE-TRONICS COMPANY, A Marathon Power Technologies Co., 2525 N. Naomi St., Burbank, CA 91504, Tel: 818-841-3210, Telex: 69-1487; Empl.: 65

MARATHON SPECIAL PRODS., 13300 Van Camp Rd., Bowling Green, OH 43402, Tel: 419-352-8441, TWX: 810-499-2988; Empl.: 150; *Sls. Mgr.:* J. Campisi

MARCON AMERICA CORP., 310 Era Drive, Northbrook, IL 60062, Tel: 312-564-2820; FSC No.: 564-1150; Empl.: 9; *Dist. Mgr.:* Helen A. Stubbs ..... **A•1116-1117, 1887**

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech Sls.	205-533-2100
AZ	Tucson, Clemick & Assocs.	602-749-4003
CA	San Jose, K-Lectron	408-942-9177
CO	Denver, Lindberg Co.	303-758-9033
FL	Altamonte Springs, Electro-Comp Assocs.	303-331-0173
FL	Deerfield Beach, Electro-Comp Assocs.	305-429-0802
FL	Melbourne, Electro-Comp Assocs.	305-242-0621
FL	St. Petersburg, Electro-Comp Assocs.	813-327-9677
GA	Norcross, Electro-Mech Sls.	404-447-6478
IL	Des Plaines, Electron Mktg.	312-298-2330
IN	Indianapolis, Insul-Reps	317-251-1994
IA	Marion, M-S-B Assocs.	319-377-6261
KS	Shawnee Mission, M-S-B Assocs.	913-432-2131
MD	Baltimore, Mech-Elec Sls.	301-342-1984
MA	Canton, D. Taggart Assocs.	617-828-6064
MI	Farmington, R. C. Merchant Co.	313-476-4600
MI	St. Joseph, R. C. Merchant Co.	616-983-7378
MN	Eden Prairie, Rockmore Sls.	612-941-1390
MO	St. Charles, M-S-B Assocs.	314-946-5577
NJ	Medford, Mech-Elec Sls.	609-654-8209
NM	Albuquerque, Lindberg Co.	505-881-1006
NY	Kingston, R. P. Kennedy Co.	914-331-0755
NY	Melville, L.I., Comtronic Assocs.	516-249-0606
NY	Rochester, R. P. Kennedy Co.	716-271-1910
NY	Rochester, R. P. Kennedy Co.	716-271-6322
NC	Raleigh, Electro-Mech Sls.	919-851-8165
OH	Cincinnati, Jayenbee Mktg.	513-531-3320
OH	Grafton, Jayenbee Mktg.	216-458-8468
OR	Portland, Harry Levinson Co.	503-245-0902
PA	McLean, E.C.C.O. Elctrn. Sls.	814-476-1376
TN	Knoxville, Insul-Reps	615-691-7586
TN	Nashville, Electro-Mech Sls.	615-885-0073
TX	Austin, Sundance Sls.	512-339-6611
TX	Houston, Sundance Sls.	713-772-4988
TX	Plano, Sundance Sls.	214-867-0592
UT	Salt Lake City, Lindberg Co.	801-467-1794
WA	Seattle, Harry Levinson Co.	206-382-1300

MARCONI INSTRUMENTS, 3 Pearl Court, Allendale, NJ 07401, Tel: 201-934-9050, TWX: 710-991-9752; *Sls. Mgr.:* William E. Bean ..... **D•1262-1264**

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns. Assocs.	205-881-5031
CA	Huntington Beach, Scientific Dvcs. West	714-840-3501
CA	San Jose, Scientific Dvcs. West	408-554-0455
CA	Westminster, Marconi	714-895-7182
FL	Boca Raton, Beacon Electrns. Assocs.	305-392-3500
GA	Atlanta, Beacon Electrns. Assocs.	404-256-9640
IL	Chicago, K.W. Meyers	312-882-4808
IN	Indianapolis, K. Meyers	317-783-1030
MD	Burtonsville, Bekr Inds.	301-421-1200
MA	Stoneham, Ken Corp.	617-926-5525
MN	Minneapolis, K.W. Meyers	612-920-7080
NJ	Elmwood Park, L & M Assocs.	201-797-0441
NM	Albuquerque, Scientific Dvcs.	505-883-3668
NY	New York City, L & M Assocs.	212-243-6155
NY	Whitney Point, Tae-Rep	607-692-3705
NC	Raleigh, Beacon Electrns. Assoc.	919-787-0330
OH	Chesterland, EQS Systems	216-729-2222
PA	Andalusia, L & M	215-245-6658
TX	Dallas, Bradenco	214-243-7261
WA	Marysville, The Western Rep	206-653-6031

MAREL INSTR. CO., 907 South East 13th Pl., Cape Coral, FL 33904, Tel: 813-574-8788; Empl.: 14; *Sls. Mgr.:* T. Swift

MARINE ELECTRIC RPD, INC., See CML Macarr Div. Marine Electric RPD, Inc.

MARINE INDUSTRIAL CABLE CORP., P.O. Box 29207, New Orleans, LA 70189, Tel: 504-254-0754

WILD OATS

MARKAT DIV., Wild Oats Corp., 3 Country Dr., Plainview, NY 11803, Tel: 516-549-9272; Empl.: 228; *Sls. Mgr.:* K. L. Campbell; *Dist. Mgr.:* W. B. Heather

Advertisement

Specialists in the design and manufacturing of Industrial Control Systems of all types. Also manufacturers of the M A R N A V marine navigation system which monitors Loran and satellite systems and all onboard operational instruments to provide instant updates on location and performance.

Local Sales Offices & Reps

AZ	Scottsdale, Southworth Sls.	602-945-3464
IN	Carmel, Hoosier Sls.	317-844-4535
NY	Massapequa Park, Systems Design & Engrg.	516-598-1270
OH	Centerville, Grimm & Co.	513-433-1717

MARKEL CORPORATION

MARKEL CORP., P.O. Box 752, Norristown, PA 19404, Tel: 215-272-8960, TWX: 510-660-0929; FSC No.: 03890; Empl.: 267; *Dist. Mgr.:* E. J. Barth ..... **C•1689**

Local Sales Offices & Reps

AZ	Phoenix, K. Jahn Co.	602-956-9060
AR	Hot Springs, MYA, Inc.	501-262-1365
CA	Anaheim, Indl. Dielectrics	714-776-7411
CA	Berkeley, Riggs/LaMoree	415-841-0601
CA	LA., Natl. Wire & Cable	213-225-5611
CA	Torrance, Insulation Supp.	213-320-9400
CO	Denver, Ward Elec. Supp.	303-572-3541
FL	Lighthouse Point, Jack Krutek & Assoc.	305-941-6544
IL	Naperville, J.J. Glenn	312-961-1902
KS	Overland Park, Mathews	913-642-9063
MD	Glen Burnie, F. Lott	301-744-4611
MA	Waltham, Datcom	617-891-4600
MI	Farmington, L. George & Assoc.	313-474-1505
MN	Edina, PWC	612-933-3393
NJ	Colonia, Heft & Ficarra	201-381-5193
NY	Lynbrook, Heft & Ficarra	516-599-3351
NY	Rochester, Gislason	716-454-4741
OH	Chagrin Falls, Electrolock	216-543-5125
PA	Flourtown, C. Newson	215-248-3377
SC	Greenville, Electrolock Inc.	803-297-9830
TN	Chattanooga, Jackson	615-267-4260
TX	Richardson, C.J. Garvey	214-234-3371
WA	Mercer Is., Electronic Component	206-232-9301
WI	Mequon, Wm. R. Bolles	414-241-3320
EXP	Philadelphia, Markel Corp., Exp. Dept.	215-665-2300

Local Distributors

CA	Berkeley, Riggs/LaMoree	415-841-0601
CA	Los Angeles, Natl. Wire & Cable	213-225-5611
CA	Torrance, Insulation Supp.	213-320-9400
IL	Naperville, J. J. Glenn	312-961-1902
OH	Chagrin Falls, Electrolock	216-543-5125
Can	Mississauga, Ont., Marflex	416-828-0220

MARKEM CORP., 1000 Congress St., Keene, NH 03431, Tel: 603-352-1130, TWX: 710-366-1800; Empl.: 1200; *Sls. Mgr.:* Jack Lyman

MARKENRICH CORP., 14946-A Shoemaker Ave., Santa Fe Springs, CA 90670, Tel: 213-921-0250, Telex: 298727 MARK UR; Empl.: 7

Local Sales Offices & Reps

CA	North Hollywood, Crown Elctrns.	213-877-3550
FL	Melbourne, Electro Mech. Standards	305-724-1027
FL	Sarasota, Electro Mech. Sls.	813-923-2804
GA	Atlanta, Beacon Elctrns.	404-256-9640
IL	Palatine, Somers-Reagan	312-991-1108
IA	Coralville, EPA, Inc.	612-835-9022
MD	Timonium, Heller Sls. Co.	301-252-4780
MA	Reading, Lincoln Tech. Sls.	617-944-9594
MN	Edina, EPA, Inc.	612-835-9022
NJ	Vincentown, Eastern Sci. Mktg.	609-268-0250
NY	Syracuse, I. A. Hotze Assocs.	315-479-6641
OR	Hillsboro, CompRepco	503-796-1350
PA	Chalfont, Eastern Sci. Mktg.	215-822-6503
PA	Montgomeryville, Eastern Sci. Mktg.	215-368-4570
TX	Houston, Spectra Sls.	713-747-2798
TX	Richardson, Spectra Sls.	214-234-3600
VA	Vienna, Eastern Sci. Mktg.	703-281-0778

MARKETING ENGINEERS, INC., 9860 Michigan Rd., Carmel, IN 46032

MARK EYELET & STAMPING, 202 Wakelee Rd., Wolcott, CT 06716, Tel: 203-756-8847, Telex: 69-6191; Empl.: 60; *Sls. Mgr.:* Ed Cyr

MARLEE SWITCH CO., 933-D N. Central Ave., Upland, CA 91786, Tel: 714-982-8988; *Sls. Mgr.:* LeRoy Tichy

MARLOW INDS., 10451 Vista Park Rd., Dallas, TX 75238, Tel: 214-340-4900, TWX: 910-860-5161; FSC No.: 55686; Empl.: 150; *Sls. Mgr.:* Richard J. Buist; *Dist. Mgr.:* David Marlow

MARQUARDT SWITCHES INC., Route 20 East, P.O. Box 465 EEM, Cazenovia, NY 13035, Tel: 315-655-8050, Telex: 703-287-40; FSC No.: 315-655-8042; *Sls. Mgr.:* J. J. Kennedy; *Dist. Mgr.:* R. A. Philipchik ..... **B•1622**

Local Sales Offices & Reps

AL	Huntsville, Electro Sls. Co.	205-830-2715
CA	Los Angeles, Universal Components, Inc.	213-641-4255

CA Santa Clara, M-2 Marketing Group 408-986-0676
CO Lakewood, Cristee Meade Co. 303-232-0287
FL Orlando, Stettner Elctrns., Inc. 305-291-7756
GA Atlanta, Electro Sls. Co. 404-394-1122
IL Rosemont, Stettner Central, Inc. 312-671-4208
IN Fort Wayne, J & B Engrg. 219-483-2813
KS Shawnee Mission, M-S-B Assocs. 913-432-2131
MI Grand Blanc, Inter-Comm 313-695-0665
MN St. Paul, Arkco Sls Co. 612-777-7454
MO St. Louis, M-S-B Assocs. 314-946-5577
NH Nashua, Bell Controls, Inc. 603-882-6984
NJ Freehold, Ballou, Inc. 201-431-0514
NJ Ridgewood, Ballou, Inc. 201-444-6990
NY Cazenovia, S.T./Woolard Co. 315-655-8145
NY Syosset, Ballou, Inc. 516-681-3068
NY Whitestone, Ballou, Inc. 212-352-9233
OK Tulsa, Rem-Air Comps. Corp. 918-742-2559
PA Phoenixville, Gil-Tronics, Inc. 215-933-8525
SC Easley, R-A Sls. Co. 803-859-1859
TN Chattanooga, Electro Sls. 615-267-4260
TX Dallas, Rem-Air Comps. 214-234-1069
UT Sandy, G-M Assocs. 801-532-7501
WA Kirkland, Manon Engrg. 206-827-7449
WI Elm Grove, Key Entpr., Inc. 414-784-3390

Local Distributors

CA Covina, Selecta Switch 213-967-4123
CA Gardena, California Switch & Signal .. 213-770-2330
CA Sunnyvale, Sierra West 408-747-1188
CO Denver, CSID 303-292-9564
FL Lakewood, Switch Controls 813-644-7564
FL West Palm Beach, Nurmi Electrns. 305-686-8553
IL Itasca, Voyager Elctrns. 312-773-4900
IL Rosemont, Central Comps. 312-671-4208
KS Wichita, Radio, Inc 316-264-2798
MI Grand Rapids, S.F. Elctrns. 616-459-0216
MI St.Claire Shores, Spemco 313-771-2700
MN Minneapolis, Control Design Supp. 612-721-1628
MO Maryland Heights, L-Comp 314-291-6200
NJ Garfield, B & R Electronics 201-470-0700
NJ Mt. Laurel, Jersey Switch 609-778-8190
NJ Warwick, Cal-Greg Comp. Inc. 401-738-6170
NC Gastonia, J.M.T. Electronics 704-867-4401
OK Oklahoma City, Radio, Inc. 405-789-0741
OK Tulsa, Radio, Inc. 918-587-9123
OR Beaverton, Murphy Electrns,Inc. 503-642-2001
TX Austin, Southwest Electrns. 512-837-8971
TX Richardson, Southwest Electrns. 214-234-3050
TX Stafford, Southwest Electrns. 713-240-4000
WA Redmond, Murphy Electrns. 206-881-1234

MARTEL ELCTRNS. CORP., 13 Heritage Hill Rd., Windham, NH 03087, Tel: 800-821-0023, 617-275-5970, Telex: 95-1232; *Sls. Mgr.:* David DeVries

MARTIN SOUND PRODS., 28 Alpha Park, Cleveland, OH 44143-2297, Tel: 216-442-2286; Empl.: 2; *Sls. Mgr.:* DeWayne (Bud) Martin; *Dist. Mgr.:* DeWayne (Bud) Martin

MARWAY PRODS. INC., 311 N. Clara St., Santa Ana, CA 92703, Tel: 714-973-1800; FSC No.: 60955; *Sls. Mgr.:* Wayne Whitney ..... **D•1944-1945**

MASTER APPLIANCE CORP., 2420 18th St., Box 68, Racine, WI 53403, Tel: 414-633-7791, Telex: 269-505; FSC No.: 83284; Empl.: 50; *Sls. Mgr.:* G. E. Mertins; *Dist. Mgr.:* G. E. Mertins

MASTER BOND, P.O. Box 522, Teaneck, NJ 07666, Tel: 201-343-8983; FSC No.: 59504; Empl.: 16; *Sls. Mgr.:* James Brenner

MASTER DYNAMICS CORP., 922 California Ave., Sunnyvale, CA 94086, Tel: 408-245-9040

MASTER ELCTRN. CONTROLS, P.O. Box 25905, Los Angeles, CA 90025, Tel: 213-452-1336, Telex: 182041; Empl.: 64; *Sls. Mgr.:* I. Nizam; *Dist. Mgr.:* Bob Kent

MASTERITE CORPORATION, 2841 Lomita Blvd., Torrance, CA 90505, Tel: 213-775-3471, TWX: 910-347-6237; FSC No.: 05041; Empl.: 680; *Sls. Mgr.:* C.J. Huebert; *Dist. Mgr.:* G. Peterson

MASTER LOGIC, 761 E. Evelyn, Sunnyvale, CA 94086, Tel: 408-732-7777; *Sls. Mgr.:* Stephen Allen

MATEC INSTRUMENTS, INC., 60 Metebello Rd., Warwick, RI 02886, Tel: 401-739-9030, Telex: 952101; Empl.: 55; *Sls. Mgr.:* Jerry Zschau

MATERIALS RESCH., Route 303, Orangeburg, NY 10962, Tel: 914-359-4200, Telex: 221862 MRC UR; Empl.: 1,000; *Sls. Mgr.:* Mel Lipton

MATH ASSOCS., 2200 Shames Dr., Westbury, NY 11590, Tel: 516-334-6800; FSC No.: 60373; Empl.: 37; *Sls. Mgr.:* Robert DeLia ..... **B•1124**

Local Sales Offices & Reps

CA Huntington Beach, Seevid 714-898-6100
NM Albuquerque, Cleveland Entprs. 505-265-7893
NC Charlotte, SFI Elctrns. 704-333-0157
TX Houston, Q-Max Mktg. 713-474-2233

Local Distributors

NY Farmingdale, Universal Video 516-420-0224
NY Hempstead, Global Computer Supps. 800-645-6393
PA Uniontown, Allegheny Teleconn Sys. 412-438-0451

MATHEMATICAL APPLICATIONS GROUP/CAD/CAM, 3 Westchester Plaza, Elmsford, NY 10523, Tel: 914-592-4646, Telex: 131644

MATHEMATICAL SYSTEMS DESIGN, INC., 2850 Ocean Park Blvd., Ste. 300, Santa Monica, CA 90405, Tel: 213-450-9851; *Sls. Mgr.:* William E. Schaff

MATRA DESIGN SYSTEMS, 2840-100 Sam Tomas Expressway, Santa Clara, CA 95051, Tel: 408-986-9000, Telex: 299-656; *Sls. Mgr.:* David T. Fletcher; *Dist. Mgr.:* Rex Brooks of Brooks Tech. Grp.

MATRIX CORP., 2260 Distributors Dr., Indianapolis, IN 46241, Tel: 317-248-2036; Empl.: 10 ..... **D•1158**

MATRIX CORP., 1639 Green St., Raleigh, NC 27603; Tel: 919-833-2837; Empl.: 30; *Sls. Mgr.:* Ray Alderman

MATRIX ENGINEERING CORP., 17000 S. Western Ave. 19, Gardena, CA 90247, Tel: 213-770-0521; Empl.: 7

MATRIX SCIENCE CORP., 435 Maple Ave., Torrance, CA 90503, Tel: 213-328-0271

MATRIX
SYSTEMS CORPORATION

MATRIX SYS. CORP., 5177 N. Douglas Fir Rd., Calabasas, CA 91302, Tel: 818-992-6776, TWX: 910-494-4975; Empl.: 50; *Sls. Mgr.:* Randy Sue Rabideau ..... **A•1715**

Local Sales Offices & Reps

AL Huntsville, Reynolds Assoc., Inc. 800-255-1965
AZ Scottsdale, Faser Techn. Sls. 602-948-4404
CA Milpitas, IFM Inc. 415-961-2828
CA N. Hollywood, Crown Elctrns. 213-877-3550
CO Broomfield, Sci. Dvcs. 303-449-9466
CO Broomfield, Scientific Dvcs. 303-469-5145
CT Marion, Poly Tek Assocs. 203-621-7000
CT Marion, Polytek Assocs. 203-621-4542
FL N. Palm Beach, Reynolds Assoc., Inc. 800-251-1965
GA Huntsville, Reynolds Assoc., Inc. 800-255-1965
IL Chicago, Comtel Midwest 312-539-4838
IN Indianapolis, Comtel Midwest 317-253-1681
IA Cedar Rapids, Comtel Midwest 319-377-9434
KS Shawnee Mission, Comtel Midwest ... 913-722-1030
MA Ashland, Poly Tek Assocs. 617-881-4741
MA Falmouth Heights, RJC Assocs. 617-540-8832
MI Southfield, Comtel-Instr. 313-358-2505
MN Wayzata, Comtel Midwest 612-476-1551
MO St. Louis, Comtel Midwest 314-991-5363
NY Mamaroneck, Bassin Tech. Sls. Co. ... 914-698-9358
NC Raleigh, Reynolds Assoc. 800-255-1965
NC Raleigh, Reynolds Assoc., Inc. 800-255-1965
OH Cleveland, Comtel Instr. 216-442-8080
OH Dayton, Comtel Instr. 513-298-7573
OH Hillard, Comtel Instr. 614-876-8305
OR Portland, Topp Engrg. Sls. 206-747-5400
PA Pittsburgh, Comtel Instr. 412-922-5720
TX Carrollton, Seaton Corp. 214-380-0414
VA Fairfax, Schibley Assocs. 703-591-3008
WA Bellevue, Topp Engrg. Sls. 206-747-5400
WI New Berlin, Comtel Midwest 414-544-6042

MATROX ELCTRN. SYS., 1055 St. Regis Blvd., Dorval, QU, Canada H9P 2T4, Tel: 514-685-2630, Telex: 05-822798; Empl.: 250; *Sls. Mgr.:* Ed Dwyer

MATSUO®

MATSUO ELECTRONICS, 2134 Main Street, Suite 200, Huntington Beach, CA 92648, Tel: 714-969-2491, TWX: 910-596-1828; Empl.: 854 ..... **A•1118-1123**

Local Sales Offices & Reps

AL Huntsville, Beacon 205-881-5031
AZ Tempe, Quatra Assocs. 602-820-7050
CA Santa Clara, Logan Sls. 408-496-0660
CO Littleton, Quatra, Inc. 303-795-3187
FL Ft. Lauderdale, Dyne-A-Mark Corp. 305-771-6501
GA Atlanta, Beacon 404-256-9640
IL Chicago, Berndt Assocs. 312-283-0713
IN Indianapolis, Needler Sls. 317-255-8056
IA Cedar Rapids, Palatine Sls. 319-365-8071
KS Mission, Palatine Sls. 913-831-0555
MA Needham, Hatch Assocs. 617-444-3310
MI Warren, DEM Elctrn. Sls. 313-575-9444
MN St. Paul, Proud Inds. 612-646-9428
MO Hazelwood, Palatine Sls. 314-839-0800
NJ Medford, Champion Elctrn. Sls. 609-983-0932
NM Albuquerque, Semi-Systems 505-898-3273
NY DeRuyter, Net Sls. 315-662-7996
NY Fairport, Net Sls. 716-467-4538
NY Seaford, Henry Abbott & Assocs. 516-781-5256
NY Troy, Net Sls. 518-274-4758
NC Raleigh, Beacon 919-787-0330
OH Cleveland, Marlow Assocs. 216-991-6500
OH Dayton, Marlow Assocs. 513-435-5673
OR Beaverton, Caruso & Northcutt 503-646-4973
PA Pittsburgh, Marlow Assocs. 412-367-8886
WA Bellevue, Caruso & Northcutt 206-454-9699
WI Milwaukee, Berndt Assocs. 414-545-8400
Can Markham, Ont., Reptronics 416-474-0111

Local Distributors

AZ Phoenix, TTI 602-861-0222
CA Garden Grove, Natl. Capacitor Supp. .. 714-892-7749
CA Lakeside, Mouser Elctrns. 714-449-2220
CA Mountain View, USI Intl. 415-969-5420
CA N. Hollywood, TTI 213-982-0201
CA San Diego, Mock III 619-560-0515
CA San Fernando, Petell Elctrns. 818-365-9841
CA San Jose, Eric Elctrns. 408-262-1111
CA San Jose, TTI 408-943-9155
CA Santa Ana, Projection Unltd. 714-261-2323
CA Santee, TTI 619-449-2220
CA Sunnyvale, Capsco 408-734-3020
CO Commerce City, Waco Elctrns. 303-289-4743
CO Denver, Waco Elctrns. 303-371-4370
FL Orlando, TTI 305-859-1000
IL Palatine, OHM Elctrns. 312-359-5500
IL Skokie, Kellner 312-677-1120
MA Billerica, A. W. Mayer Co. 617-229-2255
MA Wakefield, Lorcor 617-246-1903
NJ Fairfield, C.H.P.S., Inc. 201-882-0997
NJ Kenilworth, Ventronics 201-272-9262
NY Bohemia, TTI 516-567-1500
NY E. Farmingdale, Tri-Start Elctrns. 516-293-0400
NY Hauppauge, Prime Comps. Corp. 516-582-6258
NY Rochester, Masline Elctrns. 716-546-5373
NY Ronkonkoma, Baldwin Comps. 516-588-5700
NY Ronkonkoma, Prime Comps. 516-737-1730
OH Cleveland, Robert Elctrns. 216-238-1711
PA Norristown, Century Elctrn. Comps. ... 215-631-5400
PA York, Elctr. Comps. for Ind. 717-846-5334
TX El Paso, Era Elctrns. 915-592-4126
TX Ft. Worth, TTI 817-831-0441
WA Kent, Shannon, Ltd. 206-763-0545
Can London, Ont., C.M. Peterson Co. 519-434-3204
Can Scarborough, Ont., Carsten Elctrns. ... 416-495-9999

MAUREY INSTR. CORP., 4555 W. 60th St., Chicago, IL 60629, Tel: 312-581-4555, TWX: 910-221-6025; FSC No.: 03942; Empl.: 50; *Sls. Mgr.:* E. Maurey; *Dist. Mgr.:* Louis Derdzinski ..... **A•2023-2027; B•1170**

Local Sales Offices & Reps

FL Orlando, ASI 305-851-7929
FL Plantation, Innovative Mktg. 305-583-8895
WA Vancouver, Sls. & Engrg. Assoc. 206-573-5161

Local Distributors

CA Garden Grove, Allied Elctrns. 714-554-0731
CA Santa Clara, Allied Elctrns. 408-727-1690
CO Wheatridge, Allied Elctrns. 303-425-7144
CT Ridgefield, PIC 203-451-1533
FL Margate, Allied Elctrns. 305-973-3070
IL Elgin, Allied Elctrns.
MA Wilmington, Allied Elctrns. 617-942-0150
MI Westland, Allied Elctrns. 313-595-6565

MO St. Louis, Allied Elctrns. 314-878-1229
NY Mineola, Allied Elctrns. 516-248-2360
NC Raleigh, Allied Elctrns. 919-821-0415
OH Willoughby, Allied Elctrns. 216-951-0908
OK Tulsa, Allied Elctrns. 918-663-7630
PA Bala Cynwyd, Allied Elctrns. 215-267-6940
TX Ft. Worth, Allied Elctrns. 817-336-5401
TX Houston, Allied Elctrns. 713-932-7321
VA Alexandria, Allied Elctrns. 703-836-5002
WA Seattle, Allied Elctrns. 206-767-5772

MAURY MICROWAVE, 8610 Helms Ave., Cucamonga, CA 91730, Tel: 714-987-4715, TWX: 910-581-3408; FSC No.: 13047; Empl.: 85; *Sls. Mgr.:* M. A. Maury, Jr.

MAXI-SWITCH CO., Sub. of EECO, 9697 East River Rd., Minneapolis, MN 55433, Tel: 612-755-7660, TWX: 910-576-2690; Empl.: 160; *Sls. Mgr.:* Hank Maida; *Dist. Mgr.:* E. C. Helme, Jr.

Local Sales Offices & Reps

AL Huntsville, Montgomery Mktg. 205-830-0498
AZ Scottsdale, Williams Assocs. 602-947-4297
CA Elmonte, Cook Entprs. 213-686-2120
CA Los Altos, Recht Assocs. 415-964-6321
CA Pomona, Cook Entprs. 818-443-5147
CA San Diego, Power Assocs. 619-275-0641
CO Denver, Williams Assocs. 303-373-4730
FL Altamonte Springs, V.G. Sls. 305-831-8688
FL Pompano, V.G. Sls. 305-971-0900
GA Norcross, Montgomery Mktg. 404-447-6124
IN Ft. Wayne, MS Sls. 219-486-3023
IA Cedar Rapids, Harris Hanson 800-231-4343
MD Woodbine, Naudain Assocs. 301-442-2270
MA Westwood, Comp. Rep. Assocs., Inc. .. 617-329-3454
MI Ann Arbor, Dayton Assocs. 313-995-4082
MN Bloomington, Electronic Sls. Agy., Inc. 612-884-8291
MS Michigan City, Jack Fisher Sls 601-224-6470
MO St. Louis, B.C. Elex 314-731-1255
NJ Secaucus, Addem Sls. 201-330-8300
NM Albuqurque, Williams Assocs. 505-255-1638
NY Penfield, John Blair 716-586-1419
NY White Plains, Cane Tech. Sls. 914-694-9240
NC Cary, Montgomery Mktg. 919-467-6319
OH Dayton, Thompson Assocs. 513-435-7733
OR Beaverton, Quest Mktg., Inc. 503-641-7377
PA Huntington Valley, Omega Elex 215-947-4135
TX Austin, West & Assoc 512-441-6973
TX Dallas, West & Assoc 214-661-9400
TX Houston, West & Assoc. 713-777-4108
UT Salt Lake City, Williams Assoc. 801-532-7701
WA Bellevue, Quest Mktg., Inc. 206-747-9424

maxon DC motor

MAXON PRECISION MOTORS, INC., 838 Mitten Rd., Burlingame, CA 94010, Tel: 415-697-9614, TWX: 910-375-2049; Empl.: 270; *Sls. Mgr.:* Edward Graham ... **B•1171**

MAXWELL LABS., 8835 Balboa Ave., San Diego, CA 92123, Tel: 619-279-5100, TWX: 910-335-2063; Empl.: 300; *Sls. Mgr.:* William Fox (Prods.)

MCCOY ELECTRONICS CO., Sub. Oak Technology Inc., 100 Watts St., P.O. Box B, Mt. Holly Springs, PA 17065, Tel: 717-486-3411, TWX: 510-650-3548; Empl.: 450 ..... **A•1380-1383**

Local Sales Offices & Reps

AL Huntsville, Conley & Assocs. 205-882-0316
CA Van Nuys, Wea-K 818-989-3070
CO Denver, Advanced Tech 303-771-3366
CO Littelton, Advanced Tech Mktg. 303-979-8420
CT Meriden, JMG, Inc. 203-235-0819
FL Deerfield Bch., Conley & Assocs. 305-421-7180
FL Oviedo, Conley & Assocs. 305-365-3283
FL Tampa, Conley & Assocs. 813-885-7658
IL Bensenville, Banner Tech Sls. 312-766-4131
IA Cedar Rapids, Lorenz Sls. 319-377-4666
MA Norwood, JMG, Inc. 617-762-5333
MN Minneapolis, Dunlop Consits. 612-522-6133
KS Overland Pk., Lorenz 913-649-5556
NJ Haddonfield, Gray Assocs. 609-429-5300
NY Fayetteville, S. F. Foster Co. 315-637-5427
NY New Rochelle, Ascor Elctrns. 914-235-8838
NY Webster, S. F. Foster Co. 716-265-2072
OH Cincinnati, Stegman Bline Mktg. 513-729-1969
WA Seattle, Evergreen Assocs. 206-633-3160
TX Austin, R. F. Kimball Co. 512-443-5284
TX Houston, R. F. Kimball Co. 713-840-0590
TX Richardson, R. F. Kimball Co. 214-231-3447
EXP NJ, Oradell, Sylvan Ginsbury Ltd. 201-261-3200

MCE SEMICONDUCTOR, INC., 1111 Fairfield Dr., West Palm Beach, FL 33407, Tel: 305-845-2837, Telex: 513463; Empl.: 140

MCFADDEN SYS., INC., 8953 S. Atlantic Ave., South Gate, CA 90280-9990, Tel: 213-564-5958, Telex: 677161; FSC No.: 25750; Empl.: 42

MCG ELECTRONICS INC.

MCG ELCTRNS., 12 Burt Dr., Deer Park, NY 11729, Tel: 516-586-5125, Telex: 645518; FSC No.: 29779; Empl.: 45; *Sls. Mgr.:* Cecilia Long ..... **B•1248-1253**

Local Sales Offices & Reps

CT Norwalk, Gemini Grp. 203-852-8173
LA Covington, Svc. Elctrl. Sls. 504-893-2830
MA Woburn, EMS 617-229-6686
MS Brandon, Svc. Elctrl. Sls. 601-992-9122
MO St. Louis, Engrg. Svc. Co. 314-997-1515
NJ Caldwell, Fred Urban 201-228-5249
NC Greensboro, The Saylor Assocs. 919-292-0452

MCGILL MFG. CO., INC., Bearing Div., 909 N. Lafayette St., Valparaiso, IN 46383, Tel: 219-465-2200, Telex: 25-8446

MCGILL MFG. CO., INC., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, Tel: 219-465-2200, TWX: 910-690-4982; Empl.: 295; *Sls. Mgr.:* David Rickards (OEM Switch), Thomas Frary (Control Prods.); *Dist. Mgr.:* Thomas F. Morris ..... **B•1623**

Local Sales Offices & Reps

AL Decatur, Tenn Tech Sls. 205-350-0630
CA S. El Monte, HMC Inc. 213-442-7970
CA Santa Clara, Logan Sls. 408-496-0660
IN Indianapolis, A. E. Fred Schaab 317-253-8689
MD Baltimore, R. A. Wafer Assocs. 301-744-1133
MA Needham, Hgts. Newscott Co. 617-444-1923
MI W. Bloomfield, OBE, Inc. 313-332-4900
MN Minneapolis, Elec. Comp. Sls. 612-933-2594
MO Ellisville, Larco Sls. 314-394-7141
NJ Cherry Hill, Danco Elctrn. Sls. 609-424-5590
NY Baldwin, C. Glianna 516-378-2700
NY N. Syracuse, Advanced Comp. Corp. .. 315-699-2671
OH Cleveland, Allied Entprs. 216-779-0080
SC Columbia, H. Heaton 803-256-9230
TX Dallas, Erickson Sls. 214-739-5833
UT Salt Lake City, Sage Sls. 801-467-5451
WA Seattle, SPS Elctrns. 206-323-4140

MCGUIRK ELECTRONICS CO. INC., 212 So. Main St, P. O. Box 853, Middleton, MA 01949, Tel: 617-933-3500; FSC No.: 55902; Empl.: 10; *Sls. Mgr.:* L. McCarthy ..... **D•1929**

mci METUCHEN CAPACITORS INC.

MCI TRANSFORMER CORPORATION, 411 Manhattan Ave., Babylon, NY 11704, Tel: 516-587-0510; Empl.: 50; *Sls. Mgr.:* Timothy J. Williams ..... **A•2168-2183**

MCKINSTRY METAL WORKS, INC., 285 McKinstry Ave., Chicopee, MA 01013; Empl.: 80

MCL, INC., 10 North Beach Ave., La Grange, IL 60525-2092, Tel: 312-354-4350, Telex: 910-997-8142; FSC No.: 16469; Empl.: 75; *Sls. Mgr.:* Frank Morgan ..... **D•1408-1409**

Local Sales Offices & Reps

CA Los Angeles, RF Associates 213-478-1586
CA Palo Alto, RF Associates 415-494-3331
GA Riverdale, MCL, Inc./Bob Lundy 404-996-6632
MA Reading, Geder Assocs. 617-944-3105

MCLEAN ENGRG., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550, Tel: 609-799-0100, TWX: 510-685-2543; FSC No.: 03522; Empl.: 135; *Sls. Mgr.:* William L. Sly; *Dist. Mgr.:* Craig A. Reed ..... **C•1648-1649**

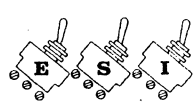
Local Sales Offices & Reps
Guelph, Ont.

AL Huntsville, Beacon Elctrns. 205-881-5031
AZ Fountain Hills, Halbar Assocs. 602-837-2464
CA Glendale, Halbar Assocs. 818-246-8263
CA San Mateo, Halbar Assocs. 415-349-4700
CO Englewood, Component Tech. 303-758-5750
CT Canton, Motoreps, Inc. 800-243-1978
FL Ft. Lauderdale, R.I. Smith Assocs. 305-772-5100
FL Orlando, R.I. Smith Assocs. 305-365-8077
GA Atlanta, Beacon Elctrns. 404-256-9640
IL Elmhurst, Scott Assocs. 312-279-5681
LA Gretna, M. F. Sls. 504-361-4343
MD Hunt Valley, Marktron 301-628-1111
MD Rockville, Marktron 301-251-8990
MA Needham, Motoreps 617-449-3252
MI East Detroit, J. Thorpe Co. 313-779-6363
MN Minneapolis, Scott Elctrn. Sls. 612-929-2985
MO Grandview, Harris-Hanson 816-763-6200
MO St. Louis, Harris-Hanson 314-432-3611
NJ Springfield, Sylvester Assocs. 201-376-3324
NM Albuquerque, Fry-Gates 505-262-1525
NY Albany, Reagan/Compar Albany 518-489-4777
NY Binghamton, Reagan/Compar 607-754-8946
NY Fairport, Reagan/Compar Albany 716-271-2230
NY New Hartford, Reagan/Compar Albany 315-732-3775
NY Rochester, Reagan/Compar 716-271-2230
OH Cleveland, Marlow Assocs. 216-991-6500
OH Dayton, Marlow Assocs. 513-275-4147
OR Beaverton, Halbar Assocs. 503-226-0451
PA Huntingdon Valley, Inacker Sls. 215-947-5660
PA Pittsburgh, Marlow Assocs. 412-367-8886
TX Dallas, Milco Mktg. 214-783-2716
TX Houston, Milco Mktg. 713-946-2841
VA Charlottesville, Marktron 804-973-5874
WA Redmond, Halbar Assocs. 206-882-0990
Can Guelph, Ont., Hammond Mfg. Co. 519-822-2960

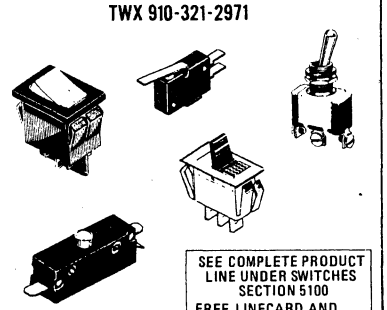
Local Distributors

FL Ft. Lauderdale, Component Distrs. 305-971-4950
GA Norcross, Component Distrs. 404-441-3320
MI Ann Arbor, Wedemeyer Elctrn. Supp. Co. 313-665-8611

McGILL
ENGINEERED SWITCHES
FULL LINE
AUTHORIZED DISTRIBUTOR



ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

NC Raleigh, Component Distrs. 919-834-9465
TX Dallas, Component Distrs. 214-698-9485
Can Guelph, Ontario, Hammond Mfg. Co. .. 519-822-2960

MCLEAN MIDWEST, 4000 83rd Ave. N., Brooklyn Pk., MN 55443, Tel: 612-561-9400, Telex: 29-0883, TWX: 910-576-2951; *Sls. Mgr.:* J. Buyse ..... **C•1650-1651**

3M CO., Carbonless/Related Prods Div Ind'l Optics, 3M Center, Bldg. 225-3S, St. Paul, MN. 55144, Tel: 612-733-4403, Telex: 29-7023, TWX: 910-563-3712; *Sls. Mgr.:* A. Rivard

3M-ELECTRONIC PRODUCTS DIVISION, Bldg. 502, P.O. Box 2963, Austin, TX 78769-2963, Tel: 512-834-6682; *Sls. Mgr.:* Bernie Graham

Local Sales Offices & Reps

AK Anchorage 907-561-1030
CA Los Angeles 213-726-6300
CA So. San Francisco 415-571-6700
GA Atlanta 404-447-7000
HI Honolulu 808-422-2721
IL Chicago 312-496-6500
MA Boston 617-449-0300
MI Detroit 313-827-2450
MN St. Paul 612-733-3300
MO St. Louis 314-997-8500
NJ West Caldwell 201-575-2000
NC High Point 919-889-7181
OH Cincinnati 513-482-3100
OH Cleveland 216-362-1700
PA Philadelphia 215-728-5300
TX Dallas 214-324-8100
WA Seattle 206-244-7200

Local Distributors

AL Huntsville, Powell Elctrns. 205-539-2731
AL Huntsville, RM Alabama 205-852-1550
AZ Tempe, Acacia Sls. 602-894-2874
AZ Tempe, Richey/Western Elctrns., Inc. 602-894-9251
CA Irvine, Acacia Sls. 714-660-0834,213-971-2428
CA Irvine, Ratel Elctrns./Xytec 714-768-0855
CA Los Angeles, Richey/Western Elctrns., Inc. 714-895-0060,800-227-0060
CA San Diego, Acacia Sls. 619-565-4365
CA San Diego, Richey/Western Elctrns., Inc. 619-271-4511
CA San Jose, Powell Elctrns. 408-943-9020
CA San Jose, Ratel Elctrns./Xytec 408-946-4300
CA Santa Clara, Richey/Western Elctrns., Inc. 408-727-7411
CA Sun Valley, Richey/Western Elctrns., Inc. 818-768-3800,213-875-2862
CA Sunnyvale, Acacia Sls. 408-745-7200
CO Denver, Ragon Elctrn. Parts 303-744-3601
CO Lakewood, Acacia Sls. 303-232-2882
CT East Haven, JV Elctrns. 203-469-2321
CT New Canaan, Impact Sls. Co. 203-972-1458
CT Yalesville, Schaal Assocs./Deanco ... 203-269-3779
FL Ft. Lauderdale, Powell Elctrns. 305-979-5000
FL Winter Park, Deanco 305-671-5100
GA Atlanta, A.C. Equip. Co. 404-451-2747
GA Atlanta, Prehler Elctrns. 404-447-5540
GA Marietta, Deanco 404-429-0126
IL Chicago, Prehler Elctrns. 312-328-6100
IL Elk Grove, RM Illinois 312-364-6622
IL Mt. Prospect, Magnuson Elctrns. 312-956-0700
IN Indianapolis, Graham Elctrns. 517-634-8202
MD Columbia, Aztech Elctrns. ..... 301-995-1760, 301-621-4070 in
MD Columbia, Powell Elctrns. ..... 301-995-0410, 301-621-4070 in
MD Gaithersburg, Deanco 301-948-5444
MA Burlington, Schaal Assocs./Deanco ... 617-272-1506
MA Canton, Impact Sls. 617-821-1500
MA Westboro, Powell Elctrns. 617-366-6100
MI Grand Rapids, RM Michigan 616-531-9300
MN St. Paul, Ragon Elctrns. 612-642-2828
MO Independence, Ragon Elctrns. 816-254-3410
MO St. Charles, Lectronix 314-946-6424
NJ Clifton, J-Mar Elctrns. 201-772-6400
NJ Englewood, Powell Elctrns. 201-894-0800
NJ Fairfield, Deanco 201-575-7960
NY Farmingdale, Addem Distrs. 516-752-9303
NY Hauppauge, Schaal Assocs./Deanco 516-434-4600
NY Ithaca, Deanco 607-257-4444
NY Ronkonkoma, Zenith Wire & Cable ... 516-585-1444
NC Cary, Powell Elctrns. 919-467-1212
NC Charlotte, Elctrns. Mktg. Corp. 704-394-6195
NC Raleigh, Prehler Elctrns. 919-876-9111
OH Columbus, Elctrns. Mktg. Corp. 614-299-4161
OH Highland Heights, Elctrns. Mktg. Corp. 216-442-3441
OH Middleburg Heights, Prehler 216-243-5510
OK Tulsa, Norvell Elctrns. 918-663-1247
OR Beaverton, Acacia Sls. 503-646-3377
OR Lake Oswego, Moore Elctrns., Inc. 503-684-3100
OR Wilsonville, Ragon Elctrns. 503-682-2929
PA Malvern, Transtek Inds. 215-296-4400
PA Philadelphia, Powell Elctrns. 215-365-1900
TX Austin, Kent Elctrns. 512-834-1900
TX Austin, Norvell Elctrns. 512-458-8106
TX Dallas, Norvell Elctrns. 214-233-0020
TX El Paso, ERA Elctrns. 915-592-4126
TX Houston, Kent Elctrns. 713-780-7770
TX Houston, Norvell Elctrns. 713-777-1666
TX Richardson, Kent Elctrns. 214-669-2600
UT Midvale, Ratel Elctrns./Xytec 801-562-2600
WA Bellevue, Powell Elctrns. 206-641-4446
WA Seattle, Ragon Elctrns. 206-241-1980
Can London, Ont., 3M 519-451-2500

3M CO., STATIC CONTROL SYS. DIV., P. O. Box 2963, Austin, TX 78769-2963, Tel: 800-328-1368; Empl.: 300; *Sls. Mgr.:* Mike Martin ..... **D•1980-1981**

Local Sales Offices & Reps

AZ Phoenix 602-934-7413,800-221-1046
CA Los Angeles 800-221-1045
CA San Francisco 415-761-1155
CO Denver 303-321-3873
DC Washington 800-241-3669
FL Orlando 800-241-3669
GA Atlanta 800-241-3670
IL Chicago 312-496-6553
MA Boston 617-449-0300
MI Detroit 800-323-4087
MN St. Paul 800-392-0312
MO St. Louis 314-997-8500
NJ Newark 800-221-1454
NJ West Caldwell 800-221-1454
NY Syracuse 800-221-1455
NC High Point 919-889-7181
OH Cincinnati 800-241-3669
OH Cleveland 216-362-1700
PA Philadelphia 215-728-5300
TX Dallas 800-442-8046
TX Houston 800-442-8046
WA Seattle 206-244-7200,206-241-2250

3M CO., TECH CERAMIC RESOURCES, 3M Center 225-4W, St. Paul, MN. 55101, Tel: 617-736-0601, Telex: 29-7023, TWX: 910-563-3712; Empl.: 83000

3M CO. VISUAL PRODS./INDUS. OPTICS., See 3M Co. Carbonless Related Prods. Div.

MDB SYS., 1995 N Batavia St., Orange, CA 92665, Tel: 714-998-6900, TWX: 910-593-1339; Empl.: 200; *Sls. Mgr.:* William Wollam

MDF PRODUCTS INC., 7 Johnson Dr., Danbury, CT 06811, Tel: 203-743-3579, Telex: 499-8051; FSC No.: 60628; Empl.: 5 ..... **D•1265**

MEA DIV., See Mechanized Elctrn. Assembly Div., Universal Instrs. Corp.

MEASUREMENTS GROUP, INC., Box 27777, Raleigh, NC 27611, Tel: 919-365-3800, Telex: 802-502, TWX: 510-920-0770; *Sls. Mgr.:* Stephen R. Katz

MS

MEASUREMENT SYS., INC., 121 Water St., Norwalk, CT 06854, Tel: 203-838-5561, Telex: 6813573, TWX: 710-468-2185; Empl.: 97; *Sls. Mgr.:* John Cronan ... **D•1126**

Local Sales Offices & Reps

IA Cedar Rapids, S & O Sls. 319-393-1845
MD Columbia, Robert Elctrn. Sls. 301-995-1900
MA Hudson, Data Rep. 617-481-0333
PA Melrose Park, R. Meyers Assocs. 215-224-1663
TX Richardson, OM Sls.,Inc 214-690-6746
VA Richmond, Robert Elctrn. Sls. 804-276-3979

MEC A/S, Industriparken 23, Ballerup, Denmark DK-2750, Tel: 452-973366

Local Sales Offices & Reps

AL Huntsville, Beacon Elctrns. 205-881-5031
AZ Phoenix, Eltron 602-266-2164
AZ Scottsdale, SMS & Assocs. 602-998-0831
AR Little Rock, Beacon Elctrns. 501-224-5449
CA Brea, Masco 714-529-0867
CA Curpertino, F & F Assocs. 408-446-2349
CA Mountain View, Switches, Inc. 415-962-8649
CA Orange County, Pacific Switch Controls, Inc. 714-953-1254
CA Van Nuys, Pacific Switch Controls, Inc. 213-873-4802
CO Aurora, Mountain View Mktg. 303-360-9641
CO Englewood, Electronic Comps. Sys. ... 303-781-5904
FL Boca Raton, Beacon Elctrns. 305-392-3500
FL Clearwater, Beacon Elctrns. 813-796-2378
FL Fort Lauderdale, KSM Elctrns., Inc. 305-971-5900
FL Maitland, Beacon Elctrns. 305-647-3498
FL Melbourne, Beacon Elctrns. 305-724-8010
GA Atlanta, Beacon Elctrns. 404-256-9640
GA Atlanta, KSM Elctrns., Inc. 404-458-2013
IL Downers Grove, Richmar Elctrns. 312-968-0118
IN Indianapolis, Insul Reps 317-251-1994
IA Cedar Rapids, Palatine Engrg. & Sls. .. 319-365-8071
KS Mission, Palatine Engrg. & Sls. 913-831-0550
MA Needham, A&M Elctrns. 617-444-8170
MA Plainville, Enterprise Tech., Inc. 617-695-4700
MI Bloomfield, Obe, Inc. 313-332-4900
MI Brighton, AP Assocs. 313-229-6550
MI Grand Rapids, Obe, Inc. 616-458-8993
MI St. Joseph, Obe, Inc. 616-429-1160
MN Minneapolis, Components Rep. Grp. .. 612-944-0800
MN Minneapolis, Elctrn. Comps. Grp. 612-559-0720
MO Hazelwood, Palatine Engrg. & Sls. 314-839-0800
NJ Ho-Ho-Kus, D. J. Fisher Co., Inc. 201-652-0090
NM Albuquerque, Syntech 505-266-7051
NY Fairport, TAC Sls. 716-425-1070
NY Great Neck, M.O.S. Assocs. 516-487-3966
NC Raleigh, Beacon Elctrns. 919-787-0330
OH Cleveland, Components, Inc. 216-243-9020
OK Bixby, Southern Sts. Mktg. 918-369-3233
PA Glenside, Wyncote Instrmn. 215-572-6500
TX Austin, Southern Sts. Mktg. 512-473-2741
TX Houston, Southern Sts. Mktg. 713-558-4900
TX Richardson, Southern Sts. Mktg. 214-238-7500
TX Richardson, Southern Sts. Mktg. 915-238-7500
UT Salt Lake City, Quality Comps. Sls. 801-268-8000
VA Fairfax, Beacon North 703-591-1300
VA Forest, Beacon North 804-239-8486
WA Kirby, A/D Elctrns. 206-821-3208
WA Mercer Island, Elctrn. Comp. Sls. 206-232-9301
WI Butler, Richmar Elctrns. 414-781-1730

Local Distributors

CA Hollywood, Yale Elec. 213-465-3186
CA Manhattan Beach, Prime Electro 213-379-3642
CA Mountain View, Target Elctrns. 415-962-8649
CA Orange County, Pacific Switch Controls 714-953-1254
CA San Carlos, Logan Elctrns. 415-594-0700
CA San Diego, Pacific Switch Controls ... 619-264-6117
CA Santa Monica, Master Distrs. 213-452-1229
CA Van Nuys, Pacific Switch Controls 213-873-4802
CO Englewood, Industrial Supp. 303-694-9444
CT Hartford, Atlantic Switch Controls 203-527-7705
CT Shelton, Century Elec. 203-736-208
FL Lakeland, Switch Controls, Inc. 813-644-7564
IL Carol Stream, Conectrix 312-653-1460
MD Beltsville, P.S.I. 301-937-4960
MD Columbia, D.K. Elctrns. 301-995-1950
MA Needham, 'You Do It' 617-449-1005
MN Minneapolis, Glen Mark 612-941-4825
NH Nashua, Atlantic Switch 603-880-1971
NJ Mt. Laurel, Jersey Switch 609-778-8190
OH Columbus, Ohio Switch 613-885-0391
OR Portland, Component Resources 503-641-8488
TX Dallas, TexaSwitch 214-357-1768
TX Hurst, Alectron Corp. 817-280-0313
WA Seattle, Component Resources 206-454-8666
WA Seattle, Radar Elctrns. 507-747-3053
Can Toronto, Ont., Deskin Sls. 416-475-1412

MECHANICAL ENGRAVING, 4500 Bullard Ave, Bronx, NY 10470, Tel: 212-324-4455; FSC No.: 99040; Empl.: 35; *Sls. Mgr.:* Bernard W. Mandel

MECHANICAL ENTPRS., 461 Carlisle Dr., Herndon, VA 22070, Tel: 703-435-9496, TWX: 710-832-0942; Empl.: 25; *Sls. Mgr.:* R.H. Twyford ..... **B•1624, 1728-1729**

Local Sales Offices & Reps

CA Irvine, Vale Electrn. Assocs. 714-551-4821, 619-693-0113
CA Santa Clara, Eastec Corp. 408-720-1807
CT Bristol, Technlg. Prod. Grp. 203-583-0703
FL Casselberry, Semi 305-831-2822
FL Ft. Lauderdale, SEMI 305-475-3686
FL Melbourne, Semi 305-831-2822
FL Palm Harbor, SEMI 813-441-3902
IL Arlington Heights, Coombs Assocs., Inc. 312-439-9810
IN Ft. Wayne, Coombs Assocs., Inc. 219-747-7661
IN Ft.Waynee, Coombs Assoc., Inc. 219-747-7661
IA Cedar Rapids, Coombs Assocs., Inc. .. 319-362-4116

MA Brookline, Technlg. Prods. 617-731-0858
MA Brookline, Technology Prod. Grp. 617-731-0858
MI Jackson, Norwood Scroggs Co. 517-750-1170
NY Cooperstown, Fitzelle Assoc. 607-547-9333
NY Cooperstown, Fitzelle Assocs. 607-547-9333
NY Rochester, Lloyd Hart Assocs. 716-225-4455
TX Dallas, Stasco 214-239-4517
WI Milwaukee, Coombs Assocs., Inc. 414-351-6123
Can Concord, Ont., Delco Electerns.,Inc. ... 416-738-1090

Local Distributors

CA Los Angeles, Electric Switches, Inc. ... 213-660-1310
CA San Diego, Sigma Electrns. 619-292-1523
IL Wheeling, Hawk Elctrns., Inc. 312-459-4030
NY Yonkers, Kintronics, Inc. 914-968-7736, 800-431-1658
Can Burnaby, B.C., Rae Ind. Electrns.,LTD .. 604-291-8866

MECHANICAL PRODUCTS, Amstar, 1824 River St. P. O. Box 729E, Jackson, MI 49204, Tel: 517-782-0391, TWX: 810-253-0827; *Sls. Mgr.:* Bob Vangermeersch

MECHANICAL TECHN., 968 Albany Shaker Rd., Latham, NY 12110, Tel: 518-785-2353, TWX: 710-443-8150; Empl.: 1000; *Sls. Mgr.:* David W. Bender; *Dist. Mgr.:* David W. Bender

MECHANIZED ELECTRONIC ASSEMBLY DIV., Universal Instrs. Corp., P.O. Box 825, Binghamton, NY 13902, Tel: 607-772-7522, TWX: 510-252-1990; *Sls. Mgr.:* Gene Exley ..... **D•1982**

Local Sales Offices & Reps

NH Bedford, Universal Instrs. Corp. 603-625-9600
NY Binghamton, Universal Instrs. Corp. ... 607-772-7472
PA Paoli, Universal Instrs. Corp. 215-296-8811

MEDA, INC., MacIntyre Electronics Design Assocs., Inc., 1930 Isaac Newton Sq., Reston, VA 22090, Tel: 703-471-1445, Telex: 910-350-0132; Empl.: 5

MEDIA RECOVERY INC., Box 1407, Graham, TX 76046, Tel: 800-527-9497, 214-630-9625 (Texas), Telex: 73-2561; Empl.: 130; *Sls. Mgr.:* J. Ricciardi

Local Sales Offices & Reps

CA San Francisco, Media Recovery 415-572-0167
CT Hartford, Media Recovery of N.J. 203-528-9776
MA Boston, Media Recovery Inc. 617-843-8400
MI Livonia, Media Recovery 313-421-4244
TX Dallas, Media Recovery of Tex 214-630-9625
TX Houston, Media Recovery of Tex 713-681-5464
TX San Antonio, Media Recovery of Texas 512-349-5854

MEGA LOGIC, 9659 Natl. Rd., Brookville, OH 45309, Tel: 513-833-5222

MEGATEK CORP., 9645 Scranton Road, San Diego, CA 92121, Tel: 619-455-5590, TWX: 910-335-2056; Empl.: 500; *Sls. Mgr.:* Robert A. Becker; *Dist. Mgr.:* Michel Schwab, Dir., International Sls.

MEGATEST, 880 Fox La., San Jose, CA 95131, Tel: 408-998-7110, TWX: 910-338-0259; Empl.: 225; *Sls. Mgr.:* Rick Carmichael

MEGATRAN ELECTRONIC POWER, Rising Sun Rd., Bordentown, NJ 08505, Tel: 609-298-7300, TWX: 510-685-3645; Empl.: 25; *Sls. Mgr.:* C. W. Harrison

MEISSNER INDS., 551 Rte. 10, Dover, NJ 07801, Tel: 201-366-1700; Empl.: 10 ..... **A•1889**

MELCHER, INC., 6290 Sunset Blvd., # 1126, Los Angeles, CA 90028, Tel: 213-463-5617, TWX: 910-321-2903; *Sls. Mgr.:* Norman R. Sutherland

MELCOR/MATERIALS ELCTRN. PRODS., 994 Spruce St., Trenton, NJ 08648, Tel: 609-393-4178, Telex: 84-3314; FSC No.: 32333; Empl.: 175; *Sls. Mgr.:* M.A. Levine ..... **C•1652-1653**

MELCO SLS., See Mitsubishi Elctrns.

MELLES GRIOT, 1770 Kettering St., Irvine, CA 92714, Tel: 714-261-5600, Telex: 678447; Empl.: 90; *Sls. Mgr.:* Paul H. Shirley

MEL-RAIN CONTROLS, 42974 M-43 Hwy., Paw Paw, MI 49079, Tel: 616-657-2527; FSC No.: 639; Empl.: 20; *Sls. Mgr.:* Howard F. Walter

MEL TEC, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090, Tel: 617-329-1508, Telex: 95-1110, TWX: 710-348-0484; Empl.: 180

MEMODYNE, 220 Reservoir St., Needham Hgts., MA 02194, Tel: 617-444-7000, Telex: 92-2537; Empl.: 50; *Sls. Mgr.:* Joseph K. McEttrick ..... **D•1068**

Local Sales Offices & Reps

AZ Tempe, Mar Tech Assocs., Inc. 602-968-4944
CA Fullerton, Elctrn. Comp. Mktg. 714-879-9460
CA Santa Clara, Nelson Elctrns. Sls. 408-980-1950
CO Englewood, F. G. Mktg. Co. 303-795-9176
CT Hamden, Burton Forrester Associates 203-248-4380
GA Atlanta, Magaro & Assoc. 404-451-8862
HI Honolulu, Aloha Assocs. 808-941-1574
IL Elmhurst, Scott Assocs. 312-279-5681
KS DeSoto, Midtec Assocs. 910-743-6565
MA Braintree, Burton Forrester Assocs. ... 617-848-7234
MI Detroit, EQS Sys. 313-961-3042
MO Florissant, Midtec Assocs. 313-837-5200
NY Clark Mills, KLM Assocs. 315-853-6126
NY Elmont, Crane & Egert Corp. 516-872-0800
NY North Syracuse, KLM Assocs. 315-458-6214
NY Pittsford, KLM Assocs. 716-381-8350
NC Greensboro, Magaro & Assocs. 919-294-4783
OH Chesterland, EQS Sys. 216-729-2222
OH Columbus, EQS Sys. 614-228-3453
OR Portland, Topp Engrg. Sls. 503-244-7265
PA Pittsburgh, EQS Sys. 412-261-2604
TX Houston, Acudata 713-488-8195
TX Plano, Acudata 214-424-3567
UT Englewood, F. G. Mktg. Co. 303-795-9176
WA Bellevue, Topp Engrg. Sls. 206-747-5400

MEMOREX CORP., San Thomas at Central Expwy., Santa Clara, CA 95052, Tel: 408-987-1000; Empl.: 12,284

MEMORY PROTECTION DEVICES INC., 320 Broad Hollow Rd., Farmingdale, NY 11735, Tel: 516-454-0340, 516-454-0341, Telex: 219801; *Sls. Mgr.:* Lou Asighieri/Charlotte Stalker; *Dist. Mgr.:* Sandy Silvani ..... **C•1451-1453**

Local Sales Offices & Reps

AL Huntsville, REP Inc. 205-881-9270
CA Pleasonton, Moulthrop Sls. 415-463-0450
CA San Diego, Tauber Assocs. 619-274-7242
GA Tucker, Rep., Inc. 404-938-4358
IN Indianapolis, Marketing Engrg. 317-872-5665
KS Olathe, Rush & West 913-764-2700
MA Burlington, Conti Younger 617-273-1582
MO Ballwin, Rush West 314-394-7271
NJ Mt. Laurel, Comtek 609-235-8505
NY Pittsford, Andres Comp. 716-381-3818
NC Raleigh, Rep., Inc. 919-851-3007
OR Tigard, Electronic Sources 503-684-0040
TN Jefferson City, Rep., Inc. 615-475-9012
TX Dallas, Dunbar 214-239-7151
UT Salt Lake City, Comp. Sls. 801-268-8440
WA Bellevue, Elctrn. Sources 206-451-3500

Local Distributors

AL Huntsville, Resistacap, Inc. 205-883-4270
CA Burlingame, Rose Elec. 415-348-0483
CA San Diego, Tauber Elec. 619-272-7242
CA San Jose, Cypress Elec. 408-945-8400
CA Van Nuys, Nesco 213-781-0505
FL Dania, Summit Distr. 305-920-6253
FL Pompano Beach, Component South .. 305-971-0350
IL Chicago, Prehler Elec. 312-384-6100
IN Indianapolis, Graham Elec. 317-634-8202
MA Sharon, Adcour 617-784-8123
MI Brighton, A. P. Sls. 313-229-6550
MI Farmington Hills, Prehler Elec. 313-473-7200
MN Burnsville, Power Grp. 612-890-1360
MN Thief River Falls, Digi Key 218-681-6674
NJ Bellmawr, Mid-Atlantic 609-931-5303
NJ Plainfield, Mars Elec. 201-757-4332
NY Buffalo, Summit Dist. 716-887-2800
OH Cincinnati, Hughes Peters 513-351-2000
OH Columbus, Hughes Peters 614-294-5351
PA Allentown, Lehigh Elec. 215-433-3045
TX Dallas, Computer Comps. 214-239-0271
WA Bellevue, Almac Elec. 206-643-9992

MEMTRON TECHNOLOGIES, INC., 1400 Weiss St., Frankenmuth, MI 48734, Tel: 517-652-2652, TWX: 910-380-9153; FSC No.: 6 V 417; Empl.: 53; *Sls. Mgr.:* Daniel T. Ortner ..... **B•1731**

Local Sales Offices & Reps

AZ Scottsdale, Semi-Systems Arizona, Inc. 602-991-1151
CO Englewood, Martec Assocs. 303-741-3322
FL Maitland, EIR, Inc. 305-660-9600
GA Lawrenceville, Tek-Rep Mktg., Inc. 404-963-1600
IL Wheaton, Chadra-Schilke & Assocs., Inc. 312-653-8126
IN Indianapolis, EMCI, Inc. 317-253-1668
MA Framington, Stone Comp. Sls. Corp. ... 617-875-3266
MO Saint Charles, Buckman & Assocs. 314-946-6201
NY Fairport, Net Sls., Inc. 716-467-4538
NY Smithtown, T & K Sls. 516-724-3456
OH Columbus, Tom Mulligan Co. 614-457-2242
PA Southampton, Campbell Assocs. 215-322-6630
TX Richardson, Lonk & Assocs. 214-238-7651
VA Martinsville, Engineering Sls. Corp. 703-632-2365
Can Rexdale, Ont., Bestec Elctrns., Ltd. 416-674-1330

Mepco//Electra

A NORTH AMERICAN PHILIPS COMPANY

MEPCO//ELECTRA, INC., North American Philips Corp., Columbia Rd., Morristown, NJ 07960, Tel: 201-539-2000, Telex: 136461, TWX: 710-986-7437; *Sls. Mgr.:* Michael F. Kirkowski; *Dist. Mgr.:* Robert G. Elko ..... **A•1124-1126, 1890-1891, 2029; B•1008**

MEPCO//ELECTRA, INC., North American Philips Corp., 11468 Sorrento Valley Rd., San Diego, CA 92121, Tel: 619-453-0332, Telex: 820534, TWX: 910-337-1120 ..... **A•2029; B•1008**

Potentiometers (Cermet, Carbon) Industrial & Military

MEPCO//ELECTRA, INC., North American Philips Corp., 5900 Australian Ave., West Palm Beach, FL 33407, Tel: 305-842-3201, Telex: 387217, TWX: 510-952-7618 ..... **A•1124; B•1009**

Tantalum Capacitors (Solid, Wet Slug, Chip) Military & Industrial

MEPCO//ELECTRA, INC., North American Philips Corp., Columbia Rd., Morristown, NJ 07960, Tel: 201-539-2000, Telex: 136461, TWX: 710-986-4737 ..... **A•1126, 1890-1891**

Metal Film Resistors (Established Reliability-Hermetic) Thick Film Chips, Thick Film Networks, Non-Linear Resistors, Film Trimmer Capacitors

MEPCO//ELECTRA, INC., North American Philips Corp., 6071 St. Andrews Rd., Columbia, SC 29210, Tel: 803-772-2500, Telex: 820676, TWX: 810-666-2662 ..... **A•1124-1126; B•1009**

DC Aluminum Electrolytic Capacitors (Computer Grade, Axial, Radial) Military, Industrial & Consumer, AC Motor Starts, Film Capacitors (Film/Foil, Metallized), Tantalum Capacitors (Foil)

MEPCO//ELECTRA, INC., Airport Road, P.O. Box 760, Mineral Wells, TX 76067, Tel: 817-325-7871, Telex: G.P.R.-881857/S.P.R.-820545 ..... **A•1890**

Metal Film Resistors (General Purpose, Standard Precision, Ultra Precision, Standard Military, Established Reliability) Carbon Film Resistors, Precision Matched Sets

Local Sales Offices & Reps

AL Huntsville, Macro-Mktg. Assocs. 205-883-9630
AZ Tempe, Mepco/Electra 602-968-9573
CA Anaheim, Mepco/Electra 714-441-0385
CA Harbor City, Refrigeration Comp. 213-325-3420
CA Milpitas, Mepco/Electra 408-945-1020
CA San Diego, The Rep Co. 619-292-9001
CA Santa Clara, I-Squared 408-988-3400
CA Sherman Oaks, Mepco//Electra 818-986-4892
CO Englewood, Thorson Rocky Mnt. 303-779-0666
CO Westminster, Mepco//Electra 303-460-0051
FL Altamonte Springs, Mepco/Electra 305-339-5073
FL Ft. Lauderdale, Mepco/Electra 305-485-0115
GA Norcross, Over & Over, Inc. 404-449-6205
IL Bannockburn, Heth 312-295-8440
IL Elk Grove Village, Oasis Sls. 312-640-1850
IL Itasca, Mepco/Electra 312-773-3399
IN Fort Wayne, Corrao Marsh, Inc. 219-637-5548
IN Greenfield, Corrao Marsh, Inc. 317-894-0377
IN Indianapolis, Corrao Marsh, Inc. 317-872-7157
IN Indianapolis, Leslie M. Devoe Co. 317-842-3245
IA Cedar Rapids, Lorenz Sls. 319-377-4666

KS Overland Park, PMR Corp. 913-381-0004
MD Columbia, Delta III Assoc. 301-730-4700
MA Woburn, Mepco/Electra 617-935-6920
MI Grand Rapids, Miltimore Sls. 616-942-9721
MI Novi, Miltimore Sls. 313-349-0260
MN Minneapolis, Electric Comps. Sls., Inc. 612-933-2594
MO Maryland Heights, PMR Corp. 314-569-1220
NE Lincoln, Lorenz Sls. 402-475-4660
NJ Englewood Cliffs, Ed Glass Assocs. ... 201-592-0200
NJ Marlton, B.G.R. Assocs. 609-983-1020
NJ Morristown, Mepco/Electra 201-539-2000
NJ Springfield, Gebhardt Mktg. 201-376-4415
NY Rochester, Electra Sls. Corp. 716-427-7860
NY Syracuse, Electra Sls. Corp. 315-463-1248
NC Charlotte, Over & Over, Inc. 704-527-3070
NC Raleigh, Over & Over 919-872-2262
OH Dayton, Mepco/Electra 513-278-5842
OR Beaverton, Mepco/Electra 503-643-5516
PA Greensburg, Pro Mark 412-832-3800
TX Richardson, Mepco/Electra 214-231-8274
UT West Valley City, Thorson Rocky Mountain 801-973-7969
WA Bellevue, Mepco/Electra 206-643-4555
WI Wauwatosa, Larsen Assoc. 414-258-0529

Local Distributors

AL Huntsville, Hamilton/Avnet 205-837-7210
AZ Phoenix, T.T.I. 602-966-1616
AZ Tempe, Hamilton/Avnet 602-231-5100
AZ Tempe, Shelley Elctrns., Inc. 602-894-2058
CA Chatsworth, Avnet Elctrns. 818-700-8668
CA Chatsworth, Hamilton Electro Sls. 818-700-1222
CA Chatsworth, QC Comps., Inc. 818-700-2622
CA Chatsworth, Shelley Elctrns., Inc. 213-998-3333
CA Chatsworth, TTI 818-709-1010
CA Compton, Harper, S.I.D. 213-979-5090
CA Costa Mesa, Avnet Elctrns. 714-754-6077
CA Costa Mesa, Hamilton Electro Sls. 714-641-4100
CA Culver City, Hamilton Electro Sls. 213-558-2131
CA Culver City, Hamilton/Avnet 213-558-2020
CA Garden Grove, Hi-Rel Elctrns., Inc. 714-898-9858
CA Ontario, Hamilton/Avnet 714-989-4602
CA Sacramento, Hamilton/Avnet 916-920-3120
CA San Diego, Hamilton/Avnet 619-571-7500
CA San Diego, Shelley Elctrns. 619-453-7133
CA San Jose, Ratel Elctrns. 408-946-4300
CA San Jose, Shelley Elctrns., Inc. 408-942-9111
CA San Jose, TTI, Inc. 408-943-9155
CA Sunnyvale, Hamilton/Avnet 408-743-3355
CO Boulder, Shelley Elctrns., Inc. 303-442-2718
CO Denver, Ragon Elctrns. 303-774-1992
CO Englewood, Hamilton/Avnet 303-740-1000
CO Englewood, NEP Elctrns. 303-799-9898
CT Danbury, Hamilton/Avnet 203-797-2800
CT New Haven, Greene Shaw Co. 203-397-0710
CT Stratford, TTI 203-375-1400
FL Ft. Lauderdale, Dielco 305-973-8700
FL Ft. Lauderdale, Hamilton/Avnet 305-971-2900
FL Orlando, T.T.I. 305-859-1000
FL St. Petersburg, Hamilton/Avnet 813-576-3930
FL Tampa, Impala Elctrns. 813-885-4747
FL Tampa, Shelley Elctrns., Inc. 813-884-0946
FL Winter Park, Hamilton/Avnet 305-628-3888
GA Norcross, Hamilton/Avnet 404-447-7507
GA Norcross, TTI 404-662-0911
IL Bensenville, Hamilton/Avnet 312-860-7700
IL Chicago, Nep Elctrns. 312-625-8400
IL Rosemont, Advent Elctrns. 312-298-4210
IN Carmel, Hamilton/Avnet 317-844-9603
IN Indianapolis, Advent Elctrns. 317-872-4910
IN Indianapolis, RM Elctrns., Inc. 317-291-7110
IA Cedar Rapids, Advent Elctrns. 319-363-0221
KS Overland Park, Hamilton/Avnet 913-888-8900
MD Beltsville, Resco/Washington 301-937-9100
MD Columbia, Aztech Elctrns. 301-995-1760
MD Columbia, Hamilton/Avnet 301-995-3500
MD White Marsh, Resco/Baltimore 301-529-0500
MA Burlington, TLC Elctrns. 617-273-0140
MA Newton, Greene-Shaw Co. 617-969-8900
MA Woburn, Hamilton/Avnet 617-935-9700
MA Woburn, Jaco Elctrns. 617-933-7760
MA Woburn, T.T.I. 617-938-8800
MI Grand Rapids, Hamilton/Avnet 616-243-8805
MI Grand Rapids, RM Elctrns., Inc. 616-531-9300
MI Livonia, Hamilton/Avnet 313-522-4700
MI Livonia, RepTron Elctrns. 313-525-2700
MN Minneapolis, Merit Elctrns. 612-546-5383
MN Minnetonka, Hamilton/Avnet 612-932-0600
MN St. Paul, Ragon Elctrns. 612-642-2828
MO Earth City, Hamilton/Avnet 314-344-1200
MO Independence, Ragon Elctrns. 816-254-3410
MO St. Louis, Olive Elctrns. 314-426-4500
NE Lincoln, Scott Elctrn. Supp. Corp. 402-466-8221
NE Omaha, Scott Elctrn. Supp. Corp. 402-734-6750
NH Manchester, Hamilton/Avnet 603-624-9400
NJ Cherry Hill, Hamilton/Avnet 609-424-0100
NJ Clifton, J-Mar Elctrns. 201-772-6400
NJ Fairfield, Hamilton/Avnet 201-575-3390
NM Albuquerque, Hamilton/Avnet 505-765-1500
NY Bohemia, Shelley Elctrns. 516-567-7751
NY Bohemia, T.T.I. 516-567-1500
NY Buffalo, Summit Distrs. 716-887-2800
NY Central Islip, Semi-Cap Elctrns. 516-582-4400
NY East Syracuse, Hamilton/Avnet 315-437-2641
NY Farmingdale, Command Elctrns. Corp. 516-293-1212
NY Hauppauge, Fairmont Elctrns. 516-231-3313
NY Hauppauge, Hamilton/Avnet 516-231-9800
NY Hauppauge, Jaco Elctrns. 516-273-5500
NY Hempstead, Kahgan Comps. 516-538-2300
NY Henrietta, CAM RPC Elctrns. 716-334-5600
NY Rochester, Hamilton/Avnet 716-475-9130
NY Rochester, Summit Distrs. 716-334-8110
NY Rome, Rome Elctrns. 315-337-5400
NY Sodus, Pace Elctrn. Prods. 315-483-9122
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Raleigh, Hamilton/Avnet 919-829-8030
OH Cleveland, CAM RPC Elctrns. 216-461-4700
OH Cleveland, Hamilton/Avnet 216-831-3500
OH Columbus, RepTron Elctrns. 614-436-6675
OH Dayton, Hamilton/Avnet 513-433-0610
OH Englewood, Argent Electra 513-836-8633
OH Fairborn, Aschbacher & Assocs. 513-252-7785
OH Westerville, Hamilton/Avnet 614-882-7004
OK Tulsa, Altair Co. 918-252-5781
OR Beaverton, Almac Elctrns. 503-641-9076
OR Lake Oswego, Hamilton/Avnet 503-635-8157
PA Allentown, Lehigh Elctrn. Comps. 215-433-3045
PA McKean, Advacom, Inc. 814-476-7774
PA Norristown, Century Elctrn. Corp. 215-631-5400
PA Pittsburgh, CAM RPC Elctrns. 412-782-3770
TX Austin, Altair Co. 512-837-4970
TX Austin, Hamilton/Avnet 512-837-8911
TX Dallas, Computer Comp. 214-239-0271
TX El Paso, Era Elctrns. 915-592-4126
TX Ft. Worth, T.T.I. Inc. 817-429-1440
TX Houston, Altair Co. 713-462-3029
TX Houston, Hamilton/Avnet 713-780-1771
TX Irving, Hamilton/Avnet 214-659-4111
TX Richardson, Altair Co. 214-231-5166
TX Richardson, Jaco Elctrns. 214-235-9575
UT Salt Lake City, Hamilton/Avnet 801-972-2800
VA Arlington, Arlington Elctrns. 703-524-2412
VA Charlottesville, Virginia Radio Supp. Co. 804-296-4184
WA Bellevue, Almac Elctrns. Corp. 206-643-9992
WA Bellevue, Hamilton/Avnet 206-643-3950
WA Kent, Shannon Ltd. 206-763-0545
WA Spokane, Almac Elctrns. Corp. 509-924-9500
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI New Berlin, Hamilton/Avnet 414-784-4510
WI New Berlin, NEP Elctrns., Inc. 414-785-9100
WI New Berlin, R.M. Elctrns. 414-784-4420

MERCURY PLASTICS, A UNIT OF ZERO CORP., 672 Fuller Rd., Chicopee, MA 01020, Tel: 413-267-5561, TWX: 710-354-1450; Empl.: 100; *Sls. Mgr.:* Douglas W. Griffith

MERECO PRODUCTS DIV., Metachem Resins Corp., 1505 Main St., West Warwick, RI 02893, Tel: 401-828-4550; Empl.: 100; *Sls. Mgr.:* John E. Powell, Jr.

MERET, INC., 1815 24th St., Santa Monica, CA 90404-4998, Tel: 213-828-7496, Telex: 371-9305; Empl.: 26; *Sls. Mgr.:* Jonathan Medved ..... **B•1121**

Local Sales Offices & Reps

AZ Sierra Vista, Aytan Dove 602-458-5042
CA West Covina, Eureka Tech. Sls., Inc. .. 213-331-8766
CO Lakewood, Technical Mktg. Mfg. Inc. .. 303-232-1516
MA Brookline, Boston Elctrn. Corp. 617-566-3821
IL Northrock, Emtech 312-564-0446
NY White Plains, Metro-Tek Assocs. 914-631-4758
UT Salt Lake City, Global Tek., Inc. 801-972-0999
VA Fairfax, Schibley Assocs.,Inc. 703-591-3008

MERIX CHEM. CO., 2234 East 75th St., Chicago, IL 60649, Tel: 312-221-8242; Empl.: 15; *Sls. Mgr.:* E. O. Sonneman; *Dist. Mgr.:* E. O. Sonneman

MERRILL, POB 308, 1316 Sumneytown Pike, Gwynedd Valley, PA 19437, Tel: 215-643-2116; FSC No.: 58624; Empl.: 10; *Sls. Mgr.:* J. Fournier

MERRIMAC INDS., 41 Fairfield Pl., West Caldwell, NJ 07006, Tel: 201-575-1300, Telex: 6853128, TWX: 710-734-4314; FSC No.: 12457; Empl.: 225; *Sls. Mgr.:* Gary Tahlmore; *Dist. Mgr.:* T.V.R.O. Prods. Only - Laurie Festa

MERRIMACK MAGNETICS CORP., 121 Hale St., Lowell, MA 01851, Tel: 617-458-1487; Empl.: 450; *Sls. Mgr.:* L. J. Woods; *Dist. Mgr.:* R. O. Ross

MESUR-MATIC ELCTRNS., 50 Grove St., Salem, MA 01970-2294, Tel: 617-745-7000; Empl.: 29; *Sls. Mgr.:* Kosma L. Evangelidis

METATEK INC., 410 93rd Ave. NW, P.O. Box 33129, Minneapolis, MN 55433, Tel: 612-786-8253, Telex: 4994418 Metatek; Empl.: 6; *Sls. Mgr.:* Don Hallblade; *Dist. Mgr.:* Don Hallblade

METAVAC, INC., 45-68 162nd St., Flushing, NY 11358, Tel: 212-HI5-0400; Empl.: 52; *Sls. Mgr.:* Clifford E. Sisler

METEREX CORP., 25 Industrial Park Rd., Hingham, MA 02043, Tel: 617-749-8100; Empl.: 4; *Sls. Mgr.:* K. Sharples

Distributor

METERMASTER, 5646 Jullson St., Los Angeles, CA 90040, Tel: 213-685-4340
..... pgs. **612, 680, 701, 781, 805, 824.**

METHODE ELCTRNS., INC., 7444 W. Wilson Ave., Chicago, IL 60656, Tel: 312-867-9600, TWX: 910-221-2468; Empl.: 900; *Sls. Mgr.:* R. Close; *Dist. Mgr.:* K. Lindsey

METHODE ELECTRONICS, INC., Interconnect Prods Div, 1700 Hicks Rd, Rolling Meadows, IL 60008, Tel: 312-392-3500, TWX: 910-687-0760; FSC No.: 95354; Empl.: 250; *Sls. Mgr.:* L. W. Ekstrom; *Dist. Mgr.:* L. W. Ekstrom

METHODS RESEARCH, 54D Asbury Ave., Farmingdale, NJ 07727, Tel: 201-938-6000; *Sls. Mgr.:* J. James Mandy

METIER MANAGEMENT SYS., INC., 5884 Point West Dr., Houston, TX 77036, Tel: 713-988-9100, Telex: 774367 (Metier Hou); Empl.: 650; *Sls. Mgr.:* James Paccotti/William Gregory

METIS, P.O. Box 1499, Bowie, MD 20716, Tel: 301-249-1702; Empl.: 2; *Sls. Mgr.:* Eric K. Pritchard

METRA INSTRS., 2056 Bering Dr., San Jose, CA 95131, Tel: 408-297-8530; Empl.: 16; *Sls. Mgr.:* Gary Heil

METRAPLEX CORP., Berkshire Indl. Park, Bethel, CT 06801, Tel: 203-748-0606, TWX: 710-456-3959; *Sls. Mgr.:* Charles B. Weaver

METRIC SYS., 645 Anchors St., Ft. Walton Beach, FL 32548, Tel: 904-244-9600, Telex: 70-2447; FSC No.: 12339; Empl.: 437

METRIX INSTRUMENT CO., 1711 Townhurst, Houston, TX 77043, Tel: 713-461-2131, Telex: 77-5486; Empl.: 50; *Sls. Mgr.:* W. B. Brown

METRON OPTICS INC., P.O. Box 690, Solana Beach, CA 92075-0690, Tel: 619-755-4477; Empl.: 15

METROPOLE PRODUCTS INC., P.O. Box 10275, Alexandria, VA 22310, Tel: 703-971-8606, 703-971-7082, Telex: 908041 BAL; FSC No.: 55908; *Sls. Mgr.:* John DePaola

METROSONICS, INC., Box 23075, Rochester, NY 14692-3075, Tel: 716-334-7300, Telex: 853348; Empl.: 80; *Sls. Mgr.:* W. Whitford; *Dist. Mgr.:* W. Whitford

METUCHEN CAPACITORS, INC., 420 Park Ave., Perth Amboy, NJ 08861, Tel: 201-442-0500, TWX: 710-998-0892; FSC No.: 55969; Empl.: 25; *Sls. Mgr.:* George Wolter ..... **A•1128-1134, 1614-1615; C•1454-1457**

THE MEYERCORD CO., 365 E. North Ave., Carol Stream, IL 60188, Tel: 312-682-6200, Telex: 72-2449; Empl.: 500; *Sls. Mgr.:* Joseph Galloni

MFE CORP., Instr. Div., Keewaydin Dr., Bldg. #1, Salem, NH 03079, Tel: 603-893-1921, Telex: 94-7477, TWX: 710-366-1887; *Sls. Mgr.:* Peter Schwartz; *Dist. Mgr.:* Jim Muckenhoupt

MF ELCTRNS. CORP., 10 Renewal Pl., New Rochelle, NY 10801, Tel: 914-576-6570, TWX: 710-563-0643; FSC No.: 08111; Empl.: 100; *Sls. Mgr.:* Bill Braverman; *Dist. Mgr.:* Bill Braverman ..... **A•1384-1385**

Local Sales Offices & Reps

AL Huntsville, E.M.A. 205-837-7363
AZ Glendale, Southwest Elec. Mktg. Assoc. 602-278-0500

CA Irvine, J. V. Earley & Assocs. 714-833-1806
CA Sunnyvale, W. W. Posey Co. 408-746-0771
CO Denver, Matthews & Assocs. 303-450-6476
CT Meriden, Orion Group 203-621-8371
FL Altamonte Springs, APM Assocs. 305-869-6831
FL Ft. Lauderdale, APM Assocs. 305-565-0056
FL Tampa, AMP Assocs. 813-886-2457
GA Atlanta, E.M.A. 404-448-1215
IL Bensenville, Banner Tech. Sls. 312-766-4131
ME Wakefield, The Orion Group 617-245-5220
MI Brighton, A.P.J. Assocs. 313-229-6550
MN Minneapolis, Peterson Sls. & Assoc. .. 612-884-3483
NJ Perth Amboy, Astro Rep. 201-826-8050
NM Glendale, S. W. Elec. Mktg. Assoc. 602-278-0500
NY Rochester, Sweetco Assocs. 716-225-2383
NY Utica, Sweetco Assocs. 315-733-6721
NY W. Babylon, Astro Rep. 516-422-2500
NC Raleigh, E.M.A. 919-847-8800
OH Dayton, APJ Assoc. 216-356-2424
OR Portland, Controltek Sls. 503-641-0877
PA Prospect Park, ELF Sls. 215-534-3340
TX Austin, Matthews & Assocs. 512-479-0028
TX Dallas, Matthews & Assocs. 214-931-0167
WA Bellevue, Controltek Sls. 206-451-8163
WI Mukwonago, Banner Tech. Sls. 414-363-5086

Local Distributors
CA Burbank, Atwater Elctrns. 714-670-1426
CA Sunnyvale, Pacesetter 408-734-5470
NJ Northtown, Aztec Engrg. 215-539-8200
PA Northtown, Aztec Engrg. 215-539-8200

MG ELECTRONICS

MG ELECTRONICS, 32 Ranick Rd., Hauppauge, NY 11788, Tel: 516-582-3400, Telex: 645113; Empl.: 14; *Sls. Mgr.:* John Kibbit; *Dist. Mgr.:* Stan Grey ..... **D•1027**

MHOTRONICS., INC., 444 Lake Cook Rd., Ste. 8, Deerfield, IL 60015, Tel: 312-948-5600, TWX: 910-686-0630 ..... **C•1459-1461**

Local Sales Offices & Reps
AL Huntsville, Cartwright & Bean 205-830-1540
AZ Phoenix, J. F. Hurlbutt Co. 602-952-2029
CA Burbank, Mod-Co. 818-848-2215
CA Santa Clara, Context Engrg. 408-748-8676
CO Golden, J. F. Hurlbutt 303-279-7796
FL Deerfield Beach, Cartwright & Bean ... 305-429-3400
FL Orlando, Cartwright & Bean 305-422-4531
GA Atlanta, Cartwright & Bean 404-233-2939
IL Elk Grove Village, Memetron 312-595-2828
IL Mt. Prospect, The Dombrow Co. 312-253-3326
LA Covington, Cartwright & Bean 504-892-1780
MA Framingham, Marathon Sls., Ltd. 617-875-3566
NY Hauppauge, Masin-Esco, Inc. 516-273-3500
NY Syracuse, Northeastern Elctrns. Co., Inc. 315-455-7561
NC Charlotte, Cartwright & Bean 704-377-5673
NC Raleigh, Cartwright & Bean 919-876-4130
OR Portland, SPS Elctrns. 503-297-6919
TN Knoxville, Cartwright & Bean 615-693-7450
TN Memphis, Cartwright & Bean 901-276-4442
TX Austin, Swearingen Sls. 512-339-8663
WA Redmond, SPS Elctrns. 206-323-4140

M.I.A.L., See TRW/Capacitor Div.

MICA CORPORATION, 8536 National Blvd., Culver City, CA 90232, Tel: 213-837-8100, Telex: WU 664336, ITT 4720769; FSC No.: 06216;Multiple; Empl.: 300

MICHIGAN MAGNETICS, 203 W. Third St., Vermontville, MI 49096, Tel: 517-726-0590; Empl.: 95; *Sls. Mgr.:* B. L. Killinger

MICOM SYSTEMS, INC., 4100 Los Angeles Ave, P.O. Box 8100, Simi Valley, CA 93062-8100, Tel: 805-583-8600, Telex: 687-497, TWX: 910-494-4910; *Sls. Mgr.:* M. Winters; *Dist. Mgr.:* A. Yilmaz

MICRA CORP., 120 Ricefield Lane, Hauppauge, NY 11788, Tel: 516-231-8600, TWX: 882633 MICRA US; FSC No.: 63071; Empl.: 200; *Sls. Mgr.:* Richard S. Davis

MICREL, INC., 1235 Midas Way, Sunnyvale, CA 94086, Tel: 408-245-2500, TWX: 910-379-0007; Empl.: 120

MICRO ASSOCIATES INC., 2349 Memorial Blvd., Port Arthur, TX 77640, Tel: 409-983-2051

MICROAVIONICS CORP., 3198-K Airport Loop Dr., Costa Mesa, CA 92626, Tel: 714-957-6904; Empl.: 15; *Sls. Mgr.:* B. H. Corzine

MICROBAR SYSTEMS, INC., 785 Lucerne Drive, Sunnyvale, CA 94086, Tel: 408-720-9300, TWX: 910-373-2047; *Sls. Mgr.:* Wes Bockstiegel

MICROBOND DIV., PO Box 689, Altamonte Springs, FL 32701, Tel: 305-339-8298, Telex: 56-4303; *Sls. Mgr.:* William S. Hodges

MICROCAP, INC., 11120 Roselle St., San Diego, CA 92121, Tel: 619-452-9812; Empl.: 23; *Sls. Mgr.:* Denise Kelly

MICRO-CIRCUIT ENGRG., See MCE Semiconductor

MICRO-CIRCUITS CO., INC., Route 1 - Box 518, New Buffalo, MI 49117, Tel: 616-469-2727

MICRO-COAX COMPONENTS, INC., a UTI Company, Box E, Collegeville, PA 19426, Tel: 215-489-3700, Telex: 84-6428, TWX: 510-660-6107; FSC No.: 215-489-1103; Empl.: 50; *Sls. Mgr.:* Lloyd Deery

MICRO COMPONENT TECHNLG., INC., P.O. Box 64013, St. Paul, MN 55164, Tel: 612-482-5100, Telex: 297422; Empl.: 700; *Sls. Mgr.:* James Gibson

MICROCOMPUTER DOCTORS, Computer Doctors, P.O. Box 470, College Park, MD 20740, Tel: 301-779-5110; Empl.: 1; *Sls. Mgr.:* Danny Akers

Microcomputer Power, Inc.

MICROCOMPUTER POWER, 15875 Concord Circle, Morgan Hill, CA 95037, Tel: 408-779-5700, TWX: 910-338-7694; Empl.: 60; *Sls. Mgr.:* Jim Armstrong; *Dist. Mgr.:* Jim Armstrong ..... **D•1721-1723**

Local Sales Offices & Reps
AZ Tempe, Electronic Dev. Sls. 602-438-1547
CA Inglewood, Basic Sys. 213-673-4300
MD Baltimore, Stemler Assocs. 301-944-8262
MA Andover, Richard Porinton, Inc. 617-475-7055
NJ Cherry Hill, Stemler Assocs. 609-966-0470
NY Plainview, Alto Assocs. 516-681-3163
PA Feasterville, Stemler Assocs. 215-638-1850
EXP CA, Santa Clara, Prima Intl. 408-496-0722

Local Distributors
AZ Glendale, Aspen Power 602-937-4784
CA Hayward, K E A Electronics 415-887-2900
CA Inglewood, Basic Sys. 213-673-4300
FL Orlando, G M I Distrs. 305-894-3354
NM Albuquerque, Walker Elctrns. 505-883-2992

MICRO COMPUTER RENTALS, 742D Hampshire Rd., Westlake Village, CA 91361, Tel: 213-991-1704

MICRODATA CORP., 17481 Red Hill Ave., Irvine, CA 92705, Tel: 714-540-6730, TWX: 910-595-1764; Empl.: 375

MICRO DEVICES PRODUCT GROUP, Therm-O-Disc, Inc., 1320 South Main Street, P.O. Box 3538, Mansfield, OH 44907, Tel: 419-756-5005, Telex: 987455; *Sls. Mgr.:* J. A. Kight ..... **B•1775**

MICRO DIGITAL ASSOCS., INC., 12791 Western Ave., Unit C, Garden Grove, CA 92641, Tel: 714-891-2363; *Sls. Mgr.:* Ralph Moore; *Dist. Mgr.:* Ralph Moore

MICRODRY CORP., Golden Grain Macaroni Co., 3111 Fostoria Way, San Ramon, CA 94583, Tel: 415-837-9106, Telex: 33-5320; Empl.: 40; *Sls. Mgr.:* Al Katskee

MICROELECTRONIC RELAYS, INC., 1300 S. Beacon St., San Pedro, CA 90731, Tel: 213-831-2331, Telex: 297340; Empl.: 25; *Sls. Mgr.:* C. D. Stalker ..... **B•1439**

Local Sales Offices & Reps
AL Huntsville, Murcota 205-539-8476
AZ Phoenix, Relcom 602-893-1209
CA San Diego, Manning Co. 619-565-6097
CO Englewood, Dynatech 303-773-2830
FL Apopka, G. F. Bohman Assocs. 305-886-1882
IL La Grange Park, Bierhaus Sls. 312-354-5100
MD Baltimore, Callas Elctrns. 301-744-7711
MA Peabody, OEM Sls. 617-535-2521
MI Jackson, Norwood Scroggs Co. 517-750-1170
NY Commack, R. C. Engrg. 516-543-3325
NY Syracuse, L. D. Allen 315-437-8387
NC Winston-Salem, Murcota 919-722-9445
OR Portland, Component Technlg. 503-292-1518
PA Harleysville, Thomas Jackson Assocs. 215-643-5560
TX Richardson, Eagle Mktg.
UT Layton, Dynatech 801-546-4837
WI Milwaukee, Bierhaus Sls. 414-963-0318
Can Ontario, Intrade 613-727-1272

Local Distributors
NJ Fairlawn, Relay Specialties 201-797-3313

MICRO ELECTRONIC SYS., INC., 3 Quarry Road, Brookfield, CT 06804, Tel: 203-775-1440, 800-243-7254, Telex: 969659

MICRO-ETCH PRODUCTS, INC., 94 Dodge Ave., P.O. Box 9712, Stratford, CT 06497, Tel: 203-378-8610; FSC No.: 24846; Empl.: 42; *Sls. Mgr.:* Frank Dichiara; *Dist. Mgr.:* Frank Dichiara

MICROFLECT, 3575 25th S.E., Salem, OR 97302-0985, Tel: 503-363-9267, TWX: 510-599-0107; Empl.: 98; *Sls. Mgr.:* John J. Kranitz

MICRO INSTR., 2250 Micro Pl., Escondido, CA 92025, Tel: 619-746-2010, Telex: 882205 MICROINST ESCD; FSC No.: FSCM 24836; Empl.: 45; *Sls. Mgr.:* C. Marks

Local Sales Offices & Reps
AZ Phoenix, R. A. Mayes 602-279-5243
CO Conifer, Energy Equip. Sls. 303-674-8111
FL Clearwater, Teqspec Inc. 813-725-2201
MA Natick, Wayland Engr. Sls. 617-655-6080
MO Platte City, Stantec Sales 816-464-2211
NJ Englewood Cliffs, Power Conversion & Conts. 201-569-0015
NM Albuquerque, R. A. Mayes 505-292-2330
NC Winston Salem, Teqspec III 919-723-8102
TX Allen, Harris Tech. Sls. 214-727-2182

MICROLAB/FXR, 10 Microlab Rd., Livingston, NJ 07039, Tel: 201-992-7700, TWX: 710-994-4850; FSC No.: 00929; Empl.: 80

MICRO LAMPS, INC., 1N111 Linlar Rd., La Fox, IL 60147, Tel: 312-232-6001; *Sls. Mgr.:* R. Marimatsu

MICRO LOGIC CORP., P.O. Box 174, 100 2nd St., Hackensack, NJ 07602, Tel: 201-342-6518

MICROLOGIC, INC., 108 Water St., Watertown, MA 02172, Tel: 617-923-1700; *Sls. Mgr.:* Eric Kapust

MICROMETALS, 1190 N. Hawk, Anaheim, CA 92807, Tel: 714-630-7420, TWX: 910-591-1690; FSC No.: 12856; Empl.: 70; *Sls. Mgr.:* K. Baker, Jr.

Local Sales Offices & Reps
MA Newton Upper Falls, Anchor Engrg. ... 617-964-6416
NY Hempstead, Kahgan Sls. 516-538-2300
TX Dallas, Southwest Elctrns. 214-690-9881

MICRO MODE PRODS., 1870 John Towers Ave., El Cajon, CA 92020, Tel: 619-449-3844, TWX: 910-331-1673; FSC No.: 15907; Empl.: 40; *Sls. Mgr.:* L. Moore; *Dist. Mgr.:* L. Moore

MICRO MO ELECTRONICS, INC., 742 2nd Ave. S., St. Petersburg, FL 33701, Tel: 813-822-2529, Telex: 807-982; Empl.: 25; *Sls. Mgr.:* S. J. O'Neil ..... **B•1172-1175**

MICRO-MOUNTING DEVICES, 4092 Keith Dr., Campbell, CA 95008, Tel: 408-866-4626; FSC No.: 59058

micronel®

MICRONEL U.S., 2142F Industrial Ct., Sycamore Research Center, Vista, CA 92083, Tel: 619-727-7400; FSC No.: 619-727-4436; Empl.: 25; *Sls. Mgr.:* S. William Linko ..... **C•1622, 1654-1673**

Local Sales Offices & Reps
MA Lexington, Micronel U.S.-East 617-862-1202

MICRONETICS, 36 Oak St., Norwood, NJ 07648, Tel: 201-767-1320, TWX: 710-991-9603; FSC No.: 54487; Empl.: 26; *Sls. Mgr.:* Gary Simonyan

MICRO SWITCH

MILITARY SPECIFICATION
INDUSTRIAL AND COMMERCIAL
AUTHORIZED DISTRIBUTOR

ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

MICRO SWITCH
a Honeywell Division

IN STOCK • IN STOCK
Franchised Distributor
FAST ENGRAVING SERVICE
LOGICOMP
ELECTRONICS, INC.

1009 W. BOSTON POST ROAD
MAMARONECK, NEW YORK 10543
PHONE: (914) 698-9332

TOLL FREE
(Outside N.Y.)
800/431-2625

MICRO NETWORKS, 324 Clark St., Worcester, MA 01606, Tel: 617-852-5400, Telex: 951808, TWX: 710-340-0067; Empl.: 300

MICRON INDS., 1830 N. 32nd Ave., Stone Park, IL 60165, Tel: 312-345-0788, Telex: 27-0248; FSC No.: 30882; Empl.: 100; *Sls. Mgr.:* Donald O. Wehrenberg

MICRO-NOW INSTR. CO., INC., 8260 N. Elmwood St., P.O. Box 856, Skokie, IL 60077, Tel: 312-677-4700, Telex: RCA 297214-MICRO-UR; FSC No.: 33288; Empl.: 25; *Sls. Mgr.:* C. Arnow

Local Sales Offices & Reps

CA	Los Angeles, Mc Dougall/Mc Laughlin	213-477-8556
CA	Mountain View, Mark V Assoc.	415-964-6275
CO	Boulder, H. Bass Assocs.	303-499-7509
CT	North Haven, Pat Jenks Assoc.	203-239-6201
MA	Woburn, Pat Jenks Assoc.	617-938-0488
NM	Albuquerque, IMEC	505-344-2212
NY	Huntington Station, Metro-Mic	516-GE3-3333
PA	Melrose Park, Robert Meyers Assoc.	215-224-1663
TX	Dallas, Texas Avionics	214-368-3566
WA	Seattle, Datacom	206-285-2525

MICRO-OHM
CORPORATION
Manufacturers of
QUALITY RESISTORS

MICRO-OHM CORP., 4900 Santa Anita Ave., El Monte, CA 91731, Tel: 818-442-3310, 213-686-0535, TWX: 910;587-3425; FSC No.: 20940; Empl.: 109; *Sls. Mgr.:* Chas. Schwab; *Dist. Mgr.:* Don Ritchey ... **A•1892-1897**

Local Sales Offices & Reps

AZ	Scottsdale, Burke Hill & Assoc.	602-945-9116
CA	Laguna Hills, Cravins Assoc.	714-855-4327
CA	Rancho Cordova, Alpha Omega Grp.	916-638-0480
CA	San Diego, Cerco	619-450-1754
CA	San Marino, Walls Assoc.	213-287-7276
CO	Denver, William Purdy Co.	303-777-1411
FL	DeBary, DJE Assoc.	305-668-6827
IL	Woodridge, Trend-Tronics	312-985-0626
MA	Canton, N E E S Co.	617-828-4835
NM	Albuquerque, Wm. J. Purdy Co.	505-266-7959
OH	Cleveland, Jim Finnigan & Co.	216-238-5905
OR	Beaverton, Wm. J. Purdy Co.	503-641-9373
UT	Salt Lake City, Wm. J. Purdy Co.	801-486-8557
EXP	Herzila, Israel, Relcom Agys.	052-855-46

Local Distributors

CA	Anaheim, A to Z Elctrns.	714-634-3620
CA	Burbank, TAW Elctrns.	213-846-3911
CA	Burlingame, Rose Elctrns.	415-348-2740
CA	Canoga Park, Myco-Vickers	213-340-2025
CA	Costa Mesa, Orange County Comps.	714-979-3597
CA	Industry, Ital Elctrn. Sls.	213-968-8515
CA	San Diego, Shelley Elctrns.	619-453-7133
IL	Des Plaines, Circuit Svc.	312-296-4412
IL	Woodridge, Trend-Tronic	312-985-0626
MN	Minneapolis, Electronic Ctr.	612-371-5200
NH	Hampstead, Astrum Elctrns.	603-329-5656
NY	New Rochelle, Derf Elctrns.	914-235-4600
NY	Oceanside, Tritech	516-678-6222
OH	Toledo, J R Inds.	419-865-1408
PA	McKean, Advacom	814-476-7774
TX	Ft. Worth, Industrial Elect.	817-731-7321
UT	Provo, Central Utah Elctrns. Supp.	801-373-7522
UT	Salt Lake City, Nytronics	800-242-7612
Intl	Japan, Tokyo, Yoshico Intl.	03-230-2641

MICROPAC INDS., 905 E. Walnut St., Garland, TX 75040, Tel: 214-272-3571, TWX: 910-860-5186; Empl.: 135; *Sls. Mgr.:* Dick Schlueter

MICROPAC INDS., INC., General Sensors Div., 905 E. Walnut St., Garland, TX 75040, Tel: 214-272-3571, TWX: 910-860-5186; Empl.: 120; *Sls. Mgr.:* Richard Schlueter

MICRO PERIPHERALS INC., 9754 Deering Ave., Chatsworth, CA 91311, Tel: 213-709-4202, TWX: 910-494-1213; Empl.: 400; *Sls. Mgr.:* Keith Murphy; *Dist. Mgr.:* Robert Lewis

MICROPHASE, 587 Connecticut Ave., Norwalk, CT 06856, Tel: 203-866-8000, TWX: 710-468-0003; Empl.: 195; *Sls. Mgr.:* F. S. Parin

MICRO PLASTICS INC., Hwy 178 North, Flippin, AR 72634, Tel: 501-453-2261, 1-800-643-2356, Telex: 783036; FSC No.: 13764; Empl.: 150; *Sls. Mgr.:* J. H. Beijen; *Dist. Mgr.:* N. Vandermast

MICRO PLASTICS INC., 20821 Dearborn St., Chatsworth, CA 91311

MICROPLEX, INC., 1977 State College Blvd., Anaheim, CA 92806, Tel: 714-979-8833, 714-634-1535; Empl.: 30

MICRO POWER INTL., INC., 9420 Activity Rd., San Diego, CA 92126, Tel: 619-271-0831

MICRO POWER SYS. INC., 3100 Alfred St., Santa Clara, CA 95050, Tel: 408-727-5350, TWX: 910-338-0154; FSC No.: 54186; Empl.: 305; *Sls. Mgr.:* Don Cavallo; *Dist. Mgr.:* Reed Neddermeyer

MICRO-PRODUCTS ENGRG. CO., 230 Ridgewood Ave., Newark, NJ 07108, Tel: 201-824-8467; Empl.: 100; *Sls. Mgr.:* Gerald Muller

MICROSCIENCE, INC., 182 Forbes Rd., Braintree, MA 02184, Tel: 617-849-1952, Telex: 750-480; *Sls. Mgr.:* Toni Z. Drybanski

MICRO SEMICONDUCTOR, 2830 S. Fairview St., Santa Ana, CA 92704, Tel: 714-979-8220, TWX: 910-595-1576; FSC No.: 14552; Empl.: 250; *Sls. Mgr.:* M. Gregson; *Dist. Mgr.:* M. Gregson

MICROSONICS
INCORPORATED

MICROSONICS INC., 60 Winter St., Weymouth, MA 02188, Tel: 617-337-4200, TWX: 710-388-6833; FSC No.: 11869; Empl.: 200; *Sls. Mgr.:* Frank Manning ... **A•1386**

Local Sales Offices & Reps

CA	Los Altos, Kolm Mktg.	415-948-2635
CA	Los Angeles, D & G	213-641-7976
CA	Torrance, Detomasit Grp.	213-327-1775
CO	N. Glenn, Hi-Tech	303-457-9666
FL	Boca Raton, Lawrence Assocs.	305-368-7373
FL	Clearwater, Lawrence Assocs.	813-443-2698
FL	Melbourne, Lawrence Assocs.	305-724-8294
IL	Mt. Prospect, Cain forlaw Co.	312-253-3578
MD	Ellicott City, V.P.I.	301-461-2525
MA	Hingham, O'Sullivan & Murphy	617-749-8680
MO	Kansas City, EIR	816-452-7030
MO	Leesburg, EIR	314-245-6860
NJ	Glen Gardner, F & M Tech. Sls.	201-832-7216
NY	Liverpool, Cain Forlaw Co.	315-457-0100
NY	Melville, Metro Mics	516-271-6677
OH	Lancaster, Cain Forlaw Co.	614-654-4800
TX	Dallas, Data Mktg. Assocs.	214-661-6300
WA	Seattle, S.J.I.	206-763-8981

MICRO SWITCH
a Honeywell Division

MICRO SWITCH, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, Tel: 815-235-6600, Telex: 257499, TWX: 910-642-0922; Empl.: 3000; *Sls. Mgr.:* J. J. Tropsa; *Dist. Mgr.:* R. A. Garner ..... **B•1476, 1625-1670, 1732-1733, 1757, 1802-1804**

Local Sales Offices & Reps

CA	Orange	714-558-7400
CA	San Jose	408-977-3008
CO	Englewood	303-779-6439
CT	Hartford	203-695-4011
GA	Atlanta	404-982-2565
IL	Bensenville	312-860-3968
IA	Bettendorf	319-359-3441
MA	Newton	617-969-0265
MI	Southfield	313-424-3569
MN	Minneapolis	612-830-3516
MO	St. Louis	314-576-2518
NJ	Westfield	201-233-9200
NY	Rochester	716-424-2700
NC	Charlotte	704-364-4770
OH	Brooklyn Heights	216-459-6075
OH	Dayton	513-237-4075
PA	Valley Forge	215-666-8340
TX	Dallas	214-688-7533
TX	Houston	713-780-6651
WA	Bellevue	206-453-7591

WI Brookfield 414-784-6260
Can Edmonton 403-453-3581
Can Ottawa 613-224-3822
Can Vancouver 604-291-6631
Can Ville St. Laurent 514-731-7681
Can Willowdale 416-491-1300
Can Winnepeg 204-632-0250

MICRO/SYS, 1011 Grand Central Ave., Glendale, CA 91201-3010, Tel: 818-244-4600, TWX: 910-588-1988; *Sls. Mgr.:* Dennis Henderson; *Dist. Mgr.:* Dennis Henderson

MICROSYSTEMS DEV. CORP. INC., 1560 Teaneck Rd., Teaneck, NJ 07666, Tel: 201-837-0051, Telex: 13-6479 Att. 296; *Sls. Mgr.:* L. G. Mansoor

MICROTECH, 1420 Conchester Hwy., Boothwyn, PA 19061, Tel: 215-459-3566; Empl.: 22; *Sls. Mgr.:* H. Carter

MICROTECH EXPORTS, 467 Hamilton Ave., Ste. 2, Palo Alto, CA 94301, Tel: 415-324-9114, TWX: 910-370-7457 MUH-ALTOS; *Sls. Mgr.:* Patricia Martz

MTI MICRO-TECHNICAL INDUSTRIES

MICRO TECHNICAL INDS., Micro-Ohm Corp., 23666 Birtcher Dr., # B, Lake Forest, CA 92630, Tel: 714-855-4326, Telex: TLX 3719688; *Sls. Mgr.:* Karen Hild ..... **D•1170-1171**

Advertisement

Micro Technical Industries manufactures affordable environmental testing instruments for the heat testing of any electronic componenet such as integrated circuits, diodes, transistors, etc. Write/call free brochures.

Local Sales Offices & Reps

AZ Scottsdale, Burke Hill & Assocs. 602-945-9116
CA San Marino, Walls & Assocs. 213-287-7276
MA Cohasset, Resch. Ultd. 617-482-5959
OR Portland, Controltek Sls. Ltd. 503-641-0877
PA Jenkintown, Arnold Assocs. 215-887-7870
TX Dallas, Dean Assocs. 214-458-1321
WA Seattle, Controltek Sls. Ltd. 206-451-8163

MICRO TECHNOLOGY, INC., 1620 Miraloma Ave., Placentia, CA 92670, Tel: 714-632-7580; *Sls. Mgr.:* Christine Schettino

MICROTEST SYSTEMS, INC., 1188 Bordeaux Dr., Sunnyvale, CA 94089-1281, Tel: 408-745-7000, TWX: 910-339-9325; *Dist. Mgr.:* Tom J. Garza

MICROTRAN company, inc.

MICROTRAN CO. INC., 145 E. Mineola Ave., Valley Stream, NY 11580, Tel: 516-561-6050, TWX: 510-225-8412; FSC No.: 00348; Empl.: 100; *Sls. Mgr.:* W. Benscher ..... **A•1241, 2098, 2184-2197**

Local Sales Offices & Reps

AL Huntsville, Over & Over 205-533-6266
AZ Scottsdale, F. Schoeffler 602-948-1004
CA Campbell, Kottmeier Assocs. 408-866-5153
CA El Monte, Cook Entprs. 213-686-2120
CO Englewood, Omega, Ltd. 303-762-1921
FL Orlando, Over & Over, Inc./Florida 305-857-4057
GA Norcross, Over & Over 404-449-6205
IL Wheaton, Chadra-Schilke Assoc. 312-653-8126
IN Noblesville, R & D Elctrn. Sls. 317-849-2026
KS Overland Pk., J.F. Guernsey Co. 913-381-2225
MA Reading, Meco, Inc. 617-944-6660
MN Minnneapolis, RK Sales 612-786-5713
MO Florissant, John F. Guernsey Co. 314-921-5720
NJ Englewood Cliffs, E. Glass Assocs. ... 212-586-8440
NM Albuquerque, C.T. Carlberg & Assocs. 505-888-3883
NY Rochester, J.G. Welch Assocs. 716-244-1100
NC Charlotte, Over & Over 704-527-3070
OH Cincinnati, J.O. Olsen Co. 513-574-7711
OH Cleveland, J.O. Olsen 216-662-3454
OR Portland, SPS Elctrns. 503-297-6919
PA Jenkintown, Arnold Assocs. 215-887-7870
PA Pittsburgh, J.O. Olsen Co. 412-279-2550
TN Antioch, Over & Over, Inc. 615-834-0140
TX Grand Prairie, Howell Sls. 214-262-5153
WA Seattle, SPS Elctrns. 206-323-4140
Intl Israel, Herzlia B, Vectronics 052-56070
Intl Switzerland, Zurich, Swisel 01-481-9188
Can Montreal, Quebec, H. W. Brieger Sls., Inc. 514-486-5869

Local Distributors

AL Birmingham, MG Elctrns. & Equip. 205-328-4525
CA Fullerton, Pyramid/Fullerton 714-773-0781
CA Santa Clara, Pyramid Elctrns. 408-727-9810
CA Santa Monica, Master Distrs. 800-421-8153
CA Sunnyvale, Sierra West Elctrns. 408-747-1188
CO Denver, Ragon Elctrns. Parts 303-744-3601
FL Clearwater, Elctrn. Precepts of Florida 813-530-9781
FL Ft. Lauderdale, Peerless Radio Corp. .. 305-973-4141
IL Northbrook, Classic Comp. 312-272-9650
IN Indianapolis, Graham Elctrns. 317-634-3202
IA Cedar Rapids, Deeco, Inc. 319-365-7551
MA Burlington, QPL Elctrn. Distr. 617-229-2424
MA Hingham, Sager Elec. Supp. 617-749-6700
MN Minneapolis, Berqquist 612-835-2322
NJ Kenilworth, Federated Elctrns. 201-272-0505
NM Albuquerque, Walker Elctrn. Supp. 505-883-2992
NY Buffalo, Summit Distrs. 716-884-3450
NY Johnson City, Help Elctrns. 607-729-3528
NY Lynbrook, Peerless Radio 516-593-2121
NY Rochester, Summit Distrs. 716-334-8110
NC Raleigh, Southeastern Radio 919-828-2311
OH Cleveland, Pattison Supp. 216-441-3000
OH Dayton, J.A. Becker Co. 513-226-1341
PA McKeesport, Barno Radio Co. 412-751-5971
PA Philadelphia, Shap Elctrns. 215-969-3300
TX Houston, Lenert Co. 713-225-1465
UT Salt Lake City, Newark Elctrns. 801-486-1048
WA Kirkland, Priebe Elexs. 206-821-4695
WI New Berlin, Classic Comp. 414-786-5300

MAG MICROWAVE APPLICATIONS GROUP

MICROWAVE APPLICATIONS GRP., 3030 Industrial Pkwy., Santa Maria, CA 93455, Tel: 805-928-5711, TWX: (MAGSAMA) 910-351-5808; Empl.: 120; *Sls. Mgr.:* D. W. Prigge

MICROWAVE ASSOCS. LTD., Humphrey Rd., Dunstable, Bedfordshire, England LU5 4SX, England, Tel: 44-(582) 60-14-41, Telex: 82295; Empl.: 400; *Sls. Mgr.:* K. Harris

MICROWAVE DEVELOPMENT LABS., 10 Michigan Dr., Natick, MA 01760, Tel: 617-655-0060, TWX: 710-386-6850; Empl.: 180; *Sls. Mgr.:* R. Tucker

MICROWAVE DIODE CORP., Washington St-Box 250, W. Stewartstown, NH 03597, Tel: 603-246-3362/3363, TWX: 710-321-8901; Empl.: 15

MICROWAVE FILTER INC., 6743 Kinne St., East Syracuse, NY 13057-0486, Tel: 315-437-3953, 800-448-1666, TWX: 710-541-0493; FSC No.: 27834; Empl.: 125; *Sls. Mgr.:* E. Bostick, V.P. Mktg.; *Dist. Mgr.:* Bill Bostick

MICROWAVE SEMICONDUCTOR CORP., 100 School House Rd., Somerset, NJ 08873, Tel: 201-469-3311, Telex: 833473, TWX: 710-480-4730; Empl.: 430; *Sls. Mgr.:* Carl Lump

MICROWAVE/SYS., 1 Adler Dr., E. Syracuse, NY 13057, Tel: 315-437-9951, Telex: 710-541-0408; FSC No.: 26058; Empl.: 25; *Sls. Mgr.:* Michael P. Busse

MICTRON INC., 6050 Porter Way, Sarasota, FL 33582, Tel: 813-371-6659; *Sls. Mgr.:* M. Weinstein

MIDDLEBURG CORP., Middco Connectors, 95 Albany Turnpike, Canton, CT 06019, Tel: 203-693-8361; Empl.: 20; *Sls. Mgr.:* Betty-Lou Berube

Local Sales Offices & Reps

CA Del Mar, Chapman & Chapman 619-775-0412
CA Placentia, Local Sls. 714-993-1800
CA San Jose, PCA Mktg. Sls. 408-723-2200
CO Denver, Aspen Sales 801-467-2401
GA Norcross, Electramark, Inc. 404-446-7915
NH Nashua, Bell Controls 603-882-6984
NY Tuxedo Park, Wakeman Norton Assocs. 914-351-5241
PA Horsham, Dalbrook 215-441-8380
TX Dallas, Milco Mktg., Inc. 214-783-2716
TX Houston, Milco Mktg., Inc. 713-723-5003
UT Salt Lake City, Aspen Sls. 801-467-2401

Local Distributors

CA Santa Ana, Mann Southwest 714-558-3202
MA Woburn, Elctrns. Packaging Comp. 617-935-0400

ME MID-EASTERN INDUSTRIES INC

MID-EASTERN INDUSTRIES, 100 Campus Dr., RD 1, Mt. Holly, NJ 08060, Tel: 609-267-3811; FSC No.: 06179; Empl.: 8; *Sls. Mgr.:* Daniel Ellenback ..... **D•1724-1726**

Local Sales Offices & Reps

AL Pimsom, JM Simpson & Assocs. 205-854-2546
CA Los Angeles, Dyna Sls. 213-268-1175
FL Altamonte Springs, WMM Assocs. 305-831-4530
FL Clearwater, WMM Assocs. 813-442-3913
FL Ft. Lauderdale, WMM Assocs.
IL Des Plains, Marsland Assocs., Inc. 312-298-2620
IN Indianapolis, Marsland Assocs., Inc. ... 317-293-5437
IA Cedar Rapids, Marsland Assocs., Inc. 319-396-8030
MI Centerline, Dietrich & Assocs. 313-754-6450
MN Minneapolis, Marsland Assocs., Inc. ... 612-545-4481
MO St. Louis, Marsland Assocs., Inc. 314-991-1399
NJ Cinnaminson, Scott Sls. Co. 609-829-2991
NY Huntington, C.R. Mayer Co. 516-WA1-7876
OH Cleveland, Dietrich & Assocs. 216-781-1855
OH Dayton, Dietrich & Assocs. 513-223-6042
PA Pittsburgh, Dietrich & Assocs. 412-892-2992
TX Garland, Tesco 214-681-1376
WA Seattle, Eicher-Richards Co. 206-LA3-7888
WI New Berlin, Marsland 414-786-6611

MIDGARD ELCTRNS., See Transkinetic Sys.

MIDGET LOUVER, 800 Main Ave., Norwalk, CT 06852, Tel: 203-866-2342; Empl.: 10; *Sls. Mgr.:* Frank J. Scallon; *Dist. Mgr.:* Frank J. Scallon

MIDLAND-ROSS CORP., Grimes Div., 515 N. Russell St., Urbana, OH 43078, Tel: 513-652-1431

MIDLAND-ROSS CORP., Midcom Unit, P.O. Box 3328, N. Mankato, MN 56001, Tel: 507-625-6521, TWX: 910-565-2244; Empl.: 200

MIDLAND-ROSS CORP., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001, Tel: 507-625-6521, TWX: 910-565-2244; Empl.: 1008

MIDLAND ROSS

MIDLAND-ROSS CORP., NEL Unit, 357 Beloit St., Burlington, WI 53105, Tel: 414-763-3591, TWX: 910-278-2450; FSC No.: 00815; Empl.: 300; *Sls. Mgr.:* Boyd Recknagel; *Dist. Mgr.:* Lyann Jung ..... **A•1387**

Local Sales Offices & Reps

AZ Scottsdale, EDP & Assocs. 602-991-6119
AR Hot Springs, ASI 501-767-5444
CA Los Angeles, EESCO 818-242-8823
CA Los Angeles, Landa Minyard, Inc. 213-879-0770
CA Rancho Bernardo, EESCO 619-233-5660
CA San Mateo, Midland-Ross 415-573-5824
CA Santa Ana, Landa Minyard, Inc. 714-543-7805
CA Santa Clara, Caltronics, Inc. 408-727-7552
CO Parker, A5 Co. 303-841-3651
CT Old Saybrook, Bell Controls 203-388-0063
FL Coral Springs, Electrocraft 305-753-8666
FL Largo, Electrocraft 813-398-4071
FL Winter Park, Electrocraft 305-628-4705
GA Marietta, Midland-Ross 404-971-6778
IL Downers Grove, Richmar Elctrn. Corp. 312-968-0118
IN Indianapolis, Richmar Elctrn. Corp. 317-846-6383
KS Kansas City, B. C. Elctrn. Sls., Inc. 913-342-1211
KS Wichita, B. C. Elctrn. Sls., Inc. 316-722-0104
MD Hunt Valley, Midland-Ross 301-666-3930
MD Timonium, Eastern Comp. Sls. Corp. .. 301-561-5811
MI Novi, Lektronics 313-349-3304

MN Minneapolis, Holmgren Assocs. 612-786-7641
MO Bridgeton, B. C. Elctrn. Sls., Inc. 314-291-1101
NV Reno, Unitronics 702-825-1978
NH East Hanover, Emtec Sls., Inc. 201-428-0600
NH Nashua, Bell Controls 603-882-6984
NY Albany, Lamb Comps. 518-869-3355
NY Buffalo, Lamb Comps. 716-874-4900
NY Melville, Emtec Sls. Inc. 516-752-1630, 510-220-9647
NY Rochester, Lamb Comps. 716-323-1250
NY Syracuse, Lamb Comps. 315-455-2469
NC Raleigh, Eastern Comp. Sls. Corp. 919-787-3416
OH Dayton, KW Elctrn. Sls., Inc. 513-890-2150
OH Shaker Heights, KW Elctrn. Sls., Inc. 216-491-9177
OH Worthington, KW Elctrn. Sls., Inc. 614-888-0483
OR Lake Oswego, R.T.S., Inc. 503-227-1189
OR Wilsonville, R.T.S., Inc. 503-638-5670
PA Allison Park, KW Elctrn. Sls., Inc. 412-487-4300
PA W. Conshohocken, Eastern Comp. Sls. Corp. 800-223-3850, 215-825-8610
TX Conroe, Richmar Elctrn. Corp. 713-580-4430
TX Georgetown, Richmar Elctrn. Corp. 512-863-4535
TX Plano, Richmar Elctrn. Corp. 214-867-8224
UT Murray, A5 Co. 801-261-0722
WA Auburn, R.T.S., Inc. 206-627-1790
WA Seattle, R.T.S., Inc. 206-527-7945
WA Vashon, R.T.S., Inc. 206-285-1363
WI Butler, Richmar Elctrn. Corp. 414-781-1730
EXP WI, Burlington, Midland-Ross, NEL Unit 414-763-3591
Can Brampton, Ont., Midland-Ross of Can., Ltd. 416-453-4200

Local Distributors

CA Anaheim, Pacesetter Elctrns. 714-777-4711
CA Canoga Park, Tim-Co Sls. 818-992-5040
CA Chatsworth, Integrated Elctrns. 818-998-2200
CA Irvine, Integrated Elctrns. 714-660-1055
CA Mountain View, Cornett Elctrns. 415-969-5420
CA Sacramento, Integrated Elctrns. 916-424-5297
CA San Diego, Mock III Sls. Co. 619-560-0515
CA San Jose, Integrated Elctrns. 408-263-1100
CA Santa Clara, Glynn Elctrns., Inc. 408-748-1666
CA Santa Monica, Master Distrs. 213-452-1229
CA Torrance, All American 213-320-0240
CA Van Nuys, Patane Avionics 818-988-4455
CO Denver, Integrated Elctrns. 303-292-6121
CO Wheat Ridge, Diplomat/ACT 303-422-9229
FL Miami, All American 305-621-8282
GA Atlanta, Prehler, Inc. 404-447-5540
IL Chicago, Prehler, Inc. 312-872-4910
IL Northbrook, Classic Comps. Supp. 312-272-9650
IL Rosemont, Advent Elctrns. 312-297-6200
IL Skokie, Mar-Con Assocs. 312-675-6450
IN Indianapolis, Advent Elctrns. 317-872-4910
IN Indianapolis, Classic Comp. Supp. 319-363-0221
IA Cedar Rapids, Advent Elctrns. 319-363-0221
IA Cedar Rapids, Bergquist 319-366-8733
MD Beltsville, Treeko Sls. 301-792-0112
MD Rockville, All American 301-792-0112
MA Billerica, A. W. Mayer Co. 617-229-2255
MI Farmington Hills, Advent Elctrns. 313-477-1650
MN Edina, Diplomat/ACT 612-559-2500
MN Minneapolis, Bergquist Co. 612-835-2322
NY Buffalo, Genesee Radio 716-546-5373
NY Rochester, Masline Elctrns., Inc. 716-546-5373
NY Stony Brook, Dove Elctrn. Comp., Inc. 516-689-7733
NC Raleigh, Prehler Elctrns. 919-876-9111
OH Cincinnati, Schuster Elec. Co. 800-543-4973
OH Englewood, Argent Electra 513-836-8633
OH Solon, Repco Elctrns. 216-248-8900
OK Tulsa, Altair Co. 918-252-5781
OR Tigard, Integrated Elctrns. 503-639-9661
PA Pittsburgh, Alder-Tronics 412-821-5565
TX Austin, Altair Co. 512-837-4970
TX Austin, Diplomat/ACT 512-452-5254
TX Dallas, Diplomat/ACT 214-980-1888
TX Houston, Altair Co. 713-462-3029
TX Houston, Diplomat/ACT 713-496-4000
TX Richardson, Altair Co. 214-231-5166
UT Salt Lake City, Diplomat/ACT 801-487-8131
UT Salt Lake City, Integrated Elctrns. 801-298-1868
WA Bellevue, Integrated Elctrns. 206-455-2727
WI Mequon, Taylor Elec. 800-242-8914
WI New Berlin, Classic Comps. Supp. 800-242-7408
EXP WI, Burlington, Midland-Ross Corp. 414-763-3591
Can Brampton, Ont., Midland-Ross of Can., Ltd. 416-453-4200

MIDLAND STANDARD, INC., 603 E. Chicago St., Box 38, Elgin, IL 60120, Tel: 312-741-6600; Empl.: 38

MIDWAY MFR. CO., 10750 W. Grand Ave., Franklin Park, IL 60131, Tel: 312-451-1360, Telex: 72-1596; Empl.: 2000; *Dist. Mgr.:* Allan Stearns

MIDWEC, See Industrial Midwec Capacitors

MCI

MIDWEST COMPS., 1981 Port City Blvd., Muskegon, MI 49443, Tel: 616-777-2602, TWX: 510-394-4130; FSC No.: 50157; Empl.: 125; *Sls. Mgr.:* J. E. Saling ..... **B•1740, 1758-1765**

Local Sales Offices & Reps

AL Huntsville, Glen White Assoc. 205-883-7938
CA Saratoga, Testco 408-253-1900
FL Light House Pt., R. C. Simon 305-941-2757
GA Norcross, Glen White Assoc. 404-441-1447
IL Chicago, D. Dolin Sls. 312-286-6200
IN Ft. Wayne, TMC Corp. 219-432-5553
MD Timonium, Glen White Assoc. 301-252-6360
MN St. Paul, R. G. Ragon 612-488-0201
NJ Burlington, Mallon Sls. 609-387-4044
NJ Ft. Lee, Necco 201-461-2789
NY New York, Necco 201-461-2789
NC Raleigh, Glen White Assoc. 919-787-7023
OH Dayton, Jay Engrg. 513-253-2151
OH N. Royalton, Jay Engrg. 216-237-4235
OK Tulsa, Norcom 918-664-9526
TN Gray, Glen White Assoc. 615-477-8850
TX Dallas, Norcom 214-386-4888
TX Houston, Norcom 713-988-0022
VA Lynchburg, Glen White Assoc. 804-237-6291
WA Bellevue, Testco 206-454-7422
WI Milwaukee, D. Dolin Sls. 414-482-1111

MIKRON INSTR., Box 211, Ridgewood, NJ 07451, Tel: 201-891-7330, TWX: 710-988-5821; Empl.: 40; *Sls. Mgr.:* K. Irani

Distributor

MIL-COMM DISTRIBUTORS, INC., 9400 Lurline Ave. # C, Chatsworth, CA 91311, Tel: 818-998-3111 ..... **D•1421**

MIL ELECTRONICS, INC., 1 Mill st., Dracut, MA 01826, Tel: 617-453-8000; FSC No.: 07862; Empl.: 40; *Sls. Mgr.:* Mark Ryan

MILFORD RIVET & MACH., 857 Bridgeport Ave., Milford, CT 06460, Tel: 203-878-4631, Telex: 964363, TWX: 710-462-0538; Empl.: 400; *Sls. Mgr.:* Robert E. Kranz, Jr.

MILLEN COMPONENTS, Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, Tel: 617-438-6951, Telex: 948-025; FSC No.: 57285; Empl.: 50; *Sls. Mgr.:* R. A. Boisseau; *Dist. Mgr.:* Gardner Gray

MILLER DIAL CORP., 4400 N. Temple City Blvd., El Monte, CA 91734, Tel: 818-283-5111, TWX: 910-587-3438; *Sls. Mgr.:* Doug Hazelip

MILLER, J.W., CO., See Bell Inds.

MILLER, L.C., CO., 717 Monterey Pass Rd., Monterey Pk., CA 91754, Tel: 213-268-3611; Empl.: 45

MILLER, SANFORD, CORP., See Sanford-Miller Corp.

MILLER, W. A., CO., Mingo Loop, P.O. Box 337, Oquossoc, ME 04964, Tel: 207-864-3344; Empl.: 18; *Sls. Mgr.:* D. Hunger

MILLER-STEPHENSON CHEM. CO., INC., George Washington Hwy., Danbury, CT 06810, Tel: 203-743-4447, Telex: 643-711

MILLIFLECT, 7752 Enterprise Dr., Newark, CA 94560, Tel: 415-791-5188; Empl.: 22; *Sls. Mgr.:* J. F. Rutschow

MILLI-SWITCH CORP., Box 67, Gladwyne, PA 19035, Tel: 215-MI2-9222; Empl.: 15

MILLIVAC INSTRS., Box 997, Curry Rd. Ext., Schenectady, NY 12301, Tel: 518-355-8300; FSC No.: 85711; Empl.: 30; *Sls. Mgr.:* (Mrs.) Pola Metzger ..... **D•1266**

Local Sales Offices & Reps

CA San Diego, Jan B. Metzger 619-571-8406
MA Needham, Addelco Corp. 617-444-4754
NY Fayetteville, Martin P. Andrews 315-637-5291
NY Melville, Paul W. Steen Assocs. 516-427-1114
PA Media, S & S Div. of Klinetics 215-565-5388
TX Houston, Scientific Sls. 713-460-9170
TX Richardson, Scientific Sls. 214-231-6541
Can Downsview, Ont., Tradeport Elctrns. Grp. 416-736-0866

MILL-MAX MFG. CORP., P.O. Box 300, Oyster Bay, NY 11771, Tel: 516-922-6000, TWX: 510-221-1820; *Sls. Mgr.:* Therese Malhame

MILLS RESISTOR CO., 3840 Catalina St., Los Alamitos, CA 90720, Tel: 213-598-2454; FSC No.: 34238; Empl.: 50 ..... **A•1899**

Local Sales Offices & Reps

AZ Scottsdale, Verein Corp. 602-948-3571
CA Los Altos, Frauman Assocs. 415-941-0660
CA Sacramento, Mills Resistor Co. 916-422-5461
CT Rocky Hill, Jim McPhail 203-721-1802
KS Leawood, James Dick Co. 913-649-0805
MA Waltham, Dynasel Assocs. 617-890-6777
OH Chagrin Falls, ARL Co. 216-543-9124
OR Gaston, SPS Elctrns. 206-323-4140
TX Houston, Ev Smith Co. 713-649-5756
WA Seattle, SPS Elctrns. 206-323-4140

Local Distributors

AZ Phoenix, Fiesta Elctrns. 602-861-1141
FL Ft. Lauderdale, Jaro Elctrns. 800-327-5551

MILPOWER SOURCE, INC., 49 Range Rd., Windham, NH 03087, Tel: 603-893-2834; Empl.: 150

Local Sales Offices & Reps

MD Baltimore, Micro Comp., Inc. 301-247-0400

MILTON ROSS CO., 511 Second St. Pike, Southampton, PA 18966, Tel: 215-355-0200, TWX: 510-667-1702; Empl.: 165; *Sls. Mgr.:* M. I. Ross

MILTOPE CORP., 1770 Walt Whitman Rd., Melville, NY 11747, Tel: 516-420-0200, TWX: 510-221-1803; Empl.: 500; *Sls. Mgr.:* Robert Ceonzo; *Dist. Mgr.:* William Jennings

MRC

MILWAUKEE RESISTOR CORP., 700 W. Virginia St., Milwaukee, WI 53204, Tel: 414-271-9900; FSC No.: 82807;15109; Empl.: 100; *Sls. Mgr.:* W. R. Pollock; *Dist. Mgr.:* W. R. Pollock ..... **A•1900-1905**

Local Sales Offices & Reps

CA San Carlos, Electro Pacific 415-592-3114
IL La Grange, PVA Co. 312-579-9300
NY Rochester, Gislason Sls. 716-328-7400

MILWAUKEE TRANSFORMER CO., MTE Corporation, 7901 W. Clinton Avenue, Milwaukee, WI 53223, Tel: 414-358-5300; *Sls. Mgr.:* Richard T. Armantrout; *Dist. Mgr.:* Richard T. Armantrout

MIMIC, INC., P.O. Box 921, Acton, MA 01720, Tel: 617-263-2101; Empl.: 5; *Sls. Mgr.:* S. Thurston

MINCO PRODS., 7300 Commerce La., Minneapolis, MN 55432, Tel: 612-571-3121, TWX: 910-576-2848; FSC No.: 09359; Empl.: 400; *Sls. Mgr.:* J. Anderson

MIN-E-CON, 1791 Reynolds, Irvine, CA 92714, Tel: 714-250-0474, TWX: 910-595-1144; *Sls. Mgr.:* Wendell Jacob

MINELCO INC. - A TALLEY IND., 135 S. Main St., Thomaston, CT 06787-0459, Tel: 203-283-8261, TWX: 710-475-1091; FSC No.: 07479; Empl.: 61; *Sls. Mgr.:* John Pfingsten

Local Sales Offices & Reps

AL Huntsville, L & D Inc. 205-837-1469
AZ Phoenix, Dood & Co. Inc 602-482-9330
CA Alhambra, M.W. Riedel & Co. 213-283-7694
CA Hayward, Liaison, Inc. 415-783-1131
CO Denver, West Inc. 303-477-8180
CT Old Saybrook, FJS Assocs. 203-388-5374
FL Orlando, Delmac 305-898-4688

GA Atlanta, L & D, Inc. 404-395-7079
IL Elk Grove Village, Midwest Meridian .. 312-640-9540
IA Cedar Rapids, J.R. Sls. Engrg. 319-393-2232
MD Severna Park, DelMarva Eng. Assoc. .. 301-647-8007
MA Winchester, F.J.S. Assocs. 617-729-3135
MN New Brighton, TWC Sls. 612-636-1770
MO Maryland Heights, Midwest Meridian .. 314-878-4441
NJ Hasbrouck Hgts., Comp-Tech Sls. 201-288-7400
NY Syracuse, J. R. Costello 315-472-0322
NC Greensboro, L & D, Inc. 919-292-3201
OH Cleveland, Jim Finnegan & Co. 216-238-5905
OR Beaverton, Caruso-Northcutt 503-646-4973
PA Downingtown, McCoy, Inc. 215-363-0350
TX Fort Worth, Midwest Meridian 817-654-2132
WA Bellevue, Caruso-Northcutt 206-454-9699

MINIATURE METAL FORMING DIV., 4819 Emerald St., P.O. Box 2962, Torrance, CA 90509, Tel: 213-370-3679, Telex: 75-7989; *Sls. Mgr.:* William Kramer

MINIATURE PRECISION BEARINGS, MPB Corp., Precision Park, Keene, NH 03431, Tel: 603-352-0310, TWX: 710-366-1801; *Sls. Mgr.:* Thomas A. Rudziensky; *Dist. Mgr.:* Jack E. Barker

Mini-Circuits

MINI-CIRCUITS LAB., 2625 E. 14th St., P.O. Box 166, Brooklyn, NY 11235, Tel: 718-934-4500, Telex: 125460, 620156 (Intl.); FSC No.: 15542 .... **A•1700, 1716-1779**

Local Sales Offices & Reps
AL Huntsville, Beacon Elctrns. 205-881-5031
AZ Phoenix, Crown Elctrns. 602-944-3721
AR Little Rock, Beacon Elctrns. 501-224-5449
CA Los Altos, Cain-White & Co. 415-948-6533
CA N. Hollywood, Crown Elctrns. 213-877-3550
FL Clearwater, Beacon Elctrns. 813-796-2378
FL Ft. Lauderdale, Beacon Elctrns. 305-491-1054
FL Maitland, Beacon Elctrns. 305-647-3498
FL Melbourne, Beacon Elctrns. 305-724-8010
GA Atlanta, Beacon Elctrns. 404-256-9640
IL Mount Prospect, Cain Forlaw Co. 312-253-3578
MD Columbia, M. Lader & Co. 301-730-1550
MD Conowingo, M. Lader & Co. 301-378-3449
MA Waltham, Scientific Devices 617-890-2252
NY Hartsdale, Spectrum Sales 914-997-1166
NY Skaneateles, Robtron 315-685-5731
NC Greensboro, Beacon Elctrns. 919-275-9997
OH Lancaster, Cain Forlaw Co. 614-654-4800
PA Lafayette Hill, M. Lader & Co. 215-825-3177
TX Dallas, Cain & Co. 214-233-6809

Local Distributors
AL Huntsville, Components Distrs. 205-883-7501
AR Little Rock, Components Distrs. 501-227-6278
CA Los Altos, Pen Stock 415-948-6552
CA N. Hollywood, Crown Elctrns. 213-877-3550
FL Ft. Lauderdale, Components Distrs. ... 305-971-4950
IL Mt. Prospect, CFC Distributors 312-253-3578
NC Raleigh, Components Distrs. 919-781-0262
PA Lafayette Hill, MLC Distrs. 215-825-3177

MINI COMPUTER TECHNLG., 696 E. Trimble Rd., San Jose, CA 95131, Tel: 408-942-1616, TWX: 910-338-2281; Empl.: 30; *Sls. Mgr.:* Doug Vincent; *Dist. Mgr.:* Ed Hagenbuch

MINI-SYSTEMS, INC., 20 David Rd., North Attleboro, MA 02761, Tel: 617-695-0203, TWX: 710-348-0564; FSC No.: 50316; Empl.: 150 ..... **A•1906**

Local Sales Offices & Reps
FL Coral Springs, Marks Tech. Sls. Assocs. 305-753-3830
MA Newton, Normell Assocs. 617-969-5478
TX Lewisville, C & J Assocs. 214-539-0140

MINI-SYSTEMS, INC., Electronic Package Div., 168 E. Bacon St., P.O. Box 1597, Plainville, MA 02762, Tel: 617-695-2000, TWX: 710-348-0564 ..... **A•1681**

MINNTRONICS CORPORATION, 2599 White Bear Ave., St. Paul, MN 55109, Tel: 612-770-5247

MITEC ELCTRNS., 15 Commerce St., Williston, VT 05495, Tel: 802-864-0064, TWX: 610-421-3572; *Sls. Mgr.:* Elayne Bernstein

MITEL SEMICONDUCTOR, P.O. Box 13089, Kanata, ON, Canada K2K 1X3, Tel: 613-592-5280, Telex: 053-3221, TWX: 610-562-8529; Empl.: 200

MITEQ INC., 125 Ricefield Lane, Hauppauge, NY 11788, Tel: 516-543-8873, TWX: 510-226-3781; Empl.: 185

MITRONICS, 2908 Oregon Court - Bldg. I-2, Torrance, CA 90503, Tel: 213-320-7011

MITSUBISHI ELCTRNS. AMERICA, Computer Peripheral Div., 991 Knox St., Torrance, CA 90502, Tel: 213-515-3993; *Sls. Mgr.:* Mike Foster

MITSUBISHI ELCTRNS., Industrial Electronics Div., 991 Knox Street, Torrance, CA 90502, Tel: 213-515-3993, Telex: 06-4703-M USA LSA, TWX: 66-4787-MELA TRNC; *Sls. Mgr.:* Don Aarons

MITSUBISHI ELCTRNS. AMERICA, INC., Semiconductor Div., 1050 East Arques Ave., Sunnyvale, CA 94086, Tel: 408-730-5900, Telex: 172296, TWX: 910-339-9549; FSC No.: 408-749-0453; *Sls. Mgr.:* John Zucker

MITSUMI ELEC. CO., LTD., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan, Tel: 489-5333, Telex: J28846/J24935; Empl.: 1700; *Sls. Mgr.:* H. Sato; *Dist. Mgr.:* U. Nishimura

MIZAR INC.

MIZAR, INC., 302 Chester St., St. Paul, MN 55107, Tel: 612-224-8941, Telex: 469542; Empl.: 17; *Sls. Mgr.:* Susan Roth ..... **D•1094-1096, 1106**

Local Sales Offices & Reps
AZ Tempe, Foley, Tallent & Lee Inc. 602-894-2345
CA Long Beach, B. K. & Associates 213-596-1233
CA Los Gatos, Data-Rep 408-279-1212
CA San Jose, Data-Rep Inc. 408-279-1212
FL Melbourne, Reynolds & Assocs. 305-259-7000
FL Melbourne, Star-Tec Co. 305-727-2247
IL North Brook, Epstein & Assocs. 312-564-9292
MA Waltham, Com-Sls. Inc. 617-890-0011
MN Minneapolis, D. A. Case & Assoc. 612-888-8666
MO Ellisville, Advanced Indl. Sys. 314-391-0366
NJ Nashua, Bell Controls 603-882-6984
NJ Springfield, Gebhardt Mktg. Inc. 201-376-4415
OH Cuyahoga Falls, Micrographics, Inc. ... 216-923-3915
OH Strongsville, Dolfuss Root & Co. 216-238-0300
PA Hatboro, Electro-Rep Engrg. 215-674-4421
PA Ivyland, Technico 215-322-5966
TX Austin, Acudata, Inc. 512-346-4033
TX Houston, Acudata, Inc. 713-580-2451
TX Plano, Acudata, Inc. 214-424-3567
WA Bellevue, Tasco, Inc. 216-923-3915
Can Edmonton, Alb., 4.M. Mottl. Mktg., Ltd. 403-486-0091

MKS ELECTRONICS CORP., 454 E. Donovan Rd., Kansas City, KS 66115, Tel: 913-371-1351; Empl.: 26

MKS INSTRS., INC., 22 Third Ave., Burlington, MA 01803, Tel: 617-272-9255, Telex: 94-9375; Empl.: 130

MOBILE-TRONICS CO., INC., Box 1022, Tustin, CA 92680, Tel: 714-546-0884; Empl.: 2

MODERN CONTROLS CORP., 4636 Hidden Forest Dr., Sarasota, FL 33580, Tel: 813-351-3042; Empl.: 4

MODICON PROGRAMMABLE CONTROL DIV., Gould Inc., P.O. Box 83 S.V.S., Andover, MA 01810, Tel: 617-475-4700, Telex: 94-7402, TWX: 710-347-6610; *Sls. Mgr.:* Steven Mader (PC's); *Dist. Mgr.:* George Dannecker (Micro 84)

MODULAR COMPUTER SYSTEMS, P.O. Box 6099, Ft. Lauderdale, FL 33310, Tel: 305-974-1380, Telex: 52-2564, TWX: 510-956-9414; Empl.: 950

MODULAR AUDIO PRODS., Modular Devices Inc., 50 Orville Dr., Bohemia, NY 11716, Tel: 516-567-9620; *Sls. Mgr.:* C. Liptman

MODULAR DEVICES, 50 Orville Dr., Bohemia, NY 11716, Tel: 516-567-9620; FSC No.: 52202; Empl.: 50; *Sls. Mgr.:* C. Liptman ..... **D•1011, 1727**

Local Sales Offices & Reps
FL Enterprise, DJE Assocs. 305-321-6623
NH Manchester, Northeast Comps. 603-627-7242
NY Rochester, T.T.A. North-Div. Tri-Tek Assocs. 716-271-6764
NY Wantagh, Tri-Tek Assocs. 516-221-7600
EXP CA, San Diego, Total Elctrns. Int'l. 619-224-3291

PHOTON SOURCES, INC., 12163 Globe Rd., Livonia, MI 48150, Tel: 313-591-0101, TWX: 810-242-3270; Empl.: 140; *Sls. Mgr.:* Pete Seamans

MODULAR POWER SYS. INC., P.O. Box 180579, Austin, TX 78718-0579, Tel: 512-834-9262, Telex: 752-890; FSC No.: 58480; Empl.: 86; *Sls. Mgr.:* Manard Overall; *Dist. Mgr.:* Manard Overall

MODULAR SYSTEMS, INC., 905 Albemarle St., Charlottesville, VA 22901, Tel: 804-295-7882; Empl.: 9; *Sls. Mgr.:* G. L. Blencowe

MODUTEC, 18 Marshall St., Norwalk, CT 06854, Tel: 203-853-3636, TWX: 710-468-2039; Empl.: 300; *Sls. Mgr.:* Lester A. Velez; *Dist. Mgr.:* William J. Betz ..... **D•1362-1363**

Local Sales Offices & Reps
AL Huntsville, Beacon Elctrns. Assocs. ... 205-881-5031
AK Anchorage, Denali Indl. Sls. 907-243-6283
AZ Scottsdale, Luscombe Engrg. Co. 602-949-9333
AR Little Rock, Beacon Elec. Assoc. 501-224-5449
CA Campbell, Luscombe Engrg. Co. 408-370-2020
CA Pasadena, Luscombe Engrg. Co. 213-684-2000
CO Arvada, Arrowhead Sls. Co. 303-423-5556
FL Clearwater, Beacon Elec. Assoc. 813-796-2378
FL Ft. Lauderdale, Beacon Elctrn. Assoc. 305-491-1054
FL Maitland, Beacon Elctrn. Assocs. 305-647-3498
FL Melbourne, Beacon Elec. Assoc. 305-724-8010
GA Atlanta, Beacon Elctrn. Assocs. 404-256-9640
HI Honolulu, Aloha Assocs. 808-941-1574
IL Arlington Hgts., Brainard-Wilson Mktg. 312-437-2700
IN Carmel, Brainard-Wilson Mktg. 317-844-2800
IN Carmel, Carter, McCormic & Peirce ... 317-844-4175
IA Marion, M-S-B Assocs. 319-377-6261
KS Shawnee Mission, M-S-B Assocs. 913-432-2131
MD Randallstown, Beacon Elec. 703-534-7200
MA Canton, New England Elctrn. Sls. Corp. 617-828-4835
MI Farmington, Carter, McCormic & Peirce 313-477-7700
MN Minneapolis, R.J. Inc. 612-866-3661
MO St. Charles, M-S-B Assocs. 314-946-5577
NJ Englewood, Sprung/Nussbaum 201-569-5666
NJ Marmora, Holdsworth & Co. 609-398-4340
NM Albuquerque, Amonette Entprs. 505-344-4143
NY Bainbridge, R. W. Mitscher 607-697-7192
NY Buffalo, R. W. Mitscher 716-633-7970
NY N. Syracuse, R. W. Mitscher 315-458-1321
NY Pittsford, R. W. Mitscher 716-586-4012
NY Red Hook, R. W. Mitscher 914-758-8375
NY Rochester, R. W. Mitscher 716-227-0839
NC Greensboro, Beacon Elctrn. Assoc. ... 919-275-9997
NC Raleigh, Beacon Elctrn. 919-787-0330
OH Cleveland, Carter, McCormic & Peirce 216-779-5100
OH Englewood, Carter, McCormic & Peirce 513-836-0951
OR Beaverton, Barrett-Squibb & Assoc. ... 503-644-2550
PA Monroeville, Carter, McCormic & Peirce 412-372-4415
PA Newtown Square, Holdsworth & Co.-SWR 215-356-8550
TX Houston, Scientific Sls. Co. 713-460-9170
TX Richardson, Scientific Sls. Co. 214-231-6541
UT Salt Lake City, Arrowhead Sls. 801-261-1661
VA Fairfax, Beacon Elctrns. 703-591-1300
VA Forrest, Beacon North 804-239-8486
WA Redmond, Barrett Squibb, Inc. 206-885-6991
WI Colgate, Rep-1 Assoc. 414-628-4016
EXP Freeport, Minthorne 516-546-4700

Local Distributors
AL Birmingham, Brownell Electro 205-322-3374
AL Huntsville, Component Distrs. 205-883-7501
AL Mobile, Brownell Electro 205-479-8581
AR Little Rock, Component Distrs. 501-227-6278
CA Inglewood, Force Elctrns. 213-776-1324
CA Los Angeles, Erlanger Sls. 213-731-2238
CA Los Angeles, Erlanger Sls. Co. 213-731-2238
CA Santa Clara, Fisher-Brownell 408-988-6041
FL Ft. Lauderdale, Component Distrs. 305-971-4950
FL Miami, Brownell Electro 305-591-3215
FL Orlando, Brownell Electro 305-843-6770
GA Hapeville, Brownell Electro 404-762-5181
IL Chicago, Newark Elctrns. 312-638-4411
IL Elk Grove Village, Meter Master 312-593-8650
IN Ft. Wayne, Graham Elctrns. 219-423-3422

IN Indianapolis, Graham Elctrns. 317-634-8202
MD Gaithersburg, Pioneer Instrumentation 301-921-0660
MA Woburn, Brownell Electro 617-935-7820
MI Ferndale, RAM Meter 313-398-6767
MO St. Louis, Olive Elctrns. 314-426-4500
NJ Belleville, Miscorp 201-751-1190
NJ Fairfield, Ampower Elctrn. Instr. 201-227-7720
NJ S. Plainfield, Brownell Electro 201-753-4600
NY Clarence, Trott Elctrns. 716-634-8500
NY New York, Brownell Electro 212-691-1171
NY Pittsford, Trott Elctrns. 716-586-8251
NC Charlotte, Brownell Electro 704-597-1270
NC Raleigh, Brownell Electro 919-876-6524
NC Raleigh, Component Distrs. 919-781-0262
OH Cleveland, Pioneer Instrumentation 216-587-3600
OH Cleveland, Weschler Elec. Co. 216-238-2550
OH Dayton, Pioneer Instrumentation 513-236-9900
PA Norristown, Kimberly-James Co. 215-666-7286
SC Columbia, Brownell Electro 803-772-6111
TN Chattanooga, Techni-Tronics 615-875-5449
TN Knoxville, Brownell Electro 615-966-3441
TN Memphis, Brownell Electro 901-795-8483
TN Nashville, Brownell Electro 615-889-8230
TX Dallas, Inotek Corp. 214-243-7000
TX Ft. Worth, Allied Elctrns. 817-336-5401
TX Ft. Worth, Inotek Corp. 817-831-2126
TX Houston, American Analog 713-941-7265
TX Houston, Brownell Electro 713-699-1981
TX Houston, Inotek Corp. 713-688-4494
WA Seattle, Eicher-Richards Co. 206-523-7888
WI Milwaukee, E-M Instrs. 414-272-7799
WI Milwaukee, Marsh Elctrns. 414-475-6000

MODU-TEL CORP., 1429 N. Halstead, Hutchinson, KS 67501, Tel: 316-662-3302, Telex: 469331 COMTRON CI; Empl.: 5; *Sls. Mgr.:* Paul Bascom

MOHAWK DATA SCIENCES, MDS Center, Herkimer, NY 13350, Tel: 315-866-5300, Telex: (71)662032; Empl.: 4500

MOHAWK WIRE & CABLE CORP., 9 Mohawk Drive, Leominister, MA 01453, Tel: 617-537-9961

MOLDCON CORP., 221 Interstate Dr., W. Springfield, MA 01089, Tel: 413-736-0371, TWX: 710-350-6463; *Sls. Mgr.:* Robert Krzynowck

MOLDING TECHNOLOGY INC., See MTI

MOLDTRONICS, INC., 703 Rogers St, Downers Grove, IL 60515, Tel: 312-968-7000, TWX: 910-695-3537; Empl.: 140; *Sls. Mgr.:* Jim Arnold

Local Sales Offices & Reps

CA Topanga, S-J-N Sales 213-455-1813
FL Winter Springs, Martinet Assocs. 305-699-0392
IL Cary, Ecro Inc. 312-639-1162
IN Indianapolis, Butler Comps. 317-253-5143
MN St. Paul, PDQ Comps 612-690-5215
OH Dayton, H. G. Lake Co. 513-277-8181
PA Lancaster, Thomas G. Armstrong Assoc. 717-397-2942
RI Wickford, R. P. Morrison Co. 401-295-5692

MOLECU-WIRE, P.O. Box 495, Farmingdale, NJ 07727, Tel: 201-938-9473, TWX: 710-723-6943; Empl.: 175 ..... **C•1860-1862**

Local Sales Offices & Reps

CA Montrose, Roger D. Dahl 213-245-3817
CT Orange, KLS Sls. 203-795-6210
IL Northbrook, Jack Norlie Assocs. 312-498-3657
KS Shawnee Mission, B.C. Elctrn. Sls. 913-342-1211
NC Charlotte, QED 704-525-3053
PA Ligonier, Patterson Elec. 412-238-6238
WA Seattle, Comptronics 206-284-4842
WI Mequon, Robco 414-241-3348

MOLEX, INC., 2222 Wellington Ct., Lisle, IL 60532, Tel: 312-969-4550, TWX: 910-695-3227; Empl.: 4,100; *Sls. Mgr.:* Gregg Johnson; *Dist. Mgr.:* Bill Hyslop ... **B•1671; C•1463-1467**

Local Sales Offices & Reps

AL Huntsville, Dennis Andrew 404-396-6120
CA Costa Mesa, Molex 714-241-8588
CA Encino, Dow Lebowski 714-241-8588
CA Mission Viejo, Tony Scutetta 714-241-8588
CA San Diego, Al Batza 619-241-8588
CA Sunnyvale, Molex 408-773-0505
CT West Hartford, Randy Stone 617-935-8983
FL North Palm Beach, Chuck Vincent 404-396-6120
FL St. Petersburg, Molex 404-396-6120
GA Atlanta, Molex 404-396-6120
IN Connersville, George Allen 317-844-8986
IN Indianapolis, Steve Byrne 317-844-8986
KY Taylorsville, Jim Lieb 404-396-6120
MD Bethesda, Molex 404-396-6120
MA Mansfield, Paul Hansen 617-935-8983
MA Marblehead, Pete Evans 617-935-8983
MA Woburn, Molex 617-935-8983
MI Grand Rapids, Mark Fluga 616-957-1205
MI Royal Oak, Schwegman & Assocs. 313-542-6767
MN Edina, Mark Boe 612-893-9029
MO Gladstone, Mark Rider 818-737-9427
MO Independence, Dy-Tronix, Inc. 816-373-6600
NJ Washington, Oscar Cobian 201-267-8014
NY Webster, Joe Schmitt 716-223-6899
NC Raleigh, Molex, Inc. 404-396-6120
OR Lake Oswego, Gary Rohde 503-636-7558
PA Rosemont, Ed M. Sullivan 617-935-8983
TN Knoxville, Insul Reps. 615-691-7586
TX Austin, Daniel Daneff 512-453-1398
TX Dallas, Dale Otten 214-247-7117
TX Manchaca, Max Bassler 512-453-1398
UT West Valley, Thorson Rocky Mountain 801-973-7969
WA Redmond, Molex 206-881-2042
PR Hato Rey, Max Anderson Co. 809-751-2202

Local Distributors

AL Huntsville, Hamilton/Avnet 205-837-7210
AZ Tempe, Fisher Brownell 602-967-1464
AZ Tempe, Hamilton/Avnet 602-231-5100
AZ Tempe, Time Elctrns. Arizona 602-967-2000
AR Little Rock, Carlton-Bates 501-666-0206
CA Alhambra, Fisher Brownell 213-289-0255
CA Chatsworth, Diplomat 213-341-4411
CA Costa Mesa, Avnet Elctrns. 714-754-6111
CA Costa Mesa, Diplomat 714-549-8401
CA Costa Mesa, Hamilton Electro Sls. 714-641-4100
CA Culver City, Hamilton Electro Sls. 213-558-2121
CA Inglewood, Force Elctrns. 213-776-1324
CA Los Angeles, Richley/Western Elctrns. 213-820-3777
CA S. San Francisco, Peters-delaet 415-873-9595
CA San Diego, Diplomat 619-292-5693
CA San Diego, Fisher Brownell 619-560-8545
CA San Diego, Hamilton/Avnet 619-571-7510
CA San Diego, Richley/Western Elctrns. 619-271-4511
CA Santa Clara, Fisher Brownell 408-988-6041
CA Santa Clara, Force Elctrns. 408-739-1324
CA Santa Clara, Peters-de Laet 408-727-9440
CA Sunnyvale, Diplomat 415-964-1700
CA Sunnyvale, Hamilton/Avnet 408-743-3355
CA Sunnyvale, Time Northern Calif. 408-734-9888
CA Torrance, Time Elctrns. West 213-320-0880
CO Denver, Integrated Elctrns. 303-534-6121
CO Englewood, Hamilton/Avnet 303-740-1000
CO Wheat Ridge, Bell Inds. 303-424-1985
CT Bethel, Heilind Elctrns. 203-797-8600
CT Danbury, Hamilton/Avnet 203-797-2800
FL Ft. Lauderdale, Hamilton/Avnet 305-971-2900
FL Ft. Lauderdale, Time Elctrns. 305-974-4800
FL Pompano Beach, Comps. South 305-971-0350
GA Atlanta, Electro-Air Corp. 404-351-3545
GA Norcross, Hamilton/Avnet 404-447-7507
IL Bensenville, Hamilton/Avnet 312-860-7700
IL Chicago, Waldom Elctrns. 312-585-1212
IL Crystal Lake, Sub-Sem Elctrns. 815-459-4139
IL Mount Prospect, Magnuson Elctrns. 312-956-0700
IN Carmel, Hamilton/Avnet 317-844-9333
KS Overland Park, Hamilton/Avnet 913-888-8900
MD Columbia, Hamilton/Avnet 301-995-3500
MD Savage, Pyttronic Inds. 301-953-9650
MA Burlington, Heilind Elctrns. 617-272-5610
MA Canton, Impact Elctrns. 617-821-1500
MA Wilmington, RC Comps. 617-273-1860
MA Woburn, Hamilton/Avnet 617-273-7500
MA Woburn, Time New England 617-935-8080
MI Clawson, Empire Elctrns. 313-435-0460
MI Grand Rapids, Hamilton/Avnet 616-243-8805
MI Livonia, Hamilton/Avnet 313-522-4700
MI Wyoming, R-M Elctrns. Co. 616-531-9300
MN Minneapolis, Indl. Comps. 612-831-2666
MN Minnetonka, Hamilton/Avnet 612-932-0600
MO Earth City, Hamilton/Avnet 314-344-1200
MO St. Charles, Lectronix 800-325-3348
MO St. Louis, Time Elctrn./Midwest 314-391-6444
NE Lincoln, Scott Elctrns. 402-466-8221
NH Hudson, Heilind Elctrns. 603-883-9536
NJ Camden, Genral Radio Supp. Co. 609-964-8560
NJ Cherry Hill, Hamilton/Avnet 609-424-0100
NJ Clifton, J-Mar Elctrns. 201-772-6400
NJ Fairfield, Hamilton/Avnet 201-575-3390
NM Albuquerque, Hamilton/Avnet 505-765-1500
NY Buffalo, Summit Distrs. 716-884-3450
NY E. Syracuse, Hamilton/Avnet 315-437-2641
NY Hauppauge, Time Elctrns. Sls. 516-273-0100
NY Melville, Hamilton/Avnet 516-454-6060
NY Plainview, Progress Elctrns. 516-433-1700
NY Rochester, Hamilton/Avnet 716-475-9130
NC Raleigh, Hamilton/Avnet 919-829-8030
NC Raleigh, Resco 919-781-5700
OH Cleveland, Hamilton/Avnet 216-831-3500
OH Columbus, Camelot/Ohio 614-252-0728
OH Dayton, Hamilton/Avnet 513-433-0610
OH Dayton, Stotts-Friedman 513-298-5555
OH Wickliffe, Gateway Megatech 216-944-8565
OR Lake Oswego, Hamilton/Avnet 503-635-8157
PA Broomall, Time Mid-Atlantic 215-359-1200
PA McKean, Advacom 814-476-7774
PA Montgomeryville, Pyttronic Inds. 215-643-2850
TN Chattanooga, Techni-Tronics 615-875-5449
TX Austin, Hamilton/Avnet 512-837-8911
TX Houston, Hamilton/Avnet 713-780-1771
TX Irving, Hamilton/Avnet 214-659-4111
TX Richardson, Fisher Brownell 214-235-3177
UT Salt Lake City, Bell Inds. 801-972-6969
UT Salt Lake City, Hamilton/Avnet 801-972-2800
VA Lynchburg, Comps., United. 804-237-6286
WA Bellevue, Electro-Air NW 206-641-3640
WA Bellevue, Hamilton/Avnet 206-643-3950
WA Seattle, Radar Elec. 206-282-2511
WI New Berlin, Hamilton/Avnet 414-784-4510

MOLON MOTOR & COIL CORP., 3737 Industrial Ave., Rolling Meadows, IL 60008, Tel: 312-259-8700, TWX: 910-687-0428; Empl.: 350; *Sls. Mgr.:* J. Bailey

MONITOR LABS, INC., 10180 Scripps Ranch Blvd., San Diego, CA 92131, Tel: 619-578-5060, Telex: 182794

MONITOR PRODS. CO., INC., Post Office Box 1966, Oceanside, CA 92054, Tel: 619-433-4510, TWX: 910-322-1381; FSC No.: 54331; Empl.: 65; *Sls. Mgr.:* Patricia Courington ..... **A•1388-1391**

Local Sales Offices & Reps

AL Huntsville, CSR Elctrns. 205-533-2444
AZ Phoenix, Eltron 602-266-2164
CA Encino, Great American Rep Co. 818-990-4870
CA Los Altos, Elrepco 415-962-0660
CA San Diego, Rep Co. 619-292-9001
CA Tustin, Great American Rep. Co. 714-954-0371
CO Aurora, Electrodyne 303-695-8903
CT Southbury, Lindco Assocs. 203-264-7200
FL Apopka, Tech Rep Assocs. 305-889-2286
FL Ft. Lauderdale, Tech Rep Assocs. 305-476-7637
FL Lake Worth, Tech-Rep Assocs. 305-968-7792
FL St. Petersburg, Tech-Rep Assocs. 813-577-2779
GA Atlanta, CSR Elctrns. 404-396-3720
IL Downers Grove, Momak Sls. 312-963-6400
IA Davenport, Ensco Rep 319-386-6600
KS Overland Park, Ensco Rep 913-381-7557
KS Wichita, Ensco Rep 316-683-1070
MA Stow, Today Comps. Sls. 617-897-7500
MN Eden Prairie, Elctrn. Innovators 612-941-0830
MO Maryland Heights, Ensco Rep 314-423-3935
NY Melville, Parallax 516-351-1000
NC Matthews, CSR Elctrns. 704-847-1927
NC Raleigh, CSR Elctrns. 919-878-9200
OH Dayton, Berberich & Assocs. 512-433-0342
OR Hillsboro, Western Tech. Sls. 503-640-4621
PA Pittsburgh, Covert & Newman Co. 412-531-2002
TX Austin, Mil-Rep Assocs. 512-459-8602
TX Houston, Mil-Rep Assocs. 713-937-0127
TX Richardson, Mil-Rep Assocs. 214-644-6731
UT Salt Lake City, Electrodyne 801-486-3801
UT Salt Lake City, Electrodyne, Inc. 801-486-3801
VA Fairfax, Beacon North 703-591-1300
VA Forest, Beacon North 804-239-8486
WA Bellevue, Western Tech. Sls. 206-641-3900
WA Spokane, Western Tech. Sls. 509-922-7600
WI Mukwonago, Momak Sls. 414-363-7744

MONOLITHIC COMPONENTS CORP., 6828 Nancy Ridge Drive, San Diego, CA 92121, Tel: 619-457-1727

MONOLITHIC SYS., 84 Inverness Circle E., Englewood, CO 80112, Tel: 303-790-7400, Telex: 45-4498; Empl.: 100; *Sls. Mgr.:* Mike Hart

MONSANTO CO., 800 N. Lindbergh Blvd., St. Louis, MO 63167, Tel: 314-694-1000, Telex: 44-7282

MONSANTO-ELECTRONICS DIV., See General Instr., Optoelctrns. Div.

MONTEK MICROSYSTEMS, P.O. Box 1845, Huntsville, AL 35807, Tel: 205-723-2927; *Sls. Mgr.:* Paul Rainosek; *Dist. Mgr.:* Paul Rainosek

MOODY TOOLS, 43 Crompton Ave., E. Greenwich, RI 02818, Tel: 401-885-0911; Empl.: 11; *Sls. Mgr.:* J. H. Moody; *Dist. Mgr.:* D .H. Moody

Local Sales Offices & Reps

CA	Alamo, Magliano-Dodds-Evans-Hall	415-820-6395
CO	Denver, A-E-S	303-777-8733
FL	Winter Park, Floritronics	305-886-4818
IL	Palatine, Witz-Knight, Inc.	312-438-9030
MD	Baltimore, Coastline Sls. Co.	301-828-8520
NY	New York, Lane-Mizner Assocs.	212-889-9711
NY	Orchard Park, S & B Indl. Sls.	716-662-5988
OH	St. Marys, Thomas Shelby & Co.	419-394-3377
RI	Barrington, Kilburn Assocs.	401-437-1839
EXP	IL, Northbrook, Vaco/Intl.	312-564-3300
Can	Islington, Ontario, Toolquip Agy. Ltd.	416-274-4918

MORRIS, J. I., CO., 372 Elm St., Southbridge, MA 01550, Tel: 617-764-4394; Empl.: 45

MORRIS ENTPRS., 16799 Schoenborn St, Sepulveda, CA 91343, Tel: 818-894-9103, Telex: 6-74681, TWX: 910-496-1525; FSC No.: 54918; Empl.: 50; *Sls. Mgr.:* J. Dumpert

MOSS CO., See Electron General

MOTION CONTROL DEVICES, INC., 80 Stedman St, Lowell, MA 01851, Tel: 617-454-3407, Telex: 955318-INTL-DIV-ATTEN-MCD-I; Empl.: 25; *Sls. Mgr.:* Joe Laliberte

MOTOROLA INC., Auto. & Indl. Elctrns. Grp., 1299 E. Algonquin Rd., Schaumburg, IL 60196, Tel: 312-576-4850, Telex: 722443; *Sls. Mgr.:* Jay A. Bonk

MOTOROLA INC.

Component Products

MOTOROLA, INC., Compt. Divs. Clock Oscillator Dept., 2553 N. Edgington, Franklin Park, IL 60131, Tel: 312-451-1000, TWX: 910-227-0799; Empl.: 1400; *Sls. Mgr.:* Barnie III; *Dist. Mgr.:* Ted Hoffman ... **A•1392-1393**

Local Sales Offices & Reps

AL	Huntsville, R. O. Whitesell	205-883-5110
AZ	Scottsdale, Thorson Desert States	602-998-2444
AR	Ft. Smith, Electra Reps.	501-452-4030
CA	Campbell, Kottmeier Assocs.	408-866-5153
CA	Fullerton, Groh Assoc.	714-837-9871
CO	Englewood, Thorsen Co.	303-779-0666
FL	Clearwater, Perrott Assocs.	813-443-5414
FL	Orlando, Perrott Assocs.	305-298-7748
FL	Sunrise, Perrott Assocs.	305-792-2211
GA	Norcross, Glen White Assoc.	404-441-1447
IN	Fort Wayne, R. O. Whitesell	219-432-5591
IN	Indianapolis, R. O. Whitesell	317-359-9283
IA	Cedar Rapids, Comstrand	319-377-1575
MD	Timonium, Glen White Assoc.	301-252-6360
MA	Natick, Wayland Engrg. Sls.	617-655-6080
MI	Southfield, R. O. Whitesell Assoc.	313-559-5454
MI	St. Joseph, R. O. Whitesell Assoc.	616-983-7337
MN	Minneapolis, Comstrand	612-788-9234
MO	St. Louis, Abrams Assoc.	314-569-0447
NM	Albuquerque, Thorsen Desert States	505-293-8555
NY	Great Neck, Trionic Assoc.	516-466-2300
NY	Rochester, Ossmann Comp. Sls.	716-442-4460
NY	Syracuse, Ossmann Comp. Sls.	315-455-6611
NC	Raleigh, Glen White Assoc.	919-787-7016
OH	Cincinnati, R. O. Whitesell	513-521-2290
OH	Cleveland, R.O. Whitesell & Assoc.	216-447-9020
OH	Columbus, R. O. Whitesell	614-888-9396
OH	Dayton, R. O. Whitesell	513-298-9546
OK	Tulsa, H. J. Daly Co.	918-494-7711
OR	Tigard, Elctrn. Sources	503-684-0040
PA	Glenside, Koebert Assoc.	215-887-2310
PA	Pittsburgh, R. O. Whitesell	412-963-6161
TN	Gray, Glen White Assoc.	615-477-8850
TX	Dallas, Electra Reps.	214-387-3594
TX	Houston, Electra Reps.	713-530-2208
UT	West Valley City, Thorsen Co.	801-973-7969
VA	Colonial Beach, Glen White Assoc.	804-224-7764
VA	Lynchburg, Glen White Assoc.	804-237-6291
WA	Bellevue, Electronic Sources	206-451-2530
WI	Milwaukee, KMA Sls. & Co.	414-259-1771
EXP	IL, Franklin Pk., Motorola	312-451-1000

MOTOROLA INC.

MOTOROLA SEMICONDUCTOR PRODS. SECTOR, Adv. 72, Box 20912, Phoenix, AZ 85036, Tel: 602-244-6900, TWX: 910-951-1334; FSC No.: 04713; *Sls. Mgr.:* Brian Hilton; *Dist. Mgr.:* John Dunleavy ..... **A•1682-1692, 2066, 2077-2087; D•1098-1101**

Local Sales Offices & Reps

AL	Huntsville	205-830-1050
AZ	Phoenix	602-244-7100
CA	Agoura Hills	213-872-1505,818-706-1929
CA	Los Angeles	818-706-1929
CA	Orange	213-417-8848
CA	Sacramento	916-922-7152
CA	San Diego	619-560-4644
CA	San Jose	408-985-0510
CO	Colorado Springs	303-599-7404
CO	Denver	303-337-3434
CT	Wallingford	203-284-0810
DC	Washington	301-577-2600
FL	Casselberry/Maitland	305-831-3422
FL	Pompano Bch./Ft. Lauderdale	305-486-9775
FL	St. Petersburg	813-576-6030
GA	Atlanta	404-256-0222
IL	Chicago/Schaumburg	312-576-7800
IN	Ft. Wayne	219-484-0436
IN	Indianapolis	317-849-7060
IN	Kokomo	317-457-6634
IA	Cedar Rapids	319-373-1328
KS	Kansas City/Mission	913-384-3050
MD	Hyattsville	301-577-2600
MA	Berlin	617-562-3856
MA	Burlington	617-273-5020
MI	Detroit/Westland	313-261-6200
MN	Minneapolis	612-941-6800
MO	St. Louis	314-872-7681
NJ	Hackensack	201-488-1200
NY	Fairport	716-425-4000
NY	Hauppauge	516-361-7000
NY	Poughkeepsie/Fishkill	914-473-8102
NC	Raleigh	919-876-6025
OH	Cleveland	216-461-3160
OH	Columbus/Worthington	614-846-9460
OH	Dayton	513-294-2231
OR	Portland	503-641-3681
PA	Philadelphia/Horsham	215-443-9400
TN	Knoxville	615-690-5592
TX	Austin	512-452-7673
TX	Dallas	214-699-3900
TX	Houston	713-783-6400
UT	Salt Lake City	801-539-1190
VA	Charlottesville	804-977-3691
WA	Bellevue	206-454-4160
WA	Seattle Access	206-622-9960
WI	Milwaukee/Wauwatosa	414-476-5554

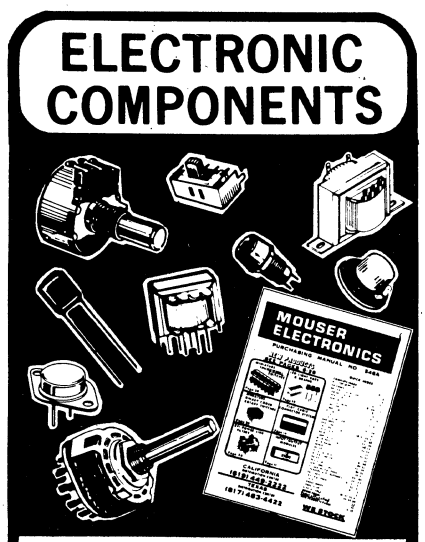
Motorola Systems Reps.

AL	Huntsville, EMA	205-830-4030
CT	Torrington, Northern Computer Sls.	203-482-3007
GA	Atlanta, EMA	404-329-0530
MA	Westwood, Northern Computer Sls.	617-326-3454
MN	Minneapolis, P.S.I. Co.	612-944-8545
NC	Raleigh, EMA	919-781-9369
OR	Beaverton, Thorson Co. Northwest	503-644-5900
PA	King of Prussia, K.S.I.	215-783-6440
WA	Bellevue, Thorson Co. Northwest	206-455-9180

Local Distributors

AL	Huntsville, Hall-Mark Elctrns.	205-837-8700
AL	Huntsville, Hamilton/Avnet Elctrns.	205-837-7210
AL	Huntsville, Pioneer/Huntsville	205-837-9300
AL	Huntsville, Schweber Elctrns.	205-882-2200
AZ	Phoenix, Hall-Mark Elctrns.	602-437-1200
AZ	Phoenix, Kierulff Elctrns.	602-437-0750
AZ	Phoenix, Schweber Elctrns.	602-997-4874
AZ	Tempe, Anthem Elctrns.	602-966-6600
AZ	Tempe, Hamilton/Avnet Elctrns.	602-231-5100
CA	Anaheim, Zeus Comps. West	714-632-6880
CA	Canoga Park, Hall-Mark Elctrns.	818-716-7300
CA	Canoga Park, Schweber Elctrns.	213-999-4702
CA	Chatsworth, Anthem Elctrns.	818-700-1000
CA	Chatsworth, Avnet Elctrns.	818-700-2600
CA	Chatsworth, Hamilton Electro Sls.	818-700-6500
CA	Chatsworth, Kierulff Elctrns.	213-341-2211
CA	Costa Mesa, Avnet	714-754-6111
CA	Costa Mesa, Hamilton Electro Sls.	714-641-4100
CA	Culver City, Hamilton Electro Sls./L.A.	213-558-2501
CA	Culver City, Hamilton/Avnet	213-558-2323
CA	Cypress, Kierulff Elctrns.	714-220-6300
CA	El Segundo, Hall-Mark Elctrns.	213-643-9101
CA	Irvine, Schweber Elctrns.	213-537-4321
CA	Irvine, Schweber Elctrns.	213-537-4321, 714-863-0200
CA	Los Angeles, Kierulff Elctrns.	213-725-0325
CA	Ontario, Hamilton/Avnet Elctrns.	714-989-4602
CA	Roseville, Bell Inds.	916-969-3100
CA	Sacramento, Hamilton/Avnet Elctrns.	916-925-2216
CA	Sacramento, Schweber Elctrns.	916-929-9732
CA	San Diego, Anthem Elctrns.	619-270-5200
CA	San Diego, Hall-Mark Elctrns.	619-268-1201
CA	San Diego, Hamilton/Avnet Elctrns.	619-571-7510
CA	San Diego, Kierulff Elctrns.	619-278-2112
CA	San Diego, Schweber Elctrns.	619-450-0454
CA	San Jose, Anthem Elctrns.	408-946-8000
CA	San Jose, Future Elctrns.	408-945-9100
CA	San Jose, Hall-Mark Elctrns.	408-773-9990
CA	San Jose, Kierulff Elctrns.	408-971-2600
CA	Santa Clara, Schweber Elctrns.	408-748-4700
CA	Santa Clara, Zeus Comps.	408-727-0714
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Sunnyvale, Hamilton/Avnet Elctrns.	408-743-3360
CA	Torrance, Hamilton/Avnet Elctrns.	213-615-3900
CA	Tustin, Anthem Elctrns.	714-730-8000
CA	Tustin, Hall-Mark Elctrns.	714-586-9346
CA	Tustin, Kierulff Elctrns.	714-731-5711
CA	Woodland Hills, Hamilton/Avnet Elctrns.	818-887-2353
CO	Denver, Kierulff Elctrns.	303-790-4444
CO	Englewood, Anthem Elctrns.	303-790-4500
CO	Englewood, Hall-Mark Elctrns.	303-694-1662
CO	Englewood, Hamilton/Avnet Elctrns.	303-740-1000
CO	Westminster, Future Elctrns.	303-650-0123
CO	Wheatridge, Bell Inds.	303-424-1985
CT	Danbury, Future Elctrns.	203-743-9594
CT	Danbury, Hamilton/Avnet Elctrns.	203-797-2800
CT	Danbury, Schweber Elctrns.	203-792-3500
CT	Norwalk, Pioneer-Harvey/Norwalk	203-853-1515
CT	Wallingford, Kierulff Elctrns.	203-265-1115
CT	West Hartford, Hartford Elec. Supp. Co.	203-236-6171
FL	Altamonte Springs, Pioneer/Florida	305-834-9090
FL	Altamonte Springs, Schweber Elctrns.	305-331-7555
FL	Bradenton, Zeus Comps.	813-748-3125
FL	Clearwater, Future Elctrns.	813-441-4771
FL	Ft. Lauderdale, Hamilton/Avnet Elctrns.	305-971-2900
FL	Ft. Lauderdale, Kierulff Elctrns.	305-486-4004
FL	Ft. Lauderdale, Pioneer/Ft. Lauderdale	305-428-8877
FL	Hollywood, Schweber Elctrns.	305-927-0511
FL	Orlando, Hall-Mark Elctrns.	305-855-4020
FL	Orlando, Hamilton/Avnet Elctrns.	305-628-3888
FL	Pompano Beach, Hall-Mark Elctrns.	305-971-9280
FL	St. Petersburg, Hall-Mark Elctrns.	813-530-4543
FL	St. Petersburg, Hamilton/Avnet Elctrns.	813-576-3930
FL	St. Petersburg, Kierulff Elctrns.	813-576-1966
FL	Winter Park, Hall-Mark Elctrns.	305-628-3888
GA	Norcross, Hall-Mark Elctrns.	404-447-8000
GA	Norcross, Hamilton/Avnet Elctrns.	404-447-7507
GA	Norcross, Kierulff Elctrns.	404-447-5252
GA	Norcross, Pioneer/Atlanta	404-448-1711
GA	Norcross, Schweber Elctrns.	404-449-9170
IL	Schaumburg, Future Elctrns.	312-882-1255
IL	Bensenville, Hall-Mark Elctrns.	312-860-3800
IL	Bensenville, Hamilton/Avnet Elctrns.	312-860-7700
IL	Chicago, Bell Inds.	312-982-9210
IL	Chicago, Newark Elctrns. Corp.	312-784-5100
IL	Elk Grove Village, Kierulff Elctrns.	312-640-0200
IL	Elk Grove Village, Pioneer/Chicago	312-437-9680
IL	Elk Grove Village, Schweber Elctrns.	312-364-3750
IN	Indianapolis, Graham Elctrns. Supp.	317-634-8208
IN	Indianapolis, Hamilton/Avnet Elctrns.	317-844-9333
IN	Indianapolis, Pioneer/Indiana	317-849-7300
IA	Cedar Rapids, Bell Elctrns.	319-395-0730
IA	Cedar Rapids, Hamilton/Avnet Elctrns.	319-362-4757
IA	Cedar Rapids, Schweber Elctrns.	319-373-1417
KS	Lexena, Hall-Mark Elctrns.	913-888-4747
KS	Overland Park, Schweber Elctrns.	913-492-2921
KS	Overland Pk., Hamilton/Avnet Elctrns.	913-888-8900
LA	New Orleans, Reily Elctrl. Supp.	504-897-2211
MD	Baltimore, Hall-Mark Elctrns.	301-796-9300
MD	Baltimore, Kierulff Elctrns.	301-636-5800
MD	Columbia, Future Elctrns.	301-995-1222
MD	Columbia, Hall-Mark Elctrns.	301-988-9800
MD	Columbia, Hamilton/Avnet Elctrns.	301-995-3500
MD	Gaithersburg, Pioneer/Washington	301-921-0660
MD	Gaithersburg, Schweber Elctrns.	301-840-5900
MA	Bedford, Schweber Elctrns.	617-275-5100
MA	Billerica, Hall-Mark Elctrns.	617-935-9777
MA	Billerica, Kierulff Elctrns.	617-667-8331
MA	Burlington, Lionex Corp.	617-272-9400
MA	Lexington, Pioneer	617-861-9200
MA	Lexington, Zeus Comps.	617-273-0750
MA	Westborough, Future Elctrns.	617-366-2400
MA	Wilmington, Lionex Corp.	617-657-5170
MA	Woburn, Hamilton/Avnet Elctrns.	617-273-7500
MI	Grand Rapids, Hamilton/Avnet Elctrns.	616-243-8805
MI	Livonia, Hamilton/Avnet Elctrns.	313-522-4700
MI	Livonia, Pioneer/Michigan	313-525-1800
MI	Livonia, RS Elctrns.	313-525-1155
MI	Livonia, Schweber Elctrns.	313-525-8100
MI	Madison Hgts., McNaughton-McKay Elec. Co.	313-399-7500
MN	Bloomington, Hall-Mark Elctrns.	612-854-3223
MN	Edina, Kierulff Elctrns.	612-941-7500
MN	Edina, Schweber Elctrns.	612-941-5280
MN	Minnetonka, Hamilton/Avnet Elctrns.	612-932-0600
MN	Minnetonka, Pioneer/Twin Cities	612-935-5444
MO	Earth City, Hall-Mark Elctrns.	314-291-5350

MO Earth City, Hamilton/Avnet Elctrns. ... 314-344-1200
MO Earth City, Schweber Elctrns. ... 314-739-0526
MO Maryland Hgts., Kierulff Elctrns. ... 314-739-0855
NH Manchester, Hamilton/Avnet Elctrns.... 603-624-9400
NJ Cherry Hill, Hall-Mark Elctrns. ... 609-424-7300
NJ Cherry Hill, Hamilton/Avnet Elctrns. ... 609-424-0110
NJ Fairfield, Hall-Mark Elctrns. ... 201-575-4415
NJ Fairfield, Hamilton/Avnet Elctrns. ... 201-575-3390
NJ Fairfield, Kierulff Elctrns. ... 201-575-6750
NJ Fairfield, Schweber Elctrns. ... 201-227-7880
NJ Mount Laurel, Future Elctrns. ... 609-778-7600
NJ Pinebrook, Pioneer-Harvey/Pinebrook . 201-575-3510
NM Albuquergue, Alliance Elctrns. ... 505-292-3360
NM Albuquerque, Bells Inds. ... 505-292-2700
NM Albuquerque, Hamilton/Avnet Elctrns.. 505-765-1500
NY Binghamton, Pioneer-Harvey/Binghamton ... 607-748-8211
NY E. Syracuse, Hamilton/Avnet Elctrns. .. 315-437-2641
NY Fairport, Pioneer-Harvey/Rochester .. 716-381-7070
NY Hauppauge, Lionex Corp. ... 516-273-1660
NY Hauppauge, Pioneer/Military ... 516-231-9800
NY Liverpool, Future Elctrns. ... 315-451-2371
NY Port Chester, Zeus Comps. ... 914-937-7400
NY Rochester, Hamilton/Avnet Elctrns. ... 716-475-9130
NY Rochester, Schweber Elctrns. ... 716-424-2222
NY Vestal, Pioneer Elctrns. ... 607-748-8211
NY Westbury, Schweber Elctrns. ... 516-334-7474
NY Woodbury, Pioneer-Harvey/Woodbury. 516-921-8700
NC Charlotte, Pioneer/Carolina ... 704-526-8188
NC Raleigh, Hall-Mark Elctrns. ... 919-872-0712
NC Raleigh, Hamilton/Avnet Elctrns. ... 919-878-0810
NC Raleigh, Kierulff Elctrns. ... 919-872-8410
NC Raleigh, Schweber Elctrns. ... 919-876-0000
OH Beachwood, Schweber Elctrns. ... 216-464-2970
OH Centerville, Hamilton/Avnet Elctrns. ... 513-439-6700
OH Cincinnati, Graham Elctrns. ... 513-772-1661
OH Cincinnati, Hall-Mark Elctrns. ... 513-563-5980
OH Cleveland, Hall-Mark Elctrns. ... 216-349-4632
OH Cleveland, Hamilton/Avnet Elctrns. ... 216-831-3500
OH Cleveland, Kierulff Elctrns. ... 216-587-6558
OH Cleveland, Pioneer/Cleveland ... 216-587-3600
OH Columbus, Hamilton/Avnet Elctrns. ... 614-882-7004
OH Dayton, Pioneer/Dayton ... 513-236-9900
OH Dayton, Schweber Elctrns. ... 513-439-1800
OH Westerville, Hall-Mark Elctrns. ... 614-891-4555
OH Westerville, Hamilton/Avnet Elctrns. .. 614-882-7004
OK Tulsa, Hall-Mark Elctrns. ... 918-665-3200
OK Tulsa, Kierulff Elctrns. ... 918-252-7537
OK Tulsa, Schweber Elctrns. ... 918-622-8000
OR Beaverton, Almac Elctrns. Corp. ... 503-641-9070
OR Lake Oswego, Anthem Elctrns. ... 503-684-2661
OR Lake Oswego, Hamilton/Avnet Elctrns.. 503-635-8831
OR Portland, Kierulff Elctrns. ... 503-641-9150
PA Horsham, Lionex Corp. ... 215-442-5150
PA Horsham, Pioneer/Delaware Valley ... 215-674-4000
PA Horsham, Schweber Elctrns. ... 215-441-0600
PA Pittsburgh, Hamilton/Avnet Elctrns. ... 412-281-4150
PA Pittsburgh, Pioneer/Pittsburgh ... 412-782-2300
PA Pittsburgh, Schweber Elctrns. ... 412-782-1600
TX Austin, Hall-Mark Elctrns. ... 512-258-8848
TX Austin, Hamilton/Avnet Elctrns. ... 512-837-8911
TX Austin, Kierulff Elctrns. ... 512-835-2090
TX Austin, Pioneer/Austin ... 512-835-4000
TX Austin, Schweber Elctrns. ... 512-458-8253
TX Dallas, Hall-Mark Corp. ... 214-343-5000
TX Dallas, Hall-Mark Elctrns. ... 214-341-1147
TX Dallas, Kierulff Elctrns. ... 214-343-2400
TX Dallas, Pioneer/Dallas ... 214-386-7300
TX Dallas, Schweber Elctrns. ... 214-661-5010
TX Houston, Hall-Mark Elctrns. ... 713-781-6100
TX Houston, Hamilton/Avnet Elctrns. ... 713-780-1771
TX Houston, Kierulff Elctrns. ... 713-530-7030
TX Houston, Pioneer/Houston ... 713-988-5555
TX Houston, Schweber Elctrns. ... 713-784-3600
TX Irving, Hamilton/Avnet Elctrns. ... 214-659-4111
UT Salt Lake City, Anthem Elctrns. ... 801-973-8555
UT Salt Lake City, Bell Inds. ... 801-972-6969
UT Salt Lake City, Hamilton/Avnet Elctrns.. 801-972-2800
UT Salt Lake City, Kierulff Elctrns. ... 801-973-6913
WA Bellevue, Almac Elctrns. Corp. ... 206-643-9992
WA Bellevue, Hamilton/Avnet Elctrns. ... 206-643-3950
WA Redmond, Anthem Elctrns. ... 206-881-0850
WA Tukwila, Kierulff Elctrns. ... 206-575-4420
WI Brookfield, Schweber Elctrns. ... 414-784-9020
WI New Berlin, Hamilton/Avnet Elctrns. .. 414-784-4510
WI Oak Creek, Hall-Mark Elctrns. ... 414-761-3000
WI Waukesha, Bell Inds. ... 414-784-0235
WI Waukesha, Kierulff Elctrns. ... 414-784-8160



MANUFACTURERS OF QUALITY ELECTRONIC COMPONENTS
•BATTERY HOLDERS & CLIPS • COILS
• CAPACITORS • CONNECTORS • FUSES
• JACKS • KNOBS • LAMPS • PLUGS
• MICROPHONES • POTENTIOMETERS
• RF COILS • RELAYS • RESISTORS
• SEMICONDUCTORS • SPEAKERS
• SWITCHES • TRANSFORMERS
OVER 15,000 DIFFERENT ITEMS IN STOCK!
• Send For New Catalog
MOUSER ELECTRONICS
11433 WOODSIDE AVE., SANTEE, CA 92071
PHONE: (619) 449-2222 TWX: 910-331-1175

MOTOR-TRONICS, INC., 2142 Industrial Ct., Bldg. 'F', Vista, CA 92083, Tel: 619-727-7430; *Sls. Mgr.:* Bill Linko ... **B•1176-1177**

MOTRONICS CORP., Riverside Indl. Pk., Little Falls, NY 13365, Tel: 315-823-4050; Empl.: 90; *Sls. Mgr.:* Otto Demuth

Local Sales Offices & Reps

CA Chatsworth, Motion Tech., Inc. ... 818-993-3762
CO Englewood, Integrated Motion Sys. 303-762-1817
IL Schaumburg, Gassner & Clark Co. 312-882-8608
IN Beech Grove, Control Sls. ... 317-353-6094
KS Shawnee Mission, L.S.C., Inc. ... 913-362-2121
MA Southborough, Motion Engrg. ... 617-485-2144
MI Livonia, Electrolines ... 313-591-2428
MN St. Paul, Northstar Motion & Cont. Co... 612-770-5311
NY Clark Mills, KLM Garner ... 315-853-6126
OH Cleveland, KT/Depco ... 216-442-6200
PA Audubon, Holmes Assocs. ... 215-666-0636
PA Pittsburgh, Greye Glass Assocs. ... 412-366-6664
TX Dallas, Blackburn Assocs., Inc. ... 214-692-8885
VA Roanoke, Engrg. & Mktg. Corp. of Vir. .. 703-986-1410
WA Bellevue, Al Smith Co. ... 206-746-6770
WI Milwaukee, Schreiber-Arterburn ... 414-545-7800

MOUSER ELECTRONICS, 11433 Woodside Ave., Santee, CA 92071, Tel: 619-449-2222, TWX: 910-331-1175; Empl.: 200; *Sls. Mgr.:* Jerry Tallent

MOUSER ELECTRONICS, 2401 Hwy. 287 North, Mansfield, TX 76063, Tel: 817-483-4422

MOUSE SYS. CORP., 2336H Walsh Ave., Santa Clara, CA 95051, Tel: 408-988-0211, Telex: 467848; *Sls. Mgr.:* Evelyn Boyd; *Dist. Mgr.:* Barbara Marsh-Wetherell

moxness products, inc.

MOXNESS PRODUCTS, INC., Versa Technologies, 1914 Indiana St., Racine, WI 53405, Tel: 414-554-5050, 800-558-5706; Empl.: 300; *Sls. Mgr.:* Thomas D. Hynes; *Dist. Mgr.:* Thomas D. Hynes ... **B•1734**

Local Sales Offices & Reps

CA Clayton, Moxness Prods., Inc. ... 415-672-9213
CA Escondido, Estco Entprs ... 619-489-8746
FL Clearwater, Frisby, Inc. ... 813-461-6055
GA Lilburn, R. L. Panyik & Assocs. ... 404-923-3703
IN Indianapolis, Elctrn. Sls. & Engrg. ... 317-849-4260
MA Framington, Petri & Jones ... 617-877-4233
NY Rochester, Empire Indl. Sls. Co., Inc. .. 716-244-9540
NC Cary, Moxness Prods., Inc. ... 919-467-2042
OH Xenia, Moxness Prods., Inc. ... 513-372-7334
WI Racine, Moxness Prods., Inc. ... 414-554-5050

MOXON INC., See Kode

MPB CORP., Precision Park, Keene, NH 03431, Tel: 603-352-0310, TWX: 710-366-1801; Empl.: 1600; *Dist. Mgr.:* Jack E. Barker

MPC SYS., Div. of Consulting Systems, RFD Box 441, Fremont, NH 03044, Tel: 603-642-5913; *Sls. Mgr.:* W. Morse

MPH ELCTRNS., 2660 Loma Ave., S. El Monte, CA 91733, Tel: 213-442-7818; *Sls. Mgr.:* A. Pastecci

MPI, 4426 S. Century Dr., Salt Lake City, UT 84107, Tel: 800-821-8848; *Sls. Mgr.:* Jamie Johnston

MPS CO., 8 N. Grant Dr., Addison, IL 60101, Tel: 312-543-1748; Empl.: 2; *Sls. Mgr.:* M. C. Mitchell

MSC PRODS./EATON CORP., 1640 Monrovia St., Costa Mesa, CA 92627, Tel: 714-642-2427, Telex: 67-8433; Empl.: 350 +; *Sls. Mgr.:* J. McDorough

MSI DATA CORP., 340 Fischer Ave., Costa Mesa, CA 92626, Tel: 714-549-6000, TWX: 910-595-1719; Empl.: 700; *Sls. Mgr.:* J. Falvey; *Dist. Mgr.:* S. Altice

MSI ELECTRONICS, INC., 34-32 57th St., Woodside, NY 11377, Tel: 212-672-6500, Telex: 426407; FSC No.: 18518; Empl.: 26; *Sls. Mgr.:* A. Lederman

MSS/MACINTOSH SOFTWARE, 170 West 73rd St. Ste 12C, New York, NY 10023, Tel: 212-799-8195; *Sls. Mgr.:* David H. M. Spector

MTE CORP., 7901 W. Clinton Ave., P.O. Box 23957, Milwaukee, WI 53223, Tel: 414-358-5300, 800-558-4332 ... **A•2199**

Local Sales Offices & Reps

AZ Tempe, EDS ... 602-438-1547
CA Danville, Bontrol Sys. ... 415-838-8540
CA San Diego, OMNI ... 619-268-9606
CA Santa Ana, El-Mar ... 714-547-8933
CO Englewood, C. M. Mktg. ... 303-850-9841
CT Avon, Tom Maguire Assocs. ... 203-673-3019
FL Casselberry, Southern Elctrn. Mktg. ... 305-831-2822
FL Ft. Lauderdale, Southern Elctrn. Mktg. ... 305-475-3686
FL Palm Harbor, Southern Elctrn. Mktg. .. 813-441-3902
GA Atlanta, Grady-Duckett ... 404-451-3529
IL Glencoe, Howard Benjamin Assocs. .. 312-835-0150
IN Carmel, Technology Mktg. ... 317-844-8462
IN Ft. Wayne, Technology Mktg. ... 219-432-5553
IA Cedar Rapids, Palatine Engrg. ... 319-365-8071
KY Louisville, Technology Mktg. ... 502-499-7808
MD Glen Arm, Rick Volk, Inc. ... 301-592-7154
MA Wellesley, Tom Maguire Assocs. ... 617-431-1120
MI Birmingham, Favco ... 313-644-0173
MI Grand Rapids, Favco ... 616-459-4425
MN Bloomington, Kettner & Assocs. ... 612-884-4343
MO Hazelwood, Palatine Engrg. ... 314-839-0800
MT Blue Springs, Palatine Engrg. ... 816-229-4007
NH Windham, Tom Maguire Assocs. ... 603-432-0363
NJ Marlton, BGR Assocs. ... 609-983-1020
NY Ridgewood, Ballou, Inc. ... 201-444-6990
OH Dayton, Electro-Com ... 513-898-5140
OK Tulsa, Components, Inc. ... 918-583-9149
TX Austin, R. F. Kimball Co., Inc. ... 512-443-5284
TX Houston, R. F. Kimball Co., Inc. ... 713-840-0590
TX Richardson, R. F. Kimball Co., Inc. ... 214-231-3447
WA Mukilteo, Robert Krippner ... 206-743-3579
WI Milwaukee, Kettner & Assocs. ... 414-351-3584

M-TRON INDS., P.O. Box 630, E. Hwy. 50, Yankton, SD 57078, Tel: 605-665-9321, TWX: 910-668-3603; Empl.: 125; *Sls. Mgr.:* Mike Huennekens; *Dist. Mgr.:* Karen Hansen ... **A•1395**

Local Sales Offices & Reps

AL Huntsville, 20th Century Mktg. ... 205-533-9281
AZ Tempe, SSA Sales ... 602-829-9338
CA Mountain View, Taarcom ... 415-960-1550
CA San Diego, Bestronics ... 619-693-1111
CA Thousand Oaks, SC Cubed ... 805-496-7307
CA Tustin, SC Cubed ... 714-731-9206
CO Littleton, Simpson Assoc. ... 303-794-8381
CT Ridgefield, Phoenix Sls. ... 203-438-9644
FL Apopka, G.F. Bohman ... 305-886-1882
FL Ft. Lauderdale, Bohman Assoc. ... 305-979-0008
FL St. Petersburg, G F Bohman ... 813-522-6120
GA Athens, ADI ... 404-548-0788

GA Norcross, 20th Century 404-446-1999
IL Arlington Hgts., Micro Sls. 312-956-1000
IN Fort Wayne, Given Corp. 219-432-5585
IA West Des Moines, SPS Assoc. 515-225-0607
KS Olathe, SPS Assoc. 913-764-4460
MD Ellicott City, Marketing Tech Inc. 301-465-5944
MA Needham Heights, Kanan 617-449-7400
MI Detroit, Rathsburg Assoc. 313-882-1717
MN Bloomington, Com-Tek Sls. 612-888-7011
MO St. Ann, SPS Assoc. 314-739-4468
NE Panama, SPS Assoc. 913-764-4460
NJ Englewood, Sprung/Nussbaum 201-569-5666
NJ Marlton, BGR 609-983-1020
NM Albuquerque, SSA 505-881-8877
NY Rochester, Ontec Sales 716-464-8636
NC Smithfield, ADI 919-934-8136
OH Dayton, Lyons Corp. 513-278-0714
OH Richfield, Lyons Corp. 216-659-9224
SC Fort Mill, ADI 803-547-2115
TN Knoxville, 20th Century 615-966-3608
TN Memphis, 20th Century 901-756-4681
TX Austin, Mech-Tron Mktg. 512-459-0802
TX Houston, Mech-Tron Mktg. 713-462-1432
TX Richardson, Mech-Tron Mktg. 214-437-4833
UT Midvale, Simpson Assoc. 801-566-3691
VA Lynchburg, Marketing Tech Inc. 804-384-6459
WA Redmond, Quadra Sls. 206-883-3550
WI Menominee, Micro Sales Inc. 414-251-0151
Can Mississaqua, Ontario, John Weiss Co. 416-673-0011
Can Nepean, Ontario, John Weiss Co. 613-726-1436
Can St. Laurent, Quebec, John Weiss Co. 154-337-5022
Can Winnipeq, Manitoba, John Weiss Co. .. 204-774-2119

Local Distributors

AL Huntsville, Pioneer Elctrns. 205-837-9300
AZ Phoenix, Sterling Elect. 602-268-2121
AZ Phoenix, Wyle Distr. Grp. 602-249-2232
AZ Tempe, Bell Inds. 602-966-7800
AR Little Rock, Carlton-Bates 501-562-9100
CA Aquara, Wyle 818-880-9000
CA Fullerton, Pyramid Elctrns. 714-773-0781
CA Irvine, Ryno Elctrns. 714-261-2500
CA Irvine, Wyle 714-863-9953
CA Rancho Cordova, Wyle 916-638-5282
CA San Diego, Ryno Elctrns. 619-453-8430
CA San Diego, Wyle 619-565-9171
CA San Jose, Capacitors Unltd. 408-946-7676
CA Santa Clara, Pyramid 408-727-9810
CA Santa Clara, Wyle Distr. Grp. 408-727-2500
CA Tustin, Image Elctrns. 714-730-0303
CO Thornton, Wyle Distr. Grp. 303-457-9953
CO Wheatridge, Bell Inds. 303-424-1985
CT E. Haven, J. V. Elctrns. 203-469-2321
CT Norwalk, Pioneer Elctrns. 203-853-1515
CT Orange, Milgray Elctrns. 203-795-0711
CT Wallingford, Mid-State Elect. 203-265-9900
FL Altamonte Springs, Pioneer 305-834-9090
FL Deerfield Beach, Pioneer Elctrns. 305-428-8877
FL Winter Park, Milgray Elctrns. 305-647-5747
GA Atlanta, Milgray 404-393-9666
GA Norcross, Pioneer Elctrns. 404-448-1711
IL Elk Grove, Pioneer Elctrns. 312-437-9680
IL Hoffman Estates, Inter Comp 312-843-2040
IN Indianapolis, Advent 317-872-4910
IN Indianapolis, Pioneer/IN 317-849-7300
IA Cedar Rapids, Advent 319-363-0221
KS Overland Park, Milgray Elctrns. 913-236-8800
MD Beltsville, Resco/Wash. 301-937-9100
MD Gaithersburg, Pioneer 301-921-0660
MD Rockville, Milgray Elctrns. 301-468-6400
MD White Marsh, Resco Washington 301-529-0500
MA Burlington, Milgray Elctrns. 617-272-6800
MA Lexington, Pioneer Elctrns. 617-861-9200
MA Wilmington, J.V. Elctrns. 617-273-4300
MA Woburn, 1st Frequency 617-935-3885
MI Farmington Hills, Advent Elec. 313-477-1650
MI Livonia, Pioneer Elctrns. 313-525-1800
MI Livonia, RS Elctrns. 313-525-1155
MN Bloomington, NWR 612-854-7329
MN Hibbing, NWR Elec. 218-262-5228
MN Minneapolis, Stark Elec. 612-332-1325
MN Minnetonka, Pioneer 612-935-5444
MO St Louis, Ric-tronics 314-576-9816
MO St. Louis, Olive Elctrns. 314-426-4500
NJ Berlin, GCI 609-768-6767
NJ Marlton, Milgray Elctrns. 609-983-5010
NJ Mt. Laurel, P.A.C. Elctrns. 609-387-3549
NJ Pinebrook, Pioneer Elctrns. 201-575-3510
NM Albuquerque, Sterling Elect. 505-884-1900
NY Binghamton, Pioneer Elctrns. 607-748-8211
NY Fairport, Pioneer 716-381-7070
NY Farmingdale, Milgray Elctrns. 516-420-9800
NY Pittsford, Milgray 716-385-9330
NY Woodbury, Pioneer Elctrns. 516-921-8700
NC Charlotte, Pioneer Elctrns. 704-527-8188
NC Raleigh, Century Elctrns. 918-872-2203
OH Cleveland, Milgray Elctrns. 216-447-1520
OH Cleveland, Pioneer Elctrns. 216-587-3600
OH Dayton, Pioneer Elctrns. 513-236-9900
OH Maumee, RS Elec. 419-893-0721
OK Oklahoma City, Radio Inc. 405-789-0741
OK Tulsa, Altair 918-252-5781
OK Tulsa, Radio Inc. 918-587-9123
OR Hillsboro, Wyle Distr. Grp. 503-640-6000
PA Horsham, Pioneer Elctrns. 215-674-4000
PA Norristown, Century Elec. 215-631-5400
PA Pittsburgh, Pioneer Elctrns. 412-782-2300
TX Austin, Altair 512-837-4970
TX Austin, Pioneer 512-835-4000
TX Austin, Wyle Distr. 512-834-9957
TX Dallas, Pioneer Elctrns. 214-386-7300
TX Houston, Altair 713-462-3029
TX Houston, Force Elec. 713-561-8644
TX Houston, Pioneer 713-988-5555
TX Houston, Wyle Laboratories 713-879-9953
TX Irving, Force Elec. 214-438-5700
TX Richardson, Altair 214-231-5166
TX Richardson, Wyle Electric 214-235-9953
UT Salt Lake City, Standard Supp. 801-486-3371
UT Salt Lake City, Wyle Distr. Grp. 801-974-9953
VT Richmond, Sterling Elect. 804-226-2190
WA Bellevue, Wyle Distr. Grp. 206-453-8300
WA Kent, Pyramid Elec. 206-872-5800
WI Milwaukee, Marsh Elect. 414-475-6000
Can Burnaby, BC, R-A-E Ltd / Camgaard .. 604-291-8866
Can Edmonton, ALB., Cardinal Elec. 403-483-6266
Can Montreal, PQ, Prelco Ltd. 514-389-8051
Can Oakville, ONT., L.A. Varah Ltd. 416-842-8484
Can Willowdale, Ontario, Electro Sonic 416-494-1666

MTS SYS., Box 24012, Minneapolis, MN 55424, Tel: 612-937-4000, Telex: 29-0521; Empl.: 1100; *Sls. Mgr.:* J. Beal

MU-DEL ELECTRONICS, INC., 2426 Linden Lane, Silver Spring, MD 20910-1288, Tel: 301-587-6087, Telex: 292038; FSC No.: 31563; Empl.: 8; *Sls. Mgr.:* Heinz E. Blum

MUELLER ELEC. CO., 1583 E 31st St., Dept. 20, Cleveland, OH 44114, Tel: 216-771-5225; Empl.: 156; *Sls. Mgr.:* J. E. Wisneski ..... **C•1468-1472**

Local Sales Offices & Reps

AZ Phoenix, The Health Grp. 602-247-9091
CA Cambell, Olsheski & Assoc. Inc. 408-378-6003
CA Downey, Ungar Sls. Assoc. 213-923-1467
CA Gardena, Ungar Sls. Assoc. 213-538-2811
CA W. Covina, Ungar Sls. Assoc. 213-339-1052
CO Colorado Springs, Norris & Warren ... 303-576-8697
FL Tampa, Palm State Mktg. Inc. 813-888-6316
GA Stone Mountain, Mfg. Sls. & Mktg. Serv. 404-469-5862
IL Libertyville, Raymond Klipp Assoc. 312-367-4676
IN Indianapolis, John Sukup, Inc. 317-253-5501
KS Shawnee Mission, Microtronics Inc. ... 913-262-1444
MA Lynn, Keene Sls. Co., Inc. 617-595-2300
MI Ferndale, Hilltronics Inc. 313-398-5556
MN Minneapolis, Boerger & Assoc. 612-560-3435
MS Jackson, Mfg. Sls. & Mktg. Serv. 601-922-8118
MO St. Charles, Microtronics Inc. 314-946-8500
NJ Medford, Champion Elec. Sls. Co. 609-983-0932
NJ Rockaway, R.O.I. Sls. Co. 201-627-8879
NY Webster, Richard W. Bienek Assoc. ... 716-872-0387
OR Portland, Jud LeBrun Co., Inc. 503-244-6805
PA Pittsburgh, F. P. Yarussi Co. 412-221-1717
SC Ft. Lawn, Mfg. Sls. & Mktg. Serv. 803-872-4454
TN White House, Mfg. Sls. & Mktg. Serv. .. 615-672-4498
TX Dallas, J. J. Sls. Co. 214-328-9739
Can Markham, Ontario, LenBrook Elctrns. .. 416-477-7722

M. U. INC., P.O. Box 1007, Oceanside, CA 92054, Tel: 619-757-7576

MUIRHEAD, 1101 Briston Rd., Mountainside, NJ 07092, Tel: 201-233-6010, Telex: 13-8275; FSC No.: 03980; Empl.: 60; *Sls. Mgr.:* Martin Wargon

MULTI-AMP CORP., TBG, 4271 Bronze Way, Dallas, TX 75237, Tel: 214-333-3201, TWX: 910-861-9052; Empl.: 400; *Sls. Mgr.:* Robert D. Libbey

MULTICORE SOLDERS, Cantiague Rock Rd., Westbury, NY 11590, Tel: 516-334-7997, TWX: 510-222-5185; Empl.: 1000

MULTI-PLATE CO., INC., 2362 Lu Field Rd., Dallas, TX 75229, Tel: 214-243-1557; Empl.: 50; *Sls. Mgr.:* Keith E. Piersall

MULTI PRODS. INTL., 218 Little Falls Rd., P.O. Box 238, Cedar Grove, NJ 07009, Tel: 201-239-8183, Telex: 219289; Empl.: 25; *Sls. Mgr.:* LeRoy Gray ..... **A•1135, 2202-2203; D•1728**

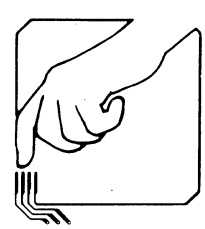
MULTI-PLATE COMPANY, INC.

A custom manufacturer of sophisticated printed circuitry

- prototype & pre-production quantities
- multi-layers up to 20 + layers
- surface mount technology
- high-temperature substrates
- commercial and miltitary

Recipient of the Texas Instruments Semiconductor Group TOP VENDOR award 1981, 1982 and 1983!

MULTI-PLATE COMPANY, INC.
.... when only perfect boards will do



2362 Lu Field Rd. Dallas, Tx. 75229
214/243-1557

Local Sales Offices & Reps

Erickson Sls., Inc.

AL	Huntsville, Elctrns Mfrs. Agts	205-830-4030
AZ	Scottsdale, Semi Sys., Inc.	602-991-1151
AR	Little Rock, Erickson Sls., Inc.	501-225-7379
CA	Campbell, Kottmeier Assocs.	408-866-5153
CA	Temple City, NMC, Inc.	818-447-0958
FL	Coral Springs, PC Elctrn. Sls.	305-755-3980
GA	Atlanta, Elctrn. Mfrs. Agts.	404-529-0530
IL	Chicago, Esco Assocs.	312-763-0800
IN	Frankfort, C-S Elctrns. Sls.	317-659-1874
KS	Overland Park, Electri-Rep	913-649-2168
LA	Chalmette, Erickson Sls., Inc.	504-271-1976
MD	Columbia, Eastern Tech. Corp.	301-995-0202
MA	Norwood, Mac Innis Co.	617-762-8090
MI	Jenison, R.C. Nordstrom & Co	616-457-5762
MI	Southfield, R. C. Nordstrom & Co.	313-559-7373
MN	St. Paul, Proud Inds.	612-646-9428
NJ	Cedar Grove, Legtonics Assocs.	201-239-4098
NC	Raleigh, Elctrns. Mfg. Agt.	919-781-4139
OH	Cleveland, Jim Finnegan & Co.	216-238-5905
OK	Oklahoma City, Erickson Sls., Inc.	405-682-2947
OR	Portland, Eltech	503-238-0805
PA	Albrightsville, Centurion Linear	717-722-0166
TN	Knoxville, Elctrn. Mfrs. Agts.	615-966-1286
TX	Austin, Erickson Sls., Inc.	512-445-2952
TX	Dallas, Erickson Sls., Inc.	214-739-5833
TX	Houston, Erickson Sls. Inc.	713-980-9606
WA	Bellevue, Eltech	206-643-4330

MULTITECH ELCTRNS. INC., 195 W. El Camino Real, Sunnyvale, CA 94086, Tel: 408-773-8400, Telex: 176004 MAC SUVL; *Sls. Mgr.:* James Tseng

MULTI-TECH INDS., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, Tel: 201-431-0550; Empl.: 40; *Sls. Mgr.:* James L. Bernard

MULTI-TECH SYSTEMS, INC., 82 Second Ave. S.E., New Brighton, MN 55112, Tel: 612-631-3550, TWX: 910-563-3610; Empl.: 65; *Sls. Mgr.:* Thomas Heimerman; *Dist. Mgr.:* Peter Hanlon

MULTI-TRONIX, 3210 Terry Dr, Toledo, OH 43613, Tel: 419-472-3360; *Sls. Mgr.:* K. L. Schepler

MULTIWIRE DIV., Kollmorgen Corp., 10 Andrews Rd., Hicksville, NY 11801, Tel: 516-938-2000, TWX: 510-223-0639; Empl.: 800

MULTIWIRE NE, Kollmorgen, 41 Simon St., Nashua, NH 03061, Tel: 603-889-0083; FSC No.: 60490; Empl.: 165; *Sls. Mgr.:* Paul Lavigne

MUPAC, 10 Mupac Dr., Brockton, MA 02401, Tel: 617-588-6110, TWX: 710-345-8458; Empl.: 100

Local Sales Offices & Reps

AL	Huntsville, Macro Mktg. Assocs., Inc.	205-883-9630
AZ	Tempe, Trembly Assocs.	602-967-2058
AR	Richardson, Lear Assocs., Inc.	214-231-5388
CA	San Diego, Hadden Assocs. Inc.	619-565-9444
CA	Santa Clara, DC Elctrns.	408-980-1199
CA	West Covina, Mupac - West Coast Off.	213-960-3042
CO	Lakewood, Trembly Assocs.	303-233-9544
FL	Orlando, Currie, Peak & Frazier	305-855-0843
IL	Addison, Engrd. Sls.	312-832-8426
IN	Fort Wayne, Hoyle Assoc.	219-485-6433
MD	Baltimore, Rep-Tron	301-799-7490
MA	Wayland, Daner-Hayes, Inc.	617-655-0888
MI	Northville, Micro Sls. Corp.	313-459-1670
MN	Minneapolis, L. F. Green Assoc.	612-571-6666
MO	Blue Springs, Chesco	816-229-1404
MO	St. Charles, Chesco	314-946-6677
NV	Las Vegas, Trembly Assocs.	702-369-8700
NJ	Woodcliff, J. Fried & Assocs.	201-391-6792
NM	Albuquerque, Trembly Assoc.	505-266-8616
NY	Great Neck, F & F Metro, Inc.	516-482-4080
NY	Syracuse, Labtronics	315-455-7314
NC	Cary, Engineering Dvcs.	510-920-0632
NC	Greensboro, Currie, Peak & Frazier	919-373-0380
OH	Dayton, Micro Sls. Corp.	513-433-8171
OH	N. Olmsted, Micro Sls. Corp.	216-734-3080
PA	King of Prussia, R.J.I.	215-265-5211
PA	Norristown, RJI	215-631-1414
TX	Austin, Lear Assoc.	512-450-1059
TX	Houston, Lear Assoc.	713-488-7893
TX	Richardson, Lear Assocs.	214-231-5388
UT	Salt Lake City, Trembly Assocs.	801-486-5292
WA	Bellevue, Comtec	206-453-1188

muRata ERIE

MURATA ERIE NORTH AMERICA, INC.

MURATA ERIE NORTH AMERICA, INC., 1148 Franklin Rd., S.E., Marietta, GA 30067, Tel: 404-952-9777, Telex: 54-2329, TWX: 810-766-1531; Empl.: 1800; *Sls. Mgr.:* Jack Driscoll; *Dist. Mgr.:* Kenneth O'Connor ....**A•1002, 1136-1139, 1396-1397, 1582, 1616-1617, 1907-1909, 1990, 2030-2031, 2089, 2205; D•1028, 1729**

Local Sales Offices & Reps

AL	Huntsville, Jack W. Harvey & Assocs.	205-536-4414
AZ	Scottsdale, Murata Erie N. America	602-941-2667
CA	Los Altos, Recht. Assocs.	415-964-6321
CA	Santa Ana, Murata Erie North America	714-835-4822
FL	Lauderhill, Innovative Mktg., Inc.	305-485-6869
FL	Maitland, Murata Erie North America	305-644-0954
GA	Marietta, Murata Erie N. America	404-952-9777
IL	Des Plaines, Murata Erie North America	312-297-5560
IN	Ft. Wayne, Murata Erie North America	219-484-1528
IN	Indianapolis, Jack Harvey & Assocs.	317-872-1031
IN	Kokomo, Jack Harvey & Assocs.	317-453-4260
KY	Prospect, Jack Harvey & Assocs.	502-228-4100
MD	Columbia, Murata Erie North America	301-992-6612
MA	Wakefield, Murata Erie North America	617-245-7880
MI	Southfield, Jack Harvey & Assocs.	313-569-4477
MN	Plymouth, Murata Erie North America	612-553-1594
NJ	Springfield, Radix	201-467-4970
NC	Greensboro, Murata Erie North America	919-299-1905
OK	Tulsa, Marata Erie North America, Inc.	918-254-8668
OK	Tulsa, Murata Erie N. America	918-254-8668
OR	Beaverton, Caruso & Northcutt, Inc.	503-646-4973
TN	Knoxville, Jack Harvey & Assocs.	615-524-7057
TX	Austin, Murata Erie North America, Inc.	512-451-8488
TX	Richardson, Murata Erie North America	214-238-8211
WA	Bellevue, Caruso & Northcutt, Inc.	206-454-9699
Can	Mississuaga, Ont., Murata Erie North America, Inc.	416-676-9484

Local Distributors

AL	Huntsville, Arrow Elctrns.	205-837-6955
AL	Huntsville, Electro-Wise, Inc.	205-830-4764
AZ	Phoenix, R.V. Weatherford	602-272-7144
AZ	Tempe, Arrow Elctrns.	602-701-7500
AZ	Tempe, Shelley Elctrns.	601-894-2058
AZ	Tempe, Time Elctrns.	602-967-2000
CA	Anaheim, R.V. Weatherford Co.	714-547-0981
CA	Anaheim, Time Elctrns.	714-937-0911
CA	Belmont, Varitech Elctrns.	415-593-3300
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Chatsworth, Diplomat Elctrns.	213-700-8700
CA	Chatsworth, Shelley Elctrns.	213-998-3333
CA	Chatsworth, Time Elctrns.	818-998-7200
CA	Costa Mesa, Diplomat Elctrns.	714-549-8401
CA	Englewood, Newark Elctrns.	214-678-0441
CA	Fullerton, Pyramid	714-773-0781
CA	Garden Grove, Inductive Prods. Inc.	714-892-7749
CA	Garden Grove, Natl. Capacitor Supp.	213-598-9611
CA	Glendale, R.V. Weatherford Co.	213-849-3451
CA	Inglewood, Newark Elctrns.	213-678-0441
CA	Mountain View, Shelly Elctrns.	415-969-1820
CA	Newport Beach, Arrow Elctrns.	714-851-8961
CA	Pomona, R.V. Weatherford Co.	714-623-1261
CA	Sacramento, Arrow Elctrns.	916-925-7456
CA	San Diego, Arrow Elctrns.	714-565-4800
CA	San Diego, Diplomat Elctrns.	619-292-5693
CA	San Diego, R.V. Weatherford Co.	714-695-1700
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	San Diego, Time Elctrns.	619-586-1331
CA	San Jose, Shelley Elctrns.	818-998-3333
CA	Santa Barbara, R.V. Weatherford	805-965-8551
CA	Santa Clara, Intl. Standard Comps.	408-496-0411
CA	Santa Clara, Pyramid Elctrns. Supp.	408-727-9810
CA	Sunnyvale, Acacia Sls.	408-745-7200
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CA	Sunnyvale, Capsco	408-734-3020
CA	Sunnyvale, Diplomat Elctrns.	408-734-1900
CA	Sunnyvale, R.V. Weatherford Co.	408-738-8694
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Torrance, Time Elctrns.	213-320-0880
CA	Tustin, Arrow Elctrns.	714-838-5422
CO	Aurora, Arrow Elctrns.	303-696-1111
CO	Boulder, Shelley Elctrns.	303-442-2718
CO	Denver, Newark Elctrns.	303-423-7941
CO	Denver, R.V. Weatherford Co.	303-428-6900
CO	Englewood, Time Electrns.	303-850-7701
CO	Lakewood, Acacia Sls.	303-232-2882
CT	Chesire, Time Elctrns.	203-271-3200
CT	Danbury, Diplomat Elctrns.	203-797-9674
CT	Orange, Milgray Elctrns.	263-795-0711
CT	Wallingford, Arrow Elctrns.	203-265-7741
CT	Wallingford, Cronin Elctrns.	203-265-3134
FL	Clearwater, Diplomat Elctrns.	813-443-4514
FL	Fort Lauderdale, Arrow Elctrns.	305-776-7790
FL	Fort Lauderdale, Diplomat Elctrns.	305-974-8700
FL	Ft. Lauderdale, Newark Elctrns.	305-587-2372
FL	Ft. Lauderdale, Time Elctrns.	305-974-4800
FL	Orlando, Time Elctrns.	305-841-6565
FL	Palm Bay, Arrow Elctrns.	305-725-1480
FL	Tampa, Newark Elctrns.	813-872-5618
FL	Tampa, Shelley Elctrns.	813-884-0946
FL	Winter Park, Milgray Elctrns.	305-647-5747
GA	Atlanta, Milgray Elctrns.	404-393-9666
GA	Atlanta, Spectrum Elctrns.	404-449-4643
GA	Atlanta, Time Elctrns.	404-351-3545
GA	Norcross, Arrow Elctrns.	404-449-8252
GA	Norcross, Diplomat Elctrns.	404-449-4133
GA	Norcross, Newark Elctrns.	404-448-1300
IL	Aurora, Newark Elctrns.	312-844-1988
IL	Bensonville, Diplomat Elctrns.	312-595-1000
IL	Bensonville, Milgray Elctrns.	312-350-0490
IL	Chicago, Bell Inds.	312-982-9210
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Oakbrook, Newark Elctrns.	312-789-3130
IL	Rosemont, Advent Elctrns.	312-297-6200
IL	Schaumburg, Arrow Elctrns.	312-397-3440
IL	Skokie, Kellner Elctrns.	312-677-1120
IN	Indianapolis, Advent Elctrns.	317-872-4910
IN	Indianapolis, Arrow Elctrns.	317-243-9353
IA	Bettendorf, Newark Elctrns.	319-359-1341
IA	Cedar Rapids, Advent Elctrns. Inc.	319-363-0221
IA	Cedar Rapids, Arrow Elctrns.	319-395-7230
KS	Overland Park, Milgray Elctrns.	913-236-8800
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Beltsville, Resco	301-937-9100
MD	Columbia, Diplomat Elctrns.	301-995-1226
MD	Columbia, Time Elctrns.	301-964-3090
MD	Rockville, Milgray Elctrns.	301-468-6400
MD	White Marsh, Resco	301-529-0500
MA	Burlington, Milgray Elctrns.	617-272-6800
MA	Needham, Cronin Elctrns.	617-449-5000
MA	Woburn, Arrow Elctrns.	617-933-8130
MA	Woburn, Diplomat Elctrns.	617-935-6611
MA	Woburn, Time Elctrns.	617-935-8080
MI	Ann Arbor, Arrow Elctrns.	313-971-7220
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MI	Grand Rapids, Arrow Elctrns.	616-243-0912
MN	Bloomington, Time Elctrns.	612-944-9192
MN	Edina, Arrow Elctrns.	612-830-1800
MN	Hopkins, The Joal Co.	612-935-6202
MN	Minneapolis, Newark Elctrns.	612-331-6350
MO	St. Louis, Arrow Elctrns.	314-567-6888
MO	St. Louis, Time Elctrns.	314-391-6444
NH	Manchester, Arrow Elctrns.	603-668-6968
NH	Salem, Cronin Elctrns.	603-898-4440
NJ	Cherry Hill, Diplomat Elctrns.	609-751-0440
NJ	Fairfield, Arrow Elctrns.	201-575-5300
NJ	Marlton, Arrow Elctrns.	609-596-8000
NJ	Moorestown, Arrow Elctrns.	609-235-1900
NJ	Rockaway, Tonar Inds.	201-586-9000
NJ	Springfield, Newark Elctrns.	201-376-9500
NJ	Totowa, Diplomat Elctrns.	201-785-1830
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NY	Bohemia, Shelley Elctrns.	516-567-7751
NY	Buffalo, Newark Elctrns.	716-892-4321
NY	Farmingdale, Arrow Elctrns.	516-293-6363
NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Hauppauge, Time Elctrns.	516-273-0100
NY	Liverpool, Arrow Elctrns.	315-652-1000
NY	Liverpool, Diplomat Elctrns.	315-652-5000
NY	Lynbrook, Varitech Elctrns.	516-593-9300
NY	Melville, Arrow Elctrns.	516-391-1485
NY	Melville, Diplomat Elctrns.	516-454-4600
NY	Pittsford, Milgray Elctrns.	711-385-9330
NY	Rochester, Arrow Elctrns.	716-275-0300
NC	Charlotte, Elctrn. Mktg. Corp.	704-394-6195
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Raleigh, Resco/Raleigh	919-781-5700
NC	Winston-Salem, Arrow Elctrns.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Cleveland, Milgray Elctrns.	216-447-1520
OH	Cleveland, Newark Elctrns.	216-361-4700
OH	Columbus, Elctrn. Mktg. Corp.	614-299-4161
OH	Columbus, Newark Elctrns.	614-451-0002
OH	Highland Hts., Elctrn. Mktg. Corp.	216-442-3441
OH	Kettering, Electronic Mktg. Corp.	513-439-4711
OH	Solon, Arrow Elctrns.	216-248-3990
OK	Tulsa, Arrow Elctrns.	918-665-7700
OR	Lake Oswego, Moore Elctrns.	503-684-3100
OR	Portland, Newark Elctrns.	503-257-0741
OR	Portland, Time Elctrns.	503-684-3780
OR	Tigard, Arrow Elctrns.	503-684-1690
PA	Broomall, Time Elctrns.	215-359-1200
PA	Monroeville, Arrow Elctrns.	412-856-7000
PA	Versailles, Newark Elctrns.	412-834-8504

TX Addison, R.V. Weatherford Co. 214-931-7333
TX Austin, Arrow Elctrns. 512-835-4180
TX Carrollton, Arrow Elctrns. 214-380-6464
TX Dallas, Arrow Elctrns. 214-386-7500
TX Dallas, Diplomat Elcrns. 214-980-1888
TX Dallas, Milgray Elctrns. 214-248-1603
TX Garland, Newark Elctrns. 214-494-5911
TX Houston, Arrow Elctrns. 713-530-4700
TX Houston, Force Elctrns. 713-561-8644
TX Houston, R.V. Weatherford Co. 713-688-7406
TX Irving, Force Elctrns. 214-438-5700
TX Austin, Diplomat Elctrns. 512-452-5254
UT Salt Lake City, Arrow Elctrns. 801-539-1135
VA Richmond, Arrow Elctrns. 804-282-0413
WA Bellevue, Arrow Elctrns. 206-634-4800
WA Bellevue, Time Elctrns. 206-641-3640
WA Seattle, R.V. Weatherford Co. 206-575-1340
WI Oak Creek, Arrow Elctrns. 414-764-6600
Can Mississauga, Ont., Prelco Elctrns. 416-678-0401
Can Montreal, Quebec, Future Elctrns. 514-694-7710
Can Nepean, Ont., Prelco Elctrns. 613-726-1800
Can Ottowa, Ont., Carsten Elctrns. 613-729-5138
Can Scarborough, Ont., Carsten Elctrns. ... 416-751-2371
Can St. Laurent, Quebec, Carsten Elctns. .. 514-334-8321

MURATA ERIE NORTH AMERICA, INC., 5 Fraser Ave., Trenton, ON, Canada K8V551, Tel: 613-392-2581

MURATA MFG. CO., LTD., 26-10-2-chome-Tenjin, Nagaoka-Kyo-Shi, Kyoto, Japan, Japan, Tel: 075-951-9111, Telex: J64270; Empl.: 2000; *Sls. Mgr.:* O. Otaka

MUSHIELD CO., Div. Bomco, Inc., 121 Madison St., P.O. Box W, Malden, MA 02148, Tel: 617-321-4410; FSC No.: 22780; Empl.: 10; *Sls. Mgr.:* Mark Standley

MVP ELCTRNS., 1161 N. Tustin, Orange, CA 92667, Tel: 714-639-9246, Telex: 678401; Empl.: 4; *Sls. Mgr.:* M. Vander Plaats ..... **D•1012**

MWS WIRE INDS., 31200 Cedar Valley Dr., Westlake Village, CA 91362, Tel: 818-991-8553, TWX: 910-336-1689; FSC No.: 51668; *Sls. Mgr.:* M. D. McClure ..... **C•1864-1865**

MYLEE DIGITAL SCIENCES, 155 Weldon Pkwy., Maryland Heights, MO 63043, Tel: 314-567-3420; Empl.: 100; *Sls. Mgr.:* G. Graves

NAE, 69 Bennett St., Lynn, MA 01905, Tel: 617-598-4800, TWX: 710-334-0254; FSC No.: 51182; Empl.: 100; *Sls. Mgr.:* Rick Kassiotis; *Dist. Mgr.:* Ellen Madden

NAMCO CONTROLS, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060, Tel: 216-946-9900, Telex: 24-1566; Empl.: 200; *Sls. Mgr.:* Jon Slaybaugh, V.P./Sales-Mktg.

NAMCO-LEUZE, A Namco Controls Affiliate Co., 7567 Tyler Blvd., Mentor, OH 44060, Tel: 216-946-9900, Telex: 24-1566; *Sls. Mgr.:* Jon Slaybaugh, V.P./Sales-Mktg.

NAMIKI PRECISION JEWEL CO., LTD., 15 Warren Street, Hackensack, NJ 07601, Tel: 201-343-3080, TWX: 710-990-1273; FSC No.: 201-343-3172

NANMAC CORP., 9 Mayhew St., Framingham, MA 01701, Tel: 617-872-4811; Empl.: 32; *Sls. Mgr.:* G. Nanigian; *Dist. Mgr.:* J. Manigian

npi®

NANO PULSE INDUSTRIES, 440 Nibus St., Brea, CA 92670, Tel: 714-529-2600, Telex: 910-997-0422; FSC No.: 57222; *Sls. Mgr.:* Michael J. Schubert ..... **A•1546-1549, 2206-2207**

Local Sales Offices & Reps
CA Mountain View, West Mark Assocs. ... 415-969-1700
CA San Diego, D2 Sls., Inc. 619-560-6266
CO Arvada, Delconec, Inc. 303-422-7023
MA Sharon, Cummings Assocs. 617-784-5600
MN Eden Prairie, Aldridge Assocs. 612-994-8433
PA Newtown, Yax Assocs. 215-860-2540
PA Waterford, Bacon Elctrns. 814-796-2381
TX Houston, Milco Mktg. 713-723-5003
WA Redmond, Electronics Northwest, Inc. 206-883-1959

NARDA MICROWAVE CORP., 435 Moreland Rd., Hauppauge, NY 11788, Tel: 516-231-1700, TWX: 510-221-1867

NASHUA CORP., 44 Franklin St., Nashua, NH 03061, Tel: 603-880-2889, Telex: 943406; *Sls. Mgr.:* Chet Mielcarz

NATEL ENGRG. CO., INC., 4550 Runway St., Simi Valley, CA 93063, Tel: 805-581-3950, TWX: 910-494-1959; Empl.: 95 ..... **A•1694-1695**

NATIONAL BERYLLIA CORP., Greenwood Ave., Haskell, NJ 07420, Tel: 201-839-1600, TWX: 710-988-5363; Empl.: 200

Distributor

NATIONAL CAPACITOR, 11731 Markon Dr., Garden Grove, CA 92641, Tel: 714-892-7749, 213-598-9611, 800-854-2451, TWX: 910-596-1316 ..... **A•1127**

NATIONAL CONTROLS CORP., 931 N. DuPage Ave., Lombard, IL 60148, Tel: 312-932-6900; Empl.: 250; *Dist. Mgr.:* Cy Pfeifer

NATIONAL ELECTRIC CABLE, 16566 S.W. 72nd Ave., Portland, OR 97224, Tel: 503-620-9400, Telex: 36-0963; FSC No.: 5P935; Empl.: 125; *Sls. Mgr.:* Dick Sass ..... **C•1866-1867**

Local Sales Offices & Reps
CA Hayward 415-785-1277
CO Englewood 303-797-8448
DE Wilmington 302-573-2525
IL Elk Grove Village 312-593-8100
OR Portland 503-620-9400
TX Houston 713-464-8555

NATIONAL ELCTRN. DISTRS. ASSN., 1420 Renaissance Dr., Ste. 211, Park Ridge, IL 60068, Tel: 312-298-9747

NATIONAL INFORMATION SYS., INC., 20370 Town Center Lane, Cupertino, CA 95014, Tel: 408-257-7700, Telex: 750031; *Sls. Mgr.:* John Enyedy

NATIONAL INSTRUMENTS, 12109 Technology Blvd., Austin, TX 78759, Tel: 512-250-9119, Telex: 756737 NAT INST AUS; Empl.: 64; *Sls. Mgr.:* Dave Aldrich; *Dist. Mgr.:* John Purvis

NATIONAL MICRONETICS, Route 28, West Hurley, NY 12136, Tel: 914-338-0333, TWX: 510-247-8046; Empl.: 900; *Sls. Mgr.:* P. A. Rivelli

NATIONAL POWER TECHNOLOGY

NATIONAL POWER TECHNLG., 2111 Howell Ave., Anaheim, CA 92806, Tel: 714-937-1301, Telex: 910-591-1893; Empl.: 85; *Sls. Mgr.:* Harold Myers ..... **D•1730-1732**

Local Sales Offices & Reps
AL Delta, Gillum Sls., Inc. 205-396-5731
CA Canoga Park, Cummings & Assocs. ... 818-340-6035
CA Palo Alto, Abbott Engrg. Co., Inc. 415-968-2265
CA San Diego, Mesa Engrg. 619-278-8021
CO Denver, Cummings & Assocs. Mktg., Inc. 303-455-6860
FL Clearwater, Gillum Sls., Inc. 813-531-2248
FL Largo, Gillum Sls., Inc. 813-531-2248
FL Orlando, Gillum Sls., Inc. 305-857-2110
KY Ft. Mitchell, G. W. Thelen 606-341-8181
MD Randallstown, Beacon North 301-655-2265
MA Chelmsford, Encotronics 617-256-4207
NJ Berkeley Heights, Cambridge, Allen & Assocs. 201-464-0203
NY Rochester, Fowler Beach Corp. 716-586-0468
OH Medina, G. W. Thelen 216-723-1293
PA Hatboro, Jacobsen Assocs. 215-674-2937
PA Lebanon, Jacobsen Assocs. 717-273-9746
UT Salt Lake City, Cummings & Assocs. Mktg., Inc. 801-263-8131
VA Fairfax, Beacon North 703-591-1300
VA Forest, Beacon North 804-239-8486
WA Bellevue, Underwood-Hanify 206-451-8223
WA Vancouver, Underwood-Hanify 503-224-0583
WI Greenfield, Olympic 414-281-9294

NATIONAL SEMICONDUCTOR CORP., 2900 Kifer Rd., # 23-200, Santa Clara, CA 95051

NATIONAL SEMICONDUCTOR OPTOELECTRONICS, 365 Jordan Road, Troy, NY 12180-8396, Tel: 518-271-2100, TWX: 710-444-4962; *Dist. Mgr.:* Donna McLaughlin

NATIONAL SEMICONDUCTORS, LTD., See Silonex Inc.

NATIONAL SOLID STATE DEVELOPMENT, INC., See NSD

NATIONAL SONICS/XERTEX CORP., 250 Marcus Blvd., Hauppauge, NY 11787, Tel: 516-273-6600, Telex: 14-4545; Empl.: 140; *Sls. Mgr.:* John Kristoffersen

NATIONAL-STANDARD CO., 601 N. 8th, Niles, MI 49120, Tel: 616-683-8100, Telex: 25-8453, TWX: 810-270-3153; Empl.: 3100; *Sls. Mgr.:* J. L. Dayton; *Dist. Mgr.:* J. L. Dayton

NATIONAL TELEPHONE & ELCTRNS. INC., 2350 N.W. 96 Avenue, Miami, FL 33172, Tel: 305-592-0551; Empl.: 50

NATIONAL TEL-TRONICS, State Road Hill, Meadville, PA 16335, Tel: 814-724-6440, Telex: NATL TELMEAD 91-4405; Empl.: 250; *Dist. Mgr.:* D. R. Booth ..... **C•1473**

Local Sales Offices & Reps
AL Birmingham, Southeastern First Rep .. 205-967-7082
CA Milpitas, Ward Elctrn. Pkg. 408-945-0420
CA San Diego, CK Assocs. 619-279-0420
CA Santa Ana, Electrotechnical Sls. 714-546-9305
CO Denver, Donohue Sls. Co. 303-455-1719
CT Hamden, F. Manzi Sls. 203-281-3534
FL Kissimmee, Southeastern First Rep ... 305-846-1306
FL Melbourne, Southeastern First Rep ... 305-784-4723
FL North Palm Beach, Southeastern First Rep 305-844-3758
GA Atlanta, Effective Mktg. 404-948-6023
GA Atlanta, Southeastern First Rep 404-393-2073
IL Chicago, Electro-Mech Sls. Co. 312-777-0554
IN Columbus, Tech. Reps. 812-376-9226
IA Des Moines, Beams Co. 515-255-1148
KS Shawnee Mission, Beams Co. 913-631-0300
MA Framington, Marathon Sls. 617-875-3566
MN Minneapolis, Hei-Lite Sls. 612-861-6051
MO St. Louis, Beams Co. 314-569-1069
NJ Cherry Hill, Ned Krouse Assocs. 609-424-3543
NJ Nutley, Falk-Baker Assocs. 201-661-2430
NY Macedon, M. M. Hare Co. 315-986-3742
NC Raleigh, RepCo Mktg. 919-787-7887
OH Cleveland, Jim Finnegan & Co. 216-238-5905
TN Greeneville, Dimark 615-639-0113
TX Dallas, Allied Comps. 214-238-0408
TX Houston, Allied Comps. 713-988-1600
TX Hurst, Allied Comps. 817-589-0456
TX Round Rock, Allied Comps. 512-244-1166
UT Salt Lake City, Meridian Mktg. 801-968-4177
WA Bellevue, Panoco 206-454-2503
Can Hamilton, Ont., Cartwright & Southall Assocs. 416-528-0294

Local Distributors
AZ Phoenix, Tri-Tek, Inc. 602-995-9352
CA Anaheim, Bisco Inds. 714-635-0380
CA Haywood, Allied Elctrns. 415-487-5250
CA Industry, Ital Elctrns. 818-968-8515
CA Redondo Beach, Mark Elctrns. 213-772-2141
CA San Jose, Bisco Inds. 408-946-8980
CA Santa Ana, Compu Svc. 714-546-5140
CA Santa Ana, CR Elctrns. 714-556-2040
CA Sunnyvale, Electronics Recs. 408-745-1420
CO Arvada, Denver Wintronics 303-431-7161
CO Denver, CSID 303-292-9594
FL Pompano Beach, Components South 305-971-0350
IL Elgin, Allied Elctrns. 312-697-8200
IL Franklin Park, Bisco Inds. 312-451-1230
IN Fort Wayne, Graham Elctrn. 219-423-3422
IN Indianapolis, Graham Elctrn. 317-634-8202
MA Burlington, Heilind Elctrns. 617-272-5610
MA Lynn, Land Elctrns. 617-592-2220
MN Fridley, Voyager Elctrns. Corp. 612-571-7766
NH Dover, American Radio 603-742-6800
NH Hudson, Heilind Elctrns. 603-883-9536
NJ Clifton, Meltronics, Inc. 201-340-3200
NY Buffalo, Summit Distr. 716-884-3450
NY Port Washington, Connector Concepts 516-883-3800

NY Rochester, Summit Distr. 716-334-8110
NC Winston-Salem, Kirkman Elctrns., Inc. 919-722-9131
OR Portland, United Radio Supp. 503-233-7151
PA Huntingdon Valley, Shap Elctrns. 215-322-7150
TX Dallas, Heilind Elctrns. 214-351-2058
TX Ft. Worth, Allied Elctrns. 817-336-5401
WA Seattle, Pacific Elctrns. 206-575-1050

NATIONAL WIRE & CABLE CORP., 136 San Fernando Rd., Los Angeles, CA 90031-1780, Tel: 213-225-5611, Telex: 181409, TWX: 910-321-4155; FSC No.: 04569; Empl.: 225 ..... **C•1868-1884**

Local Sales Offices & Reps

AZ Phoenix, Coker Assoc. 602-277-7494
AR Gassville, P.M.I. Sls. Co. 501-435-2004
CA Redwood City, National Wire & Cable 415-365-1952
CA San Diego, McKinley Elctrn. Sls. 619-271-7221
CA Santa Clara, Ross Mktg. 408-988-8111
CO Arvada, Arrowhead Sls. 303-423-5556
FL Altamonte Springs, Gugel-Tuttle Assocs. 305-788-0845
FL Orlando, National Wire & Cable 305-898-3801
GA Lawrenceville, Tek-Rep Mktg. 404-963-1600
HI Hilo, Kirco Corp. 808-959-3888
IL Northfield, H. S. Tollaksen 312-441-6644
MD Glen Burnie, Faion Lott 301-744-4611
MA Wellesley, Tom Maguire Assocs., Inc. 617-431-1120
MI Livonia, Luebbe Sls. 313-477-3131
MN Bloomington, Electro Sls. Inc. 612-854-8775
MO St. Louis, P.M.I. Sls. Co. 314-894-0073
NJ Wayne, GT Assoc. 201-694-6040
NY Farmingdale, National Wire & Cable 516-752-8038
NY Sodus, Kehoe Comp. Sls. 315-483-9122
OH Cincinnati, Luebbe Sls. 513-891-5770
OH Cleveland, Luebbe Sls. 216-333-0425
OH Columbus, Luebbe Sls. Co. 614-431-0474
OH Dayton, Luebbe Sls. 513-294-0426
PA Hatboro, Jacobsen Assocs. 215-674-2937
PA Pittsburgh, Luebbe Sls. Co. 412-931-0414
TX Fort Worth, J. H. Gibbs Assocs. 817-430-1861

NATIONWIDE ELECTRONIC SYSTEMS, See NES, Inc.

NAUGLER ENGRG., Off Dunham Rd., Beverly, MA 01915, Tel: 617-922-5634; FSC No.: 05222; Empl.: 10; *Sls. Mgr.:* Charles A. Osborn

NAZ-DAR INTL., 1087 N. Branch St., Chicago, IL 60622, Tel: 312-943-8338, Telex: 25-3303; Empl.: 53; *Sls. Mgr.:* Don Finwall; *Dist. Mgr.:* Don Finwall

N.C.E., Mail Station 331, 9925 Lyndale Ave. S., Bloomington, MN 55420, Tel: 612-890-1360; *Sls. Mgr.:* Irene R. Smith ..... **D•1428-1429**

NCR COMTEN, INC., NCR Corp., 2700 Snelling Avenue N., St. Paul, MN 55113, Tel: 612-638-7777, Telex: 6879018 COMTEN, TWX: 910-563-3661; FSC No.: 7025-0010; Empl.: 2900; *Sls. Mgr.:* Lewis M. Meador; *Dist. Mgr.:* Michael R. Wageman

NCR MICROELECTRONICS DIV., NCR Corp., 8181 Byers Rd., Miamisburg, OH 45342, Tel: 800-543-5618, 513-866-7471, Telex: 241669 NCR NVMEM MSBG; FSC No.: 60924; *Sls. Mgr.:* Walt Krysiak

NCR CORP., Terminal Sys Div., Babcock Hall, Terrace Hill, Ithaca, NY 14850, Tel: 607-273-5310

NCR POWER SYSTEMS, 584 S. Lake Emma Rd., Lake Mary, FL 32746, Tel: 305-323-9250, 800-327-7612, TWX: 810-856-0290; Empl.: 156; *Sls. Mgr.:* David A. Kemp

NEC ELECTRONICS, INC., 401 Ellis Street, Mtn. View, CA 94039, Tel: 415-960-6000, TWX: 910-379-6985; Empl.: 1100; *Sls. Mgr.:* Bob Commins; *Dist. Mgr.:* Phil Hubbert

NEC ELCTRNS. USA INC., NEC Electron Div., 252 Humboldt Ct., Sunnyvale, CA 94086, Tel: 408-745-6520, Telex: 35-7475, TWX: 910-339-9539; *Sls. Mgr.:* Robert Buchanan; *Dist. Mgr.:* Jason Stewart

NEC INFORMATION SYSTEMS, NEC Corporation, 1414 Massachusetts Ave., Boxborough, MA 01719, Tel: 617-264-8000, Telex: 92-3434; Empl.: 900; *Sls. Mgr.:* Richard Gilbert

NEDA, See National Elctrn. Distrs. Assn.

NEFF INSTR., 700 S. Myrtle Ave., Monrovia, CA 91016, Tel: 818-357-2281, TWX: 910-585-1833; Empl.: 125; *Sls. Mgr.:* James T. Barber

NELSON STUD WELDING TRW INC., 28th & Toledo Ave., Lorain, OH 44055, Tel: 216-245-6931, Telex: 980466; Empl.: 350; *Sls. Mgr.:* B. Robinson

NEPENTHE/YAMAICHI, 2471 E. Bayshore, #520, Palo Alto, CA 94303, Tel: 415-856-9332, TWX: 910-373-2060; FSC No.: 415.856 8650; *Sls. Mgr.:* G. Hall

NESHAMINY TRANSFORMER, Neshaminy Electronics Corp., Edison-Furlong Road, Furlong, PA 18925, Tel: 215-794-7411; *Sls. Mgr.:* Philip Klein

For the finest in Panel Meters!

NES, INC. (NATIONWIDE ELECTRONIC SYSTEMS), 3003 Wakefield, Carpentersville, IL 60110, Tel: 312-426-5900; Empl.: 293; *Sls. Mgr.:* David A. Voelker; *Dist. Mgr.:* David A. Voelker .... **B•1089; D•1069, 1127, 1159, 1365-1368**

Local Sales Offices & Reps

CA Palo Alto, Priz Co. 415-326-9333
IL Moline, Jim Otis & Assocs. 309-762-9311
IN Indianapolis, Electro Dev. & Engrg. Co. 317-547-5274
LA Baton Rouge, Control Sys. Consultants 504-292-1462
MD Baltimore, Wistex, Inc. 301-366-6303
NE Lincoln, Jim Otis & Assocs. 402-474-2390
NY Albany, L-Tron Assocs. Corp. 518-482-1987
NY Rochester, L-Tron Assocs. Corp. 716-436-4410
OH Cincinnati, Anderson-Bolds 513-528-5680
OH Cleveland, Anderson-Bolds 216-229-4700
PA Wayne, Wistex, Inc. 215-687-5930
UT Sandy, Priz Co. 801-571-7311
WI Waukesha, Bll 414-549-4141

Local Distributors

IL Bridgeview (Chicago), Norman Equip. Co. 312-430-4000
IL Countryside, Pacific Indicator 312-352-3500
KY Louisville, Main Elec. 502-587-6511
NC Charlotte, General Elctrn. of Charlotte 704-568-6793
SC Charleston, Flow Control 803-722-0176
TX Houston, Quality Instr. Lab 713-524-0528

NETCOM, 3002 Commercial Ave., Northbrook, IL 60062, Tel: 312-564-5100, TWX: 910-686-5478; FSC No.: 57193; Empl.: 85; *Sls. Mgr.:* Wayne Roeder

NEUTRIK PRODUCTS, See Kulka Smith

NEW ENGLAND INSTR., Robertshaw Controls, 14 Kendal Lane, Natick, MA 01760, Tel: 617-875-9711, TWX: 710-346-0398; Empl.: 600

NEW ENGLAND SMELTING WORKS, INC., 502 Union St., W. Springfield, MA 01090, Tel: 413-734-6491; FSC No.: 3439; Empl.: 35; *Sls. Mgr.:* David R. Saffer

Local Sales Offices & Reps

MI Franklin, New England Smelting Works Inc. 313-855-1133,800-521-0352
MI Southfield, New England Smelting Wks. Sls. 313-355-0393, 800-521-0352

NEW HAMPSHIRE BALL BEARINGS, INC., Rte. 202, Peterborough, NH 03458, Tel: 603-924-3311, TWX: 710-364-1805; Empl.: 1000

NEW HAVEN WIRE & CABLE, P.O. Box 266, New Haven, IN 46774, Tel: 219-493-4489, Telex: 232414; Empl.: 52

NEWMAN, M. M., CORP., Heli-Tube Div., P.O. Box 615, Marblehead, MA 01945, Tel: 617-631-7100; FSC No.: 09106; *Sls. Mgr.:* C. Loutrel; *Dist. Mgr.:* C. Loutrel ..... **C•1885**

NEW MEDIA GRAPHICS CORP., 279 Cambridge St. #5, Burlington, MA 01803, Tel: 617-272-8501

NEWPORT

NEWPORT ELECTRONICS, 630 E. Young St., Santa Ana, CA 92705, Tel: 714-540-4914, TWX: 910-595-1787; Empl.: 150; *Sls. Mgr.:* Jim Way ..... **D•1370-1371**

Local Sales Offices & Reps

AL Huntsville, Beacon Elctrns. Assocs. 205-881-5031
AZ Phoenix, CPS Assocs. 602-246-1097
CA MT. View, IFM, Inc. 415-961-2828
CA Pasadena, Luscombe Engrg. Co. 213-684-2000
CO Denver, AKI Entprs. 303-388-4488
CT Madison, Eastronix, Inc. 203-421-4514
FL Boca Raton, Beacon Elctrns. Assocs. 305-392-3500
GA Atlanta, Beacon Elctrns. Assocs. 404-256-9640
IL Arlington Hgts., Brainard-Wilson 312-437-2700
IN Carmel, Brainard-Wilson 317-844-2800
KS Mission, H & H Elec. Sls. 913-236-4460
MD Perry Hall, Electra-Tech 301-256-2723
MA Bedford, Eastronix, Inc. 617-275-5775
MI Farmington, Amtech Reps. 313-474-8300
MN Eden Prairie, Rockmore Sls. Corp. 612-941-1390
MO St. Charles, Power Transmission Sys. 314-928-1750
NJ Parlin, JMR Sls. 201-254-8484
NY East Setauket, JMR Sls., Inc. 516-689-8871
NY Skaneateles, ADN Entprs. 315-685-8991
NC Raleigh, Beacon Elctrns. Assocs. 919-787-0330
OH Centerville, Dolfuss-Root & Co. 513-433-6776
OH Strongsville, Dolfuss-Root & Co. 216-238-0300
OK Tulsa, Associated Dyn. 918-743-8116
OR Portland, Calvert Controls, Inc. 503-222-6473
PA Bridgeville, Dolfuss-Root & Co. 412-221-4420
PA King of Prussia, J. E. Cuesta & Co., Inc. 215-265-5800
TX Addison, Associated Dyn., Inc. 214-387-3800
TX Houston, Associated Dyn., Inc. 713-777-9443
VA Dumfries, Electra-Tech 703-670-6962
WA Spokane, Calvert Controls 509-244-3601
WI Menomonee Falls, Brainard-Wilson 414-255-3400

Local Distributors

..... 615-885-1302
AL Birmingham, Brownell-Electro, Inc. 205-323-4761
AL Muscle Schoals, Jones Elctrns. 205-383-1241
AZ Phoenix, Metermaster 602-437-1425
AZ Tempe, Beta Distrs. 602-894-9824
AR Little Rock, Brownell Instr. & Controls 501-562-2061
CA Costa Mesa, FLW, Inc 714-751-7512
CA Hayward, FLW, Inc. 415-487-2222
CA Los Angeles, EIL Instrs., Inc. 213-685-7020
CA Los Angeles, Metermaster 213-685-4340
CA San Leandro, Coast Instr. 415-483-3774
CO Englewood, Beta Distrs. 303-779-4494
CT Middletown, EIL Instrs., Inc. 203-346-6646
FL Miami, Brownell Electro, Inc. 305-591-2636
GA Atlanta (Hapeville), Brownell Electro 404-762-5181
GA Marietta, FLW, S.E. 404-424-1731
HI Kailua, FLW, Inc. 808-945-1030
IL Chicago, Data Elctrns. Co. 312-283-0300
IL Elk Grove Village, Metermaster 312-593-8650
IN Indianapolis, Data Elctrns. 317-359-5368
IA Davenport, Universal Precision Instr. 319-326-5757
KS Kansas City, Kornfeld Thorp 913-321-7070
KY Louisville, EIL Instrs. 502-454-3420
LA Baton Rouge, Beta Distrs. 504-924-6826
MD Gaithersburg, Pioneer Instrs. 301-921-0660
MD Sparks, EIL Instr. 301-771-4800
MA Waltham, Calibron Instrs. 617-894-6440
MI Livonia, Pioneer Instr. 313-525-1800
MI Royal Oak, George Instr. 313-280-1111
MN Plymouth, Data Elctrns. 612-559-1434
MO St. Louis, Universal Precision Inst. 314-394-4693
NJ Newfoundland, Hosica Labs. 201-697-6111
NM Albuquerque, Beta Distrs. 505-966-2420
NY Buffalo, Robert F. Lamb Co. 716-874-4900
NY Clarence, Trott Elctrns. 716-634-8500
NY Hauppauge, EIL Instrs., Inc. 516-231-6333
NY NYC, Brownell Electro 212-924-6000
NY Rochester, Robert F. Lamb Co. 716-323-1250
NC Concord, FLW Southeast 704-597-7623
NC Raleigh, Brownell Electro 919-876-6524
OH Cleveland, Metermaster 216-651-4100
OH Cleveland, Pioneer Instr. 216-587-3600
OH Cleveland, Weschler Elec. 216-238-2550
OH Dayton, EIL Instrs., Inc. 513-435-2134

OH Dayton, Pioneer Instr. 513-236-9900
OK Tulsa, Inotek 918-622-8570
OR Portland, Westcon 503-283-0132
PA Pittsburgh, Pioneer Instr. 412-782-2300
TN Memphis, FLW Southeast 901-345-3563
TN Nashville, Brownell Electro, Inc. 615-889-8230
TX Austin, Beta Distrs. 512-452-0199
TX Dallas, Dallas Meter Tek 214-349-6044
TX Dallas, Inotek 214-243-7000
TX Ft. Worth, Inotek 817-877-5100
TX Garland, Metermaster 214-271-5671
TX Houston, American Analog 713-941-7265
TX Houston, Beta Distrs. 713-682-1234
TX Houston, Inotek 713-688-7000
TX Richardson, Beta Distrs. 214-783-1065
UT S.L.C., Beta Distrs. 801-972-4455
VA Richmond, Metermetrics 804-275-1431
WA Seattle, Eicher-Richards Co. 206-523-7888
WA Seattle, EIL Instrs., Inc. 206-762-0880
WI Milwaukee, E-M Instrs. 414-272-7799

NEW-TONE ELECTRONICS, INC., 44 Farrand St., Bloomfield, NJ 07003, Tel: 201-748-5089; Empl.: 50; *Sls. Mgr.:* Annette Fuchs

NEW WAVE INSTRUMENTS, 3760 Masters Court, San Jose, CA 95111, Tel: 408-629-3105

N.Y. TESTING LABS., INC., 81 Urban Ave., Westbury, NY 11590, Tel: 516-334-7770, TWX: 212-297-1449; Empl.: 50

NIC COMPONENTS CORP., 238 Rte. 109, Farmingdale, NY 11735, Tel: 516-694-0060, 800-645-9333, Telex: 221-228; Empl.: 50; *Sls. Mgr.:* Ronald J. Travis; *Dist. Mgr.:* Nancy Lamendola ..... **A•1140-1141, 1910**

Local Sales Offices & Reps

AL Huntsville, Novus Group 205-881-2207
AZ Phoenix, Sterling Elctrns. 602-258-4531
AZ Phoenix, Tech Sls. 602-246-1614
AR Little Rock, Carlton Bates 501-562-9100
CA Fullerton, Pyramid Elctrns. 714-773-0781
CA Mission Viejo, Par Mktg. 714-768-6021
CA Redwood City, James S. Heaton Co. .. 415-367-9000
CA San Diego, Bestronic South 619-452-5500
CA San Diego, Ryno 619-292-6022
CA Santa Ana, Projections Unlimited 714-641-1472
CA Sun Valley, QC Comps. 213-768-6111
CT Bloomfield, SLR Assocs. 203-243-9343
CT Danbury, Pilgrim Elctrns. 203-792-7274
FL Clearwater, Perrott Assocs. 813-443-5214
FL Largo, Graham Elctrns. 813-541-4434
IL Champaign, Klaus Radio 217-356-1896
IL Lisle, W. G. Controls 312-963-5954
IL Melrose Park, Belford Elctrns, ... 312-865-2400
IN Fort Wayne, Graham Elctrns. 219-423-3422
IN Indianapolis, Elctrn. Rep. Inc. 317-894-1414
IA Cedar Rapids, Deeco 319-365-7551
KS Shawnee Mission, K&M Sls. 913-262-1444
KY Louisville, Peerless 502-637-7674
MD Baltimore, Burgin-Kreh Assocs. 301-265-8500
MD Rockville, MS Elctrns. 301-340-6400
MA Bedford, SLR Assocs. 617-275-5550
MA Burlington, TLC 617-273-0140
MI Detroit, Burcaw Co. 313-533-7700
MI Grand Rapids, SF Elctrns. 616-459-0216
MI Livonia, Reptron 313-525-2700
MN Bloomington, NWR 612-854-7329
MN Golden Valley, Ambassador Ino Mktg. 612-542-8437
NH Londonderry, S Squared 603-434-2033
NJ Perth Amboy, Sterling 201-442-8000
NJ Union, Cougar 201-687-7722
NY Hauppauge, Belmont Elctrns. 516-273-1333
NY Jericho, J-Square Mktg. Inc. 516-935-3200
NY Suffern, M&M Assoc. 914-368-0583
NC Greensboro, United Sls. 919-674-9849
OH Cincinnati, Graham Elctrns. 513-772-1661
OH Cincinnati, Stegman Blaine Mktg. Inc. 513-729-1969
OH Dayton, Dulian 513-445-0424
OH Vandalia, Stegman Blaine Mktg. Inc. .. 513-890-7975
OR Beaverton, ACACIA 503-646-3377
PA Philadelphia, Paragon Sls. 215-563-7060
TN Nashville, Graham 615-242-2682
TX Dallas, Design Mktg. 214-680-9767
TX Dallas, Heiland Elctrns. 214-351-2050
TX Hurst, Design Mktg. 817-268-2004
UT S. Jordan, Mac III 801-566-3781
EXP New York Farmingdale, NIC Comps. Corp. 516-694-0060

NICHICON (AMERICA) CORP., 927 E. State Pkwy., Schaumburg, IL 60195, Tel: 312-843-7500, Telex: 20-6577; FSC No.: 312-843-2798; 312-843-7125; *Sls. Mgr.:* Russ Edwards; *Dist. Mgr.:* Robert Poteracki

NICHIFU AMERICA, INC., 1494 N. Charlotte St., Pottstown, PA 19464, Tel: 215-323-7120; *Sls. Mgr.:* Roy Allen

NICOLET'S COMPUTER GRAPHICS DIVISION, P.O. Box 3020, 777 Arnold Dr., Martinez, CA 94553, Tel: 415-372-7568, TWX: 910-481-5951 ZETAPLOTS MART; FSC No.: 52893; Empl.: 150; *Sls. Mgr.:* Howard Keiper

NICOLET INSTR. CORP., Oscilloscope Div., 5225 Verona Rd., Madison, WI 53711, Tel: 608-271-3333, TWX: 910-286-2737; Empl.: 525; *Sls. Mgr.:* Dean Dawson

Local Sales Offices & Reps

AZ Phoenix, Axtec Entprs. 602-944-9185
CA Los Angeles, Nicolet Instr. 714-549-7611
CA San Diego, Nicolet Instr. 619-454-6274
CA San Jose, Nicolet Instr. 408-946-3310
CO Littleton, Aztec Entprs. 303-795-0250
FL Valrico, Nicolet Instr. 813-685-0444
GA Tucker, Nicolet Instr. 404-491-0127
IL Chicago, Nicolet Instr. 312-843-2905
MD Lanham, Nicolet Instr. 301-459-2940
MA Burlington, Nicolet Instr. 617-273-4404
MI Brighton, Nicolet Instrument 313-229-4655
MN Minneapolis, Nicolet Instr. 612-933-0048
MO St. Louis, Nicolet Instr. 314-821-2868
NJ Cherry Hill, Nicolet Instr. 609-665-5100
NJ Cranford, Nicolet Instr. 201-276-6677
NM Albuquerque, Aztec Entprs. 505-262-1688
NY Schenectady, Nicolet Instr. 518-346-2503
NC Charlotte, Nicolet Instr. Corp. 704-364-0240
OH Chardon, Nicolet Instr. 216-951-8249
OH Hamilton, NIC Inst. 513-868-3611
PA Beaver Falls, Nicolet Instrument 412-847-0100
TX Plano, Nicolet Instr. 214-422-4014
UT Salt Lake City, Aztec Entprs. 801-621-1655
WA Edmonds, Nicolet Instr. Corp. 206-771-2400
WI Madison, Nicolet Instr. 608-273-5008

NICOLET PARATRONICS, 201 Fourier Ave., Fremont, CA 94539, Tel: 415-490-8300, TWX: 910-381-7030; FSC No.: 6625; Empl.: 95; *Sls. Mgr.:* Bob Francisco

NIDEC-TORIN CORPORATION, 100 Franklin Drive, Torrington, CT 06790, Tel: 203-482-4422, Telex: 643963; Empl.: 200; *Sls. Mgr.:* Robert Murphy; *Dist. Mgr.:* Rich Brache

NISSEI SANGYO AMERICA, LTD., 1701 Golf Rd., Ste. 401, Rolling Meadows, IL 60008, Tel: 312-981-8989, Telex: 28-0547, TWX: 910-233-5865; *Sls. Mgr.:* Y. Hamada

NITRON, 10420 Bubb Rd., Cupertino, CA 95014, Tel: 408-255-7550, TWX: 910-338-0222; Empl.: 150; *Sls. Mgr.:* R. Gardner

NITTANY PIEZO CERAMICS, Box 756, Pine and Mill Streets, Bellefonte, PA 16823, Tel: 814-355-1593, 814-355-1594; FSC No.: 5955; Empl.: 28; *Sls. Mgr.:* T. E. Kolbe

NITTO DENKO AMERICA, INC., 27 Seaview Blvd., Port Washington, NY 11050, Tel: 516-484-9700, Telex: 96-1386; *Sls. Mgr.:* Steven E. Schoenstadt

NJE CORPORATION, 329 Culver Rd, P.O. Box 669, Dayton, NJ 08810-0669, Tel: 201-329-4611, TWX: 710-480-5674; FSC No.: 98380; Empl.: 125; *Sls. Mgr.:* John M. Slavik ..... **D•1733**

Local Sales Offices & Reps

AL Huntsville, REMCO-Rakes Engrg. & Mktg. 205-533-3763
AR Fort Smith, Electra Reps 501-452-4030
CA Garden Grove, Elsco Elctrns., Inc. 714-891-4621
CA Los Gatos, Pro Assocs., Inc. 408-358-3861
CO Englewood, F. G. Mktg. 303-795-9176
CT Ansonia, R. H. Sturdy Co. 203-734-2186
FL Coral Springs, CBC Elctrns. 305-755-1111
FL Longwood, CBC Elctrns. 301-831-5380
GA Atlanta, REMCO-Rakes Engrg. & Mktg. 404-447-6937
IA Davenport, Ensco-Rep, Inc. 319-386-6600
KS Overland Park, Ensco-Rep, Inc. 913-381-7557
KS Wichita, Ensco-Rep, Inc. 316-683-1070
MD Rockville, Spectro Assocs., Inc. 301-294-9770
MA Wellesley Hills, R. H. Sturdy Co. 617-235-2330
MI Brighton, A. P. Assocs. 313-229-6550
MN Edina, Grayden & Flemmer 612-941-1120
MO Maryland Heights, Ensco-Rep, Inc. 314-423-3935
NJ Dayton, NJE Corp. 201-329-4611
NY Lynbrook, P. Saftler & Assocs. 516-593-7880
NC Raleigh, REMCO-Rakes Engrg. & Mktg. 919-847-5079
OH Englewood, Allen Nace Co. 513-836-0931
OH Richfield, Allen Nace Co. 216-659-7178
PA Glenshaw, Allen Nace Co. 412-487-1217
TX Austin, Electra Reps 512-339-1163
TX Dallas, Electra Reps 214-248-3842
WA Bellevue, Underwood-Hanify 206-451-8223
WA Vancouver, Underwood-Hanify 503-224-0583

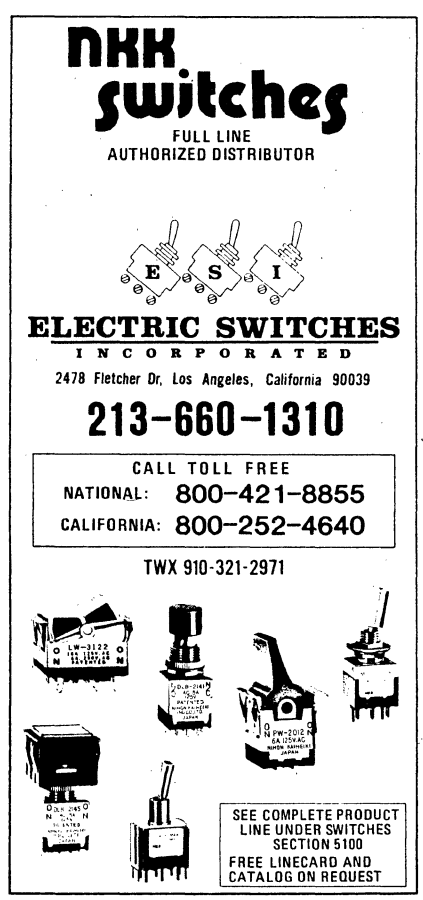
NKK SWITCHES OF AMERICA, INC., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, Tel: 602-991-0942, TWX: 910-950-1167; FSC No.: 7T118; Empl.: 50; *Sls. Mgr.:* Clemens J. Czapinski, Jr.; *Dist. Mgr.:* Clemens J. Czapinski, Jr. ..... **B•1673-1681**

Local Sales Offices & Reps

AL Huntsville, Over & Over 205-837-7105
AZ Scottsdale, Mahaffey & Assocs. 602-991-9790
AZ Scottsdale, NKK Switches 602-991-0942
CA Granada Hills, C & W Component Sls. 213-368-4032
CA Mountain View, Caltron Components Corp. 415-964-3244
CA San Diego, McKinley Elctrn. Sls. 619-271-7221
CO Parker, Technology Mktg. 303-841-3435
CT Yalesville, Newscott Co. 203-269-2645
FL Brandon, Over & Over, Inc. 813-689-9104
GA Norcross, Over & Over, Inc. 404-449-6205
IL Rolling Meadows, KMA Sales 312-398-5300
IN Fort Wayne, Frank E. Kahsar Sls. 219-422-0311
IN Indianapolis, Frank E. Kahsar Sls. 317-888-8396
KS Merriam, Midwest Tech. Sls. 913-236-8557
MD Timonium, Eastern Comps. Sls. 301-561-5811
MA Needham Hgts., Newscott Co. 617-444-1923
MI Farmington, Amtech Reps. 313-474-8300
MN Minnetonka, SAI Mktg. Corp. 612-935-0777
MO St. Charles, Midwest Tech. Sls. 314-441-1012
NY Fairport, NET Sales Co. 716-467-4538
NY Oceanside, Bittan Assocs. 516-678-6222
NC Charlotte, Over & Over 704-527-3070
OH Cincinnati, Frank E. Kahsar Sls. 513-922-3133
OH Hudson, Frank E. Kahsar Sls. 216-650-1089
OR Portland, James J. Backer, Inc. 503-297-8744
PA West Conshohocken, Eastern Comps. Sls. 215-825-8610
TX Dallas, Rem Air Components Corp. ... 214-234-1069
UT Salt Lake City, Tech. Mktg. Assocs. ... 801-483-1009
WA Seattle, James J. Backer Co. 206-285-1300
WI Milwaukee, KMA Sls. Co. 414-259-1771
Can Toronto, Ont., Renmark Elctrn. Sls. 416-494-5445

Local Distributors

AL Huntsville, Powell Elctrns. 205-539-2731
AZ Phoenix, Dalis Elctrn. Supp. 602-275-2885



AZ Tucson, Inland Elctrn. Supp. 602-889-5301
CA Costa Mesa, Powell Elctrns. 714-754-1717
CA Los Angeles, Electric Switches, Inc. ... 213-660-1310
CA San Diego, Mock III Sls. Co., Inc. 619-560-0515
CA San Diego, Shanks & Wright 619-239-0176
CA San Dimas, Mrs. Switch, Inc. 714-599-6639
CA San Jose, Cypress Elctrns., Inc. 408-945-8400
CA San Jose, Powell Elctrns. 408-943-9020
CA San Jose, Rose Elctrn. Dist. Co. 401-263-9700
CA Torrance, Cypress Elctrns., Inc. 213-533-6005
CA Tustin, Western Switches & Controls 714-731-4333
CO Arvada, Denver Wintronics 303-431-7161
CO Aurora, Jet Elctrns. Supp. Co. 303-364-1000
CT Danbury, Pilgrim Elctrns., Inc. 203-792-7274
FL Ft. Lauderdale, Powell Elctrns. 305-979-5000
FL Largo, Graham Elctrns. 813-541-4434
FL Longwood, Interec Comps., Inc. 305-834-7777
FL Miami, Electronic Equip. Co. 305-871-3500
FL West Palm Beach, Nurmi Elctrn. Supp., Inc. 305-686-8553
IL Chicago, NEP Elctrns., Inc. 312-625-8400
IL Wheeling, Hawk Elctrns., Inc. 312-459-4030
IN Fort Wayne, Graham Elctrns. Supply .. 219-423-3422
IN Indianapolis, Graham Elctrns. Supply 317-634-8202
IN Indianapolis, MAR Elctrns. 317-875-4510
KS Wichita, Airtechnics, Inc. 316-267-2849
LA New Orleans, Southern Radio Supp. Co. 504-524-2343
MD Columbia, Powell Elctrns. 301-995-0410
MD Kensington, Marine Air Supply Co. 301-949-9560
MA Boston, Controller Svc. & Sls. 617-269-1300
MA Westborough, Powell Elctrns. 617-366-6100
MA Woburn, E.P.C., Inc. 617-935-0400
MI St. Clair Shores, Spemco Switches Mfg. 313-771-2700
MN Eden Prairie, Cassidy Elctrns. 612-944-0100
MN Hopkins, The Joel Co. 612-935-6202
MO St. Louis, Franklin Elctrns. Co. 314-993-5333
NJ E. Brunswick, Brothers Elctrns. 201-238-2200
NJ Englewood, Powell Elctrns. 201-894-0800
NY Hempstead, Electronic Equip. Co. 516-538-5510
NY Mt. Vernon, QAR Industrial Elctrn. Sls., Inc. 914-699-2224
NY Plattsburgh, Rostech Elctrns. 518-561-8357
NY Rochester, Masline Elctrns., Inc. 716-546-5373
NY Rome, Rome Elctrns. 315-337-5400
NY Troy, Trojan Elctrn. Supp. Co. 518-274-4481
NY Yonkers, Kintronics, Inc. 914-968-7736
NC Cary, Powell Elctrns. 919-467-1212
OH Cincinnati, Schuster Elec. Co. 513-489-1400
OH Columbus, Wedemeyer Elctrn. Supp. Co., Inc. 614-436-9600
OH Twinsburg, Schuster Elec. Co. 216-425-8134
OK Oklahoma City, Radio, Inc. 405-789-0741
OK Tulsa, Radio, Inc. 918-587-9123
OR Beaverton, Norvac Elctrns. 503-644-1025
OR Beaverton, Rose Elctrn. Distr. 503-629-9288
PA Allentown, Lehigh Elctrn. Comps. 215-433-3045
PA Exton, VSH Elctrns. 215-363-2250
PA Philadelphia, Powell Elctrns. 215-365-1900
PA Wayne, Peak Elctrns. 215-293-9000
SC Taylors, Cantrell Whlse. Prods. 803-268-1194
TN Chattanooga, Techni-Tronics, Inc. 615-875-5449
TN Memphis, Bluff City Elctrns. 901-345-9500
TX Austin, Southwest Elctrns. 512-837-8971
TX Dallas, Off The Shelf Comps., Inc. 214-247-0052
TX Dallas, Wallace Elctrns. 214-340-0400
TX Houston, E.P.C., Inc. 713-447-5800
TX Irving, Powell Elctrns. 214-258-6841
TX Richardson, Southwest Elctrns. 214-234-3050
TX Stafford, Southwest Elctrns. 713-240-4000
UT Salt Lake City, Ballard Supp. Corp. 801-972-2430
WA Bellevue, Powell Elctrns. 206-641-4446
WA Kirkland, Priebe Elctrns., Inc. 206-821-4695
WI Mequon, Taylor Elec. 414-241-4321
WI Oconomowoc, GW Elctrns., Ltd 414-367-6003

NKR PRECISION MFG., Rte. 17M, Box 333, Harriman, NY 10926, Tel: 914-782-8562; Empl.: 17

NL BEARINGS/NL INDUSTRIES INC., PO Box 934, Toledo, OH 43694, Tel: 419-381-3100; Empl.: 1000; *Sls. Mgr.:* James Doherty; *Dist. Mgr.:* B. Sexauer

NMB CORP., MOTOR DIV., 9601 Mason Ave., Chatsworth, CA 91311, Tel: 213-709-1555

NOBEX DIV., Griffith Plastics Corp., 1027 California Dr., Box 4365, Burlingame, CA 94010, Tel: 415-342-8170, TWX: 910-374-2840; FSC No.: 32767; Empl.: 35

NOBLE U.S.A., INC., 151 Stanley St., Elk Grove Village, IL 60007, Tel: 312-364-6038, Telex: 206745; FSC No.: 1-3123646045; *Sls. Mgr.:* Vyto Omilijonas; *Dist. Mgr.:* Vyto Omilijonas

NOLATRON, P.O. Box 4042, Harrisburg, PA 17111, Tel: 717-564-3398; Empl.: 10

NOLL, J. A. CO., P.O. Box 312, Monroeville, PA 15146, Tel: 412-733-1009; *Sls. Mgr.:* P. Carson; *Dist. Mgr.:* P. Carson

NON-LINEAR SYSTEMS/DIV. OF KAYPRO CORP., 533 Stevens Ave., Solana Bch., CA 92075, Tel: 619-481-3900, TWX: 910-322-1132; Empl.: 55; *Sls. Mgr.:* Ben W. Fisher; *Dist. Mgr.:* Jeanne Simmons

Local Distributors

AZ Phoenix, Metermaster 602-273-7331
CA Costa Mesa, Marvac Elctrns. 714-540-3280
CA Garden Grove, Allied Elctrns. 714-554-0731
CA Hayward, Allied Elctrns. 415-487-5250
CA Hollywood, Yale 213-465-3186
CA Irvine, Meter Craft 714-979-1420
CA Los Angeles, E.I.L. Instrs. 213-685-7020
CA Los Angeles, Metermaster 213-685-4340
CA Monterey, Zackit 408-375-3144
CA Oakland, Western Electro. Mech. 415-452-1936
CA Palo Alto, Metermaster 415-968-0313
CA San Diego, Metermaster 619-560-4841
CA San Jose, Allied Elctrns. 408-727-1690
CO Denver, E. I. L. 303-534-4160
CT Middletown, E. I. L. 203-346-6646
FL Ft. Lauderdale, Allied Elctrns. 305-486-0550
FL Miami, Brownell Electro 305-591-3215
FL Orlando, Brownell Electro 305-843-6770
FL Palm City, Eil Instrs. 305-725-8300
GA Atlanta, Brownell Electro 404-762-5181
GA Atlanta, Metermaster 404-446-0166
IL Bridgeview, Eil Instrs. 312-430-2292
IL Elgin, Allied Elctrns. 312-697-8200
IL Elk Grove, Metermaster 312-593-8650
IL Itasca, Metermaster 312-250-0606
IL Niles, Joseph Elctrns. 312-297-4200
IL Peoria, Klaus Radio 309-691-4840
IN Indianapolis, Eil Instrs. 317-545-1373
KY Louisville, Eil Instrs. 502-637-7677
LA Harahan, Indus. Instru. Works 504-733-8355
LA Lafayette, Ralph's of Lafayette 318-234-4507
MD Elkridge, Sunshine Sci. Instrs. 301-796-5600
MD Marlow Heights, Allied Elctrns. 301-423-0161
MD Rockville, Capitol Radio Whlsrs. 301-881-2270
MD Sparks, E. I. L. Instrs 301-252-1260
MA Boston, Allied Elctrns. 617-942-0150
MA Burlington, E.I.L. Instrs. 617-272-9450
MA Hingham, Sager Elec. Supp. 617-542-2281
MI Ferndale, Ram Meter 313-547-1000
MN Minneapolis, Instrumentation Svc. 612-544-8916
MO Kansas City, Electronic Supp. 816-931-0250
MO St. Louis, Eil Instrs. 317-545-1373
NV Las Vegas, Hurley Elctrns. 702-384-5666
NJ Edison, Brownell 202-287-2030
NJ N. Caldwell, Hosica Labs 201-256-7724
NM Albuquerque, Electronic Parks 505-293-6161
NY Albany, Edwin E. Taylor 518-438-7811
NY Buffalo, Summit Distrs. 716-884-3450
NY Clarence, Trott Elctrns. 716-634-8500
NY Hauppauge, Eil Instrs. 516-231-6333
NY Mineola, Allied Elctrns. 516-248-2360
NY New York, Advance Elctrns. 212-687-2224
NY Port Chester, Wise Elctrns. 914-939-3940
NY Rochester, Eil Instrs. 716-424-5750
NY Rochester, Simcona Elctrns. 716-328-3230
NC Charlotte, Brownell Electro 704-597-1270
NC Raleigh, Brownell Electro 919-876-6524
OH Cincinnati, Hughes-Peters 513-351-2000
OH Cleveland, Metermaster 216-651-4100
OH Columbus, Hughes Peters 614-294-5351
OH Dayton, Eil Instrs. 513-435-2134
OH Wickliffe, Gateway-Megatech 216-944-8565
OK Oklahoma City, Trice 405-524-4411
OK Tulsa, Radio, Inc. 918-587-9123
OK Tulsa, Trice 918-585-5718
OR Portland, United Radio Supp. 503-434-2171
PA Philadelphia, Sunshine Sci. Instrs. 215-673-5600
PA Pittsburgh, CAM/RPC 412-782-3770
PA Pittsburgh, Eil Instrs. 412-731-5230
PA Reading, Barbey 215-376-7451
PA York, Cumberland 717-845-8791
SC Columbia, Dixie Elctrns. 803-779-5332
TN Chattanooga, Curle Elctrns. 615-266-4728
TN Knoxville, Brownell Electro 615-966-3441
TN Memphis, Brownell Electro 901-795-8487
TN Nashville, Brownell Electro 615-889-8230
TX Austin, Electrotex 512-454-0318
TX Dallas, Dallas Meter Tek 214-349-6044
TX Dallas, Eil Instrs. 214-931-1236
TX Dallas, Metermaster 214-271-5671
TX Ft. Worth, Allied Elctrns. 817-336-5401
TX Houston, Allied Elctrns. 713-681-2983
TX Houston, Eil Instrs. 713-271-3100
TX Houston, Electrotex 713-526-3456
TX San Antonio, Sherman Elctrns. 512-224-1001
VA Alexandria, Eil Instrs. 703-354-4330
VA Virginia Beach, Eil Instrs. 804-499-3746
WA Seattle, Eil Instrs. 206-762-0880

NORELCOM INDS., 63 Marine St., Farmingdale, NY 11735, Tel: 516-249-7245; Empl.: 55; *Sls. Mgr.:* Richard E. Thaw; *Dist. Mgr.:* Regina Vena

C. A. NORGREN CO., 5400 South Delaware, Littleton, CO 80120-1663, Tel: 303-794-2611; Empl.: 661; *Sls. Mgr.:* Patrick Maley

NORITAKE ELCTRNS., INC., Noritake Co., Ltd. (Japan), 22410 Hawthorne Blvd., #6, Torrance, CA 90505, Tel: 213-373-6704, Telex: 67-4910; *Sls. Mgr.:* T. Ohki

NORLAND CORP., Norland Dr., Ft. Atkinson, WI 53538, Tel: 414-563-8456, Telex: 26-5448; Empl.: 275; *Sls. Mgr.:* Robert J. Millar

NORPLEX DIV., 10 V.O.P. Plaza, Des Plaines, IL 60016, Tel: 312-391-2000

NORSAL INDS., 85 D Hoffman Lane So., Central Islip, NY 11722, Tel: 516-234-1200, TWX: 510-227-1045; *Sls. Mgr.:* Les Lipset

NORTH AMERICAN PHILIPS CONTROLS CORP., See Airpax Corporation, Cheshire Div.

NORTH AMERICAN PHILIPS LIGHTING, Bank St., Hightstown, NJ 08520, Tel: 609-448-4000, TWX: 510-685-5651; Empl.: 600; *Sls. Mgr.:* C. J. Lehmann

NORTH AMERICAN PRINTED CIRCUIT DIV., Tyco Labs., Inc., Box 145, Stafford, CT 06075, Tel: 203-684-2703; Empl.: 230

NORTH AMERICAN SOAR CORP., 11126 Cornell Ave., Cherry Hill, NJ 08002, Tel: 609-488-1060; Empl.: 7; *Sls. Mgr.:* Robert Liska ..... **D•1174, 1267-1281, 1394-1396**

NORTH ATLANTIC INDS., Instrument Div., 60 Plant Ave., Hauppauge, NY 11788, Tel: 516-582-6500, TWX: 510-227-9660; FSC No.: 07342; Empl.: 320; *Sls. Mgr.:* K. Salz ..... **D•1283, 1373**

Local Sales Offices & Reps

AZ Phoenix, Aztec Entprs. 602-944-9185
CA Cupertino, T. Louis Snitzer Co. 408-257-8333
CA Delmar, T. Louis Snitzer Co. 714-226-0305
CA Los Angeles, T. Louis Snitzer Co. 213-836-6170
CO Littleton, Aztec Entprs. 303-795-0250
CT Cheshire, Meco 203-271-0026
FL Cocoa Beach, TeqSpec 305-783-3444
FL Palm Harbor, Teqspec 813-785-2296
GA Marietta, Periphix Teqspec 404-980-9328
IL Chicago, Pat Lind Elctrns. 312-726-3513
IN Indianapolis, Pat Lind Elctrns. 317-632-7444
MD Wheaton, Brimberg Sls. Co. 301-946-2670
MA Reading, Meco 617-944-6660
MI Madison Hgts., WKM Assoc. 313-588-2300
MN Circle Pines, P. Lind 612-786-5770
NM Albuquerque, Aztec Entprs. 505-262-1688
NC Winston-Salem, Teqspec III 919-723-8102
OH Cleveland, WKM Assoc. 216-524-5930
OR Beaverton, Northwest Test & Meas. ... 503-646-9966
PA Doylestown, Tech. Instr. Sls. 215-345-4110
TX Houston, Scientific Sls. 713-460-9170
TX Richardson, Sci. Sls. 214-231-6541
UT Ogden, Aztec Entprs. 801-621-1655
WA Redmond, Northwest Test & Meas. ... 206-881-8857
WI Milwaukee, Pat Lind Elctrns. 414-224-0146

NORTHEAST SCIENTIFIC CORP., 30 Wetherbee St., Acton, MA 01720, Tel: 617-263-2711; Empl.: 10; *Sls. Mgr.:* C. Moritz

NORTHERN ENGRG. LABS., See Midland-Ross Corp., NEL Unit

NORTHERN PRECISION LABS., 11 Madison Rd., Fairfield, NJ 07006, Tel: 201-227-4800, TWX: 710-734-4301; Empl.: 95; *Sls. Mgr.:* M.P. Nigro

NORTH HILLS ELCTRNS., 1 Alexander Pl., Glen Cove, NY 11542, Tel: 516-671-5700, Telex: 46-6886; FSC No.: 98821; Empl.: 100; *Sls. Mgr.:* H. H. Marx ..... **A•1243, 1780, 2208-2210; D•1734**

Local Sales Offices & Reps

CA Los Angeles, McDougall/McLaughlin Co. 213-477-8556
CA Palo Alto, Tri Rep 415-965-1822

MD Silver Spring, A2Y 301-598-5740
MA Burlington, Microwave Comps. Mktg. .. 617-273-3106
MA Woburn, Microwave Comp. Mktg., Inc. 617-273-3106
MN Minneapolis, Hei-Lite Sls. 612-861-6051

NORTHLAKE ENGRG., 999 Anita Ave., Antioch, IL 60002, Tel: 312-395-5710; FSC No.: 50638; Empl.: 120; *Sls. Mgr.:* W. A. Hardt

NORTHWEST MICROCIRCUITS, INC., 2115 N. College, Newberg, OR 97132, Tel: 503-538-7081; Empl.: 7; *Sls. Mgr.:* Wm. H. Ferwalt

NORTON, One New Bond St., Worcester, MA 01606, Tel: 617-853-1000, Telex: 920428, TWX: 710-340-1126; Empl.: 19000

NORTON ASSOCS., 10 Di Tomas Ct., Copiague, NY 11726, Tel: 516-842-4666; FSC No.: 08739

NORTON CHEMPLAST, 31-150 Dey Rd., Wayne, NJ 07470, Tel: 201-696-4700, TWX: 710-988-5834; Empl.: 300; *Dist. Mgr.:* Wes Wheeler

NORTRAN, Power Elctrns. Corp., 96 Milton Rd., Rochester, NH 03867, Tel: 603-332-3334, TWX: 510-297-4462; *Sls. Mgr.:* Robert S. Karstedt

NOTHELFER WINDING LABS, See NWL Transformers

NOUMENON CORP., 512 Westline Dr., Alamdea, CA 94501, Tel: 415-521-2145, Telex: 176340; *Sls. Mgr.:* Michael C. Mead

NOVA

TAURUS™ by Nova

NOVA ELEC., Hobart Bros. Co., 263 Hillside Ave., Nutley, NJ 07110, Tel: 201-661-3434, Telex: 219077; FSC No.: 29019; Empl.: 50; *Sls. Mgr.:* Kenneth Niovitch ..... **D•1946**

Local Sales Offices & Reps
AZ Glendale, Adtek 602-931-9289
AZ Phoenix, Adtek 602-931-9289
CA Laguna Hills, Elotek Sys. 714-830-4856
CA San Diego, Elotek Sys. 714-830-4856
CA SunnyVale, Ichirep 408-249-2585
FL Orlando, Data Rep 305-843-5224
FL Orlando, Datarep 305-843-5224
GA Atlanta, Teqspec II 404-399-6780
HI Honolulu, Victor Kim Assoc. 808-841-6266
IL Schaumberg, Kenneth Meyers Co. 312-882-4808
IN Indianapolis, Kenneth Meyers Co. 317-243-6681
IA Cedar Rapids, Kenneth Meyers Co.
MD Silver Springs, Sel-Tronics Inc. 301-589-3391
MA Norwell, Bordewieck Eng. Sls. Co. 617-659-4915
MA Wakefield, Bordewieck Engrg. 617-659-4915
MI Highland Park, Marsh Equip. Co. 313-869-9200
MN Minneapolis, Kenneth Meyers Co. 612-920-7080
MO St. Louis, Comtel Midwest 314-991-5363
NJ Elmwood Park, L&M Assoc. 201-797-0441
NY Buffalo, Bromor Co. 716-874-4595
NY New York, L&M Assoc. 212-243-6155
NC Winston-Salem, Teqspec III 919-723-8102
OH Columbus, R. D. Cloon Assoc. 614-459-2890
OH Columbus, R.D. Cloon Assoc. 614-459-2890
PA Pittsburgh, Donwil Assoc. 412-343-6767
PA Reading, L&M Assoc. 215-775-9559
TN Montgomeryville, Teqspec II 615-587-0980
TX Houston, T-S-H 713-868-2190
WA Seattle, Industrial Elctrn. Equip. 206-775-3516
EXP Hayden Int'l. Corp.
Can Lachine Quebec, Electro Design 513-636-4838

NOVA TRAN, 100 Deposition Dr., Clear Lake, WI 54005, Tel: 715-263-2333; FSC No.: 56643; Empl.: 45; *Sls. Mgr.:* R. Schley

NOVATRONICS, Box 878, Pompano Beach, FL 33061, Tel: 305-942-5200, TWX: 510-956-9878; Empl.: 225; *Sls. Mgr.:* W. G. Peters

NRD

NRD, Mark IV Ind., Inc., 2937 Alt Blvd. N., Grand Island, NY 14072, Tel: 716-773-7634, Telex: 91578 NRD GRDI; *Sls. Mgr.:* James R. Curtis; *Dist. Mgr.:* Larry Keating ..... **D•1983**

Local Sales Offices & Reps
AZ Scottsdale, Williams Assocs. 602-947-4297
CA Mountain View, Tech-Ser, Inc. 415-969-9020
CA Torrance, Tech-Ser, Inc. 213-320-8101
CO Commerce City, Williams Assocs. 303-289-5647
FL Orlando, Delmac Sls. 305-898-4688
GA Atlanta, Electro-Rep Assocs. 404-320-1134
IL Libertyville, Ray Klipp Assocs. 312-367-4676
IN Indianapolis, Electronic Mktg. Conslts., Inc. 317-253-1668
MD Laurel, CSDS 301-490-3800
MA Ashland, Sullivan & Powers 617-881-5055
MA Weston, Sullivan & Powers 617-899-3443
MI Grand Blanc, Inter-Comm 313-695-0666
MN Eden Prairie, Bitronics Sls. Co. 612-944-9070
MO Liberty, Lectro-Reps 816-781-2522
NM Albuquerque, Williams Assocs. 505-255-1638
NY Mt. Vernon, Oalco 212-260-5637
NY Rochester, Pak-Tek, Inc. 716-544-5705
NC Charlotte, Electro-Rep Assocs. 704-527-2530
OH Cleveland, Marlow Assocs. 216-991-6500
OH Columbus, Marlow Assocs. 614-885-7643
PA Pittsburgh, Marlow Assocs. 412-367-8886
TX Dallas, P. J. Scanlon Co., Inc. 214-231-4661
UT Salt Lake City, Williams Assocs. 801-485-6511
Can Scarborough, Ont., Sigma Mktg. 416-752-4017

Local Distributors
CT Wallingford, Astesch, Inc. 203-265-4241
KS Witchita, R.S.C. Elctrns. 316-267-5213
MD Laurel, RMA Co. 703-273-6660
MA Holliston, R-Tech 617-429-7222
MI Flint, Royalite 313-238-8641
MI Grand Rapids, S.F. Elctrns. 616-459-0216
MI Pontiac, Techno Inds., Inc. 313-628-4090
MO St. Louis, Van Sickle Radio Elctrns., Inc. 314-621-5000
NY Cortland, Monroe-Metz 1-800-424-2442
PR Rio Piedras, Rubber & Gasket Co. of P.R. 809-763-8787
Can Mississauga, Ont., Prelco Elctrns. 416-678-0401
Can Montreal, Que., Prelco Elctrns. 514-389-8051
Can Nepean, Prelco Elctrns. 613-726-1800

NSD, 10936 Portal Dr., Los Alamitos, CA 90720, Tel: 714-527-4896; *Sls. Mgr.:* Paul Pomerantz; *Dist. Mgr.:* Paul Pomerantz

NTK TECHNICAL CERAMICS, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. #205, Richardson, TX 75081, Tel: 214-235-8332; FSC No.: 95-246-1286; *Sls. Mgr.:* K. C. Ogawa; *Dist. Mgr.:* Mark Ota ..... **A•1398-1399; B•1805; D•1029**

Local Sales Offices & Reps
AL Huntsville, L&D, Inc. 919-292-3201
CA Culver City, DeAngelo Rothman and Co. Inc. 213-827-2202
CA San Jose, Frequency Control Assocs. 408-446-0200
CT Bloomfield, Zaslow Sales Co. 203-242-7781
FL Maitland, D.J. Ellis & Assocs. Inc. 305-645-1101
GA Atlanta, L&D Inc. 404-455-3483
IN Indianapolis, Intl. Elctrns. Corp. of Indiana 317-257-8115
IN Scottsburg, Intl. Elctrns. Corp. of Indiana 812-752-4611
IA Chanhassen, Barnes Sls. Assocs. 612-934-2907
KS Overland Park, Barnes Midwest Sls. .. 913-341-9317
MD Baltimore, Espy Sls. Co. 301-441-6982
MI Ann Arbor, Elliott Sls. Co. 313-662-4087
MN Chanhassen, Barnes Sales Assocs. ... 612-934-2907
NY Smithtown, Pafi Assocs. 516-360-0940
NC Raleigh, L&D Inc. 919-876-5301
PA Rydal, Espy Sls. Assocs. 215-576-0780
TN Seymour, Espy Sls. Assocs. 315-573-6511
VA Richmond, Espy Sls. Assocs. 804-359-0125
WA Seattle, Northmar Inc. 206-524-5170

NUCLEAR RESCH. CORP., 125 Titus Ave., Warrington, PA 18976, Tel: 215-343-5900, Telex: 510-665-8525 NRC WNTN; FSC No.: 96696; Empl.: 85; *Sls. Mgr.:* D.T. McIntyre, V.P.

Local Sales Offices & Reps
FL Naples, Nuclear Research Corp. 813-775-8686
IL Mt. Prospect, Contemporary Science .. 312-255-3793
NC Charlotte, BinCo. 704-366-5092
SC Georgetown, Nuclear Research 803-546-1724

NUCLEONIC PRODS., See Thomson-CSF Comps. Corp., Passive Comps. Div.

NU-CONCEPT COMPUTER SYS., Rte. 309 & Advance La., Colmar, PA 18915, Tel: 215-822-8400, Telex: 5106614838; FSC No.: 58561; Empl.: 17; *Sls. Mgr.:* Thomas Dvorak

NU DATA, 32 Fairview Ave., Little Silver, NJ 07739, Tel: 201-842-5757, Telex: 132405, TWX: 710-722-5754; Empl.: 20; *Sls. Mgr.:* Keith Taylor

NUMARK ELCTRNS. CORP., 503 Raritan Ctr., Edison, NJ 08817

NUMERIX CORP., 20 Ossipee Rd., Newton, MA 02164, Tel: 617-964-2500, Telex: 948032; *Sls. Mgr.:* Harold Messias

NU-METRICS, 947 Longdale Ave., Longwood, FL 32750, Tel: 305-331-7717; Empl.: 12; *Sls. Mgr.:* Timothy Check

NURAD, INC., 2165 Druid Pk. Dr., Baltimore, MD 21211, Tel: 301-462-1700, TWX: 710-234-1071; Empl.: 120

NWL TRANSFORMERS

NWL TRANSFORMERS, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505, Tel: 609-298-7300, TWX: 510-685-3645; Empl.: 230; *Sls. Mgr.:* C. W. Harrison ..... **A•2211; D•1735**

NWL TRANSFORMERS, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505, Tel: 609-298-7300, TWX: 510-685-3645; Empl.: 225; *Sls. Mgr.:* C. W. Harrison ..... **D•1735**

NYE, WILLIAM F., INC., P.O. Box G-927, New Bedford, MA 02742-0927, Tel: 617-996-6721, Telex: 940807; Empl.: 15

NYLTITE, 3451 S. Clinton Ave., S. Plainfield, NJ 07080, Tel: 201-561-1300; *Sls. Mgr.:* Frances Gould

Nytronics Components Group, Inc.

NYTRONICS COMPONENTS GRP., INC., Orange St., Darlington, SC 29532, Tel: 803-393-5421, TWX: 810-665-2182; FSC No.: 83125; Empl.: 502; *Sls. Mgr.:* Mack W. Windham ..... **A•1142-1155, 1204, 1244-1263, 1550-1554, 1911**

Local Sales Offices & Reps
AL Huntsville, B.C.I. 205-539-4411
AZ Tucson, Clemick & Assocs. 602-749-4003
CA Granada Hills, Clemick Neenan & Assocs. 818-895-2431
CA San Diego, Clemick Neenan & Assocs. 619-693-0863
CA Sunnyvale, W.W. Posey 408-746-0771
CO Denver, Component Sls. 303-759-1666
FL Boca Raton, Lawrence Assocs. 305-368-7373
GA Chamblee, B.C.I. 404-455-0405
IL Rolling Meadows, Sumer Inc. 312-991-8500
IN Indianapolis, EMCI 317-253-1668
KS De Soto, Mid-Tec Assoc. 913-441-6565
MA Woburn, Astrorep of New England 617-938-6692
MI Rockford, H.C. Heym Assoc. 616-874-7443
MN Minneapolis, Dunlop Conslts. 612-529-7626
MO Florissant, Mid-Tec Assoc. 314-837-5200
NJ West Orange, National Atlantic 201-731-0703
NY Pittsford, W.A. Franklin Sls. 716-248-8251
NY Valley Cottage, LRC Assocs. 914-268-4435
NC Charlotte, B.C.I. Inc. 704-567-0473
OH Akron, Imtech 216-666-1185
OK Tulsa, Design Mktg. 918-742-2589
OR Tigard, Eltech, Inc. 503-684-3458
PA Narberth, Bresson Assocs. 215-664-6460
TX Dallas, Design Mktg. 214-680-9767
TX Round Rock, Design Mktg. 512-255-9896
UT Salt Lake City, Component Sls. 801-466-8623

VA Lynchburg, Bresson Assocs. 703-237-1304
WA Bellevue, Eltec 206-643-4330
WI Brookfield, Sumer, Inc. 414-784-6641
Intl Ramat Gan, Isreal, Sietel Engrg., Ltd. 03-265571
Can Toronto, Ont., RFQ, Ltd. 416-595-0616

Local Distributors

CA Garden Grove, Hi Rel 213-594-9571
CA Garden Grove, Inductive Prods. 714-891-2572
CA Gardena, Bell Inds. 213-515-1800
CA San Diego, Mock III 619-560-0515
CA San Jose, Cypress 408-945-8400
CA Sunnyvale, Bell Inds. 408-734-8570
CA Thousand Oaks, Bell 805-499-6821
CA Walnut, A. C. L. 213-331-0735
CO Denver, Newark Elec. 303-757-3351
CO Englewood, Industrial Elctrns. 303-694-9444
CO Wheatridge, Bell Inds. 303-424-1985
FL Ft. Lauderdale, Newark Elect. 305-587-2372
IL Chicago, Bell Inds. 312-982-9210
IL Chicago, Newark Elect. 312-638-4411
IN Indianapolis, Graham Elect. 317-634-8202
IA Cedar Rapids, Newark Elect. 312-362-1171
MD Baltimore, Radio Elect. 301-823-0070
MD Beltsville, Newark Elec. 301-937-5085
MA Needham, Cronin Elctrns. 617-449-0500
MA Waltham, Sterling Elec. 617-894-6200
MN Minneapolis, Joel Co. 612-545-5669
MN Minneapolis, Newark Elect. 216-361-4700
NJ Kenilworth, Newark Elect. 201-272-8410
NY Farmingdale, Pride Elctrns. 516-293-4020
NY Hauppauge, Fairmont Elctrns. 516-231-3313
NY Hauppauge, Jaco Elect. 516-273-5500
NY Plainview, ACI Elect. 516-293-6630
NY Rome, Rome Elect. 315-337-5400
NC Raleigh, Radio Elec. Svc. 919-781-5700
OH Centerville, C.V. Clark 513-435-3000
OH Cleveland, Newark Elect. 216-361-4700
OR Lake Oswego, Bell Inds. 503-241-4115
PA Montgomeryville, Pyttronic Inds. 215-643-2850
PA Philadelphia, Herback Rademan 215-426-1700
PA Philadelphia, Philadelphia Elctrns. 215-568-7400
PA York, E. C. I. 717-846-5334
TX Dallas, Wholesale Elect. 214-824-3001
UT Salt Lake City, Newark Elect. 801-486-1048
WA Bellevue, Bell Inds. 206-747-1515
WI Brookfield, Newark Elect. 414-781-2450

ok

Soldering Equipment and Tools

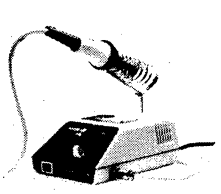
Authorized Distributors

RAG ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



Model SA-3-115

OAK MATERIALS GROUP INC., Laminates Div., 1 Mechanic Street, Hoosick Falls, NY 12090, Tel: 518-686-4379, Telex: 710-965-9721; FSC No.: 53240; *Sls. Mgr.:* Robert L. Fidrych; *Dist. Mgr.:* Richard Spiak

OAK SWITCH SYS., 100 S. Main St., Crystal Lake, IL 60014, Tel: 815-459-5000, Telex: 72-2447, TWX: 910-634-3353; FSC No.: 76854; Empl.: 1200

OAKTRON INDS., 1000 30th St., Monroe, WI 53566, Tel: 608-328-5560; FSC No.: 07109; Empl.: 250; *Sls. Mgr.:* J. F. Disch; *Dist. Mgr.:* J. F. Disch ..... **D•1030**

Local Sales Offices & Reps

AZ Phoenix, S. Fisher Assoc. 602-247-7865
CA Mill Valley, Roy Colen Sls., Inc. 415-383-8700
CA Newhall, Lessing Assoc. 213-348-6662
CO Arvada, C B Elctrn. Mktg. 303-422-0561
FL Tampa, SRT Marketing 813-884-4805
GA Atlanta, Millar Elctrl. 404-261-6160
IL Elmhurst, E.S.I. 312-941-0710
IN Mulberry, Maish Sls. 317-296-2322
MA Millis, R. G. Assoc. 617-376-2044
MN Minneapolis, Kodo Assoc. 612-881-1255
MO Kansas City, Nevco 816-421-1751
MO St. Louis, Nevco 314-843-7406
NY Rochester, Warren Kaufman Assoc. ... 716-266-2728
NY Whitestone, J. Brown Elctrl. Sls. 718-767-1977
NC Raleigh, Millar Elctrl. 919-787-9564
OH Akron, Shamrock Elctrl. 614-888-7638
OH Dayton, Shamrock Elctrl. 513-298-1227
TX Richardson, Campion Sls. 214-238-8145
VA Great Falls, Kendall & Assoc. 703-759-3128
WA Seattle, Vector/RMC 206-322-4343
EXP IL, Chicago, Magnus Elctrl. 312-679-6070

OAL ASSOCS., P.O. Box J, Escondido, CA 92025, Tel: 619-743-7143; Empl.: 10; *Sls. Mgr.:* Mark Lohkemper

Local Sales Offices & Reps

CA Costa Mesa, Pat Dooley Co. 714-548-2232
NY Great Neck, W&A Holland 516-487-8877

OAR CORP., A CompuDyne Co., 10447 Roselle St., San Diego, CA 92121, Tel: 619-453-4013, Telex: 697852; *Sls. Mgr.:* Michael A. Duke

OAS INC., See Optimum Applied Systems

OCEAN MARINE INSTRUMENT, 629 Terminal Way # 15, Costa Mesa, CA 92627, Tel: 714-548-9569 ..... **D•1947**

OCEAN RESCH. EQUIP., INC., Box 709, Falmouth, MA 02541, Tel: 617-548-5800, Telex: 94-0859; Empl.: 125; *Sls. Mgr.:* J. Angell

OCLI PHOTOELCTRNS. DIV., See Applied Solar Energy

ODELL, M. P., CO., 1620 Chesapeake Dr., Hoffman Estates, IL 60195, Tel: 312-991-2828; *Sls. Mgr.:* Maria McClurkin

OECO CORP., 712 S.E. Hawthorne Blvd., Portland, OR 97214, Tel: 503-238-2440, Telex: 36-0350; FSC No.: 95266; Empl.: 559; *Sls. Mgr.:* Bob Bunker

OGALLALA ELCTRNS., Div. Arnold Engrg. Co., Box 59, Ogallala, NE 69153, Tel: 308-284-4093; Empl.: 37; *Sls. Mgr.:* H. L. Harrington

O'HANLON COMPUTER SYSTEMS, INC., 8383-158th Ave NE, Seattle, WA 98052, Tel: 206-885-2502; Empl.: 32; *Sls. Mgr.:* Dennis Sullivan; *Dist. Mgr.:* Dennis Sullivan

OSI

OHIO SEMITRONICS, INC., 1205 Chesapeake Ave., Columbus, OH 43212, Tel: 614-486-9561, TWX: 810-482-1630; FSC No.: 12066; Empl.: 58; *Sls. Mgr.:* G. Clagett ..... **B•1776, 1806-1819; D•1284-1289**

Local Sales Offices & Reps

CA Arcadia, Van Gott & Assocs. 818-445-9728
CA Hayward, FLW, Inc. 415-786-9070
CO Boulder, Meas. Conslts. 303-449-7506
CT Wallingford, Pat Jenks Assocs.
FL Orlando, Datarep 305-843-5224
GA Acworth, Zelco Assocs. 404-974-8647
IL Columbia, R. L. Weisheimer & Assocs. 618-281-4148
IL Park Ridge, Elctrn. Instr. Assocs. 312-298-2290
MA Woburn, Pat Jenks Assocs. 617-938-0488
MN Minneapolis, The Mark Co. 612-933-3026
NJ Garwood, E. R. Mertz, Inc. 201-232-4643
NY Latham, L-Tron Corp. 518-785-5032
NC Charlotte, Zelco Assocs. 704-523-2961
OH Dayton, Mohawk Intronics 513-434-8873
OH No. Ridgeville, TMS, Inc. 216-327-3527
PA Carnegie, Flow Media 412-923-1619
PA King of Prussia, FLW, PA, Inc. 215-337-4343
TN Memphis, Jordan/Marlar/Hale, Inc. ... 901-452-7441
TX Houston, Scientific Sls. Co. 713-460-9170
TX Richardson, Scientific Sls. Co. 214-231-6541
UT Salt Lake City, Meas. Conslts. 801-364-3174
WA Bellevue, Topp Engrg. Sls. Corp. 206-747-5400

OHIOSWITCH, INC., 6534 Singletree Dr., Columbus, OH 43229, Tel: 614-885-0319

OHMITE MFG. CO., 3601 W. Howard St., Skokie, IL 60076, Tel: 312-675-2600, Telex: 72-4433, TWX: 910-223-0805; FSC No.: 44655; *Sls. Mgr.:* Robt. Axthelm; *Dist. Mgr.:* Robt. Axthelm ..... **A•1912-1921, 2032-2033**

Local Sales Offices & Reps

AL Huntsville, Cartwright & Bean 205-830-1540
AK Anchorage, H. J. Lang Assoc. 907-279-5741
AZ Phoenix, Mercury Eng. Sls. 602-244-0123
CA Los Angeles, Wiley Co. 213-666-1611
CA Palo Alto, Ohmite Mfg. Co. 415-494-6954
CA San Diego, Wiley Co. 619-571-2881
CO Denver, Lindberg Co. 303-758-9033
CT North Haven, Coakley, Boyd & Abbett 203-239-6217
FL Deerfield Beach, Cartwright & Bean ... 305-429-3400
FL Orlando, Cartwright & Bean 305-422-4531
GA Atlanta, Cartwright & Bean 404-233-2939
IL Skokie, Ohmite Mfg. Co. 312-675-2600
IN Indianapolis, Electronic Reps, Inc. 317-894-1414
IN Mishawaka, Electronic Reps, Inc. 219-259-9365
LA Covington, Cartwright & Bean 504-892-1780
MA Needham Hgts., Coakley, Boyd & Abbett 617-444-5470
MI Grosse Pointe Park, Greiner Assocs. .. 313-499-0188
MN St. Paul, Northport Engrg. 612-457-8000
MS Jackson, Cartwright & Bean 601-981-1170
MO Gladstone, Delltron Co. 816-436-6445
MO St. Louis, Delltron Co. 314-869-4779
NH Plaistow, Coakley, Boyd & Abbett 617-444-5470
NJ River Edge, Ohmite Mfg. Co. 201-488-3690
NJ Willingboro, Ohmite Mfg. Co. 609-871-1691
NM Albuquerque, Lindberg Co. 505-881-1006
NY Rochester, Electra Sls. 716-427-7860
NY Syracuse, Electra Sls. Corp. 315-463-1248
NC Charlotte, Polytech Svcs. 704-372-4161
OH Chardon, Ohmite Mfg. Co. 216-287-7454
OH Dayton, Ohmite Mfg. Co. 513-277-6543
OK Broken Arrow, Erickson Sls. 918-455-4276
OR Tigaird, Electronic Sls. 503-245-2342
PA Monroeville, Ohmite Mfg. Co. 412-373-2695
TN Knoxville, Cartwright & Bean 615-693-7450
TN Memphis, Cartwright & Bean 901-276-4442
TX Austin, Erickson Sls. 512-445-2952
TX Dallas, Erickson Sls. 214-739-5833
TX Houston, Erickson Sls. 713-226-1604
UT Salt Lake City, Lindberg Co. 801-467-1794
WA Mercer Island, Electronic Comp Sls. ... 206-232-9301

ohmtek INC.

OHMTEK, INC., 2160 Liberty Dr., Niagara Falls, NY 14304, Tel: 716-283-4025; FSC No.: 57489; Empl.: 143; *Sls. Mgr.:* John Burger ..... **A•1923-1925**

Local Sales Offices & Reps

CA Santa Clara, I2 Inc. 408-988-3400
CA Woodland Hills, Interstate Mktg. Assoc. 213-883-7606
CO Aurora, High Tech. Assocs. 303-695-1990
FL Maitland, Beacon 305-647-3489
KS Overland Pk., Advanced Techn. Sls. ... 913-642-6675
MA Shrewsbury, Compatible Comps. 617-422-7641
MN Mendota Hgts., G-II Sales 612-454-3086
NJ Englewood, Harold Gray Assocs. 201-894-0894
NM Albuquerque, Power Entprs. 505-298-1918
NY Rochester, Fritz Dasson 716-338-1699
OH Cincinnati, John F. Kilfoil Co. 513-791-6150
PA Wynnewood, Metz-Benham Assocs. .. 215-896-7300
TX Lewisville, Jim Hughes Co. 214-221-1536

OK INDUSTRIES, INC., 3455 Conner St., Bronx, NY 10475, Tel: 212-994-6600, Telex: 12-5091; Empl.: 100; *Sls. Mgr.:* David Leventhal

OKONITE, Box 340, Ramsey, NJ 07446, Tel: 201-825-0300, TWX: 710-988-1017; Empl.: 1900; *Sls. Mgr.:* A. C. Coppola

Local Sales Offices & Reps

AL	Birmingham	205-592-8968
AZ	Tempe	602-838-8596
CA	Los Angeles	213-802-1759
CA	S. San Francisco	415-873-8590
CO	Denver	303-759-2776
FL	Tampa	813-877-0581
GA	Atlanta	404-953-3510
IL	Downers Grove	312-932-8200
LA	New Orleans	504-246-3840
MA	Hingham	617-749-3374
MI	Southfield	313-569-3230
MO	Frontenac	314-997-2320
MO	Kansas City	816-358-5600
NJ	Cherry Hill	215-567-5739
NY	Syracuse	315-479-8313
NC	Charlotte	704-535-6535
OH	Cincinnati	513-761-1333
OR	Portland	503-228-3172
PA	Leetsdale	412-734-2503
TX	Dallas	214-243-3318
TX	Houston	713-820-9990
UT	Salt Lake City	801-263-3048
VA	Vienna	703-938-4770
WI	Milwaukee	414-476-4550

OLIVER ADVANCED ENGRG., 676 W. Wilson Ave., Glendale, CA 91203, Tel: 818-240-0080, Telex: 194773; Empl.: 28; *Sls. Mgr.:* Dane Hutchins; *Dist. Mgr.:* Dane Hutchins

OLYMPIC WIRE & CABLE, 1 Madison Rd., Fairfield, NJ 07006, Tel: 201-227-7996, Telex: 75-2217; FSC No.: 63830; Empl.: 35; *Sls. Mgr.:* Robert T. Mello; *Dist. Mgr.:* Yvette Archer

OMEGA ENGINEERING, INC.

OMEGA ENGRG., Box 4047, Stamford, CT 06907, Tel: 203-359-1660, Telex: 99-6404; Empl.: 400; *Sls. Mgr.:* George Vermilyea .....**B•1683, 1766-1767, 1820-1821; C•1887; D•1013, 1070, 1128, 1160, 1290, 1374-1375, 1407**

OMNI SPECTRA, INC., Microwave Connector Div., 140 Fourth Ave., Waltham, MA 02154, Tel: 617-890-4750

OMNIBYTE CORP., 245 W. Roosevelt Rd., Bldg. 1-5, W. Chicago, IL 60185, Tel: 312-231-6880; Empl.: 35; *Sls. Mgr.:* Susan Cochran

Local Sales Offices & Reps

AZ	Scottsdale, Frontier Technology	602-998-4438
CA	Santa Clara, Applied Micro Tech.	408-730-1289
CA	Woodland Hills, Applied Micro Tech.	213-888-2027
CO	Englewood, Davis Assocs., Inc.	303-761-7980
FL	Melbourne, Reynolds & Assoc.	305-259-7000
IL	Park Ridge, Ad Tech Inc.	312-692-7320
MA	Waltham, Digital Sales	617-899-4300
MI	Southfield, Infinity, Inc.	313-557-7230
MN	Minneapolis, Jen-Ray Sys.	612-831-5060
NJ	Boonton, Winter Assoc.	201-334-3434
NY	Caledonia, E. F. Sls.	716-538-4754
TX	Houston, Dyna Marketing	713-460-0314
EXP	IL, Chicago, Computer Overseas Corp.	312-332-3272
Can	Scarbouough, Ontario, Finnan Engineered Prods., Ltd.	416-438-6070

OMNI SPECTRA, 21 Continental Blvd., Merrimack, NH 03054, Tel: 603-424-4111, Telex: 953053, TWX: 710-366-0674; FSC No.: QUIP; Empl.: 750; *Sls. Mgr.:* Ernest J. Devita; *Dist. Mgr.:* Terri Hastings

OMNI SPECTRA, INC., Microwave Subsystems Div., 2626 So. Hardy Dr., Tempe, AZ 85282, Tel: 602-966-1471, TWX: 910-950-1296; *Sls. Mgr.:* Carl Seburn; *Dist. Mgr.:* Carl Seburn

OMNI SWITCH, INC., 21630 N. 19th Ave., Suite B-20, Phoenix, AZ 85027, Tel: 602-582-0629, Telex: 602-582-0665; Empl.: 100; *Sls. Mgr.:* Jim Burkett

OMNITEC DATA INC., 2405 S. 20th St., Phoenix, AZ 85034, Tel: 602-258-8244, 800-528-8423, TWX: 910-951-4247; *Sls. Mgr.:* Dan J. Mitchell; *Dist. Mgr.:* Dan J. Mitchell

OMNITEK, INC., P.O. Box 102, 820 Pennsylvania Blvd., Feasterville, PA 19047, Tel: 215-355-4443, TWX: 510-667-1730; FSC No.: 54316; *Sls. Mgr.:* Frank Shandelman

OMNI-WAVE ELECTRONICS CORP., P.O. Box 660, Gloucester, MA 01930, Tel: 617-281-2800

OMRON ELCTRNS., INC., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195, Tel: 312-843-7900, TWX: 910-291-2494; Empl.: 209; *Sls. Mgr.:* D. Nelson

ONSET COMPUTER CORP., 199 Main St., PO Box 1030, N. Falmouth, MA 02556, Tel: 617-563-2267, Telex: 469915; Empl.: 8; *Sls. Mgr.:* Elaine Boyd

ONTEL CORP., 250 Crossways Park Dr., Woodbury, NY 11797, Tel: 516-364-2121, Telex: 961-382; Empl.: 430; *Sls. Mgr.:* Ed Heinze

OPAMP LABS, INC., 1033 N. Sycamore Ave., Los Angeles, CA 90038, Tel: 213-934-3566; FSC No.: 24699; Empl.: 18 ..... **D•1014**

OPTEK TECHNOLOGY, INC., 345 Industrial Blvd., McKinney, TX 75069, Tel: 214-542-9461, TWX: 910-860-5625; Empl.: 580; *Sls. Mgr.:* James Trautwein; *Dist. Mgr.:* Dave Kimbrough

OPTELECOM, 15940 Luanne Dr., Gaithersburg, MD 20877, Tel: 301-840-2121; FSC No.: 59338; Empl.: 50; *Sls. Mgr.:* F. C. Eggleston

OPTICAL & CONDUCTIVE COATINGS, Meridian Inds., Inc., 428 N. Buchanan Cir., # 8, Pacheco, CA 94553, Tel: 415-798-6066, Telex: 171309 HQ WNCK; FSC No.: 9U775; Empl.: 8; *Sls. Mgr.:* Glenn G. Grupe

OPTICAL ELECTRONICS, INC., Box 11140, Tucson, AZ 85734, Tel: 602-624-8358, TWX: 910-952-1283; FSC No.: 5962; Empl.: 16; *Sls. Mgr.:* George L. Hill

Local Sales Offices & Reps

CA	San Diego, California Elctrn. Mktg.	619-692-3551
CA	Santa Ana, California Elctrn. Mktg.	714-835-2702
CA	Santa Clara, Comtronics	408-773-9800
CT	Burlington, Tritek, Inc.	617-272-4550
MA	Burlington, Tritek, Inc.	617-272-4550
NJ	Paramus, Design Elctrns.	201-845-6224
TX	Hurst, El-Tec Sls.	817-268-2896

OPTICAL FIBER TECHNOLOGIES, INC., P.O. Box 148, Nutting Lake, MA 01865, Tel: 617-663-6629, Telex: 948-288; *Sls. Mgr.:* Patricia Whalen

OPTICAL PUBLISHING CO., INC., Berkshire Common, Pittsfield, MA 01201, Tel: 413-499-0514, Telex: 232-005-ASAS Attention: Optical; *Sls. Mgr.:* George Cominsky

OPTICAL TECHNIQUES INTL., 1800 E. Garry, Ste. # 214, Santa Ana, CA 92705, Tel: 714-540-9040; *Sls. Mgr.:* Robert Theriault; *Dist. Mgr.:* Robert Theriault

OPTICS FOR RESEARCH, INC., P.O. Box 82, Caldwell, NJ 07006, Tel: 201-228-4480, Telex: 130-224; *Sls. Mgr.:* Donald K. Wilson

OPTICS INTERNATIONAL, Box 101, Tenafly, NJ 07670, Tel: 201-567-4799; Empl.: 10

OPTIMA ENCLOSURES, 2166 Mountain Indl. Blvd., Tucker, GA 30084, Tel: 404-939-6340, TWX: 810-766-3967; FSC No.: 10110; Empl.: 250; *Sls. Mgr.:* Al Waters

OPTIMATION, See Julie Research Labs

OPTIMIZED DEVICES, INC., 220 Marble Ave., Pleasantville, NY 10570, Tel: 914-769-6100; Empl.: 30

OPTIMUM APPLIED SYSTEMS, 145 Palisade St., Dobbs Ferry, NY 10522-1696, Tel: 914-693-9001, Telex: 646141 ATT:OAS; Empl.: 30; *Sls. Mgr.:* H. Joseph Brakl

opt INDUSTRIES INC.

OPT INDS. INC., 300 Red School La., Phillipsburg, NJ 08865, Tel: 201-454-2600, TWX: 510-235-2920; Empl.: 290 ..... **A•1401, 2212; D•1736-1739**

Local Sales Offices & Reps

CA	Campbell, Sheehan Mktg. Assocs.	408-370-6900
CT	Windsor, Janco Technlg.	203-743-9436
FL	Lauderhill, Innovative Mktg.	305-485-6869
FL	Lighthouse Point, Sales Engrg. Concepts	305-781-4800
FL	Melbourne, EMS, Inc.	305-724-1027
GA	Cumming, RGA Sls., Inc.	404-438-4125
IL	Chicago, LGS Elctrns. Co.	312-456-9616
IN	Ft. Wayne, Corrao Marsh, Inc.	219-637-5548
IA	Cedar Rapids, Cahill, Schmitz & Cahill	319-377-8219
MD	Baltimore, Controy Sls.	301-296-2444
MN	Minneapolis, White Sls. Co.	612-755-0855/3511
NJ	Palisades Park, Janco Technlg.	201-941-4008
NY	Rochester, Alan Lupton Assocs., Inc.	716-482-7700
OH	Cincinnati, Ken C. Hoffman, Jr. Co.	513-931-1686
OH	Dayton, Patrick Montplaisir	513-434-4316
OK	Tulsa, The Hugh Daly Co.	918-494-7711

OPTOELECTRONICS, INC., 1309 Dynamic St., Petaluma, CA 94952, Tel: 707-763-4181, Telex: 34-0186; Empl.: 40; *Sls. Mgr.:* Victor Yen

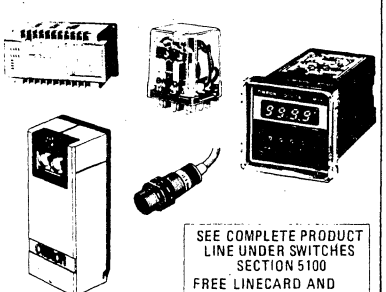
OPTOELECTRONICS, INC., 5821 N.E. 14th Ave., Ft. Lauderdale, FL 33334, Tel: 305-771-2050, Telex: 514849; Empl.: 25; *Sls. Mgr.:* L. R. Hufft; *Dist. Mgr.:* L. R. Hufft

OPTOMICRONIX, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014, Tel: 408-725-1220; *Sls. Mgr.:* W. M. Otsuka

OPTO TECHNOLOGY, INC., 1674 S. Wolf Rd., Wheeling, IL 60090, Tel: 312-537-4277, TWX: 910-687-1490; Empl.: 35; *Sls. Mgr.:* Richard E. Hegberg

OMRON®
OMRON ELECTRONICS, INC.
AUTHORIZED DISTRIBUTOR

E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

OPTO 22, 15461 Springdale St., Huntington Bch., CA 92649, Tel: 714-891-5861, Telex: 692-386; Empl.: 120 ..... **B•1440-1441**

Local Distributors

AL	Birmingham, Industrial Elec. Supply	205-956-8504
AL	Huntsville, Hamilton Avnet Elctrns.	205-837-7210
AL	Huntsville, Pioneer/Huntsville	205-837-9300
AZ	Phoenix, Wyle Labs.	602-249-2232
AZ	Tempe, Hamilton Avnet Elctrns.	602-231-5100
AZ	Tucson, Wyle Labs.	602-884-7082
AR	Little Rock, Carlton Bates	501-562-9100
CA	Agoura, Wyle Labs.	818-880-9000
CA	Chatsworth, Hamilton Avnet Elctrns.	818-700-2600
CA	Costa Mesa, Avnet Elctrns.	714-754-6111
CA	Costa Mesa, Hamilton Electro Sls. Orange County	714-641-4100
CA	Culver City, Hamilton Electro Sls.	213-558-2121
CA	El Segundo, Wyle Labs.	213-322-8100
CA	Huntington Beach, Opto 22 Distibutor Sls.	714-891-5861
CA	Irvine, Wyle Labs.	714-863-9953
CA	Ontario, Hamilton Avnet Elctrns.	714-989-4602
CA	Rancho Cordova, Wyle Labs.	916-638-5282
CA	Sacramento, Hamilton Avnet Electronics	916-925-2216
CA	San Diego, Hamilton Avnet Elctrns.	619-571-7510
CA	San Diego, Wyle Labs.	619-565-9171
CA	Santa Clara, Wyle Labs.	408-727-2500
CA	Sunnyvale, Hamilton Avnet Elctrns.	408-743-3355
CO	Englewood, Hamilton Avnet Elctrns.	303-740-1000
CO	Thornton, Wyle Labs.	303-457-9953
CT	Danbury, Hamilton Avnet Elctrns.	203-797-2800
CT	Norwalk, Pioneer/Connecticut	203-853-1515
DC	Washington, Hamilton Avnet Elctrns.	301-621-5410
FL	Altamonte Springs, Pioneer/Orlando	305-834-9090
FL	Deerfield Beach, Pioneer/Ft. Lauderdale	305-771-7520
FL	Fort Lauderdale, Hamilton Avnet Elctrns.	305-971-2900
FL	Orlando, Hamilton Avnet Elctrns.	305-628-3888
FL	St. Petersburg, Hamilton Avnet Elctrns.	813-576-3930
GA	Norcross, Hamilton Avnet	404-447-7507
GA	Norcross, Pioneer/Georgia	404-448-1711
GA	Norcross, Professional Control Corp.	404-449-4577
IL	Bensenville, Hamilton Avnet Elctrns.	312-860-7700
IL	Berkeley, Tara	312-449-6434
IL	Elk Grove Village, GBL Goold Elctrns.	312-593-3220
IL	Elk Grove Village, Pioneer/Chicago	312-437-9680
IL	Moline, Jim Otis	309-762-9311
IN	Carmel, Hamilton Avnet Elctrns.	317-844-9333
IN	Indianapolis, Pioneer/Indiana	317-849-7300
IN	Indianapolis, Process Automation Devices	317-849-3682
IA	Cedar Rapids, Hamilton Avnet Elctrns.	319-362-4757
KS	Overland Park, Hamilton Avnet Elctrns.	913-888-8900
MD	Baltimore, Automation Indl. Control	301-944-8400
MD	Columbia, Hamilton Avnet Elctrns.	301-995-3500
MD	Gaithersburg, Pioneer Technlgs. Grp., Inc.	301-921-0660
MD	Mount Airy, Thermal Devices	301-442-1007
MA	Lexington, Pioneer/Massachusetts	617-861-9200
MA	N. Redding, Martindale Assocs.	617-664-0355
MA	Woburn, Hamilton Avnet Elctrns.	617-273-7500
MI	Grand Rapids, Hamilton Avnet Elctrns.	616-243-8805
MI	Livonia, Hamilton Avnet Elctrns.	313-522-4700
MI	Livonia, Pioneer/Michigan	313-525-1800
MI	Madison Heights, McNaughton-McKay Elect.	313-399-7500
MN	Minneapolis, Cassidy Elctrns.	612-944-0100
MN	Minnetonka, Hamilton Avnet Elctrns.	612-932-0600
MN	Minnetonka, Pioneer/Twin Cities	612-935-5444
MN	St. Paul, Kim Controls	612-780-2991
MO	Earth City, Hamilton Avnet Elctrns.	314-344-1200
NE	Omaha, Jim Otis & Assocs.	402-392-0523
NH	Manchester, Hamilton Avnet Elctrns.	603-624-9400
NJ	Cherry Hill, Hamilton Avnet Elctrns.	609-424-0100
NJ	Fairfield, Hamilton Avnet Elctrns.	201-575-3490
NJ	Newark, Norman Bragar	201-344-1100
NJ	Pine Brook, Pioneer/New Jersey	201-227-1262
NM	Albuquerque, Hamilton Avnet Elctrns.	505-765-1500
NY	East Syracuse, Hamilton Avnet Elctrns.	315-437-2641
NY	Fairport, Pioneer/Rochester	716-381-7070
NY	Glen Head, Livera-Polk Assocs.	516-759-9300
NY	Melville, Hamilton Avnet Elctrns.	516-434-7421
NY	Rochester, Hamilton Avnet Elctrns.	716-475-9130
NY	Vestal, Pioneer/Binghamton	607-748-8211
NY	Woodbury, Pioneer/Woodbury	516-921-8700
NC	Charlotte, Pioneer/Carolina	704-527-8188
NC	Charlotte, Regan Controls	704-523-9137
NC	Raleigh, Hamilton Avnet Elctrns.	919-878-0810
OH	Centerville, I. P. D.	513-435-2086
OH	Cincinnati, Richard Equip.	513-271-8666
OH	Cleveland, Hamilton Avnet Elctrns.	216-831-3500
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Columbus, Great Lakes Controls Corp.	614-451-7872
OH	Columbus, Hamilton Avnet Elctrns.	614-882-7004
OH	Dayton, Hamilton Avnet Elctrns.	513-439-6700
OH	Dayton, Pioneer/Dayton	513-236-9900
OH	North Royalton, Great Lakes Controls Corp.	216-582-0020
OK	Tulsa, Quality Comps.	918-664-8812
OR	Hillsboro, Wyle Labs.	503-640-6000
OR	Lake Oswego, Hamilton Avnet Elctrns.	503-635-8831
OR	Portland, Pacific Control Supply	503-249-2033
PA	Horsham, Pioneer/Delaware Valley	215-674-4000
PA	King of Prussia, Applied Controls	215-265-3832
PA	Pittsburgh, Customized Control Sys.	412-921-3196
PA	Pittsburgh, Great Lakes Control Corp.	412-341-8922
PA	Pittsburgh, Hamilton Avnet Elctrns.	412-281-4150
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
TX	Addison, Quality Comps.	214-733-4300
TX	Austin, Hamilton Avnet Elctrns.	512-837-8911
TX	Austin, Pioneer/Austin	512-835-4000
TX	Austin, Quality Comps.	512-835-0220
TX	Austin, Wyle Labs.	512-834-9957
TX	Dallas, Pioneer/Dallas	214-386-7300
TX	Houston, Hamilton Avnet Elctrns.	713-780-1771
TX	Houston, Pioneer/Houston	713-988-5555
TX	Houston, Quality Comps.	713-240-2255
TX	Houston, Wyle Labs.	713-879-9953
TX	Irving, Hamilton Avnet Elctrns.	214-659-4111
TX	Richardson, Wyle Labs.	214-235-9953
UT	Salt Lake City, Hamilton Avnet Elctrns.	801-972-2800
UT	Salt Lake City, Wyle Labs.	801-947-9953
WA	Bellevue, Hamilton Avnet Elctrns.	206-643-3950
WA	Bellevue, Wyle Labs.	206-453-8300
WA	Kent, Shannon, Ltd.	206-763-0545
WA	Redmond, Cascade Controls	206-881-8843
WI	Germantown, Professional Control Corp.	414-251-3000
WI	Milwaukee, Hamilton Avnet Elctrns.	414-784-4510
WI	Milwaukee, Taylor Elctrns.	414-241-4321

OPTRON, INC., See TRW Optron

ORAM ELCTRNS., Rte. 22, Putnam Business Park, Brewster, NY 10509-9587, Tel: 914-279-2966, Telex: ORAM 628-382-40; Empl.: 25; *Sls. Mgr.:* Vincent A. Gianguzzi

ORAM ELECTRONICS, 12 Cranston Rd., Pittsford, NY 14534, Tel: 716-381-4673; Empl.: 150; *Sls. Mgr.:* M. I. Mindell ..... **D•1740**

ORBIT INDS., 2670 Lockheed Way, Carson City, NV 89701, Tel: 702-882-6123; Empl.: 10

ORBIT INSTRUMENT CORP., 80 Cabot Ct., Hauppauge, NY 11788, Tel: 516-435-8300, TWX: 510-221-2122; FSC No.: 11263; *Sls. Mgr.:* Bruce Reissman, Dennis Sunshine ..... **B•1735; D•1129**

Local Sales Offices & Reps

CA	San Diego, Orbit Instr. Corp.	619-566-3437

ORBIT INSTRUMENT OF CAL., 6431 Global Dr., Cypress, CA 90630, Tel: 714-527-0561, TWX: 510-221-2122; FSC No.: 11263; *Sls. Mgr.:* Bruce Reissman

ORIEL CORP., 250 Long Beach Blvd., Stratford, CT 06497-0872, Tel: 203-377-8282, TWX: 710-453-8719

ORIONICS, INC., 34368E Frontage Rd., Bozeman, MT 59715, Tel: 406-586-8256, TWX: 910-963-2063

ORTEL CORP., 2015 W. Chestnut St., Alhambra, CA 91803, Tel: 818-281-3636, Telex: 752434; *Sls. Mgr.:* Brent J. Ware

OSBORNE TRANSFORMER, 19636 Derby St., Detroit, MI 48203, Tel: 313-368-4136; Empl.: 30; *Sls. Mgr.:* J. R. Osborne

OSCILLATEK CORP., 620 North Lindenwood Dr., Olathe, KS 66062, Tel: 913-829-1777, Telex: 437045; FSC No.: 57693; Empl.: 24; *Sls. Mgr.:* A. Ghafoor ..... **A•1402-1407**

OSHINO ELECTRIC LAMP WORKS, LTD., 5-2, Mianami-Shinagawa 2-chome, Shinagawa-Ku, Tokyo, Japan, Tel: 03-471-8548, Telex: 0242-2117; FSC No.: 03-450-3939; Empl.: 300; *Sls. Mgr.:* T. Koyama ..... **B•1090**

Local Sales Offices & Reps

CA	Fountain Valley, WAMCO Inc.	714-545-5560

OSLO CONTROLS, 328 Industrial Ave, Cheshire, CT 06410, Tel: 203-272-2794, TWX: 710-455-3774; *Sls. Mgr.:* J. J. Martinez ..... **B•1684-1685**

Local Sales Offices & Reps

	Century Elec. Supp.	
CA	Los Angeles, Minarik Elec.	213-485-1291
CA	Riverside, Elctrn. Supp.	714-683-7300
AZ	Scottsdale, Semi-Systems	602-991-1151
CA	Brea, Masco	714-529-0866
CA	Mountain View, Westech Sls.	415-961-1422
CO	Englewood, Computech Mktg.	303-773-3981
CT	Bloomfield, Zaslow Sls.	203-242-7781
FL	Longwood, CBC Elctrns.	305-831-5380
IL	Lisle, W-G Controls	312-963-5954
MD	Silver Spring, L. G. White & Co.	301-434-1555
MI	Grosse Pointe Park, Greiner Assocs.	313-499-0188
MN	Minneapolis, JOS-CO/Melius	612-861-3343
MO	St. Louis, Hill & Co.	314-432-1136
NJ	Caldwell, Grimm Siegal Assocs.	201-575-9300
NY	Syracuse, Canavan-Scanlon Assocs.	315-437-1271
OH	Cincinnati, O. H. Bromberg & Assocs.	513-771-9333
OH	Mentor, KT/DEPCO	216-729-3588
PA	Broomall, White-Whiddett	215-353-6347
TX	Dallas, Glidden Electro Equip.	214-341-0610
WA	Mercer Island, J. H. Andersen & Assocs.	206-232-0484

Local Distributors

CA	Gardena, California Switch & Signal	213-770-2330, 213-538-9830
CA	Los Angeles, Master Distrs.	213-829-4656
CA	Los Angeles, Minarik Elect.	213-485-1291
CA	Riverside, Elctrn. Supply	714-683-7300
CA	San Diego, Deco Elctrns.	619-693-1595
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Tustin, Western Switches	714-731-4333
CA	Van Nuys, Pacific Switch Controls	213-873-4802
CT	Shelton, Century Elec. Supply	203-736-2684
CT	West Hartford, Atlantic Switch Controls	203-527-7705
FL	Lakeland, A A Elec.	800-237-8274
FL	Lakeland, Switch Controls	813-644-7564
IL	Lombard, R. M. Elctrns.	312-932-5150
IL	Wheaton, Conectrix	312-653-1460
MA	Canton, Impact Elctrns.	617-821-1500
MI	St. Clair Shores, Spemco	313-771-2700
MN	Minneapolis, Elctrn. Center	612-338-5881
NJ	Fair Lawn, Relay Specialties	201-797-3313
NJ	Mt. Laurel, Jersey Switch	609-778-8190
NY	Woodside, Switches Unltd.	212-478-5000
OH	Cincinnati, Cartessa Mfg.	513-522-3100
OH	Columbus, Ohio Switch	614-885-0319
TX	Dallas, Glidden Electro Equip. Co.	214-341-0610
TX	Dallas, Texaswitch	214-357-1768
WI	Mequon, Taylor Elec.	414-241-4321
EXP	Ponce PR, Distributronics	809-843-3321
PR	Ponce, Distributronics	809-843-3321

OSTBY & BARTON, 487 Jefferson Blvd., Warwick, RI 02886, Tel: 401-739-7310, Telex: 927573; *Sls. Mgr.:* Jos. E. Burns

OTTO ENGRG., 2 E. Main St., Carpentersville, IL 60110, Tel: 312-428-7171, Telex: 722426; FSC No.: 21649; Empl.: 120; *Sls. Mgr.:* R. E. Sparks ..... **B•1686-1687**

Local Sales Offices & Reps

CA	Los Angeles, Electric Switches, Inc.	213-664-2125, 213-660-1464
AL	Decatur, El Tech	205-353-7899
CA	Anaheim, Gabriel & Assocs.	714-666-0660
CA	Costa Mesa, Gabriel Assocs.	714-957-1981
CO	Denver, Lindberg Co.	303-758-9033
FL	Deerfield Beach, Newell Hynes Assocs., Inc.	305-429-3207
IL	Downers Grove, Rockford Controls Co.	312-960-2046
IL	Glen Ellyn, Rockford Controls Co.	312-469-6016
IN	Indianapolis, Rockford Controls Co.	317-248-2518
MA	Needhan Heights, Newscott	617-444-1923
MI	Madison Heights, Pine Sls., Inc.	313-589-0350
MN	Minneapolis, Boerger & Assocs.	612-560-3435
MO	Kansas City, Harris-Hanson Co.	816-444-9494

MO St. Louis, Harris-Hanson Co. 314-432-3611
NJ Medford, Jack McCoy, Inc. 609-953-0770
NY Great Neck, Tylinski Co. 516-466-9070
NC Kernersville, Heritage Sls. Assocs. 919-996-4374
OH Cleveland, Electro-Com 216-676-8154
OH Dayton, Electro-Com 513-898-5140
TX Dallas, Control Comps. Corp. 214-458-8877
WA Bellevue, James Findlay Co. 206-455-9597

Local Distributors
AZ Tempe, Fisher Brownell 602-967-1464
CA Los Angeles, Electric Switches, Inc. ... 213-664-2125
MD Kensington, Marine Air Supp. 301-949-1353
MA Hingham, Sager Elec. Supp. 617-749-6700
NM Albuquerque, International Elctrns. 505-345-8127
NY Hicksville, Durham Aircraft Svc., Inc. .. 516-681-9800
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY Woodside, Durham Aircraft Srvc. 212-274-9000
NC Greenville, Womack Elctrns. 919-758-5047
TX Dallas, Associated Aircraft Supp. 214-331-4381

ovenaire

OVENAIRE, Electronic Technologies Inc., 706 Forrest St., Charlottesville, VA 22901, Tel: 804-977-8050, TWX: 910-997-8053; FSC No.: 12020; Empl.: 165; *Sls. Mgr.:* Andy Bell ..... **A•1408-1411**

Local Sales Offices & Reps
AL Huntsville, L & D, Inc. 205-837-1469
CA San Mateo, Melvin Sls. 415-349-7445
CA Van Nuys, R.L. Assocs. 213-782-7826
CO Loveland, Morbak Mktg. 303-669-8900
FL Maitland, Ellis & Assocs. 305-645-1101
GA Atlanta, L & D Inc. 404-395-7079
IL Des Plaines, Janus Inc. 312-298-9330
IN Fort Wayne, TX Sls., Inc. 219-489-4447
MD Towson, Dickison Sls. Co. 301-823-0923
MA Milton, Naton Assocs. 617-698-0670
MN St. Paul, Countryman 612-645-9151
NJ Cherry Hill, H. J. White Co. 609-428-4544
NJ Paramus, Eltech Sls. 201-967-1309
NY Buffalo, Quality Comps. 716-837-5430
NC Greensboro, L & D, Inc. 919-292-3201
NC Raleigh, L&D Inc. 919-876-5301
TN Seymour, L&D Inc. 615-577-1549
TX Bedford, W. Pat Fralia Co. 817-354-1144
WA Seattle, Carlyle Tech. Sls. 206-575-6750
WI Milwaukee, Janus Inc. 414-476-9104

OVEN INDS., 191 Hempt Rd., P.O. Box 290, Mechanicsburg, PA 17055, Tel: 717-766-0721; FSC No.: 21302; Empl.: 70; *Sls. Mgr.:* T. M. Nolan

OXLEY, INC., 6290 Sunset Blvd., Ste. 1126, Los Angeles, CA 90028, Tel: 213-463-5120, TWX: 910-321-2903; *Sls. Mgr.:* Norman R. Sutherland

Local Sales Offices & Reps
CA San Jose, J. T. McFarland Assocs. 408-286-9333
CA Tustin, West, Inc. 714-852-9211
CT Meriden, Abbott-Allison Co. 203-481-0405
FL Tampa, APM Assocs. 813-886-2457
IL Chicago, Electro-Tech Mktg. Assocs. .. 312-588-4535
MN St. Paul, Bonament Heyda Co. 612-484-8531
NY Rochester, R. P. Kennedy Co. 716-271-6322
PA Paoli, Stitzer Assocs. 215-644-5500
TX Richardson, Eagle Marketing 214-238-5383

PACCOM, 3928 148th NE, Redmond, WA 98052, Tel: 206-883-9200, 800-426-6254, TWX: 910-449-2592; Empl.: 15; *Sls. Mgr.:* D. Tully; *Dist. Mgr.:* C. Beaudette

PACE INC., 9893 Brewers Ct., Laurel, MD 20707, Tel: 301-490-9860, Telex: 87446; *Sls. Mgr.:* James K. Bausell

PACER INDUSTRIES, INC., 1450 First Ave., Chippewa Falls, WI 54729, Tel: 715-723-1141, Telex: 260391; FSC No.: 60162; *Sls. Mgr.:* Steven Prince; *Dist. Mgr.:* Steven Prince

PACIFIC ATLANTIC ELCTRNS., Box 754, El Cerrito, CA 94530, Tel: 415-237-5837, TWX: 910-366-7296; Empl.: 4; *Sls. Mgr.:* P. Yen; *Dist. Mgr.:* P. Yen

PACIFIC CYBER/METRIX INC., 6800 Sierra Ct., Dublin, CA 94568, Tel: 415-829-8700, TWX: 910-389-6890; *Sls. Mgr.:* R. Nelson

PACIFIC COMMUNICATIONS, 2041-A S. Grand Ave., Santa Ana, CA 92705, Tel: 714-546-0147; Empl.: 35

PACIFIC ELECTRICORD, 747 W. Redondo Bch. Blvd., Gardena, CA 90247, Tel: 213-532-6600, TWX: 910-346-7619; Empl.: 600; *Sls. Mgr.:* W. A. Fiechtner; *Dist. Mgr.:* Gary M. Payne

PACIFIC ELECTRO DYNAMICS, INC., 11465 Willows Rd. N.E., Redmond, WA 98052, Tel: 206-881-1700, TWX: 910-449-2977; Empl.: 350

PACIFIC INSTRS. INC., 215 Mason Circle, Concord, CA 94518, Tel: 415-827-9010, TWX: 910-481-9977; Empl.: 45 ..... **D•1015**

Local Sales Offices & Reps
AL Huntsville, Lee Assocs.-Mid South, Inc. 205-533-5896
CA Alhambra, Dale-Dahl Assocs. 213-682-3417
CA Walnut Creek, Dale/Dahl Assocs. 415-933-9595
CT Hamden, JBL Assocs. 203-281-3161
FL Maitland, Wade H. Boggs, Inc. 305-647-2226
IL Park Ridge, EIA, Inc. 312-298-2290
MA Acton, Applied Measurements 617-263-2766
MI Farmington Hill, Anderson Elctrns., Inc. 313-553-7600
NJ Elizabeth, Instrumentation Prods., Inc. 201-351-1155
NM Albuquerque, Vic Myers Assocs. 505-884-6878
NY Latham, L-Tron Corp. 518-785-5332
OH Dayton, RDP Corp. 513-253-6171
PA Pittsburgh, Wainwright Tech. Sls., Inc. 412-487-5055
PA Radnor, Roberts Engrg. 215-688-6525
TX Arlington, John T. Houston Assocs., Inc. 817-265-2931
VA Arlington, Gans & Pugh Assocs. 703-527-3262
WA Bellevue, Tasco, Inc. 206-453-1414
Can Rexdale, Ont., SRP Control Sys., Ltd. .. 416-746-0117

PACIFIC MAGNETICS CORP., 2602 Transportation Ave., Ste. F, National City, CA 92050, Tel: 619-474-8216; *Sls. Mgr.:* Mary Hill

PACIFIC MEAS., INC., 488 Tasman Drive, Sunnyvale, CA 94086, Tel: 408-734-5780, TWX: 910-339-9273; Empl.: 100; *Sls. Mgr.:* Ed Mendel

PACIFIC MICROCOMPUTERS, INC., 160 Chesterfield Dr., Cardiff, CA 92007, Tel: 619-436-8649, Telex: 701-578; Empl.: 34; *Sls. Mgr.:* Phyllis Maloy

PACIFIC MICRO SYS., INC., 160 Gate 5 Rd., Sausalito, CA 94965, Tel: 415-331-2525; Empl.: 12; *Sls. Mgr.:* Donald Shipley; *Dist. Mgr.:* Donald Shipley

PACIFIC
POWER SOURCE CORP.

PACIFIC POWER SOURCE CORP., 15122 Bolsa Chica St., Huntington Bch., CA 92649, Tel: 714-898-2691, 800-854-2433; Empl.: 49; *Sls. Mgr.:* A. F. Hatlestad ..... **D•1949-1953**

Local Sales Offices & Reps
KS Overland Park, Ramsey Assocs. 913-649-6996
MA Burlington, Intersell, Inc. 617-273-3844
MN Minneapolis, Loren Green Assocs. 612-571-6666
MO Maryland Heights, Ramsey Assocs. ... 314-878-5042
NY Dewitt, D. B. Assocs. Inc. 315-446-0220
NY Wantagh, Bytec Reps. 516-781-7400
WA Bellevue, Al Smith 206-746-6770
WA Vancouver, Al Smith 206-892-9912

Local Distributors
EXP Los Angeles, CA, Trans World Trade .. 213-476-8406

PACIFIC RESISTOR CO.

PACIFIC RESISTOR CO., 18300 Oxnard St., Tarzana, CA 91356, Tel: 818-345-7811, Telex: 06416; *Sls. Mgr.:* Douglas Trewhitt ..... **A•1926-1927**

Local Sales Offices & Reps
CA San Jose, Silcon Valley 408-286-7510
MN St. Paul 612-642-2828

PACIFIC SCIENTIFIC CO., 4301 Kishwaukee, Rockford, IL 61105, Tel: 815-966-3600, Telex: 257-315; Empl.: 400

PACIFIC SWITCH CONTROLS, INC., 16116 Leadwell St., Van Nuys, CA 91406, Tel: 213-873-4802

PACIFIC TIMER INC., 21739 N.E. 18th Way, Redmond, WA 98052, Tel: 206-881-1785; *Sls. Mgr.:* Karen A. Pettyjohn

PACIFIC TRANSDUCER, 2301 Federal, Los Angeles, CA 90064, Tel: 213-478-1134; Empl.: 23

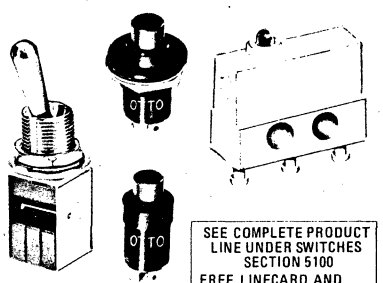
PACTEC DIV., LaFrance Corp., Enterprise & Executive Avenues, Philadelphia, PA 19153, Tel: 215-365-8400, Telex: 83-1732; *Dist. Mgr.:* Edward Fitzpatrick ..... **C•1002, 1070-1071**

Local Sales Offices & Reps
AZ Phoenix, Gramer & Co. 602-995-9455
CA Buena Park, PAC-TEC CORP. 714-522-6410
CA Fallbrook, Martronix 619-728-7678
CA Santa Clara, Warren Assoc. 408-988-7762
CO Englewood, High Plains Mktg. 303-792-2020
FL Key Largo, Jerrold Helbein & Assocs., Inc. 305-367-3025
IL Arlington, Brainard-Wilson Mktg. 312-437-2700
IN Indianapolis, STB & Assocs., Inc. 317-844-9227
MD Columbia, Snowden Center 301-964-0225
MA Newton, Gerber Sls. 617-969-2620
MI Warren, Burcaw Co. 313-573-4605
MN Excelsior, Lestronix 612-474-1935
MN St. Louis Park, Lestronix 612-926-8466
MO Grandview, Harris Hanson Co. 816-763-6200
MO St. Louis, Harris Hanson Co. 314-432-3611
NJ Broomall, L. D. Lowery, Inc. 215-528-5170
NJ Woodcliff Lake, Joe Freid & Assoc. ... 201-391-6792
NY Great Neck, F & F Metro 516-482-4080
NY Mendon, Tech-Mark 716-624-3840
OH Richfield, Bear Mktg. 216-659-3131
OR Portland, James J. Backer Co. 503-297-8744
PA Broomall, L.D. Lowery, Inc. 215-528-5170
TX Dallas, MGR Elctrn. 214-238-5246
UT Salt Lake City, High Plains Mktg. 801-968-9456
WA Seattle, James J. Backer Co. 206-285-1300
WI Colgate, Rep 1 & Assocs. 414-628-4016
Can Markham, Ont., Avotronics, LTD 416-475-2024
Can Ottawa, Ont., Avotronics, LTD 613-233-5527
Can Pointe Claire, Que., Avotronics, LTD .. 514-697-2135

OTTO
CONTROLS
Div. of OTTO Engineering, Inc.
FULL LINE
AUTHORIZED DISTRIBUTOR

E S I

ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

Local Distributors

AL Birmingham, American Elctrns. Supp. 205-942-4656
AL Birmingham, Forbes Distrbg. 205-251-4105
AL Decatur, Forbes Distrs. 205-353-4762
AL Huntsville, Forbes Distrbg. 205-533-4150
AZ Phoenix, Lion Elctrns. 602-869-9611
AZ Phoenix, R. V. Weatherford 602-272-7144
AZ Phoenix, Tri-Tek 602-995-9352
AZ Tempe, Circut Specialists, Inc. 602-966-0764
AZ Tucson, Anatech Corp. 602-881-2348
AZ Tucson, Elliot Elctrns. 602-884-7394
CA Anaheim, A-Z Elctrns. 714-634-3620
CA Burbank, Electronic City 213-842-5275
CA Canoga Park, Sandy's Elctrns. Supp. .. 213-346-8353
CA Costa Mesa, Marvac 714-540-3280
CA Cucamonga, Abletronics 714-987-7606
CA El Segundo, Force Elctrns. 213-772-1324
CA El Toro, R-Vac 714-586-1210
CA Freemont, Terminal Sls. Corp. 415-656-7722
CA Gardena, California Switch & Signal .. 714-522-8600
CA Glendale, R. V. Weatherford 213-849-3451
CA Goleta, Bill's Stereo 805-967-8280
CA Monterey, Zackit (Monterey) 408-375-3144
CA Palo Alto, Zack Elctrns. 415-326-5432
CA Redding, North Valley Elec. Distr. 916-222-1500
CA Sacramento, Zackit/Sacramento 916-446-3131
CA San Diego, R. V. Weatherford 619-695-1700
CA San Diego, Southland Comps. 619-578-6630
CA San Jose, Quement Elctrns. 408-998-5900
CA San Jose, Rose Elctrns. 408-263-2934
CA San Rafael, Electronics Plus 415-457-0456
CA Santa Anna, C. R. Elctrns., Inc. 714-556-2040
CA Valleyo, Zackit (Valleyo) 707-644-6676
CO Denver, Gateway Elctrns. 303-458-5444
CO Denver, Intergrated Elctrns. 303-292-5337
CO Denver, R. V. Weatherford 303-428-6900
CO Greeley, Greely Walker 303-353-3241
CT New Haven, Hatry Elctrns. 203-527-1881
CT New London, Jan Elctrns. 203-442-4386
CT Stratford, Utronics 203-378-4201
CT Wallingford, Midstate Elctrns. 203-265-9900
DE Wilmington, Wholesale Elctrns. 302-656-9988
FL Clearwater, Electronic Precepts of FL 813-530-9781
FL Dania, Summit Distrs. 305-920-6253
FL Longwood, Interec Comps. 305-834-7777
FL Miami, Electronic Equip. Co. 305-871-3500
FL Orlando, EMSCO 305-849-6362
FL St. Petersburg, Knapp of Florida 813-392-0406
FL Tampa, Dow Elctrns. 813-626-5195
FL Tampa, Leader Elctrns. 813-870-3315
FL Tampa, Sunex Elctrns. 813-885-4074
FL West Palm Beach, Nurmi Elctrns. 305-686-8553
GA Atlanta, Ack Radio 404-351-6340
GA Atlanta, Specialty Distr. Co. 404-873-2521
IL Berwyn, BB & W Inc. 312-242-1533
IL Chicago, Electronic Distrs. 312-283-4800
IL Chicago, R. W. Elctrns. 312-248-2480
IL Elk Grove, Martec Assocs. 312-956-8090
IL Geneva, Melvin Elctrns. 312-279-5015
IL Mt. Prospect, Tri State Elctrns. 312-255-0600
IL Niles, Joseph Elctrns. 312-297-4200
IL Peoria, Klaus Radio 309-691-4840
IL Rosemont, Advent Elctrns. 312-298-4210
IN Bloomington, Stansifer Radio Co. 812-336-6339
IN Gary, Calumet Elctrns. 317-887-4961
IN Indianapolis, Advent Elctrns. 317-872-4910
IN Indianapolis, Electronic Service Parts 317-635-7822
IN Indianapolis, Prehler Elctrns. 800-228-5839
IN Jasper, Elex Mart 812-482-4101
IA Cedar Rapids, Iowa Radio Supply 319-393-4510
KS Overland Park, Burnstein & Assocs. ... 913-642-6444
KS Salina, Electronics, Inc. 913-827-7377
KY Bowling Green, Randolph, Hale & Meredith 502-781-1460
KY Louisville, Peerless Elctrns. 502-637-7674
MD Aberdeen, Harco Elctrns. 301-838-7990
MD Beltsville, Mark Elctrns. 301-595-5040
MD Beltsville, P.S.I. 301-937-4960
MD Gaithersburg, Almo Elctrns. 301-792-9197
MD Glen Burnie, Revacto of Maryland 301-766-3400
MD Rockville, Capitol Radio 301-881-2270
MD Towson, Baynesville Elctrns. 301-823-0082
MA Hingham, Sager Elec. Supp. 617-749-6700
MA Newton Upper Falls, In Stock Products Co. 617-964-6200
MI Battle Creek, Great Lakes Elctrns. 616-731-4156
MI Berrien Springs, Data Comms. 616-471-2119
MI Clawson, Radio Supp. & Engrg. 313-435-6420
MI Farmington Hills, Prehler Elctrns 800-336-1406
MI Grand Rapids, S. F. Elctrns. 616-459-0216
MI Lansing, Fulton Radio 517-394-5020
MI Livonia, RS Elctrns. 313-525-1155
MN Minneapolis, Aero-Space-Computer Supp. 612-884-4725
MN Minneapolis, Northern Elctrns. 612-944-1167
MO St. Louis, Gateway Elctrns. 314-427-6116
NE Lincoln, Scott Elctrns. 402-466-8221
NJ Frenchtown, Sintec/Aries 201-996-4093
NJ Pine Brook, Parts Masters 201-227-7797
NM Albuquerque, Walker Radio Co. 505-883-2992
NY Buffalo, Summit Distr. 716-887-2800
NY Farmingdale, Midway Indl. Electro 516-293-6800
NY Freeport, KRP Elctrns. 516-623-3346
NY New York, Advance Elctrns. 212-730-7030
NY Rochester, Rochester Radio Supp. 716-454-7800
NY Rochester, Summit Distr. 716-334-8110
NY Troy, Trojan Elctrn. Supp. 518-274-4481
NC Burlington, Womack Elctrns. 919-227-7486
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Raleigh, Southeastern Elctrns. 919-828-2311
OH Cincinnati, Hughes-Peters 513-351-2000
OH Cincinnati, R. S. Elctrns. 513-793-2450
OH Columbus, Hughes-Peters 614-294-5351
OH Strongsville, Roberts Elctrns. 216-238-1711
OK Oklahoma City, She Elctrns. 405-843-5941
OK Tulsa, Radio Inc. 918-587-9123
OR Beaverton, Norvac Elctrns. 503-644-1025
OR Beaverton, Rose Elctrns 503-629-9288
OR Portland, Radar Elec. 503-232-3404
PA Allentown, A.A. Peter, Inc. 215-434-5237
PA Coatesville, County Supply 215-384-4585
PA Marcus Hook, Linwood Wholesalers .. 215-485-0777
PA Philadelphia, Almo Elctrns. 215-698-4000
PA Willow Grove, Resco Elctrns. 215-659-4575
PA York, Rosen Elctrns. 717-843-7881
RI Pawtucket, Jabbour Elctrns. 401-944-2570
SC Columbia, Dixie Elctrns. 803-779-5332
TN Chattanooga, Curle Elctrns. Supp. 615-266-4729
TN Chattanooga, Techni-Tronics 615-842-0514
TN Clarksville, Randolph, Hale & Matthews 615-647-2325
TN Columbia, Randolph & Williams 615-388-7566
TN Cookeville, Randolph & Parks 615-526-6184
TN Memphis, Bluff City 901-345-9500
TN Nashville, Bluff City 615-242-8000
TN Nashville, Randolph & Rice 615-255-5602
TN Tullahoma, Randolph & Vandergriff ... 615-455-4531
TX Austin, EPC 512-339-1131
TX Austin, Galtronics 512-837-7470
TX Dallas, R. V. Weatherford 214-243-1571
TX Dallas, Wholesale Elctrns. Supp. 214-824-3001
TX Forth Worth, Allied Elctrns. 817-336-5401
TX Houston, Ace Elctrns. 713-688-8114
TX Houston, EPC 713-447-5800
TX Houston, Force Elctrns. 713-561-8644
TX Houston, Gateway Elctrns. 713-978-6575
TX Irving, Force Elctrns. 214-438-5700
TX San Antonio, Altex Elctrns. 512-828-0503
UT Salt Lake City, Standard Supp. 801-486-3371
VA Charlottesville, Virginia Radio 804-296-4184
VA Richmond, Meter Metrics Div./Tr. 804-275-2675
VA Springfield, Crossroads Elctrns. 703-931-0600
WA Bellevue, Almac Elctrns. DKM Co. 206-643-9992
WA Seattle, R. V. Weatherford 206-575-1340
WA Seattle, Radar Elec. 206-282-2511
WA Seattle, Zephyr Elctrn. Sls. 206-241-1980
WI Milwaukee, Industrial Elctrns., Inc. 414-276-1212
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI Oshkosh, Electronic Inds., Inc. 414-235-8930
Can Mississauga, Ont., Rush Elctrns. 416-677-7280
Can Pointe Claire, Que., Future Elctrns. 514-694-7710

Paine®

PAINE INSTRS., 2401 S. Bayview St., Seattle, WA 98144, Tel: 800-426-0366, TWX: 910-444-2164; FSC No.: 13624; Empl.: 69; *Sls. Mgr.:* R. E. Helmick ..... **B•1823**

Local Sales Offices & Reps

CA Laguna Hills, Elotek Sys., Inc. 714-830-4856
CO Boulder, A. Bissell Co. Indl. Sls. 303-444-1173
FL Orlando, Physimetrics, Inc. 305-894-8081
GA Atlanta, Physimetrics, Inc. 404-955-0155
IL Lansing, Van Meter Instrs., Inc. 312-474-3580
IN Indianapolis, Carter, McCormic & Peirce, Inc. 317-844-4175
MD Rockville, Electronic Mktg. Assocs., Inc. 301-744-7700
MI Farmington Hills, W. R. Hummon & Assocs., Inc. 313-474-0661
NJ Plainfield, Cosine, Inc. 201-654-3551
NM Albuquerque, Burt Dieruf Assocs. 505-299-0989
NY Clark Mills, KLM-Garner 315-853-6126
NY N. Syracuse, KLM-Garner 315-458-6214
NY Pittsford, KLM-Garner 716-381-8350
NC Concord, Physimetrics, Inc. 704-788-1317
OH Englewood, Carter, McCormic & Peirce, Inc. 513-836-0951
OH Fairview, Carter, McCormic & Peirce, Inc. 216-799-5100
PA Monroeville, Carter, McCormic & Peirce, Inc. 412-372-4415
TX Houston, Scientific Sls. Co. 713-460-9170
TX Richardson, Scientific Sls. Co. 214-231-6541
WA Seattle, Paine Instrs., Inc. 206-723-1705
Can Burlington, Ont., Panacon Control Sys., Inc. 416-336-7139
Can Richmond, B.C., Maxwell Morton Assocs., Ltd. 604-273-1337

PAK-TRONIC, See Tracor Paktronics

PALADIN, 3543 Old Conejo Rd., Newbury Park, CA 91320, Tel: 805-499-0318, Telex: 910-494-2799; Empl.: 9; *Sls. Mgr.:* Ronald Vogel

PALL ULTRAFINE FILTRATION CORP., 2200 Northern Blvd., East Hills, NY 11548, Tel: 516-484-5400, Telex: 968855, TWX: 510-223-0606; Empl.: 3500; *Sls. Mgr.:* Alison Ray; *Dist. Mgr.:* Fred Nordhauser

PALOMAR ENGRS., Box 455, Escondido, CA 92025, Tel: 619-747-3343; Empl.: 9

PAMOTOR, 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-347-1203, TWX: 910-374-2353; Empl.: 35; *Sls. Mgr.:* F. L. Nelson; *Dist. Mgr.:* F. L. Nelson

PAMRAN, 1101 Cedar Creek, Racine, WI 53402, Tel: 414-639-9076; Empl.: 28; *Sls. Mgr.:* R. C. Pfeil

PANAMETRICS, 221 Cresent St., Waltham, MA 02254, Tel: 617-899-2740, Telex: 6817337, 951006; Empl.: 200; *Sls. Mgr.:* Bob Mel

PANASONIC, IND'L. ELCTRN. COMPS., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094, Tel: 201-348-7000, Telex: 701 992-8920; Empl.: 25 ..... **D•1422-1427**

Local Sales Offices & Reps

AZ Phoenix, Dar-C 602-991-0110
FL Fern Park, S.E.C. 305-781-4800
FL Lighthouse Pt., S.E.C. 305-781-4800
MI Brighton, A.P. Assocs. 313-229-6550
MI Holland, AP Assocs. 800-624-5496
OH Dublin, AP Assocs. 800-624-5496
OH Fairview Park, AP Assocs. 800-624-5496
OH Lorain, AP Assocs. 800-624-5496
PA Eastern PA, Comtek 609-235-8505
PA Western PA, AP Assocs. 800-624-5496

Local Distributors

AZ Scottsdale, Electro Mktg. 602-991-0110
CO Colorado Springs, C.M.T. 303-598-6888
NJ Clifton, Engineered Assem. 201-340-0600
OR Wilsonville, Micro Power 503-694-2888

PANAVISE PRODS., 2850 E. 29th St., Long Beach, CA 90806, Tel: 213-595-7621, Telex: 18-2135; Empl.: 29; *Sls. Mgr.:* Michael Steffen; *Dist. Mgr.:* Michael Steffen

PANDUIT CORP., 17301 Ridgeland Ave., Tinley Park, IL 60477-0981, Tel: 312-532-1800, Telex: 25-4560; FSC No.: ;06383; Empl.: 1200 ..... **C•1474-1476, 1888-1891**

Local Sales Offices & Reps

AL Birmingham, Frank Parker & Assocs. .. 205-853-3152
AK Anchorage, Bar Elec. Agt. 907-345-7281
AZ Phoenix, Panduit Corp. 602-861-3969
AR Little Rock, Byron Carson Co. 501-568-6798
CA Los Altos, Ewing-Foley 415-941-4525
CA San Diego, Tak Sls. Co. 619-287-6141
CA Santa Ana, Panduit Corp. 714-546-5700
FL Lakeland, Panduit Corp. 813-665-5850
GA Atlanta, Panduit Corp. 404-256-5940
HI Honolulu, Agencies Co./Pacific 808-359-8343
IN Fort Wayne, Panduit Corp. 219-424-4082
IN Indianapolis, Panduit Corp. 317-251-8332
IA Des Moines, Panduit Corp. 515-280-8343
KS Kansas City, Panduit Corp. 913-764-7170
KY Louisville, A. L. Pickens Co. 502-491-4215
LA New Orleans, Wells-Keown & Assocs. 504-244-0330
MD Landover, Agency Group, Inc. 301-773-9292
MI Fraser, Panduit Corp. 313-791-1700
MI Grand Rapids, Panduit Corp. 616-942-0420
MN Minneapolis, Electric Comp. Sls. 612-933-2594
MO St. Louis, Panduit Corp. 314-894-7800
NH Salem, Sales Eng. Co. 603-893-5521
NY Niagara Falls, Panduit Corp. 800-532-4439
NC Winston-Salem, L. G. White Southern 919-725-3612

OH Cincinnati, Panduit Corp. 513-874-0660
OH Cleveland, Panduit Corp. 216-835-2050
OH Columbus, Panduit Corp. 614-262-6052
OK Tulsa, Panduit Corp. 918-745-1420
OR Portland, Panduit Corp. 503-654-9455
PA Carnegie, Myles F. Smith & Assoc. 412-276-5363
PA Erie, Myles F. Smith & Assocs. 814-459-7464
PA Glenside, Kunz, Powell & Assoc. 215-224-2434
SC Greenville, L. G. White Southern 803-271-0630
TN Knoxville, Panduit Corp. 615-588-2476
TN Memphis, Byron Carson Co. 901-276-0614
TN Nashville, Panduit Corp. 615-871-0732
TX Dallas, Panduit Corp. 214-620-7713
TX Houston, Panduit Corp. 713-580-0100
TX San Antonio, Panduit Corp. 512-656-2208
VA Richmond, L. G. White Southern 804-740-7093
WA Bellevue, Panduit Corp. 206-454-7267
WV Dunbar, Myles F. Smith & Assoc. 304-768-9910
WI Appleton, H. Mercer Co. 414-739-6223
PR Santurce, L. Gandia & Assocs. 809-725-3473

PANEL COMPONENTS CORP., P.O. Box 6626M, Santa Rosa, CA 95406, Tel: 707-523-0600, Telex: 176-747; Empl.: 18 ..... **B•1254-1255; C•1478-1482, 1892-1893**

Local Sales Offices & Reps
AL Huntsville, DHR Mktg. Inc. 205-533-5165
CA Santa Clara, Ross Mktg. Assoc. 408-988-8111
CA Tustin, Schoenbachler-Dobson Co. ... 714-544-1888
CO Englewood, Omega Ltd. 303-762-1921
GA Atlanta, DHR Mktg., Inc. 404-451-9848
IL Northbrook, Raines & Assocs. 312-498-0890
IA Marion, M-S-B Assocs., Inc. 319-377-6261
KS Shawnee Mission, M-S-B Assocs., Inc. 913-432-2131
MA Lexington, Zieco 617-861-8300
MN St. Paul, Arkco Sls. 612-777-7454
MO St. Charles, M-S-B Assocs., Inc. 314-946-5577
NY Great Neck, Tylinski Assocs. 516-466-9070
NY Rochester, Lloyd Hart Assocs. 716-244-3253
NC Raleigh, DHR Mktg., Inc. 919-876-5450
OH Cleveland, K-T Depco 216-442-6200
OR Portland, Earl & Brown Co. 503-245-2283
PA Doylestown, T.O.E. Sls. 215-348-2212
PA Pittsburgh, K-T Depco 412-367-1011
SC Greenville, DHR Mktg. Inc. 803-235-3594
TX Lewisville, Jim Hughes Co. 214-221-1536
TX Stafford, Jim Hughes Co. 713-343-0673
WA Seattle, Earl & Brown Co. 206-284-1121
Can Ottawa, Ont., Lloyd Ellam Assocs. 613-224-1720

PANEL CONTROLS, 1000 Mt. Elliott Ave., Detroit, MI 48207, Tel: 313-568-2400; Empl.: 24

PANELGRAPHIC CORP., 10 Henderson Dr., W. Caldwell, NJ 07006, Tel: 201-227-1500, TWX: 710-734-4367; FSC No.: 52657; Empl.: 100

PAN-MAG

PAN-MAGNETICS INTL., INC., 455-A Carson Plaza Dr., Carson, CA 90746, Tel: 213-532-1790, Telex: 664-759; *Sls. Mgr.:* W. Dull ... **A•1265, 2213-2220; D•1742-1743**

Local Sales Offices & Reps
AZ Scottsdale, E.D.P. & Assocs. 602-991-6119
CT Marlborough, Precision Sls. 203-295-0580
GA Norcross, Dixie Tech. Mktg., Inc. 404-447-6832
IN Kokomo, Schillinger Assocs., Inc. 317-452-4057
KS Overland Park, Electri-Rep 913-649-2168
MD Towson, Electronic Comp. Mktg. 301-321-8611
MA Newton, Precision Sls. 617-969-0594
MN Minneapolis, DeBeck-Hays Assocs. ... 612-835-3610
MO Maryland Heights, Electri-Rep, Inc. 314-878-8209
NC Raleigh, Dixie Tech. Mktg., Inc. 919-878-0909
OR Tigard, Electronic Sources 503-684-0040
WA Bellevue, Electronic Sources 206-643-0400

PANNIER CORP., Graphics Div., John Fitch Industrial Park, Warminster, PA 18974, Tel: 215-672-3600; Empl.: 45; *Sls. Mgr.:* Barry Stefaniw

PAPST MECHATRONIC CORP., Aquidneck Indl. Pk., Newport, RI 02840, Tel: 401-849-5930, Telex: 952092; *Sls. Mgr.:* Emanuel V. Lauria

PARABAM, INC., 3017 E. Las Hermanas St., Rancho Dominguez, CA 90221, Tel: 213-537-1771; Empl.: 85

PARAGON ELECT., 606 Parkway Blvd., Two Rivers, WI 54241, Tel: 414-793-1161, Telex: 26-3450; Empl.: 1000; *Sls. Mgr.:* Don Karman

PARALINE
TRANSFORMER SPECIALISTS

PARALINE TRANSFORMER CORP., 511 South Palm Ave., Alhambra, CA 91803, Tel: 818-281-0222; FSC No.: 59465; Empl.: 52 ..... **A•2221-2225**

PARAMOUNT TUBE, INC., 1430 Progress Rd., Ft. Wayne, IN 46808, Tel: 219-484-4111; Empl.: 46; *Sls. Mgr.:* D. L. Gibson

PARKER HANNIFIN CORP., 17325 Euclid Ave., Cleveland, OH 44112, Tel: 216-531-3000, Telex: 980636

PARKER MCCRORY MFG. CO., 2000 Forest Ave., Kansas City, MO 64108, Tel: 816-221-2000; *Sls. Mgr.:* Ken Turner; *Dist. Mgr.:* Ken Turner

PARKER SEAL GRP., P.O. Box 11751, Lexington, KY 40512, Tel: 606-269-2351; Empl.: 2,200; *Sls. Mgr.:* Frank Chesnik

PARLEX CORP., 145 Milk St., Methuen, MA 01844, Tel: 617-685-4341, ext. 325, TWX: 710-342-1528; Empl.: 600; *Sls. Mgr.:* Valerie Mickalide

PARSONS MFG., 1055 O'Brien Dr., Menlo Park, CA 94025, Tel: 415-324-4726, TWX: 910-373-2106; Empl.: 85; *Sls. Mgr.:* C. E. Plummer

PASO SOUND PRODS., 14 First St, Pelham, NY 10803, Tel: 914-738-4800, Telex: 646783 Paso Pelm; Empl.: 50; *Sls. Mgr.:* David Moore

Local Sales Offices & Reps
CA West Covina, Don Forth Assocs. 818-919-2322
CT Greenwich, Miller Assoc. 203-869-7793
FL Hialeah, Miguel A. Lopez 305-822-6853
FL Pembrook Pines, World Wide Prods., Inc. 1-800-223-5651
GA Marietta, Dewitt Austin Co. 404-926-4943
IL Arlington Heights, Brainard Wilson Mktg. 312-437-2700
IN Carmel, Brainard Wilson Mktg. 317-844-2800
MA Braintree, Anderson Sls. Assocs. 617-848-9194
MN Moorhead, Northland Assocs. 218-233-4616
NJ Moorestown, Piper Mktg. 609-235-8006
NY Liverpool, Jack Mesnick Sls. 315-622-3211
NC Charlotte, De Witt Austen Co. 704-334-0174
OH Medina, J. H. Podolny Co. 216-725-8814
PA Pittsburgh, James Podolny Co. 412-353-5877
TN Memphis, Electronic Sls. Co. 901-682-2281
VA Ashland, Piper Mktg. 804-798-9299
WI Waukesha, Brainard Wilson Mktg. 414-255-3400
Can Toronto, Paco Elctrns. 416-475-0740

PASS & SEYMOUR, INC., P.O. Box 4822, Syracuse, NY 13221, Tel: 315-468-6211, Telex: 93-7232; *Sls. Mgr.:* Kenneth Hooper

PATHCOM, INC., Pace Two-Way Radio Prods., 24105 S. Frampton Ave., Harbor City, CA 90710, Tel: 213-325-1290; Empl.: 600

PATTON-MACGUYER INC., 17 Virginia Ave., Providence, RI 02905, Tel: 401-941-6000; FSC No.: 77147; Empl.: 55; *Sls. Mgr.:* J. Allen

Local Sales Offices & Reps
CA Mission Viejo, Coastline Connectors .. 714-859-7878
GA Cumming, Reno Ivy & Assocs. 404-887-4533
MI Farmington, Lloyd George & Assocs. 313-474-1505
MO Lee's Summit, MYA Midwest Inc. 816-525-1290
NC Greensboro, Manufacturers Sales 919-274-2474
OH Chesterland, P.M.S. Associates 216-729-2248
RI Providence, Patton-MacGuyer Inc. 401-941-6000

PAYNE ENGRG., Box 70, Scott Depot, WV 25560, Tel: 304-757-7353, Telex: 88-5452; Empl.: 40; *Sls. Mgr.:* Matthew J. Gilberto; *Dist. Mgr.:* Diane Nelson

PCA ELECTRONICS INC.
28 SMD 3/85

PCA ELCTRNS., 16799 Schoenborn St., Sepulveda, CA 91343, Tel: 818-892-0761, Telex: 67-4681, TWX: 910-496-1525; FSC No.: 97722; Empl.: 45; *Sls. Mgr.:* Ben Weinberg ..... **A•1556-1566**

Local Sales Offices & Reps
AZ Phoenix, Toward Engrg. Assocs. 602-955-3193
CA San Diego, Littlefield & Smith Assoc. .. 619-455-0055
CA Santa Clara, Fahrner-Miller Assocs. ... 408-727-9800
FL Boca Raton, Lawrence Assocs. 305-368-7373
FL Clearwater, Lawrence Assocs. 813-584-8110
IL Westchester, W. G. Brouillette & Assocs. 312-345-6500
MA Southboro, KSA of New England 617-485-9432
MN Minneapolis, Bill Deming and Assocs. 612-888-5000
NJ Wayne, Howard Kagan Assocs. 201-694-1115
OH Cleveland, Weschler Elec. Corp. 216-238-2550
OR Portland, Elctrn. Comp. Sls. 503-245-2342
TX Dallas, Blackburn Assocs. 214-692-8885
TX Houston, Blackburn Assocs. 713-463-1354
UT Salt Lake City, Sage Sls. 801-467-5451
VA Front Royal, Eltron Sls., Ltd. 702-635-7201
WA Mercer Island, Elctrn. Comp. Sls. 206-232-9301
WA Seattle, Elctrn. Comp. Sls. 206-232-9301

PCB
PIEZOTRONICS

PCB PIEZOTRONICS, 3425 Walden Ave., Depew, NY 14043-2495, Tel: 716-684-0001, TWX: 710-263-1371; Empl.: 110; *Sls. Mgr.:* Roy Maines

Local Sales Offices & Reps
CA Alhambra, Dale-Dahl Assocs. 213-682-3417
CA Walnut Creek, Dale-Dahl Assocs. 415-933-9595
CT Hamden, Northeast Engrg. 203-248-4481
FL Orlando, Microspec, Inc. 305-299-6508
GA Lilburn, Microspec, Inc. 404-921-3840
IL Crystal Lake, ITI Systems 815-455-1411
MD Dayton, Gans-Pugh Assocs. 703-527-3262
MA Danvers, Northeast Engrg. 617-774-3010
MI Farmington, Carter, McCormic & Peirce 313-477-7700
MO St. Louis, Adelphi, Inc. 314-821-1232
NM Albuquerque, Rustco Entprs. 505-292-2741
NY Manhasset, Northeast Engrg. 516-365-9633
NY Syracuse, Labtronics, Inc. 315-455-7314
OH Englewood, Carter, McCormic & Peirce 513-836-0951
OH Fairview Pk, Carter, McCormic & Peirce 216-779-5100
PA Chester Springs, Letronix 215-458-8977
PA Monroeville, Carter, McCormic & Peirce 412-372-4415
SC Rock Hill, Microspec, Inc. 803-366-3015
TN Nashville, Microspec, Inc. 615-383-4064
TX Dallas, Techn. Prods. 214-357-9603
TX Houston, Techn. Prods. 713-493-6520
UT Logan, Western Mktg. Assocs. 801-753-0073
VA Arlington, Gans-Pugh Assocs. 703-527-3262
WA Seattle, Brett Assocs. 206-431-8090

PC INTERNATIONAL, 4400 MacArthur Blvd., Newport Beach, CA 92660, Tel: 714-476-1020

PCK ELASTOMERICS, INC., Kollmorgen Corporation, 333 Byberry Road, Hatboro, PA 19040, Tel: 215-672-0787, 215-672-4741, TWX: 510-387-236; FSC No.: 64914; *Sls. Mgr.:* Thomas G. Campbell; *Dist. Mgr.:* John Seibert ..... **C•1483**

Local Sales Offices & Reps
AZ Scottsdale, TC Elctrn. Sls., Inc. 602-994-5153
CA Fullerton, Libratronix 714-871-1513
CA Mountain View, Marquez & Assocs. ... 415-966-1012
CT South Dartmouth, Kentronics 617-999-2188
FL Coral Springs, Janco Resch. & Sls. Co. 305-755-0631
ID Spokane, L. D. Elctrns. 509-922-0883
IL Arlington Heights, Coombs Assocs., Inc. 312-439-9810
IN Ft. Wayne, Coombs Assocs., Inc. 219-747-4017
IA Cedar Rapids, Coombs Assocs., Inc. .. 319-362-4116

MA Wakefield, Kentronics 617-246-0245
MI Troy, C. B. Jensen & Assocs. 313-643-0506
MN Brooklyn Center, William Assocs. 612-566-5010
NJ Madison, Livera-Polk Assocs., Inc. 201-377-3220
NY Glen Head, Livera-Polk Assocs., Inc. .. 516-759-9300
OR Beaverton, L. D. Elctrns. 503-649-8556
WA Snohomish, L. D. Elctrns. 206-568-0511
WI Milwaukee, Coombs Assocs., Inc. 414-351-6123

PCK TECHNOLOGY DIV., Kollmorgen Corp., 322 South Service Rd., Melville, NY 11747, Tel: 516-454-4400, Telex: 6852163, TWX:; Empl.: 250; *Sls. Mgr.:* J. F. Dennis-Browne

PCM-PAC CYBER-METRIC, 6800 Sierra Ct., Dublin, CA 94568, Tel: 415-829-8700, TWX: 910-389-6890; Empl.: 19; *Sls. Mgr.:* T. J. Netoff

PC TRANSFORMER CORP., 64 D Nancy St., West Babylon, NY 11704, Tel: 516-491-3300; FSC No.: 62281; Empl.: 11; *Sls. Mgr.:* Stanley L. Goldstein ..... **A•2226-2229**

PEARSON ELCTRNS., 1860 Embarcadero Rd., Palo Alto, CA 94303, Tel: 415-494-6444, Telex: 171-412; FSC No.: 05280; Empl.: 23; *Sls. Mgr.:* Patricia L. Pearson ..... **A•2230**

PECA, INC., 592 Winks Lane, Bensalem, PA 19020, Tel: 215-245-1550; Empl.: 30; *Sls. Mgr.:* Jean Douglass

PENFIELD, INC., West & W. Main Sts., Plantsville, CT 06479, Tel: 203-621-9141; Empl.: 25

PENN AIRBORNE PRODS., Industrial Hwy., Southampton, PA 18966, Tel: 215-355-3400, Telex: 834759; FSC No.: 25805; Empl.: 25; *Sls. Mgr.:* W. Williams

PENN ENGRG. & MFG., P.O. Box 1000, Danboro, PA 18916, Tel: 215-766-8853; FSC No.: 46384; Empl.: 480; *Sls. Mgr.:* John E. O'Brien

PENN FIBRE & SPEC., 4343 "G" St., P.O. Box 4890A, Philadelphia, PA 19124, Tel: 215-288-7366; Empl.: 66; *Sls. Mgr.:* L. C. Jones

PENN KEYSTONE CORP., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492, Tel: 203-269-8701, Telex: 96-3485, TWX: 710-476-1397; FSC No.: 03034; *Sls. Mgr.:* Jack Fitzgerald

PENN RESCH. CORP. (PRC), 2652 South Main St., P.O. Box 3357, Kennesaw, GA 30144, Tel: 404-429-9061, Telex: 753010; *Sls. Mgr.:* Wallace Hundley

PENN-TRAN

PENN-TRAN CORP., Box 1321, Rte. 144N, Wingate, PA 16880, Tel: 814-355-1521, Telex: 706473; FSC No.: 50783; Empl.: 115; *Sls. Mgr.:* William Holt ..... **A•1266, 2231; D•1741**

Local Sales Offices & Reps
AZ Tempe, Systems Sls. of Arizona 602-829-9338
CA Los Altos, Cain-White & Co. 415-948-6533
CA Pasadena, A-F Sls. Engrg., Inc. 213-681-5631
CO Englewood, Dynatech, Inc. 303-773-2830
CT Madison, United Comp. 203-245-4810
IN Ft. Wayne, Aktron 219-747-3650
MN Minneapolis, International Sls. Co. 612-831-8423
NM Albuquerque, Systems Sls. of New Mexico 505-881-8877
NY Mendon, Tech-Mark, Inc. 716-624-3840
NC Raleigh, DHR Mktg., INc. 919-876-5450
OR Portland, Intertech Sls. 503-775-3390
PA Glenside, Koebert Assocs., Inc. 215-887-2310
UT Layton, Dynatech, Inc. 801-546-4837
VA Front Royal, Eltron Sls., Ltd. 703-635-7201

PENNTUBE PLASTICS, Madison Ave. & Holly St., Clifton Heights, PA 19018, Tel: 215-622-2300, Telex: 845-212; Empl.: 145

PENN VIDEO INC., 929 Sweitzer Ave., Akron, OH 44311, Tel: 216-762-4840, Telex: 98-6327 PVI-AKR; Empl.: 40; *Sls. Mgr.:* Sandra Donaldson; *Dist. Mgr.:* Chris Abrams

PENNWALT CORP., Three Pkwy., Philadelphia, PA 19102, Tel: 215-587-7520, TWX: 215-569-9748

PENRIL DATACOMM, Penril Corp., 207 Perry Parkway, Gaithersburg, MD 20877, Tel: 301-921-8600, TWX: 710-828-0522; Empl.: 250; *Sls. Mgr.:* David L. Johnson

PERCON, 2190 W. 11th, Eugene, OR 97402, Tel: 503-344-1189; Empl.: 9; *Sls. Mgr.:* Peter Harnack; *Dist. Mgr.:* Peter Harnack

PERFECT GEAR & INSTR., 2101 Jericho Tpk., New Hyde Park, NY 11040, Tel: 516-328-3300, TWX: 510-223-0642; Empl.: 210; *Sls. Mgr.:* Murray Ores

PERFECTION MICA CO., see Magnetic Shield Div.

PERFORMANCE CONTROLS INC., 333-E Byberry Rd., Hatboro, PA 19040, Tel: 215-675-6500, Telex: 881478; FSC No.: 61773; Empl.: 30; *Sls. Mgr.:* M. Edward Wokulich ..... **B•1178**

PERIPHERALS, 3001 Red Hill, Bldg. 6, Ste. 107, Costa Mesa, CA 92626, Tel: 714-540-4925

PERITEK CORP., 5550 Redwood Rd., Oakland, CA 94619, Tel: 415-531-6500, TWX: 910-366-2029; *Sls. Mgr.:* John Brogan

PERKIN-ELMER

PERKIN-ELMER CORP., Elctrn. Prods. Dept., Main Ave., Norwalk, CT 06856, Tel: 203-762-4786, TWX: 710-468-3213; Empl.: 70; *Sls. Mgr.:* D. P. Duggan ...**A•2232**

Local Sales Offices & Reps
CA Encino, C.D.H. Assocs. 213-707-1970

PERMAG, 400 Karin La., Hicksville, NY 11801, Tel: 516-822-3311, TWX: 710-581-5264; Empl.: 50

PERMAGILE-SALMON LTD., Insulcast Div., 101 Commercial St., Plainview, NY 11803, Tel: 516-349-1100, Telex: 221720 PERM UR; *Dist. Mgr.:* Edward R. Salmon

Local Sales Offices & Reps
FL Boca Raton, Olson Assocs. 305-368-1845
IL Chicago, Karl D. Engle Co., Inc. 312-539-1820
NC Raleigh, DHR Mktg., Inc. 919-781-1961

Local Distributors
AZ Phoenix, The Advance Grp. 602-437-1334
CA Anaheim, The Advance Grp. 714-870-0300
CA Belmont, The Advance Grp. 415-592-4550
CO Denver, The Advance Grp. 303-388-0923
FL Boca Raton, Olson Assocs. 305-368-1845
NC Raleigh, Southeastern Elctrns. 919-828-2311
OH Canal Winchester, Rudolph Bros. 614-833-0707
OH Dayton, Electro Supp. 513-299-5020
TX Houston, The Advance Grp. 713-956-5436
WA Seattle, The Advance Grp. 206-575-4323

PERMALUSTER, INC., 1844 N. Keystone St., Burbank, CA 91504, Tel: 213-849-4543; Empl.: 9; *Sls. Mgr.:* J. Ross

PERMANENT MAGNET, 4437 Bragdon St., Indianapolis, IN 46226, Tel: 317-547-1336; Empl.: 85; *Sls. Mgr.:* Jack Amigh

PERMA POWER ELCTRNS., 5615 W. Howard Ave., Chicago, IL 60648, Tel: 312-647-9414; Empl.: 52; *Sls. Mgr.:* Michael Shatz; *Dist. Mgr.:* Michael Shatz .....**B•1256; C•1690-1691**

Local Sales Offices & Reps
AR El Dorado, D. Bellew Sls. 214-373-4590
CA San Francisco, Techn. Sls. 415-467-1434
CA Sun Valley, Tegni-Rep 213-768-4223
CO Denver, Stan Sliz & Assoc. 303-666-4760
MA Wolburn, W & D Mktg. 617-935-5610
IN Indianapolis, Green-Wissler 317-872-9981
MI Plymouth, J. Malcolm Flora 313-453-4296
MN St. Paul, R. W. Sls. 612-646-2710
MO Jefferson City, C. A. Vignola 314-636-3121
NJ Marlton, Fahy Mktg. 609-983-2366
NY Phelps, L. S. M. Assocs. 315-548-4891
NY Plainview, Landau & Mack 516-293-3310
NC Greensboro, Adams & Assocs. 919-272-6838
OH Stow, J. Lehner Co. 216-686-1965
TX Dallas, Berthold Sls. 214-328-0067
WA Seattle, Northmar, Inc. 206-524-5170
EXP N.Y., Plainview, Morhan Export. 516-293-5582

PERRY AMPLIFIER, 138 Fuller St., Brookline, MA 02146, Tel: 617-734-0844; Empl.: 18; *Sls. Mgr.:* N. Geskos

PERSONAL MICRO COMPUTERS, 275 Santa Ana Ct., Sunnyvale, CA 94086, Tel: 408-737-8441, TWX: 910-379-5022

PERTEC PERIPHERALS CORP., P.O. Box 2198, Chatsworth, CA 91311, Tel: 818-882-0030, TWX: 910-494-2093; Empl.: 650; *Sls. Mgr.:* Bernie Kallai

PERVEL INDS., INC., Bemis, P.O. Box 61, Community Ave., Plainfield, CT 06374, Tel: 203-564-2741, Telex: 966450; Empl.: 350; *Sls. Mgr.:* Rick Arnold

PFC, See Southern Elctrns. Co. Inc.

PHALO CORP., Transitron Elctrn. Corp., 2 Friberg Parkway, Westborough, MA 01581, Tel: 617-366-0830, Telex: 92-0416, TWX: 710-392-1383; Empl.: 450

PHAOSTRON INSTRUMENT & ELECTRONIC CO., 151 Pasadena Ave., South Pasadena, CA 91030, Tel: 213-255-1471

PHELPS DODGE CABLE & WIRE, Box 2100, Greenwich, CT 06836, Tel: 203-625-3200, TWX: 710-560-0006; Empl.: 750; *Sls. Mgr.:* T. P. Reilly

PHELPS DODGE INTL., 2121 Ponce de Leon Blvd., Ste. 850, Coral Gables, FL 33134, Tel: 212-775-1395, 800-221-3333

PHELPS DODGE MAGNET WIRE, P.O. Box 600, Ft. Wayne, IN 46801, Tel: 219-456-4444, TWX: 810-332-1501; *Sls. Mgr.:* G. H. Guyer; *Dist. Mgr.:* W. H. Deininger

PHILADELPHIA INSULATED WIRE CO. INC., 333 New Albany Rd., Moorestown, NJ 08057, Tel: 609-235-6700, TWX: 710-897-0187; Empl.: 110; *Sls. Mgr.:* Fred Newman

PHILAMON, INC., 33 Dubon Ct., Farmingdale, NY 11735, Tel: 516-249-2700, TWX: 510-224-6512; FSC No.: 95267; Empl.: 27; *Sls. Mgr.:* B.F. Grib

PHILIPS AUDIO VIDEO SYS. CORP., See AKG Acoustics

PHILIPS ECG, See Sylvania Electronic Components

PHILIPS ECG, INC., 100 First Ave., Waltham, MA 02254, Tel: 617-890-6107; Empl.: 600; *Sls. Mgr.:* D. R. Kronenwetter; *Dist. Mgr.:* E. H. Frost

PHILIPS ELECTRONICS, LTD., Crystal Dept., 601 Milner Avenue, Scarborough, Ontario, Can. M1B 1M8, Tel: 416-292-5161, Telex: 065-25100, TWX: 610-492-0483; Empl.: 40; *Sls. Mgr.:* Mr. Jack F. Gehrels

Local Sales Offices & Reps
CA El Segundo, Fetty/Schoenduve, Inc. .. 213-322-4991
FL Pompano Beach, Technology Mktg. Assocs. 510-955-9854
NY Great Neck, Tylinski Assocs., Inc. 516-466-9070

PHILIPS ELMET, 1560 Lisbon Rd., Lewiston, ME 04240, Tel: 207-784-3591, TWX: 710-223-0675; Empl.: 250

PHILIPS TELEVISION SYS., INC., P.O. Box 618, 900 Corporate Dr., Mahway, NJ 07430, Tel: 201-529-1550, Telex: 37-62558; *Sls. Mgr.:* Warren Anderson, Dir. of Mktg.

PHILIPS TEST & MEASURING INSTRS., 85 McKee Dr., Mahwah, NJ 07430, Tel: 201-529-3800; Empl.: 70; *Sls. Mgr.:* Bob Hynes

PHILMORE MFG., 40 Inip Dr., Inwood, NY 11696, Tel: 516-239-6161; Empl.: 22

PhiTech.

PHI TECHNOLOGIES, INC., 4605 North Stiles, Oklahoma City, OK 73105, Tel: 405-521-9000, TWX: 901-831-3286; Empl.: 60; *Sls. Mgr.:* Gary Zebrowski ..... **D•1052-1054**

PHOENIX CONTACT, 1900 Greenwood St., Harrisburg, PA 17104, Tel: 717-232-0500, TWX: 510-650-4913; *Sls. Mgr.:* Howard C. Minnick, Jr.; *Dist. Mgr.:* Mark F. Gilliford ..... **C•1484-1488**

Local Sales Offices & Reps

AZ Scottsdale, Mahaffey & Assocs. Inc. ... 602-991-9790
CA Fremont, Vontek ... 415-651-7966
CA Pasadena, Luscombe Engrg. Co. ... 213-684-2000
CA San Diego, Luscombe Engrg. Co. ... 619-295-4300
CO Denver, Spectrum Sls. ... 303-696-1601
CT Bloomfield, Zaslow Sls. Co. ... 203-242-7781
FL Tampa, J-R Controls ... 813-961-9478
GA Atlanta, C.S.R Elctrns. ... 404-396-3720
IL Mt. Prospect, Magnuson Assocs./Magnuson Elctrns. ... 312-956-0700
KS Merriam, Mid-West Tech. Sls. ... 913-236-8557
MD Baltimore, McCourt Co., Inc. ... 301-747-0044
NJ Rockaway, R.O.I. Sls. Co. ... 201-627-8879
NY North Syracuse, Lachut Electrical Sls. ... 315-422-2575
NC Charlotte, Mec-Tric Control Co. ... 704-376-8555
OH Medina, J. C. Hofstetter Co. ... 216-241-4880
PA Carnegie, Brown-Yates Electrical Equip. Co. ... 412-279-1101
PA Willow Grove, Jacobson-Rodger Assocs. ... 215-657-4300
TX Dallas, Lynn Elliott Co., Inc. ... 214-239-8533
TX Houston, Lynn Elliott Co., Inc. ... 713-499-1571
VA Richmond, McCourt Co., Inc. ... 804-741-3253
WA Bellevue, Comtec ... 206-453-1188

Local Distributors

AZ Phoenix, Sterling Elctrns. ... 602-2121
CA Concord, Omega Supp. ... 415-671-7796
CA Duarte, Nelson West Coast, Inc. ... 213-303-1526
CA Gardenia, Cal Switch ... 213-770-2330
CA Riverside, Elctrn. Supply Co. ... 714-683-7300
CO Englewood, E & M Sls., Inc. ... 303-761-6202
CT Wallingford, Sager Electrical ... 203-265-4600
FL Lakeland, A-A Elec. ... 813-665-6941
GA Atlanta, A-C Equip. ... 404-451-2747
GA Norcross, Mayer Elec. Supp. Co. ... 404-447-6800
IL Lombard, MacGregor & Co. Inc. ... 312-629-5752
IN Carmel, Altex Elctrns. ... 317-848-1323
LA Baton Rouge, Ralph's Indl. Elctrns. ... 504-344-3761
LA Lafayette, Ralph's Indl. Elctrns. ... 318-234-4507
MD Baltimore, A.I.C. ... 301-747-0044
MA Hingham, Sager Electrical ... 617-749-6700
MI Roseville, Madison Elec. ... 313-778-7640
MO St. Charles, Lectronix Inc. ... 314-946-6424
NJ East Rutherford, A-A Elec. ... 201-777-5477
NJ Pennsauken, Resco Elctrns. ... 609-662-4000
NY Orchard Park, Park Elec. ... 716-662-7070
NY Rochester, Rochester Radio ... 716-454-7800
NY Syracuse, Salmon Motor Repair ... 315-455-7924
NC Charlotte, Dixie Elctrns. ... 704-377-5413
NC Gastonia, JMT Elctrns. & Controls, Inc. ... 704-867-4401
OH Cincinnati, Schuster Elctrns. ... 513-489-1400
OH Cleveland, Adcon Engrg. ... 216-238-3915
OH Twinsburg, Schuster Elctrns. ... 216-425-8134
OR Portland, North Coast Elec. ... 503-228-5111
OR Portland, United Radio Supp. ... 503-233-7151
PA Bradford, B-B Elec. Supp. Co. ... 814-368-4173
PA Pittsburgh, Grant Industrial Controls .. 412-787-9770
PA Reading, R.A.M. Motors and Controls ... 215-376-7102
SC Columbia, Dixie Elctrns. ... 803-779-5332
TX Dallas, Sterling Elctrns. ... 214-243-1600
TX Houston, General Elec. Supp. Co. ... 713-939-5100
TX Houston, Sterling Elctrns. ... 713-627-9800
TX Houston, Timers & Controls, Inc. ... 713-894-0714
UT Salt Lake City, Standard Supp. Co. ... 810-486-3371
VA Richmond, Sterling Elctrns. ... 804-226-2190
WA Spokane, North Coast Controls ... 509-922-1317
WI Cedarburg, A-A Elec.. ... 414-377-8000

PHOENIX DATA, INC., 3384 W. Osborn Rd., Phoenix, AZ 85017, Tel: 602-278-8528, TWX: 910-951-1364; Empl.: 55; *Sls. Mgr.:* Art Swiggers

PHOENIX MICROSYSTEMS, P.O. Box 4206, Huntsville, AL 35802, Tel: 205-881-2173, Telex: 752592; Empl.: 45; *Sls. Mgr.:* Mel Mayo

PHOENIX WIRE, INC., 100 Teflon Ave., S. Hero, VT 05486, Tel: 802-372-4561; Empl.: 25

Advertisement

MicroMiniature ****** High-Reliability Wires & Cables for Electronic, Medical, Mechanical & Packaging applications. Teflon Magnet Wire -- Twin & Tri-Lead In addition to its standard line of Micro Miniature Hook-up Wires, Flat & Twisted Cables, Phoenix Wire specializes in the Custom application of Teflon to Fine Wire. Wires .001 to .064 of any composition can be Insulated with less than .000025 to over .020 inches of True Concentric Teflon. ***** Also High Flexibility Wires *****

PHOTOBELL, 26 Just Rd., Fairfield, NJ 07006, Tel: 201-227-3613, TWX: 710-734-4387; Empl.: 50; *Sls. Mgr.:* Bernard M. Clongoli

PHOTO CHEM. PRODS. CAL., 18031 Susana Rd., Compton, CA 90224, Tel: 213-603-0400; FSC No.: 16339; Empl.: 65

PHOTOCIRCUITS GLEN COVE, DIV., KOLLMORGEN CORP., 31 Sea Cliff Ave., Glen Cove, NY 11542, Tel: 516-674-1303, TWX: 516-671-3155; Empl.: 850

PHOTOCIRCUITS RIVERHEAD DIV., KOLLMORGEN CORP., See Additive Products Div., Kollmorgen Corp.

PHOTODYNE INC.

PHOTODYNE, 1175 Tourmaline Dr., Newbury Park, CA 91320, Tel: 818-889-8770, Telex: 18-1159; FSC No.: 59912; Empl.: 48; *Sls. Mgr.:* Eamon Murphy; *Dist. Mgr.:* Eamon Murphy ... **B•1122-1123**

Local Sales Offices & Reps

AL Huntsville, JMS ... 205-533-5450
CA San Luis Obispo, Johnson Assocs. ... 213-670-4794
CA Sunnyvale, Ichirep Co. ... 408-249-2585
HI Honolulu, Data Mgt. Assn. ... 808-943-1944
IL Rosemont, Synmark Sls. Co. ... 312-825-3455
IN Ossian, Science Sls. ... 219-622-7383
MA Sudbury, Poulin Assocs. ... 617-443-7333
MN Minneapolis, All Phase Agency ... 612-835-4940
MO St. Louis, Engineering Svcs. Co. ... 314-997-1515
NJ Pennsauken, Scientific Reps. ... 609-662-5222
NM Albuquerque, Grady Moore Assocs. ... 505-262-1416
NY Plainview, Eastern Metro Assocs. ... 516-931-1414
NC Fayetteville, Zim-Tek ... 919-488-4101
OH Risingsun, Mecom Inc. ... 419-457-3231
TX Dallas, Southwestern Engrg. & Equip. Co. ... 214-340-1741
TX Houston, Southwestern Engrg. & Equip. Co. ... 713-820-2500
VA Fairfax, Scientific Assocs. ... 703-385-0600
WA Walla Walla, Northwest Tech. Co. ... 509-529-2051

PHOTON, INC., 14125 Capri Dr. # 4, Los Gatos, CA 95030, Tel: 408-866-0566, Telex: 17-1618 refer: Photon; Empl.: 12; *Sls. Mgr.:* John M. Fleischer

PHOTO RESCH., Kollmorgen Corp., 3000 N. Hollywood Way, Burbank, CA 91505, Tel: 818-843-6100, Telex: 69-1427; FSC No.: 92434; Empl.: 68; *Sls. Mgr.:* M. L. Woolsey

PHOTOSWITCH DIV., Electronics Corp. of Amer., 265 Winter St., Waltham, MA 02154, Tel: 617-466-8000; *Sls. Mgr.:* S. L. Davis

PHOTRONIC LABS., Secor Rd., Brookfield Ctr., CT 06805, Tel: 203-775-0465; Empl.: 55; *Sls. Mgr.:* Deno Macricostas

PHO-TRONICS, 8701 W. Bradley Rd., Milwaukee, WI 53224, Tel: 414-355-6704, TWX: 910-262-3099; Empl.: 85; *Sls. Mgr.:* John R. Henry

PIC DESIGN, P.O. Box 1004, Middlebury, CT 06762, Tel: 203-758-8272, TWX: 710-477-5234; Empl.: 150; *Sls. Mgr.:* Robert W. Westlake

PICKLES & TROUT, P.O. Box 1206, Goleta, CA 93116, Tel: 685-4641, TWX: 910-3341180; Empl.: 10; *Sls. Mgr.:* C. Pickles

PICO CRIMPING TOOLS, 9832 Jersey Ave., Santa Fe Springs, CA 90670, Tel: 213-723-2150; Empl.: 12

PICO ELCTRNS., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, Tel: 914-699-5514, 800-431-1064; FSC No.: 31669; *Sls. Mgr.:* Joe Sweeney ... **A•1267-1271, 2233-2255; D•1744-1751**

Local Sales Offices & Reps

AZ Scottsdale, Piper Sls. Co. ... 602-946-4437
CA Santa Clara, Fisher Assocs. ... 408-733-7350
CO Arvada, Piper Sls. Co. ... 303-420-4646
WA Seattle, W. Spaulding Co. ... 206-282-9173

PICONICS, 26 Cummings Road, Tyngsboro, MA 01879, Tel: 617-649-7501, Telex: 754759; FSC No.: 26618; Empl.: 48; *Sls. Mgr.:* I. Kadesh ... **A•1273, 1618, 1696**

Local Sales Offices & Reps

AZ Scottsdale, Semper-Fi Sls. ... 602-991-4601
CA N. Hollywood, Jewett Co. ... 213-789-8103
CA Palo Alto, J/M Assocs. ... 415-857-1260
CO Parker, Mikro Sls. Co. ... 303-841-4131
FL Lighthouse Point, R. C. Simon ... 305-941-2757
IL Chicago, Shaumberg Phoenix Co. ... 312-595-2300
MA Natick, Wayland Engrg. Sls. Co. ... 617-655-6080
MN Minneapolis, Peterson, Snater & Assocs. ... 612-944-0030
MO Grandview, Harris-Hanson Co. ... 816-763-6200
MO St. Louis, Harris-Hanson Co. ... 314-432-3611
NY Huntington, Regulus Indl. Sls. Co. ... 516-673-6252
NY Rochester, J. G. Welch Assocs. ... 716-244-1100
OH Cincinnati, G&H Sls. Co. ... 513-272-0580
PA Glenside, R. F. Koebert & Assocs. ... 215-887-2310
TX Ft. Worth, El-Tec Sls. ... 817-268-2896
VA Gladys, Ralley Entprs. ... 804-283-5656

PIEZO CRYSTAL, 100 "K" St., Box 619, Carlisle, PA 17013, Tel: 717-249-2151, TWX: 510-650-2280; Empl.: 250; *Sls. Mgr.:* Glen R. Kurzenknabe

PIEZO ELEC. PRODS., INC., 212 Durham Ave., CN-15, Metuchen, NJ 08840, Tel: 201-548-2800, TWX: 710-998-0592; Empl.: 125; *Sls. Mgr.:* Jack Gray ... **B•1768-1769**

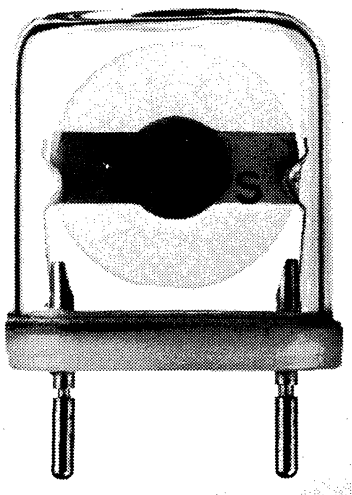
Local Sales Offices & Reps

IL Lisle, W-G Controls ... 312-963-5954
IN Ft. Wayne, Given Corp. ... 219-432-5585
PA Harleysville, Thomas Jackson Assocs. ... 215-643-5560

PIEZO

PIEZO TECHNOLOGY INC., 2525 Shader Rd., Orlando, FL 32804, Tel: 305-298-2000, TWX: 810-850-4136; FSC No.: 25120; *Sls. Mgr.:* Dave Stewart ... **A•1308, 1413-1418**

A CLEAR CASE FOR PHILIPS CRYSTALS



☐ vacuum sealed.
☐ visual inspection.
☐ consistently low long-term aging.
☐ HI-REL

(416) 292-5161

Crystals PHILIPS

Local Sales Offices & Reps

AZ Scottsdale, Faser Tech. Sls. 602-948-4404
CA Los Altos, Cain-White & Co. 415-948-6533
CA Van Nuys, R.L. Assocs. 213-782-7826
CT Milford, Bengal Assocs. 203-878-3946
DC Washington, M. Lader Co. 202-296-2497
FL Maitland, D. J. Ellis & Assocs. 305-645-1101
KS Overland Park, Barnes Mid-West Sls. 913-341-9317
MA Randolph, Bengal Assocs. 617-961-4120
MN Chanhassen, Barnes Sls. Assocs. 612-934-2907
NJ Haddonfield, Mesa Tech. Assocs. 609-429-9531
NY Buffalo, Quality Comps. 716-837-5430
NY Great Neck, Phase 4, Inc. 516-482-1790
TX Richardson, Vector Sls. Co. 214-234-4291

PIHER INT'L. CORP., 903 Feehanville Dr., Mt. Prospect, IL 60056, Tel: 312-640-8300, 800-323-6693, Telex: 254190, TWX: 206653; Empl.: 40; *Sls. Mgr.:* Gus Stoltz; *Dist. Mgr.:* Wm. Pragit

PINLITES, See Refac Elctrns.

PIONER COMPONENTS, 2352 E. 66th St., Brooklyn, NY 11234, Tel: 718-444-3880; Empl.: 3; *Sls. Mgr.:* Michael R. Verter; *Dist. Mgr.:* Michael R. Verter

PIONEER MAGNETICS, 1745 Berkeley St., Santa Monica, CA 90404, Tel: 213-829-6751, Telex: 182-093, TWX: 910-343-6249; FSC No.: 08676; Empl.: 450; *Sls. Mgr.:* A. Hagiwara ..... **D•1752-1753**

Local Sales Offices & Reps

CA Los Altos, Frauman Assocs. 415-941-0660
CA Santa Monica, Pioneer Magnetics, Inc. 213-829-6751
CO Commerce City, Williams Assocs. 303-289-5647
FL Deerfield Beach, Pen-Tech Assocs. ... 305-421-4989
MA Wayland, Daner-Hayes 617-655-0808
MN Eagan, Pioneer Magnetics 612-452-7747
OH Westlake, KRW Sales 216-871-7521
PA Cheltenham, Stein Instrm. 215-379-1990
TX Dallas, Remtek 214-387-2855
WA Vashon, RTS, Inc. 206-285-1363

PIRELLI CABLE CORP., Special Cable Div., P.O. Box 50, Wallingford, CT 06492, Tel: 203-265-5533, 800-243-3959, TWX: 710-476-0764; Empl.: 110; *Sls. Mgr.:* Art Fabritiis

PIRELLI CIMCO, 800 Rahway Ave., Union, NJ 07083, Tel: 201-687-8444, Telex: 138918, TWX: 6874009; Empl.: 80; *Sls. Mgr.:* John N. Vanderbeek

PITTMAN, Penn Engrg. & Mfg. Corp., 343 Godshall Dr., Harleysville, PA 19438, Tel: 215-256-6601, TWX: 510-661-8696; FSC No.: 98938; Empl.: 135 ..... **B•1179**

Local Sales Offices & Reps

AZ Fountain Hills, Halbar Assocs. 602-837-2464
CA Glendale, Halbar Assocs. 818-246-8263
CA San Mateo, Halbar Assocs. 415-349-4700
CO Commerce City, Williams-Assocs. 303-289-5647
FL Bradenton, Tropi-Tec, Inc. 813-748-2868
FL Plantation, Tropi-Tec 305-581-0101
IL Mount Prospect, K-W Assocs. 312-253-6680
IN Fort Wayne, Neal Engrg. 219-436-2300
IN Indianapolis, Neal Engrg. 317-849-4201
MA Wayland, M. L. Assocs. 617-358-5540
NJ Summit, R.A. Potter 201-277-0220
NM Albuquerque, Williams-Assocs. 505-255-1638
NY Buffalo, Application Spec. 716-834-3377
NY Rochester, Application Spec. 716-586-6226
NY Syracuse, Application Spec. 315-437-2813
NC Charlotte, Electro-Rep Assocs. 704-527-2530
OH Cleveland, Servo-Mark 216-871-2353
OK Tulsa, Blair Engrg. 918-622-3100
TX Austin, Blair Engrg. 512-458-3107
TX Dallas, Blair Engrg. 214-241-5655
TX Houston, Blair Engrg. 713-973-8800
UT Salt Lake City, Williams-Assocs. 801-485-6511
WA Redmond, Halbar Assocs. 206-882-0990
WA Vancouver, Halbar Assocs. 206-696-0170
PR Hato Rey, Tropi-Tec 809-759-7303

PKS - DIGIPLAN LTD., 1859 Charter Lane, Lancaster, PA 17601, Tel: 717-299-2706, Telex: 887352; Empl.: 100; *Sls. Mgr.:* Roy J. W. Horne

PLAINVIEW ELCTRNS., 28 Cain Dr., Plainview, NY 11803, Tel: 516-249-6677, Telex: 125043; Empl.: 6; *Sls. Mgr.:* B. Erde

PLANT SPECIALTIES, INC., PO Box 1097, Carrollton, TX 75006, Tel: 214-245-9673; *Sls. Mgr.:* J. E. Bryer

PLASMAGRAPHICS CORP., 141 Mount Bethel Rd., P.O. Box 4903, Warren, NJ 07060, Tel: 201-757-5000, Telex: 83-3456-0, TWX: 710-997-9529; *Dist. Mgr.:* Ronald Pignatello

PLASMARC TECHNOLOGIES, INC., 180 Passaic Avenue, Fairfield, NJ 07006, Tel: 201-575-0870, Telex: 833245; FSC No.: 6Y983; Empl.: 15; *Sls. Mgr.:* Gregory A. Galaida

PLASMA RESEARCH CORP., 2900 Main St., Alameda, CA 94501, Tel: 415-521-5532; FSC No.: 84067; Empl.: 3

PLASMA-THERM, INC., Rt. 73, Kresson, NJ 08053, Tel: 609-767-6120, Telex: 837220; *Sls. Mgr.:* John D. Raffl

PLASTIC CAPACITORS, INC., 2623 N. Pulaski Rd., Chicago, IL 60639, Tel: 312-489-2229, TWX: 910-221-1354; FSC No.: 99120; Empl.: 105; *Sls. Mgr.:* F. J. Pavey

Local Sales Offices & Reps

AL Huntsville, B.J.R., Inc. 205-881-3569
CA Palo Alto, Horne Electro Sls., Inc. 415-494-6777
CA San Diego, EESCO/LANDA/MINYARD, Inc. 619-942-1086
CA Santa Ana, EESCO/LANDA/MINYARD, Inc. 714-543-7805
CT E. Haven, Eagle Assocs. 203-467-6542
FL Lighthouse Point, Jack Krutek & Assocs., Inc. 305-941-6544
IL Elk Grove Village, Carlson Elctrn. Sls. Co. 312-956-8240
IN Fort Wayne, W. W. Bieberich, Inc. 219-432-2537
IA Cedar Rapids, Carlson Elctrn. Sls. Assocs. 319-377-6341
MD Timonium, Eastern Comps. Sls. Corp. 314-645-8670
MA Pinehurst, Eagle Assocs. 617-444-3446
MO St. Louis, Cadon Tech. Co. 314-645-8670
NJ Springfield, F. F. Sylvester Assoc. 201-376-3324
NY Rochester, APEX Assocs., Inc. 716-235-9052
NC Raleigh, Eastern Comps. Sls. Corp. ... 919-787-3416
OH Dayton, Electro-Com 513-898-5140
OR Tigard, Components West, Inc. 503-684-1671
PA W. Conshohocken, Eastern Comps. Sls. Corp. 215-825-8610
TX Seagoville, Delta Comps., Inc. 214-287-6333
WA Redmond, Components West, Inc. 206-885-5880
WI Milwaukee, Carlson Elctrn. Sls. Co. 414-476-2790
EXP NY, New York, B F I Intl. 212-513-7171
Can North Vancouver, Interworld Elctrns. .. 604-984-4171

PLASTIC FORMING CO., INC., 5 Lunar Dr., P.O. Box N, Woodbridge, CT 06525, Tel: 203-397-1338, Telex: 963437; Empl.: 37; *Sls. Mgr.:* John C. Womer

PRECISION MOLDED PRODUCTS, INC., 582 Meyer Lane, Redondo Beach, CA 90278, Tel: 213-372-7373

PLASTIGLIDE MFG., 2701 W. El Segundo Blvd., Hawthorne, CA 90250, Tel: 213-777-8108, Telex: 9103215755; Empl.: 425; *Sls. Mgr.:* T. Bubonic

PLASTOID CORPORATION, 45 Gingerbread Castle Rd., Hamburg, NJ 07419, Tel: 201-827-7141

PLASTRONICS INC., 3111 Gardenbrook, Dallas, TX 75234, Tel: 214-243-0611, TWX: 910-860-5542; Empl.: 47

PLATO PRODS., 2120 E. Allen Ave., Glendora, CA 91740, Tel: 800-423-4510, Telex: 673-488; FSC No.: 32399; Empl.: 75; *Sls. Mgr.:* Walter Schaub

PLESSEY CERAMIC DIV., 8th & Harrison Sts., Frenchtown, NJ 08825, Tel: 201-996-2121, TWX: 510-235-3399; Empl.: 198; *Sls. Mgr.:* William Blackford

PLESSEY ELECTRO-PRODUCTS, 3860 Centinela Ave., Los Angeles, CA 90066, Tel: 213-390-3585, TWX: 910-343-6483; Empl.: 60; *Sls. Mgr.:* Joan Marie Hill

PLESSEY MICROSYSTEMS, Plessey Trading Corp., 1641 Kaiser Ave., Irvine, CA 92714, Tel: 714-540-9931/9932, TWX: 910-595-1930; *Sls. Mgr.:* Garry T. Tomlins

PLESSEY MICROSYSTEMS, The Plessey Co., Ltd., One Blue Hill Pla., Pearl River, NY 10965, Tel: 914-735-4661

PLESSEY SEMICONDUCTORS, 1641 Kaiser Ave., Irvine, CA 92714, Tel: 714-540-9979, TWX: 910-595-1930; FSC No.: 52648; Empl.: 75; *Sls. Mgr.:* Jerry Surloff

PLUMER PRECISION OPTICS, 601 Montgomery Ave., Pennsburg, PA 18073, Tel: 215-679-6272; Empl.: 160; *Sls. Mgr.:* Ray Boulay

PMI MOTORS, KOLLMORGEN CORP., 5 Aerial Way, Syosset, NY 11791, Tel: 516-938-8000, TWX: 510-221-1875; Empl.: 246; *Dist. Mgr.:* R. Malton

Local Sales Offices & Reps

AZ Phoenix, Flexible Tech. 602-996-6421
AR El Dorado, Indl. Controls Assocs. 800-643-1109
AR Searcy, Industry Controls Assoc. 501-268-8552
CA Hemet, PMI Motors 714-652-6288
CA San Jose, Motion Control 408-997-0544
CA San Marino, Motion Control 818-796-0189
FL Altamonte Springs, Machine Controls, Inc. 305-788-6606
GA Atlanta, Factory Automated Inc. Controls 404-355-7475
IL Bartlett, T. Meyer 312-830-3374
IN Elkhart, Shaum Mfg. 219-264-0771
IN Spencer, Shaum Mfg. Inc. 317-842-2255
LA Baton Rouge, Industrial Controls Assocs. 800-643-1109
MA Beverly, Electro Kinetics 617-922-4007
MA Wellesley, Electro Kinetics 617-235-9415
MI Belding, Shaum Mfg. Inc. 616-897-5385
MI Birmingham, Pyramid Intergrated Control 313-649-5735
MI Rochester, Pyramid Intergrated Control 313-652-1375
MN Cottage Grove, Applied Motion Technlg. 612-459-0600
NY Cazenovia, D & O Engrg. 315-655-8602
NY Lewiston, D & O Engrg. 716-745-3915
NY Syosset, Motion Control Sls. 516-921-5656
NY Syosset, PMI Corp. Offices 516-938-8000
NY Youngstown, D & O Engrg. 716-745-3915
NC Greensboro, Engrg. & Mktg. Corp. of Virginia 919-275-1309
NC Plymouth, Engrg. & Mktg. Corp. of Virginia 919-793-4461
OH Chagrin Falls, Exonic Sys. 216-247-4788
OH Cincinnati, Shaum Mfg. 513-793-6145
OK Edmond, Industrial Controls Assocs. .. 405-340-8653
OR Lake Oswego, Drive Motor Control ... 403-636-7931
PA King of Prussia, Associated Controls .. 215-768-9739
PA Pittsburgh, Exonic Systems 412-784-8400
TN Memphis, Industrial Control Assocs. .. 800-643-1109
TX Arlington, Industrial Controls Assocs. .. 800-643-1109
TX Fort Worth, Industrial Controls Assocs. 817-498-6222
TX Houston, Industrial Control Assocs. ... 800-643-1109
TX San Antonio, Industrial Control Assocs. 800-643-1109
UT Salt Lake City, Control Agency 801-972-8788
VA Roanoke, Engrg. & Mktg. Corp. of Va .. 703-986-1410
WA Renton, Drive Motor Control Sys. Co. 206-872-8446
WI Racine, T. Beyer 414-632-6100
Can Willowdale, Ontario, Arthur Rosenblum Sls. Ltd. 416-224-1177

Distributor

POCO SALES, 8925 Fullbright St., Chatsworth, CA 91311, Tel: 818-700-8727 ..... pgs. **691, 705**

POINT 4 DATA CORP., 2569 McCabe Way, Irvine, CA 92714, Tel: 714-863-1111, Telex: 4722040; Empl.: 180; *Sls. Mgr.:* Mr. Ted Cooper; *Dist. Mgr.:* Mr. Ted Cooper

POLARAD ELCTRNS., INC., 5 Delaware Dr., Lake Success, NY 11042, Tel: 516-328-1100, TWX: 510-223-0414; FSC No.: 82199; Empl.: 175; *Sls. Mgr.:* Ron Ramirez

POLAROID CORP., 119 Windsor St., Cambridge, MA 02139, Tel: 617-577-2237, Telex: 921482, TWX: 710-320-0610; *Sls. Mgr.:* Fredric Cohen

POLYCORE ELCTRNS., 1107 Tourmaline Dr., Newbury Pk., CA 91320, Tel: 805-499-6777, Telex: 910-336-1547; Empl.: 40; *Sls. Mgr.:* S.K. Leong

POLYMER CORP., P.O. Box 422, Reading, PA 19603, Tel: 215-320-6600, Telex: 836-440, TWX: 510-651-5396; Empl.: 1000; *Sls. Mgr.:* J. D. Beatty

POLYPHASE Instrument Co.

POLYPHASE INSTR., 175 Commerce Dr., Ft. Washington, PA 19034, Tel: 215-643-6950, Telex: 84-6327; FSC No.: 98330; Empl.: 175; *Sls. Mgr.:* R.H. Simmons ..... **A•1619-1622, 2257-2264**

POLYPHASER CORPORATION, 1425 Industrial Way, P.O. Box 1237, Gardnerville, NV 89410-1237, Tel: 702-782-2511, 800-325-7170, Telex: 215406 TBYT UR: PolyPhaser ..... **B•1257**

Local Sales Offices & Reps
Professional Communications

CA	Sacramento, JN Sls.	916-635-5899
CO	Aurora, Electro-Tek Sls., Inc.	303-343-8937
FL	Coral Springs, Cemco	305-753-6777
GA	Atlanta, Cemco	404-491-0520
HI	Honolulu, Manon Engrg.	808-833-9545
IL	Elk Grove Village, IRO-Company	312-593-0644
MI	Grand Blanc, Webster Assocs., Inc.	313-694-3256
MI	Rochester, Webster Assocs.	313-375-0420
MN	Stillwater, Ned Gordon & Assocs.	612-430-1572
NV	Gardnerville, PolyPhaser Corp.	702-782-2511
NM	Albuquerque, Electro-Tek Sls., Inc.	505-883-4871
NM	Albuquerque, Horizon Engrg. Sls. Co.	505-877-0277
OH	Toledo, Webster Assocs.	419-535-0708
OK	Tulsa, Horizon Engrg. Sls. Co.	918-252-7222
OR	Portland, Manon Engrg.	503-245-7553
PA	Venetia, Webster Assocs.	412-941-8848
RI	Lincoln, Adams-McGregor	401-726-1300
RI	West Warwick, Adams McGregor, Inc.	401-821-1320
TX	Houston, Horizon Engrg. Sls. Co.	713-495-1018
TX	Rockwall, Horizon Engrg. Sls. Co.	214-475-1179
WA	Kirkland, Manon Engrg.	206-827-7449

Local Distributors

CA	Sacramento, Sacramento Elctrns.	916-441-4821
CO	Aurora, Electro-Tek Sls.	303-343-8937
IL	Elk Grove Village, IRO Co.	312-593-0644
KS	Dodge City, Teletron	316-225-3736
NV	Carson City, Schwartz Radio, Inc.	702-883-4500
NV	Gardnerville, PolyPhaser Corp.	702-782-2511
NC	Greensboro, West Antenna	919-621-2473
TX	Rowlett, Horizon Engrg. Sls.	214-475-1179
VA	Blacksburg, Professional Comms.	703-552-4443
Can	Ontario, Motorola, Ltd.	416-499-1441

POLY-SCIENTIFIC, Litton Inds., 1213 N. Main St., Blacksburg, VA 24060, Tel: 703-552-3014, TWX: 710-875-3694; Empl.: 625

POLYTRON DEVICES, Box 398 - River St. Sta., Paterson, NJ 07544, Tel: 201-345-5885; Empl.: 10

POMFRET RESEARCH OPTICS, 817 Long Ridge Rd., Stamford, CT 06902, Tel: 203-322-6386; Empl.: 5

POMONA ELECTRONICS, See ITT Pomona

POP FASTENERS DIV., 510 River Rd., Shelton, CT 06484, Tel: 203-735-9341, Telex: 963465, TWX: 710-451-3734; Empl.: 375; *Sls. Mgr.:* James Lynch

Portescap U.S. escap®

PORTESCAP U.S., 1547 Trooper Rd., P.O. Box 780, Worcester, PA 19490, Tel: 215-277-0433, Telex: 846367 ..... **B•1181**

Local Sales Offices & Reps

CA	Pomona	714-622-4185
MA	Medfield	617-359-2336
MN	Bloomington	612-854-6456
TX	Richardson	214-690-9000

POSITRONIC INDUSTRIES, INC., 423 North Campbell, Springfield, MO 65801, Tel: 417-866-2322, Telex: 436445; FSC No.: 28198; Empl.: 250; *Sls. Mgr.:* J.E. Myers; *Dist. Mgr.:* Linda Haley

Local Sales Offices & Reps

AZ	Phoenix, Jarko Assocs.	602-243-4387
CA	Irvine, J.V. Earley & Assocs.	714-833-1806
CA	Mountain View, Gene Woempner	415-964-5454
CA	Mountain View, Gene Woempner Co.	415-964-5454
CO	Englewood, Delta Sales Assocs.	303-799-0646
CT	Fairfield, Schumacher/Yarrington	203-259-0772
FL	Coral Springs, H.A. Inc.	305-752-7520
FL	Coral Springs, H.A., Inc.	305-752-7520
IL	Itasca, L-Tec, Inc.	312-773-2900
IN	Carmel, Technology Mktg. Corp.	317-844-8462
MD	Silver Spring, Carwithen Assoc.	301-589-9040
MI	Birmingham, Favco, Inc.	313-644-0173
MN	Minneapolis, R K Sls.	612-786-5713
MO	Springfield, Bill Gentry	417-866-2322
NJ	Medford, Comp. Conslts.	609-386-5300
NJ	Medford, Component Conslts.	609-654-5300
NY	Fairport, Net Sls.	716-467-4538
NY	Manhasset, Martech	516-627-1151
NC	Raleigh, R.W. Mitscher Co., Inc.	919-848-0941
OH	Cleveland, Components, Inc.	216-243-9200
OH	Miamisburg, Components, Inc.	513-866-0661
RI	Warwick, Schumacher/Yarrington	401-884-5671
TX	Plano, Richmar Elctrns.	214-867-8224
WA	Mercer Island, Elctrn. Comp. Sls.	206-232-9301
WA	Mercer Island, Electronic Comp. Sls.	206-232-9301

POTTER & BRUMFIELD, AMF Incorporated, 200 S. Richland Creek Dr., Princeton, IN 47671-0001, Tel: 812-386-1000, Telex: 27-8451, TWX: 810-350-2343; Empl.: 3000; *Sls. Mgr.:* Don Morrow; *Dist. Mgr.:* Gordon Collins

POTTER CO., P.O. Box 337, North Hwy. 51, Wesson, MS 39191, Tel: 601-643-2215, TWX: 510-981-4072; FSC No.: 601-643-5126; Empl.: 300 ..... **A•1623**

Local Sales Offices & Reps

CA	Los Angeles, Potter Co.	818-704-1151
CA	San Jose, Potter Co.	408-244-0951
FL	Orlando, Potter Co.	305-831-2782
IL	Chicago, Potter Co.	312-364-0424
MA	Boston, Potter Co.	617-449-1242
MN	Minneapolis, Potter Co.	612-933-7712
NY	Syracuse, Potter Co.	315-455-5808
NC	Raleigh, Potter Co.	919-878-8018
OR	Wilsonville, Potter Co.	503-682-7213
TX	Austin, Potter Co.	512-451-5721
TX	Richardson, Potter Co.	214-644-0575

Local Distributors

AL	Alhambra, Fischer-Brownell	818-289-0255
AZ	Tempe, Fischer-Brownell	602-967-1464
CA	Cerritos, El-Com, Inc.	714-739-5656
CA	San Diego, El-Com, Inc.	619-578-0900
CA	San Diego, Fischer-Brownell	619-560-8545
CA	San Francisco, KEA Elctrn. Distributing	415-887-2900
CA	Santa Clara, Richey Western	408-727-7411
CT	New Haven, Cronin Elctrns.	203-265-3134
CT	Orange, Milgray Elctrns.	203-795-0711
FL	Orlando, Intertec Comps.	305-834-7777
FL	Winter Park, Milgray Elctrns.	305-647-5747
GA	Atlanta, Milgray Elctrns.	404-393-9666
IL	Chicago, Advent Elctrns.	312-297-6200
IN	Indianapolis, Advent Elctrns.	317-872-4910
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
KS	Kansas City, Milgray Elctrns.	913-236-8800
MD	Rockville, Milgray Elctrns.	301-468-6400
MA	Boston, Cronin Elctrns.	617-449-5000
MA	Burlington, Milgray Elctrns.	617-272-6800
MI	Detroit, Advent Elctrns.	313-477-1650
MN	Minneapolis, Industrial Comps., Inc.	612-831-2666
NJ	Marlton, Milgray Elctrns.	609-983-5010
NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	North Syracuse, ANDCO	315-699-2660
OH	Cleveland, Milgray Elctrns.	216-447-1520
PA	Philadelphia, Century Elctrn. Comps.	215-631-5400
TX	Richardson, Fischer-Brownell	214-235-3177
WA	Kirkland, Fischer-Brownell	206-821-4788

POTTER INSTR., 10 Main St., Gonic, NH 03867, Tel: 603-332-1991, Telex: 94-4483; FSC No.: 11-1563382; Empl.: 20; *Sls. Mgr.:* S. Alexander

POULIN ASSOCIATES, INC., 302 North Rd., Sudbury, MA 01776, Tel: 617-443-7333; *Sls. Mgr.:* Scott Spalding

POWERBOX, INC., 1860 Broadway, New York, NY 10023, Tel: 212-586-1992; *Sls. Mgr.:* Len Elmlund

POWER COMPS. CO., Vanguard Elctrns. Co., 1480 W. 178th St., Gardena, CA 90248, Tel: 213-323-8120, TWX: 910-346-7067; FSC No.: 213-329-8427; *Sls. Mgr.:* Ken Finley

POWER CONTROL, 122 Gamma Dr., Pittsburgh, PA 15238, Tel: 412-782-3120; Empl.: 75

POWER CONTROLS, P.O. Box 5860, San Antonio, TX 78201, Tel: 512-734-7155, Telex: 767222; Empl.: 90; *Sls. Mgr.:* Robert A. McAlister

POWER CONVERSION PRODS., 42 East St., Box 380, Crystal Lake, IL 60014, Tel: 815-459-9100, TWX: 910-634-3356; FSC No.: 31751; Empl.: 130; *Sls. Mgr.:* C. Seyer

Local Sales Offices & Reps

CA	San Jose, Manufacturing Mktg. Grp.	408-446-0176
CO	Aurora, Electro-Tek Sales	303-343-8937
DC	Baltimore, Callas Elctrns.	301-744-7711
FL	Tampa, Telcom Assocs.	813-935-5006
IL	Chicago, Power Conversion Prods.	312-787-0723
IL	Park Ridge, Conrardy Co.	312-692-2226
LA	Metairie, Lynn Elliott	504-831-4669
MI	Farmington Hills, Joseph H. Clark Sls. Co.	313-553-0610
NJ	Cherry Hill, L. H. Walke	609-424-3766
NM	Albuquerque, Electro-Tek Sls.	505-883-4871
NY	White Plains, Metrotek Assocs.	914-631-4758
OH	Chagrin Falls, Joseph H. Clark Sls. Co.	216-247-7848
TX	Richardson, Power Conversion Prods.	214-644-0108

Polaroid

Industrial Photographic Line

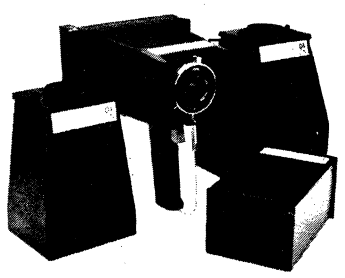
Authorized Distributors

RAG ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

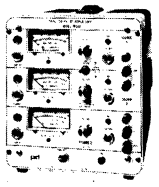
21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



Model DS-34

POWER DESIGNS



REGULATED DC POWER SOURCES

- THE PREFERRED LAB SUPPLY
- HIGH STABILITY, LOW NOISE
- CUSTOM OEM CAPABILITY

SEE PRODUCT LISTING PGS D•1755-1759

- SEND FOR UPDATED CATALOG

POWER DESIGNS INC.
516-333-6200 • TWX 510-222-6561

POWER INSTRUMENTS

AUTHORIZED DISTRIBUTOR

SUNSHINE

THE SOURCE FOR METERS & TEST EQUIPMENT

Offices
1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT
(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area
(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

POWERCUBE CORP., Sub. Unitrode Corp., 8 Suburban Pk. Dr., Billerica, MA 01821, Tel: 617-667-9500, TWX: 710-347-6792; FSC No.: 31557; Empl.: 156; *Sls. Mgr.:* Roger LaFontaine

POWER DESIGNS, INC., 1700 Shames Dr., Westbury, NY 11590, Tel: 516-333-6200, TWX: 510-222-6561; Empl.: 100; *Sls. Mgr.:* Lillian Kelly ..... **D•1755-1759**

Local Sales Offices & Reps

AZ	Scottsdale, Gemini Sls.	602-948-5900
CA	North Hollywood, O'Halloran Assocs.	818-877-0173
CA	Palo Alto, O'Halloran Assocs.	415-326-1493
IL	Elk Grove Village, Loren Green & Assocs.	312-593-0282
IN	Indianapolis, Loren Green & Assocs.	317-293-9827
MN	Minneapolis, Loren Green & Assocs.	612-571-6666
MA	North Billercia, AST/Servo Sys., Inc.	617-667-8541
NY	Great Neck, The Instrument Mart	516-487-7430
Can	Ottawa, Subtec, Ltd.	613-744-3066

POWER DYNAMICS, 59 Lakeside Ave., West Orange, NJ 07052, Tel: 201-762-6886, Telex: 666 173, TWX: 136567 (PDI); FSC No.: 60046; *Sls. Mgr.:* James Papianni; *Dist. Mgr.:* Lyle Scott ..... **A•1628; B•1258-1259, 1689; C•1489-1493, 1615**

Local Sales Offices & Reps

CA	Laguna Niguel, David Budge & Assoc.	714-831-7720
CA	Laguna Niguel, David Budge Assocs.	714-831-7720
CA	Mountain View, Bart Budge Assocs.	415-961-0940
CA	San Diego, David Budge Assocs.	619-587-0131
CT	Vernon, GM Assoc.	203-646-4443
FL	Coral Springs, E.P.M. Corp.	305-755-5387
FL	Coral Springs, EPM Corp.	305-755-5387
FL	Orlando, EPM Corp.	305-755-5387
FL	Vero Beach, EPM Corp.	305-425-6149
GA	Atlanta, Electro Sls., Inc.	404-394-1122
GA	Lawrenceville, BTF, Inc.	404-963-9495
IL	Crystal lake, E. S. Healy Assocs.	815-459-4386
IL	Crystal Lake, E. S. Healy & Assocs.	815-459-4386
KY	Louisville, KW Elctrn. Sls.	502-451-1860
MA	Framingham, G.M. Assocs.	617-872-4871
MA	Framingham, GM Assoc.	617-872-4871
MI	Ypsilanti, Tamco Inc.	313-572-1950
MI	Ypsilanti, Tamco, Inc.	313-572-1950
MN	Minneapolis, R. K. Sls.	612-786-5713
MN	Minneapolis, RK Sls.	612-786-5713
NH	Exeter, GM Assoc.	603-778-7472
NJ	Englewood Cliffs, Ed Glass Assoc.	201-592-0200
NJ	Englewood Cliffs, Ed Glass Assocs.	201-592-0200
NY	Fayetteville, C. W. Floring Assocs., Inc.	315-637-4552
NY	Poughkeepsie, C. W. Floring Assocs., Inc.	914-471-2973
NY	Scottsville, C. W. Floring Assocs., Inc.	716-271-6865
NY	Syracuse, C. W. Floring Assocs., Inc.	315-478-2149
NC	Raleigh, Barker Assocs.	919-876-0282
NC	Raleigh, BTF, Inc.	919-782-3493
OH	Dayton, K. W. Elctrns.	513-890-2150
OH	Dayton, KW Elctrn. Sls.	513-890-2150
OH	Shaker Heights, K. W. Elctrns.	216-491-9177
OH	Shaker Heights, KW Elctrn. Sls.	216-491-9177
OH	Worthington, K. W. Elctrns.	614-888-0483
OH	Worthington, KW Elctrn. Sls.	614-888-0483
OK	Tulsa, Rem-Air Comp.	918-742-2559
OR	Tigard, Electronic Comp. Sls.	503-245-2342
PA	Allison Park, K. W Elctrns.	412-487-4300
PA	Allison Park, KW Elctrn. Sls.	412-487-4300
PA	Prospect Park, Elf Sls.	215-534-3340
TN	Chattanooga, Electro Sls.	615-267-2160
TX	Dallas, Rem-Air Comp.	214-234-1069
TX	Dallas, Rem-Air Comps.	214-234-1069
UT	Salt Lake City, Aspen Sls.	801-467-2401
WA	Mercer Island, Elctrn. Comp. Sls.	206-232-9301
WA	Mercer Island, Electronic Comp. Sls.	206-232-9301
PR	Old San Juan Stn., Casanova Indl. Sls. Corp.	809-753-8674
Can	Toronto, Tienkay, Inc.	416-661-5499

Local Distributors

CA	Burlingame, Rose Elctrns.	415-348-2740
CA	El Segundo, Force Elctrns.	714-522-1324
CA	San Jose, Force Elctrns.	408-943-1324
CA	San Jose, Rose Elctrns.	408-263-9700
CT	New Canaan, Impact Sls.	203-972-1458
FL	Ft. Lauderdale, KSM Elctrns.	305-971-5900
FL	Ft. Lauderdale, NRC Elctrns.	305-772-4500
GA	Atlanta, KSM	404-458-2013
IL	Crystal Lake, Sub-Sem	312-782-3954
MA	Canton, Impact Sls.	617-821-1500
MN	Bloomington, NWR Elctrns.	612-854-7329
NC	Raleigh, Century Elctrns.	919-872-2203
OR	Beaverton, Murphy Elctrns.	503-642-2001
OR	Beaverton, Rose Elctrns.	503-629-9288
PA	Norristown, Century Elctrns.	215-631-5400
TN	Memphis, Electrotec	901-362-1350
TX	Austin, Force Elctrns.	512-476-2104
TX	Austin, Southwest Elctrns.	512-837-8971
TX	Houston, Force Elctrns.	713-561-8644
TX	Irving, Force Elctrns.	214-438-5700
TX	Richardson, Southwest Elctrns.	214-234-3050
TX	San Antonio, Force Elctrns.	512-733-7177
TX	Stafford, Southwest Elctrns.	713-240-4000
WA	Redmond, Murphy Elctrns.	206-881-1234

POWER ELCTRNS., 96 Milton Rd., Rochester, NH 03867, Tel: 603-332-3334; Empl.: 125; *Sls. Mgr.:* Robert S. Karstedt

POWER FUNCTIONS ENGRG., 3831 Cavalier Dr., Garland, TX 75042, Tel: 214-278-0996; Empl.: 9

POWER GENERAL, Unitrode, 152 Will Dr., Canton, MA 02021, Tel: 617-828-6216, TWX: 710-348-0200; Empl.: 400; *Sls. Mgr.:* Steve Dutton; *Dist. Mgr.:* Paul Hurly ..... **D•1760-1767**

Local Sales Offices & Reps

AL	Huntsville, Murcota	205-539-8476
AZ	Scottsdale, TC Elctrn. Sls.	602-994-5153
CA	Orange, XBX Sls.	714-998-8200
CA	San Jose, Custom Tech. Sls.	408-252-9901
CO	Englewood, Frontier Reps.	303-799-6063
FL	Melbourne, EMS	305-724-1027
FL	Plantation, EMS	305-587-7146
FL	Sarasota, EMS	813-923-2804
IL	Palatine, T-Squared Assocs.	312-991-2144
IA	Cedar Rapids, Palatine Eng. & Sls.	319-365-8071
KS	Mission, Palatine Eng. & Sls.	913-831-0555
MA	Canton, Power Gen.	617-828-6216
MI	Birmingham, Favco	313-644-0173
MI	Grand Rapids, Favco	616-459-4425
MN	Minneapolis, Comtek Sls.	612-888-7011
MO	Hazelwood, Palatine Engrg. & Sls.	314-839-0800
NV	Reno, Dunning & Assocs.	702-329-9004
NJ	Rockaway, R.O.I. Sls. Co.	201-340-1515
NY	Cortland, Net Sls. Co.	607-756-6592
NY	DeRuyter, Net Sls.	315-662-7996
NY	Fairport, Net Sls.	716-467-4538
NY	Troy, Net Sls.	518-274-4758
NY	Webster, Net Sls. Co.	716-467-4538
NC	Winston Salem, Murcota	919-722-9445
OH	Columbus, McFadden Sls.	614-459-1280
OR	Aloha, Huntley Assocs.	503-649-5388
TX	Austin, Mech-Tron Mktg.	512-835-0980
TX	Dallas, Mech-Tron Mktg.	214-343-3786
TX	Houston, Mech-Tron Mktg.	713-462-1432
VA	Fairfax, Beacon North	800-572-0405
VA	Falls Church, Beacon North, Inc.	703-591-1300
VA	Forest, Beacon North, Inc.	804-239-8486
WA	Everett, Huntley Assocs.	206-353-1833

Local Distributors

Intl	Belgium, Gent, Belgium Computer Prods.	
Intl	France, Orsay, Microel	907.08.24

POWER GROUP INTERNATIONAL, Dept. 227, 2200 West 66th Street, Richfield, MN 55423, Tel: 612-890-1360; FSC No.: 25441; Empl.: 500; *Sls. Mgr.:* Hortense M. Rowe ..... **D•1428-1429**

POWER INSTRS. PRODUCTS, Amatek/Mansfield & Green Div., 8600 Somerset Dr., Largo, FL 33543, Tel: 813-536-7831, Telex: 808-741; Empl.: 45; *Sls. Mgr.:* Tony Ruggiero

POWER INTEGRITY CORP., 1840 Pembroke Rd., P.O. Box 9682, Greensboro, NC 27408, Tel: 919-379-9773; *Sls. Mgr.:* James T. Fesmire

POWER LABS, INC., 5 Towle Ave., Dover, NH 03820, Tel: 603-742-4613; Empl.: 9

POWERMARK, 3855 Ruffin Rd., San Diego, CA 92123, Tel: 619-565-8363; Empl.: 75; *Sls. Mgr.:* Ron Baietto ..... **D•1955**

Local Sales Offices & Reps

AL	Birmingham, Sesco	205-988-8304
AK	Anchorage, John P. Bagoy & Assocs.	907-274-8531
AZ	Phoenix, Bob Anderson Co.	602-266-2070
CO	Colorado Springs, Cleveland Entprs. of Colo.	303-597-8872
FL	St. Petersburg, Sesco	813-576-6991
GA	Atlanta, Sesco	404-458-6423
HI	Honolulu, Ind'l. Elctrns.	808-533-6095
IL	Elk Grove Village, Loren Green Assocs.	312-593-0282

KS Shawnee, Atech 913-268-9644
LA Baton Rouge, Sesco 504-928-4951
MD Gaithersburg, Powell-Pendergraph 301-921-4200
MA Wellesley, Power Conversion Sys. 617-235-7884
MN Minneapolis, Loren Green Assocs. 612-571-6666
MO St. Louis, Atech 314-428-7447
NH Londonderry, Power Conversion Sys. 603-434-2371
NJ Ridgewood, Ballou, Inc. 201-444-6990
NY Clarence, Trott Elctrns. 716-634-8500
NY Pittsford, Trott Elctrns. 716-586-8251
NC Cary, Sesco 919-467-7482
OH Cleveland, Jim Finnegan & Co. 215-238-5905
OK Tulsa, Sesco 918-622-3868
PA King of Prussia, J. E. Cuesta & Co. 215-265-5800
TX Austin, Sesco 512-892-2490
TX Dallas, Sesco 214-231-9364
TX Houston, Sesco 713-999-3510
VA Richmond, Powell-Pendergraph 804-270-1400
WA Bellevue, Underwood-Hanify Assocs. 206-451-8223
WA Vancouver, Underwood-Hanify Assocs. 503-641-4463

POWER/MATE, See RTE Power/Mate

Power-one

POWER-ONE, INC., Power-One Linear Products, 740 Calle Plano, Camarillo, CA 93010, Tel: 805-987-8741, TWX: 910-336-1297; FSC No.: 54407; Empl.: 317 ..... **D•1768-1773**

Local Sales Offices & Reps

AZ Tempe, System Sls. of AZ 602-829-9338
CA Los Angeles, A-F Sls. Engrg. 213-681-5631
CA Pasadena, A-F Sls. Engrg. 213-681-5631
CA San Diego, A-F Sls. Engrg. 619-224-8424
CA San Jose, Richards Assocs. 408-297-3010
CO Denver, Quorum 3 303-696-8480
FL Casselberry, Elctrn. Mktg. 305-339-7070
GA Marietta, FLW Southeast 404-424-1731
IL Itasca, L-Tec 312-773-2900
IA Cedar Rapids, Lorenz Sls. 319-377-4666
KS Overland Park, ATS 913-642-6675
MA Brockton, Forsberg 617-522-6300
MI Southfield, L. H. Dickelman 313-353-8210
MN Minneapolis, Components Grp. Corp. 612-374-1250
MO St. Louis, ATS 314-227-4448
NE Lincoln, Lorenz Sls. 402-475-4660
NM Albuquerque, System Sls. of AZ 505-881-8877
NY Great Neck, Trionic Assocs. 516-466-2300
NY Pittsford, C. W. Beach 716-586-3200
NY Syracuse, C. W. Beach 315-446-9587
OH Columbus, Tom Mulligan Co. 614-457-2242
OK Tulsa, Advance Tech. Sls. 918-664-0482
OR Beaverton, W3 503-641-5790
PA Philadelphia, Eastern Comp. Sls. 215-825-8610
PA Stewartstown, Eastern Comp. Sls. 800-223-3850
TX Austin, Advance Tech. Sls. 512-459-1351
TX Dallas, Advance Tech. Sls. 214-340-1300
TX Houston, Advance Tech. Sls. 713-440-3888
UT Sandy, Quorum 3 801-943-9227
VA Manasas, Eastern Comp. Sls. 703-368-3936
WA Seattle, W3 206-285-2667
WI Milwaukee, L-Tec 414-774-1000

Local Distributors

AZ Phoenix, Arrow Elctrns. 602-968-4800
AZ Phoenix, Sterling Elctrns. 602-258-4531
CA Chatsworth, Arrow Elctrns. 213-701-1133
CA Chatsworth, Diplomat Elctrns. 818-341-4411
CA Costa Mesa, FLW 818-989-5237
CA Los Angeles, Hanex, Inc. 213-556-3807
CA San Diego, Arrow Elctrns. 619-565-4800
CA San Diego, Diplomat Elctrns. 619-292-5693
CA San Jose, Compumech Elctrns. 408-289-9171
CA Sunnyvale, Arrow Elctrns. 408-745-6600
CA Sunnyvale, Diplomat Elctrns. 408-734-1900
CA Tustin, Arrow Elctrns. 714-838-5422
CO Denver, Arrow Elctrns. 303-696-1111
CO Englewood, Diplomat Elctrns. 303-799-8300
CT Danbury, Diplomat Elctrns. 203-797-9674
CT Norwalk, Pioneer/Connecticut 203-853-1515
CT Wallingford, Arrow Elctrns. 203-265-7741
CT Wallingford, Sterling Elctrns. 203-265-9535
FL Clearwater, Diplomat Elctrns. 813-443-4514
FL Ft. Lauderdale, Arrow Elctrns. 305-776-7790
FL Ft. Lauderdale, Pioneer/Lauderdale ... 305-771-7520
FL Miami, Elctrn. Equip. Co. 305-871-3500
FL Palm Bay, Arrow Elctrns. 305-725-1480
GA Norcross, Arrow Elctrns. 404-449-8253
GA Norcross, Diplomat Elctrns. 404-449-4133
IL Arlington Heights, C. W. Elctrns. 312-489-9810
IL Bensenville, Diplomat Elctrns. 312-595-1000
IL Elk Grove Village, Pioneer/Chicago ... 312-439-9680
IL Northbrook, Classic Comps. 312-272-9650
IL Schaumburg, Arrow Elctrns. 312-397-3440
IN Ft. Wayne, Graham Elctrns. 219-423-3422
IN Indianapolis, Advent Elctrns. 317-872-4910
IN Indianapolis, Arrow Elctrns. 317-243-9353
IN Indianapolis, Classic Comps. 317-872-4777
IA Cedar Rapids, Deeco, Inc. 319-365-7551
KS Edwardville, C. Tennant & Sons 913-441-1801
LA Metairie, Sterling Elctrns. 504-887-7610
MD Baltimore, Arrow Elctrns. 301-247-5200
MD Columbia, Diplomat Elctrns. 301-995-1226
MD Timonium, Zebra Elctrns. 301-252-6576
MA Canton, Impact Sales 617-821-1500
MA Woburn, Arrow Elctrns. 617-933-6770
MI Ann Arbor, Arrow Elctrns. 313-971-8220
MI Grand Rapids, Arrow Elec. 616-243-0912
MI Livonia, Pioneer/Mich. 313-525-1800
MI Livonia, Reptron 313-525-2700
MN Edina, Arrow Elctrns. 612-830-1800
MN Minneapolis, Aero Space Computer ... 612-884-4725
MN Minnesota, Pioneer/Twin Cities 612-935-5444
MO St. Charles, Finnigan Elctrns. 314-946-6201
MO St. Louis, Arrow Elctrns. 314-567-6888
NE Omaha, Scott Elctrns. 402-734-6750
NH Manchester, Arrow Elctrns. 603-668-6968
NJ Marlton, Arrow Elctrns. 609-596-8000
NJ Perth Amboy, Sterling Elctrns. 201-442-8000
NJ Pine Brook, Pioneer/NJ 201-575-3510
NJ Saddle Brook, Arrow Elctrns. 201-797-5800
NJ Totawa, Diplomat Elctrns. 201-785-1830
NM Albuquerque, Arrow Elctrns. 505-243-4566
NM Albuquerque, Sterling Elctrns. 505-854-1900
NY Hauppauge, Arrow Elctrns. 516-231-1000
NY Liverpool, Arrow Elctrns. 315-652-1000
NY Mamaroneck, Logicomp Elctrns. 914-698-9332
NY Melville, Diplomat Elctrns. 516-454-6400
NY Rochester, Arrow Elctrns. 716-275-0300
NY Rochester, CAM/RPC Elctrns. 716-865-2080
NY Rochester, Zeller Elctrns. 716-254-8840
NY Woodbury, Pioneer/Woodbury 516-921-8700
NC Charlotte, Pioneer/Carolina 704-527-8188
NC Raleigh, Arrow Elctrns. 919-876-3132
NC Raleigh, Southeastern Elctrns. 919-828-2311
NC Winston-Salem, Arrow Elctrns. 919-725-8711
OH Centerville, Arrow Elctrns. 513-435-5563
OH Cincinnati, Applied Data Mgt. 513-579-8108
OH Cleveland, CAM/RPC Elctrns. 216-461-4700
OH Cleveland, Pioneer/Cleveland 216-587-3600
OH Columbus, Reptron 614-436-6675
OH Dayton, Pioneer/Dayton 513-236-9900
OH Solon, Arrow Elctrns. 216-248-3990
OK Tulsa, Sterling Elctrns. 918-663-2410
OR Portland, Radar Elec. 503-232-3404
PA Horsham, Pioneer/Delaware Valley ... 215-674-4000
PA Lancaster, CAM/RPC Elctrns. 717-392-8141
PA Monroeville, Arrow Elctrns. 412-856-7000
PA Pittsburgh, Alder Tronics 412-821-5565
PA Pittsburgh, CAM/RPC Elctrns. 412-782-3770
PA Wayne, Peak Elctrns. 215-293-9000
RI Warwick, Major Edwards Elctrns. 401-781-3000
TX Dallas, Arrow Elctrns. 214-386-7500
TX Dallas, Force Elctrnd. 214-438-5700
TX Dallas, Pioneer/Dallas 214-386-7300
TX Dallas, Sterling Elctrns. 214-243-1600
TX Houston, Force Elctrns. 713-772-8483
TX Houston, Sterling Elctrns. 713-627-9800
TX Stafford, Arrow Elctrns. 713-491-4100
UT Salt Lake City, Arrow Elctrns. 801-539-1135
UT Salt Lake City, Diplomat Elctrns. 801-486-4135
VA Richmond, Arrow Elctrns. 804-282-0413
VA Richmond, Sterling Elctrns. 804-226-2190
WA Bellevue, Arrow Elctrns. 206-643-4800
WA Seattle, Radar Electric 206-282-2511
WI Oak Creek, Arrow Elctrns. 414-764-6600
EXP CA, Los Angeles, Hanex, Inc. 213-556-3807

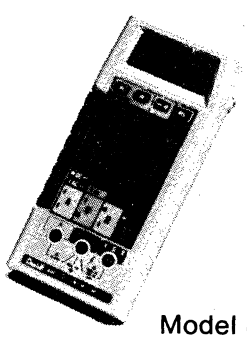
POWER-ONE, INC., Power-One Switching Products, 833 Flynn Rd., Camarillo, CA 93010, Tel: 805-482-0757, Telex: 752083; FSC No.: 54407; Empl.: 214

POWER PAC INC.

POWER PAC, 32 Meadow St., S. Norwalk, CT 06856, Tel: 203-866-4484; FSC No.: 53998; Empl.: 175; *Sls. Mgr.:* Abe Partner ..... **D•1774-1778**

POWER-ONE
DC POWER SUPPLIES
IN STOCK • IN STOCK
Franchised Distributor
LOGICOMP
ELECTRONICS, INC.
1009 W. BOSTON POST ROAD
MAMARONECK, NEW YORK 10543
PHONE: (914) 698-9332
TOLL FREE
(Outside N.Y.)
800/431-2625

FLUKE®
DMM's, Counters, and Temperature Logging Systems
Authorized Distributors
RAG ELECTRONICS, INC.
New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing
21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500
CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



Model 8060a

Local Sales Offices & Reps

AL Huntsville, BCI 205-539-4411
CA Los Altos, AARD Engr. 415-948-5740
CA Westlake Village, Powerdyne Inc. 213-991-0632
CT Hamden, Digital Sls. Assoc. 203-248-3641
GA Chamblee, BCI 403-455-0405
MD Seabrook, W. A. Brown-Equip. Co. 301-577-6105
MA Waltham, Digital Sls. Assoc. 617-899-4300
MN Minneapolis, R.J. Inc. 612-866-3661
NJ E. Hanover, Emtec 201-428-0600
NJ Princeton, Murtronics 609-394-3737
NJ Teaneck, SGL Sls. 201-837-2352
NY Cazenovia, S.T. Woolard 315-655-8145
NY Melville, Emtec 516-752-1630
NC Raleigh, BCI 919-781-9426
PA Harrisburg, Beil & Whitaker 717-564-6900
TX Houston, Scientific Sls. 713-666-5318
TX Richardson, Scientific Sls. 214-231-6541

Local Distributors

CT Hamden, Digital Sls. Assoc. 203-248-3641
MA Waltham, Digital Sls. Assoc. 617-899-4300

POWER-PAK, INC., 6216 Oakton St., Morton Grove, IL 60053, Tel: 312-966-6000; Empl.: 16; *Sls. Mgr.:* Robert Villari

POWER PRODUCTS DIV., COMPUTER PRODS., INC., See Power Products Group

COMPUTER PRODUCTS™
POWER CONVERSION

POWER PRODUCTS DIV., Computer Products, Inc., 2981 Gateway Drive, Pompano Beach, FL 33069, Tel: 305-974-2442, TWX: 510-956-3098; FSC No.: 62125; Empl.: 180 ..... **D•1446, 1552-1553, 1559-1572, 1584-1585**

Refer to Computer Prods., Inc., Pompano Beach, FL, for sales offices & representatives & distributors.

POWER-SCIENCE, 7667 Vickers St., San Diego, CA 92111, Tel: 619-292-4322; Empl.: 6; *Sls. Mgr.:* E. Cooper

POWER SONIC
RECHARGEABLE BATTERIES

POWER-SONIC, Box 5242, 3106 Spring St., Redwood City, CA 94063, Tel: 415-364-5001, Telex: 348400; Empl.: 30; *Sls. Mgr.:* B. A. Ender; *Dist. Mgr.:* B. A. Ender ..... **D•1431**

Local Sales Offices & Reps

CA Irvine, English/Damco 714-837-3801
FL Tampa, SRT Mktg. 813-884-4805
IL River Forest, Pete Collins 312-366-7076
MA Natick, Steve Dworkin 617-653-7188
MS Jackson, Welch & Doby 601-932-5534
NY Wantagh, Dony Tech. Sls. 516-826-5550
NC Raleigh, DHR Mktg. 919-876-5450
PA Media, W. Reeves Assocs. 215-566-6709
SC Greenville, DHR Mktg. 803-235-3594
TX Dallas, Power Connection 214-357-8207

Local Distributors

CA Chatsworth, Mil-Comm Distr. 213-998-3111
CA Fountain Valley, Components Center 714-979-0433
CA Santa Clara, Components Center 408-988-3751
CO Denver, Hensley Battery 303-455-3643
CT Waterbury, Lighting Svcs., Inc. 203-756-8148
FL Miami, ESL Elctrn. Distr. 305-633-6973
FL Tampa, Leader Elctrns. 813-870-3315
GA Atlanta, Allied Elctrns. 404-237-3366
GA Atlanta, Security Wherehouse 404-955-1006
IL Chicago, Allied Elctrns. 312-697-8200
IL Villa Park, Melvin Elctrns. 312-378-7741
LA Lafayette, Ralph's Elctrns. 318-234-4507
MA Sharon, Adcour 617-784-3996
MI Detroit, Alarm Supp. 313-425-2500
MO St. Louis, Olive Elctrns. 314-426-4500
NM Albuquerque, Betatron, Inc. 505-344-2381
NY Ridgewood, J.A. McDermott Corp. 212-456-3606
OK Tulsa, Radio, Inc. 918-587-9123
PA Pittsburgh, Triangle Elctrns. 412-441-9659
TX Austin, Harrison Indl. Elctrns. 512-458-3555
TX Ft. Worth, Allied Elctrns. 817-265-9341
TX Houston, Harrison Equip. 713-652-4700
TX San Antonio, Sherman Elctrns. 512-224-1001
VA Richmond, Sterling Elctrns. 804-226-2190

POWER SYSTEMS, 12 Tobey Rd., Bloomfield, CT 06002, Tel: 203-243-0357, TWX: 710-425-8778; FSC No.: 50463; Empl.: 375; *Sls. Mgr.:* Richard Milne ..... **D•1780-1781**

Local Sales Offices & Reps

AZ Phoenix, Tech Sls./Powerhouse 602-246-1614
CA San Jose, Powerhouse 408-748-1555
CA Santa Ana, Powerhouse 714-549-9599
CT Westbrook, Comptech, Inc. 203-399-9704
MA Tyngsboro, Comptech 617-649-3030

POWER SYSTEMS & CONTROLS, INC., 3206 Lanvale Ave., Richmond, VA 23230, Tel: 804-355-2803; Empl.: 40

POWER SYS. GRP., Rantec Div., Emerson Elec., 9401 Oso Ave., Chatsworth, CA 91311, Tel: 818-885-8223, TWX: 910-493-1247; FSC No.: 04971; Empl.: 265; *Sls. Mgr.:* Daniel L. Esau

POWERTEC, INC.

POWERTEC, INC., 20550 Nordhoff St., Chatsworth, CA 91311, Tel: 818-882-0004, TWX: 910-494-2092; Empl.: 349; *Sls. Mgr.:* Royston A. Allman ..... **D•1782-1799**

POWERTECH, INC., 0-02 Fairlawn Ave., Fairlawn, NJ 07410, Tel: 201-791-5050, Telex: 353970; FSC No.: 32953; Empl.: 49; *Sls. Mgr.:* Alan J. Melnyk

Power Technology Inc.

POWER TECHNOLOGY, INC., P.O. Box 9769, Little Rock, AR 72219, Tel: 501-568-1995, TWX: 910-722-7313; Empl.: 69; *Sls. Mgr.:* John Webb ..... **B•1125**

POWERTREND, INC., 3139-G Los Feliz Dr., Thousand Oaks, CA 91362, Tel: 805-496-2945; *Sls. Mgr.:* R. Jones

POWER TEN, INC., 486 Mercury Dr., Sunnyvale, CA 94086, Tel: 408-738-5959, Telex: 172588 SNLO; FSC No.: 61987; *Sls. Mgr.:* Vince Mutascio ..... **D•1779**

Local Sales Offices & Reps

AZ Mesa, Insight 602-820-4955
AZ Phoenix, Jayson Co., Inc. 602-867-1964
IA Cedar Rapids, Palatine Engrg. & Sls. 319-365-8071
KS Mission, Palatine Engrg. & Sls. 913-831-0555
MO Hazelwood, Palatine Engrg. & Sls. 314-839-0800
NJ Wayne, Ramapo 201-839-6767
NY Rochester, Scientific Dvcs. 716-334-2445
OR Portland, Westcon 503-283-0132
PA Glenside, Koebert 215-887-2310
TX Austin, Eberts Elctrns. Sls. 512-258-1067
TX Latexo, Eberts Elctrns. Sls. 409-687-4342

POWERTRON, See Industrial Test Equipment Co., Inc.

POWERTRON, Contraves Goerz Corp., 3821 Barranger Dr., Charlotte, NC 28210, Tel: 704-525-8962, Telex: 572-444; *Sls. Mgr.:* Sam LoBue

POWR-UPS CORP., 50 Orville Drive, Bohemia, NY 11716, Tel: 516-589-3602; Empl.: 50; *Sls. Mgr.:* Alon Kopstein ..... **B•1182-1183**

Local Sales Offices & Reps

CA Fullerton, ESCO 714-879-7260
CA San Diego, Total Elctrns. Int'l. 619-224-3291
IL Oak Brook, A.G. Erickson 312-323-1367
KS Shawnee Mission, LSC, Inc. 913-362-2121
MA Southborough, Motion Engrg. 617-485-2144
NY Pittsford, Magna Prod. Corp. 716-586-8621
OH Dover, AJ Assocs. 216-343-2224
PA Audubon, Holmes Assocs. 215-666-0636

PPC PRODS., 7516 Central Industrial Dr., Riviera Beach, FL 33404, Tel: 305-848-9606, TWX: 510-952-7611; FSC No.: 33178; Empl.: 50; *Sls. Mgr.:* Nick Ernick

PPD

PPD, INC., Hwy. 70W, Resco Ct., P.O. Box 31347, Raleigh, NC 27612, Tel: 919-781-3955 ..... **A•1157-1165**

PPM, INC., 4521 Emery Ind. Pkwy., Cleveland, OH 44128, Tel: 216-292-6006; Empl.: 20; *Sls. Mgr.:* A. L. Bletcher ..... **D•1291**

Local Sales Offices & Reps

AZ Phoenix, J. Smith & Assocs. 602-267-0981
CO Denver, J. Smith & Assocs. 303-597-5343
MI Ferndale, Tiby Co. 313-547-3550
NM Albuquerque, J. Smith & Assocs. 505-265-3406
NC Charlotte, Binco 704-366-5092
OH Cleveland, Tiby Co. 216-371-5335
OH Dayton, Tiby Co. 513-277-3822

PRACTICAL AUTOMATION, Trap Falls Rd., Shelton, CT 06484, Tel: 203-929-5381, Telex: 6813310; Empl.: 150; *Sls. Mgr.:* R. M. Banzaca

Local Sales Offices & Reps

AL Huntsville, Elctrn. Mfr. Agts., Inc. 205-830-4030
CA Los Alamitos, Gemini Assocs. 213-594-9618
CA Mountain View, Thorson West 415-964-9300
CA North Hollywood, Gemini Assocs. 818-846-2633
CA San Diego, Gemini Assocs. 619-268-1181
CT Ellington, J. J. Wild, Inc. 800-223-9456
FL St. Petersburg, Elctrn. Mfr. Agts., Inc. 813-894-1171
IL Elk Grove Village, Martec Assocs. 312-956-8090
MD Rockville, JH Computer 301-424-0700
MA Needham, J. J. Wild 617-449-5600
MI Grand Rapids, R. P. Urban & Assocs. 616-245-0511
MN Minneapolis, Chris & Assocs. 612-861-1634
NJ Pompton Lakes, Wild & Rutkowski 201-839-0071
NY Clark Mills, KLM-Garner 315-853-6126
NY Jericho, Wild & Rutkowski 516-935-6600
NY Pittsford, KLM-Garner 716-381-8350
NC Winston Salem, Elctrn. Mfr. Agts. 919-784-7304
OH Cleveland, Electro Sls. Assoc. 216-261-5440
OH Dayton, Electro Sls. Assoc. 513-426-5551
PA Willow Grove, QED Elctrns. 215-657-5600
TX Houston, Barry Sls. Inc. 713-784-5860
TX Richardson, Barry Sls. Inc. 214-234-0255
WA Bellevue, Tasco Inc. 206-453-1414

PRACTICAL TECHNOLOGY, 12 Village Ctr., Box 449, Carmel Valley, CA 93924, Tel: 408-659-3128; FSC No.: 59089; Empl.: 7; *Sls. Mgr.:* Keith Rosburg

PRAGMATIC DESIGNS, INC., 950 Benicia Ave., Sunnyvale, CA 94086, Tel: 408-736-8670, Telex: 17-1627, TWX: Nanet D Suvl; FSC No.: 94-2543110; Empl.: 45

PRD ELCTRNS., DIV. OF HARRIS CORP., see Harris Corp., PRD Electronics Div.

Precontact, inc.

PRECICONTACT, INC., 835 Wheeler Way, Langhorne, PA 19047, Tel: 215-757-1202, Telex: 83-4253; FSC No.: 60197; *Sls. Mgr.:* Joseph Carroll ..... **C•1494-1495**

Local Sales Offices & Reps

AL Huntsville, Electro Sls., Inc. 205-830-2715
AZ Litchfield Park, G. B. Elctrns. 602-935-3984
AZ Tuscon, G.B. Elctrns. 602-297-9759
CA Mountain View, The Gene Woempner Co. 415-964-5454
CA Orange, Elctrn. Tech. Assocs. 714-998-2901
CO Englewood, White Sls. Co. 303-694-9555
GA Atlanta, Electro Sls., Inc. 404-394-1122
IL Rolling Meadows, Heartland Tech. Mktg. 312-577-9222
IN Greenwood, Valentine & Assocs. 317-888-2260
IN South Bend, Valentine & Assocs. 219-288-7070
MD Rockville, Mechtronics Sls., Inc. 301-340-2130
MA Norwood, The Mac Innis Co. 617-762-8090
NJ Mountain Lakes, Components for Elctrns. 201-334-2921

NY Courtland, Net Sls. Co. 607-756-6592
NY DeRuyter, Net Sls. Co. 315-662-7996
NY East Northport, Components For Elctrns. 516-266-5020
NY Fairport, Net Sls. Co. 716-467-4538
NY Troy, Net Sls. Co. 518-274-4758
NY Webster, Net Sls. Co. 716-467-4538
NC Raleigh, Tingen Tech. Sls., Inc. 919-781-1100
OH Cincinnati, Makin & Assocs. 513-871-2424
OR Portland, Electronic Mktg. Grp. 503-289-5320
PA Hatboro, Jacobsen Assocs. 215-674-2937
PA Lebanon, Jacobsen Assocs. 717-273-9746
PA Pittsburgh, Kneip Sls. 412-823-0169
TN Chattanooga, Electro Sls., Inc. 615-267-4260
TX Plano, Sundance Sls. 214-867-0592
UT Salt Lake City, Charles Fields & Assocs. 801-531-6177
WA Redmond, Electronic Mktg. Grp. 206-882-0962
WI Milwaukee, Heartland Tech. Mktg. 414-931-0606
Can Rexdale, Ont., Electro Source, Inc. 416-675-4490
Can Vancouver, B.C., Davetek Mktg. 604-430-3680

Local Distributors

AZ Litchfield Park, GB Elctrns. 602-935-3984
CA Orange, Electronic Connexions Corp. 714-998-2901
CA San Diego, Park West 619-277-8433
CA San Jose, Cypress Elctrns. 408-945-8400
CA Santa Clara, DC Elctrns. Supp. 408-980-1199
CA Sunnyvale, Future Elctrns. 408-745-6570
CA Torrance, Cypress Elctrns. 213-533-6005
CO Denver, CSID, Inc. 303-292-9594
CO Westminster, Future Elctrns. 303-650-0123
CO Wheatridge, Cypress Elctrns. 303-431-2622
CT Danbury, Future Elctrns. 203-743-9594
CT Norwalk, Park Distrs. 203-853-2010
CT Wallingford, Cronin Elctrns., Inc. 203-265-3134
FL Clearwater, Electronic Precepts of FL 813-530-9781
FL Clearwater, Future Elctrns. 813-441-4771
FL Lake Park, Park/South, Inc. 305-863-7275
FL Pompano Beach, Components South 305-971-0350
IL Lisle, Components, Inc. 312-852-7707
IL Palatine, OHM Elctrns., Inc. 312-359-5500
IN Indianapolis, Mar Elctrns. 317-875-4510
MD Columbia, Future Elctrns. 301-995-1222
MD Rockville, Wire Tech., Inc. 301-340-1445
MA Needham, Cronin Elctrns. 617-449-5000
MA Norwood, Emtel Elctrns. 617-769-9500
MA Westborough, Future Elctrns. 617-366-2400
MA Westford, Electronic Specialty Intl. 617-486-8495
MA Wilmington, Aved Elctrns. 617-657-8310
NH Nashua, Brevan Elctrns. 603-889-7230
NJ Bellmawr, Mid-Atlantic Elctrns. 609-931-5303
NJ Berlin, GCI Corp. 609-768-6767
NJ Englewood, Powell 201-894-0800
NJ Mt. Laurel, Future Elctrns. 609-778-7600
NJ Springfield, Route Elctrns. 201-379-7710
NM Albuquerque, Connecting Comps. Div. 505-345-8921
NY Bohemia, Norelcom Elctrns. Corp. 516-567-8866
NY Brooklyn, Beryl Elctrns. 718-383-2208
NY Brooklyn, Connector Resources 718-383-2208
NY East Syracuse, Future Elctrns. 315-453-6633
NY Farmingdale, Resources for Elctrns. 516-420-8555
NY Hauppauge, Jaco Elctrns. 516-273-5500
NY Liverpool, Future Elctrns. 315-451-2371
OH Dayton, Televox, Inc. 513-294-4499
OH Mansfield, Rush Elctrns. Distrs., Inc. 419-756-2311
OR Beaverton, Component Resources 503-641-8488
PA Wayne, Peak Elctrns. 215-293-9000
PA York, E.C.I. 717-843-8971
TX Allen, Prime Distrbg. Co. 214-231-0170
TX Grand Prairie, Dial Supp. 214-647-2371
TX Richardson, Jaco Elctrns. 214-235-9575
TX Richardson, Southwest Elctrns. 214-234-3050
TX Stafford, Southwest Elctrns. 713-240-4000
UT Salt Lake City, Future Elctrns. 801-972-8489
WA Bellevue, Future Elctrns. 206-624-9609
WA Bellevue, Integrated Elctrns. 206-455-2727
WA Seattle, Pacific Elctrns. 206-575-1050
WI Brooklyn Center, Willman Assocs. 612-566-5010
Can Calgary, Alb., Future Elctrns. 403-259-6408
Can Downsview, Ont., Future Elctrns. 416-663-5563
Can Edmonton, Alb., Future Elctrns. 403-486-0974
Can Ottawa, Ont., Future Elctrns. 613-820-8313
Can Pointe Claire, Que., Future Elctrns. 514-694-7710
Can Vancouver, B.C., Future Elctrns. 604-438-5545

PRECISION COMPONENTS, INC., 1110 W. National Ave., Addison, IL 60101, Tel: 312-543-6400

PRECISION ELCTRN. COMPS. LTD., 1919 Hafis Rd., Toronto, ON, Canada M6M 2V6, Tel: 416-249-7103, Telex: 06-969671

PRECISION ELCTRNS., 9101 King Ave., Franklin Park, IL 60131, Tel: 312-678-5350; Empl.: 25; *Sls. Mgr.:* William Stow

PRECISION EXTRUSIONS, INC., Box 120, Bensenville, IL 60106, Tel: 312-766-0340; *Sls. Mgr.:* Jim Achen

PRECISION FILTERS, INC.

PRECISION FILTERS, 240 Cherry St., Ithaca, NY 14850, Tel: 607-277-3550, Telex: 646846; FSC No.: 66-II-F & 66-II-I; Empl.: 49; *Sls. Mgr.:* D. F. Chandler ..... **A•1624-1627; D•1017**

Local Sales Offices & Reps

AZ Tempe, Cleveland Entprs. 602-820-1127
CA La Crescenta, Beckrep 818-957-1111
CA San Jose, Synergistic Sls. 408-292-6573
CO Colorado Springs, Cleveland Entprs. of Colorado 303-597-8872
DC Arlington, Gans & Pugh 703-527-3262
FL Osprey, Dick Ridgewell Co. 813-484-2020
MD Dayton, Gans & Pugh Assocs. 301-596-9094
MN Chanhassen, Electronic Instr. Conslts. 612-445-7056
NJ Midland Park, Langstrom Instrs. 201-891-2829
NM Albuquerque, Cleveland Entprs. 505-265-7893
UT Salt Lake City, Cleveland Entprs. 801-355-8424
VA Arlington, Gans & Pugh Assocs. 703-527-3262
WA Bellevue, Topp Engrg. Sls. 206-747-5400
Can Downsview, Ont., Rayonics Scientific 416-736-1600

PRECISION LAMP, INC., 480 Aaron Dr., Cotati, CA 94928, Tel: 707-792-0333, Telex: 348498; Empl.: 25

PRECISION LEVEL VIAL CO., Warren Industries Inc., 1800-D Mearns Rd., Warminster, PA 18974, Tel: 215-675-2355; Empl.: 12; *Sls. Mgr.:* Christopher Beyer; *Dist. Mgr.:* Christopher Beyer

PRECISION MECHANISMS, 44 Brooklyn Ave., Westbury, NY 11590, Tel: 516-ED3-5955; FSC No.: 08127; Empl.: 26; *Sls. Mgr.:* Leon N. Canick

PRECISION METAL PRODS. CO., Centennial Indl. Pk., Peabody, MA 01960, Tel: 617-532-5500, TWX: 710-347-0123; FSC No.: 86577; Empl.: 54; *Sls. Mgr.:* Robert H. Degnan

Local Sales Offices & Reps

AZ Phoenix, J. Osborn Assocs. 602-996-1291
CA Corte Madera, P. Oneal & Assocs. 415-924-1691
CA Garden Grove, Impact Elctrns., Inc. 213-431-3581
CO Arvada, Challenge Sls. 303-427-3149
FL Clearwater, Chaco Sls. 813-536-9503
IL Hinsdale, Hill-Gray Assocs. 312-325-4810
IN South Bend, Schillinger Assocs. 219-291-6258
NJ Cherry Hill, ESA Assoc. 609-667-4066
NJ Verona, L. J. Roth Assoc. 201-857-3393
NY Syracuse, C.W. Floring & Assocs. 315-478-2149
OH Dayton, Electro-Com 513-276-3993
OR Portland, Paul Oneal Assoc N/W, c/o Clyde W. Olsen 503-775-3552
SC Greenville, Component Sales Co. 803-288-1922
TX Richardson, Draper Co. 214-680-1650

PRECISION MICRO IMAGES, Box 1330, Altamonte Springs, FL 32701, Tel: 305-830-7244, Telex: 56-4303; *Sls. Mgr.:* Williams S. Hodges

PRECISION MONOLITHICS, INC., 1500 Space Dr., Santa Clara, CA 95054, Tel: 408-727-9222, TWX: 910-338-0218; FSC No.: 06665; Empl.: 1,000; *Sls. Mgr.:* Jo Nall; *Dist. Mgr.:* Mike Dennison

PRECISION RESISTIVE PRODS., INC., P.O. Box 189, Highway 61 South, Mediapolis, IA 52637, Tel: 319-394-9131; Empl.: 90; *Sls. Mgr.:* Oscar Cline; *Dist. Mgr.:* Oscar Cline ..... **A•1929**

Local Sales Offices & Reps

CA Anaheim, Impact Electrns. Inc. 714-533-1351
CA Los Altos, Frauman Assoc. 415-941-0660
CA San Diego, KCE 619-278-7640
CO Denver, Williams Assocs. 303-373-4730
CT Milford, Cuming Assocs. 203-878-3946
FL Cocoa Beach, Reynolds & Assocs. 305-784-4700
IL Chicago, Ellinger Sls. 312-763-1570
IN Greenwood, Valentine Assocs. 317-888-2200
MD Ellicot City, Technical Sls. Inc. 301-461-2400
MA Waltham, Jesco, Inc. 617-893-0094
MI Warren, DEM Elctrns. Sls. 313-575-9444
MN Minneapolis, Intl. Sls. 617-831-8423
MO St. Charles, Chesco 314-946-6677
NY Hauppauge, Masin-Enco, Inc. 516-273-3500
NY Syracuse, C.W. Floring and Assocs., Inc 315-478-2149
OH Cincinnati, G & H Sls. Co. 513-272-0580
TX Richardson, Campion Sls. Co. 214-238-8145
WA Seattle, W3 Assocs., Inc. 206-285-2667

PRECISION RESISTOR CO., INC., 10601 75 St. N., Largo, FL 33543, Tel: 813-541-5771, Telex: 821788; FSC No.: 48615; Empl.: 45; *Sls. Mgr.:* R. L. Wright ..... **A•1930-1933; B•1770-1771**

PRECISION TECH. SEWING, 921 E. Charleston Rd., Palo Alto, CA 94303, Tel: 415-856-2128

PRECISION TUBE, Church Rd. & Wissahickon, N. Wales, PA 19454, Tel: 215-699-5801, Telex: 84-6439; FSC No.: 82413; Empl.: 240; *Sls. Mgr.:* William J. McNeil

Local Sales Offices & Reps

AZ Tempe, Walter Assocs. 602-967-1020
CA Carlsbad, Addem San Diego 619-729-9216
CA Santa Ana, RMS Assocs. 714-556-4155
CA Santa Clara, R. Donahue Assocs. 408-727-6694
CO Golden, J. F. Hurlbut Co. 303-279-7796
FL Melbourne, Hanson Assocs. 305-727-7474
IL Park Ridge, Probe Electrns. 312-696-2828
IN Indianapolis, John Sukup Inc. 317-253-5501
IA Cedar Rapids, Snider Sls. Co. 319-362-4410
MD Frederick, Applied Engrg. Prod., Inc. 301-663-4202
MA Burlington, Tri Tek 617-272-4550
MO St. Peters, D-S Sls. 314-928-5153
NJ Haddonfield, Sunday-O'Brien 609-429-4013
NY Huntington, CDB Enterprises 516-692-5200
NY Syracuse, I.A. Hotze 315-479-6641
TX McKinney, Williams Assocs. 214-548-0995
EXP Hants England, Sealectro. Ltd ... 011-44-705-373211
EXP Ramat-Gan Isreal, Elina, Ltd 03-7514129
EXP Toulo Cedex France, Sealectro, SA 011-33-947-58443
Can St. Laurent Quebec, RF Microwave, Ltd 514-931-8115

Local Distributors

CA El Cajon, Micro Mode Prods. 619-449-3844
CA Santa Clara, Waltronic Sls. 408-727-1200
CA Sunnyvale, Electronic Resources 408-745-1420
FL Stuart, Microwave Comp., Inc. 305-286-4455
MD Baltimore, Resco Baltimore 301-823-0070
MD Beltsville, Resco Washington 301-937-9100
MA Woburn, Pacer Electrns. 617-935-8330
NY Freeport, Mil Spec Wire & Cable 516-546-5454
NY New Rochelle, Compucon Dists. 914-576-2888
Can St. Laurent Quebec, Omniconnect, Inc. 514-335-2337

PREFERRED ELCTRNS., INC., Main Line Dr, P.O. Box 954, Westfield, MA 01086, Tel: 413-568-2301, Telex: 955-339; Empl.: 250; *Sls. Mgr.:* Merton I. Rosenberg

PREH ELECTRONICS INDUSTRIES, INC.

PREH ELECTRONICS INDUSTRIES, INC., 5665 Howard Street, Niles, IL 60648, Tel: 312-647-8338, Telex: 297112; FSC No.: 36-3193682; Empl.: 7; *Sls. Mgr.:* George Zib ..... **A•2034; B•1736; C•1497**

Local Sales Offices & Reps

CA Sunnyvale, James Inds. West 408-971-6016
IL Inverness, James Inds., Inc. 312-358-8000

PREMAX PRODS. DIV., Highland & College Aves., Niagara Falls, NY 14305, Tel: 716-285-9186, Telex: 91-531; FSC No.: 74183; Empl.: 350

PREMIER METAL

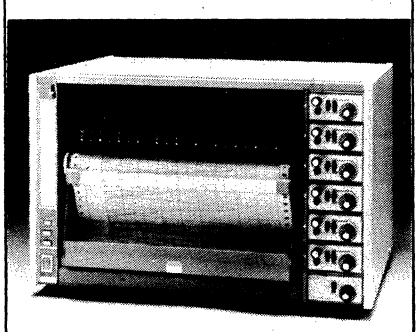
PREMIER METAL PRODS. CO., 381 Canal Pl., Bronx, NY 10451, Tel: 212-993-9200; Empl.: 75; *Sls. Mgr.:* Anthony E. Bozza ..... **C•1072-1073**

Local Sales Offices & Reps

AZ Phoenix, CPS Associates 602-246-1097
CA City of Industry, Premier Metal 818-336-4534
CA San Jose, Silicon Valley Sls., Inc. 408-286-7510
CA Westmunster, West Elctrn. Sls. Co. 714-898-0120
CO Denver, AKI Enterprises 303-338-4488
CT East Haven, Eagle Assocs. 203-467-6542
FL Lake Worth, Adams & Assocs. 305-588-7630
GA Marietta, Adams & Assocs. 404-973-0853
IL Elmhurst, Utronix Sls. 312-834-1100
KS Overland Park, Delltron Co. 913-649-2078
MD Burtonsville, Eastern Instrmn. 301-384-8500
MA Needham, Eagle Assocs. 617-444-3446
MI Brighton, Electronic Sources 313-227-3598
MN Minneapolis, J.E.M. Anderson Co. 612-823-6459
MO St. Louis, Delltron Co. 314-869-4779
NM Rio Rancho, RML Associates 303-757-6654
NY New Hyde Park, Harris & Aldrich Sls. 516-488-2622
NY Syracuse, Lewis-Dunnigan Co. 315-446-5522
NY Yonkers, Sonkin Assocs. 914-968-8282
NC Greenboro, Adams & Assocs. 919-272-6838
OH Akron, ImTech Inc. 216-666-1185
PA Bensalem, Eastern Instrmn. 215-245-6660
TX Bedford, W. Pat Fralia Co. Inc. 817-267-3577
TX Houston, W. Pat Fralia Co. Inc. 713-772-1572
EXP FL, Miami, Emec, Inc. 305-871-3124

Local Distributors

AL Huntsville, Mock Elctrns. 205-539-2401
AL Opelika, Southern Elctrns. 205-745-5298
AZ Phoenix, Dalis Elctrns. 602-275-2885
CA Burlingame, Rose Elctrns. 415-348-2740
CA San Jose, Quement Elctrns. 408-998-5900
CT Middletown, Midstate Elctrns. 203-347-5638
FL Dania, Summit Elctrns. 305-920-6253
FL Miami, Electronic Equip. Co. 305-871-3500
IL Elk Grove Village, GBL/Gould Elctrns. 312-593-3220
IN Fort Wayne, Graham Elctrns. 219-423-3422
LA Baton Rouge, Menard Elctrns. 504-355-0323
MD Baltimore, ASI Elctrns. 301-265-5100
MD Baltimore, Resco 301-823-0070
MD Bethesda, Empire Elctrns. 301-656-3300
MA Hingham, Sager Electrical Supp. 617-749-6700
MA Newton, Greene-Shaw Co. 617-969-8900
MI Ann Arbor, Purchase Radio Supp. 313-668-8696

PRIMELINE™
Recorders
Authorized Distributors
RAG ELECTRONICS, INC.
New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing
21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500
CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225

Model R-306

MO Kansas City, Walters Radio Supp. 816-531-7015
NJ Cranford, Garden State Indl. Elec. 201-272-6400
NJ Green Brook, Green Brook Elctrn. 201-968-3500
NJ Hanover, State Elctrns. PTS 201-887-2550
NJ Kenilworth, Federated Purchaser 201-272-0505
NY Buffalo, Summit Distrs. 716-884-3450
NY Hauppauge, Broadline Elec. Dist. 516-231-4100
NY Hempstead, Davis Elctrn. Corp. 516-483-9200
NY Lynbrook, Peerless Radio Dist. Corp. .. 212-523-3456
NY LIC, H. L. Dalis Inc. 212-361-1100
NY New York, Argil Elec. LTD 212-691-8111
NY New York, Martin Audio/Video Corp. 212-541-5900
NY Rochester, Masline Elctrns. 716-546-5373
NY Rochester, Simcona Elctrn. Corp. 716-328-3230
NY Rochester, Summit Elctrns. 716-334-8110
NY Yonkers, Yonkers Elec. Supp. 914-969-6044
NC Raleigh, Southeastern Radio 919-828-2311
OH Warren, Rem Elctrns. 814-453-5626
PA Allentown, Federated Elctrns. 215-437-4481
PA Braddock, Leff Elctrns. 412-271-7100
PA Horsham, Toner Cable Equip. 215-675-2053
PA Philadelphia, Philadelphia Elctrns. 215-568-7400
PA Reading, Barbey Elctrns. 215-376-6116
PA West Chester, West Chester Elec. Supp. 215-696-7500
RI Warwick, Edwards Elctrns. 401-732-3200
SC Charleston, Wholesale Indl. Elec. 803-722-2634
TN Clarksville, Randolph Hale & Matthews 615-647-2325
TN Cookeville, Randolph & Parks 615-526-6184
TN Nashville, Randolph & Rice 615-255-5601
TN Tullahoma, Randolph Rice & Williams 615-455-4531
TX Farmers Branch, Summers Elec. Co. .. 214-748-6533
TX Ft. Worth, Swieco Inc. 817-335-6521
TX Houston, Lenert Co. 713-225-1465
VA Arlington, Arlington Elctrns. 703-524-2412
WA Seattle, Radar Elec. Co. 206-282-2511

PREMIER MICROWAVE, 35 New Broad St., Port Chester, NY 10573, Tel: 914-939-8900, TWX: 710-569-1609; FSC No.: 15870; Empl.: 70 ..... **A•1781**

Local Sales Offices & Reps

CA Los Angeles, R.F. Assocs. 213-478-1586
GA Smyrna, BC Elctrn. Sls. 404-436-5169
IL Chicago, L.G.S. Elctrns. Sls. 312-456-9616
MD Catonsville, Callas Elctrns. Dist. 301-744-7711
MA Natick, Gerald Rosen 617-879-5505
MO St. Louis, Boweng Tech. Rep. 314-429-7327
NY Huntington, C.D.B. Entprs. 516-692-5220
OH Dayton, BEK Assocs. 513-278-1343
EXP CA, N. Hollywood, Air Frame Mfg. & Supp. 213-765-2600

Local Distributors

CA Los Angeles, R.F. Assocs. 213-478-1586
FL Cleatwater, Brennan Assocs., Inc. 813-446-5006
GA Smyrna, B-C Electrns. of Geroria 404-436-5169
IL Chicago, L.G.S. Electrns. 312-456-9616
MD Catonsville, Callas Electrns. 301-744-7711
MA Framingham, Gerald Rosen Co.,Inc. ... 617-879-5505
MO St. Louis, Boweng Technical Reps., Inc. 314-429-7327
NY Fayetteville, R.D. Sherman, Inc. 315-637-9861
NY Huntington, GDB Enterprises 516-692-5200
OH Dayton, KW Electrns., Sls. 513-890-2150
TX McKinney, Williams Assoc. 214-548-0995
EXP Shantinagar, Hyderabad, Kashinath & Co. 346-353-6942
Can Lachine, Quebec, Electrodesign Ltd ... 514-636-4838

PREM MAGNETICS, 3521 N. Chapel Hill Rd., McHenry, IL 60050, Tel: 815-385-2700, TWX: 910-642-3763; Empl.: 300; *Sls. Mgr.:* D. Hertel ..... **A•2265-2267**

PRES-AIR-TROL CORP., 1009 Boston Post Rd., Mamaroneck, NY 10543, Tel: 914-698-2026-800-431-2625 (outside NY) ..... **B•1690**

PRESIDIO COMPONENTS, INC., 7185 Construction Ct., San Diego, CA 92121, Tel: 619-578-9390, TWX: 910-335-1254; FSC No.: 60212

Local Distributors

TX Richardson, Central States Comps. ... 214-644-2070

PRESS-ON PRODS., 39 Factory Rd., Addison, IL 60101, Tel: 312-628-2255; Empl.: 40; *Sls. Mgr.:* T. Cummins

PRESSURE CONTROLS, INC., 406 Cortlandt St., Belleville, NJ 07109, Tel: 201-751-5003; Empl.: 15; *Sls. Mgr.:* P. Emmarco

PRESSURE SYSTEMS, INC., 15 Research Dr., Hampton, VA 23666, Tel: 804-865-1243, Telex: 901406; Empl.: 45; *Sls. Mgr.:* J. S. Yakshe

PRESTOLITE WIRE DIV., 3529 24th St., Port Huron, MI 48060, Tel: 313-987-6300

PRESTON SCIENTIFIC, 805 E. Cerritos Ave., Anaheim, CA 92805, Tel: 714-776-6400, Telex: 655-321; Empl.: 61; *Sls. Mgr.:* Charles J. McGuire ..... **D•1161**

Local Sales Offices & Reps

AL Huntsville, Mo-Co 205-881-5968
AZ Scottsdale, Williams Assocs. 602-947-4297
CA Laguna Hills, Elotek 714-830-4856
CA Santa Clara, PBC Assocs. 408-727-7244
CO Denver, Williams Assocs. 303-289-5647
CT Avon, Power Mark 203-678-0123
FL Orlando, Truex Assocs. 305-859-2160
IL Arlington Heights, Coombs Assocs. ... 312-439-9810
IN Ft. Wayne, Coombs Assocs. 219-747-7661
KS Shawnee Mission, Techn. Sls. Assocs. 913-888-3330
MD Clarkesville, Riffe Assocs. 301-953-2811
MA Falmouth, RJC Assocs. 617-540-8832
MN St. Paul, Vikeland Sls. 612-645-4647
MO Ferguson, Techn. Sls. Assocs. 314-725-5361
NJ Franklin, Hansen/Hughes 201-848-8900
NM Albuquerque, Williams Assocs. 505-255-1638
NC Winston-Salem, Radco 919-722-9671
OH Dayton, Hocker Assocs. 513-298-8638
OR Portland, Sci. Dvcs. 503-292-6934
PA Cheltenham, Stein Instrmn. 215-379-1990
TX Houston, Lear Assocs. 713-488-7893
TX Spring, Lear Assocs. 713-370-7449
UT Salt Lake City, Williams Assocs. 801-485-6511
WA Bellevue, Sci. Dvcs. 206-747-5169
WI Milwaukee, Coombs Assocs. 414-351-6123

PRIMELINE-SOLTEC DISTBN., Soltec Corp., P.O. Box 818, Sun Valley, CA 91353-0818, Tel: 800-525-5554, 818-764-5400, Telex: 494-3094 SOLTEC UI; *Sls. Mgr.:* Phillip Braden; *Dist. Mgr.:* Byron G. McIntire

PRIME/POWER

PRIME POWER, INC., Prime Technology Co., Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, Tel: 203-481-5721, TWX: 710-452-3092; *Sls. Mgr.:* J. L. Jamieson ..... **D•1801**

Local Sales Offices & Reps

CA Buena Park, Chuck Cooper Co. 714-739-8526
CO Denver, WEST High-Tech, J.V. 303-477-8180
CT Washington, Tri-Com Assocs. 2-3-563-2241
NJ Fort Lee, FJK Assocs., Inc. 201-592-1002

PRIME TECHNOLOGY, See General Risistance, Inc., Transducers and Systems, Inc. Prime Power, Inc., AND INTERNATIONAL INSTRUMENTS, INC.

PRIMO, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan, Tel: 0422-43-3121, Telex: 2822-326; Empl.: 350; *Sls. Mgr.:* S. Shirota

PRINCETON CASE CO., INC., 667 Lehigh Ave., Union, NJ 07083, Tel: 201-687-1750; Empl.: 60; *Sls. Mgr.:* S. E. Parker

PRINCETON ELCTRN. PRODS., Box 101, North Brunswick, NJ 08902, Tel: 201-297-4448, TWX: 710-380-3832; Empl.: 70; *Sls. Mgr.:* R. Shermister; *Dist. Mgr.:* R. Shermister

PRINCO INSTRS., INC., 1020 Industrial Hwy., Southampton, PA 18966, Tel: 215-355-1500; FSC No.: 48620; Empl.: 66; *Sls. Mgr.:* S. A. Clayton

PRINTER PRODUCTS, Capitol Circuits Corporation, 25 Denby Road, Boston, MA 02134, Tel: 617-254-1200; Empl.: 200; *Sls. Mgr.:* John Callanan.

PROBE MASTER, INC., 4898 Ronson Ct., San Diego, CA 92111, Tel: 619-560-9676, 800-854-1519, 800-772-1519; *Sls. Mgr.:* Dick Press ..... **D•1397**

PROBE-RITE, INC., 2725 Lafayette St., Santa Clara, CA 95050, Tel: 408-727-0100, TWX: 910-338-0260; *Sls. Mgr.:* Marilyn Bailey

PROCESS ANALYZERS, INC., 3 Headley Pl., Fallsington Ind'l Pk, Fallsington, PA 19054, Tel: 609-921-7330, TWX: 510-685-9254

PRODUCTION INDUSTRIES, INC., 12880-E Pierce Street, Pacoima, CA 91331, Tel: 818-896-0555, 800-423-5618; *Dist. Mgr.:* Linda Dice ... **C•1075-1077; D•1384**

PRODUCTS FOR RESCH., 88 Holten St., Danvers, MA 01923, Tel: 617-774-3250, Telex: 940-287; Empl.: 20; *Sls. Mgr.:* Harry Martin

PTS
FREQUENCY SYNTHESIZERS

PROGRAMMED TEST SOURCES, Beaver Brook Rd., Littleton, MA 01460, Tel: 617-486-3008; Empl.: 20 ..... **D•1292**

Local Sales Offices & Reps
CA La Crescenta, Beckrep, Inc. 818-957-1111

PROJECTS UNLTD., 3680 Wyse Rd., Dayton, OH 45414, Tel: 513-890-1918, TWX: 810-450-2523; Empl.: 75; *Sls. Mgr.:* Greg Kimpton

PRO-LOG, 2411 Garden Rd., Monterey, CA 93940, Tel: 408-372-4593, TWX: 910-360-7082; Empl.: 200

PROTEON, INC., 4 Tech Circle, Natick, MA 01760, Tel: 617-655-3340, Telex: PROTEON; Empl.: 75; *Sls. Mgr.:* Arthur F. Lynch

PROTO STAMPING CORP., 850 Charter St., Redwood City, CA 94063, Tel: 415-365-0498, Telex: 709241; *Sls. Mgr.:* David Duncan

PROTO SYSTEMS OF ATLANTA, 625 Sims Industrial Blvd., Alpharetta, GA 30201, Tel: 404-475-1330, Telex: 469432; *Sls. Mgr.:* John Gregory

PROTOTEK, INC., 25 Standen Dr., Hamilton, OH 45015, Tel: 513-874-5094; FSC No.: 60813 ..... **C•1714**

Local Sales Offices & Reps
CA Riverside, Cal Tech Pro, Inc. 714-682-8506
CA Santa Clara, Covington Sls. 408-241-2877
CO Denver, Matthews & Assocs., Inc. 303-450-6476
MD Gaithersburg, Simcomp, Inc. 301-258-9358
MA Tewksbury, United Sls., Inc. 617-658-4281
OH Columbus, Seltech Mktg. 614-451-3865
TX Dallas, Matthews & Assocs., Inc. 214-248-7881
EXP CT, Litchfield, Intrade, Inc. 800-243-5252

PSG INDS., 1225 Tunnel Road, Perkasie, PA 18944, Tel: 215-257-3621, Telex: 827361; FSC No.: 18509; Empl.: 150; *Sls. Mgr.:* John Feldermann, Jr.

PTC TRANSFORMERS, P.O. Box 397, Rising Sun Road, Bordentown, NJ 08505, Tel: 609-298-8200, Telex: 510-685-3645; Empl.: 25; *Sls. Mgr.:* C. W. Harrison

PTK DIVISION, Emerson Electric Co., 1173 Los Olivos Ave., Los Osos, CA 93402, Tel: 805-528-5858, Telex: 88-8863, TWX: 910-351-5802; FSC No.: 60132; Empl.: 140; *Sls. Mgr.:* Wayne Hamari

PTL ELCTRNS., 10211 Vinemont St., Dallas, TX 75218, Tel: 214-327-3180; Empl.: 10

PTS ELECTRONICS INC., Box 272, Bloomington, IN 47401, Tel: 812-824-9331; Empl.: 525; *Sls. Mgr.:* R. W. King; *Dist. Mgr.:* J. Hamilton

PTX-PENTRONIX INC., 1737 Cicotte, Lincoln Park, MI 48146, Tel: 313-388-3100, Telex: 23-0398; Empl.: 21; *Sls. Mgr.:* J. Schultz

PULIZZI ENGINEERING, INC., 3260 S. Susan St., Santa Ana, CA 92704-6865, Tel: 714-540-4229; *Sls. Mgr.:* Michael B. Pulizzi; *Dist. Mgr.:* Michael B. Pulizzi ..... **D•1956-1958**

Local Sales Offices & Reps
AL Huntsville, E.M.A 205-830-4030
CA San Jose, J & M Mktg. 408-996-8763
IA Des Moines, Beams 500 to 528 515-255-1148
MA Brookline, Vernon Newland 617-739-2727
NJ Union, Stearns Assocs. 201-686-2980
TX Dallas, T.S.S 214-458-0644

PULNIX AMERICA, INC., 770-A Lucerne Drive, Sunnyvale, CA 94086, Tel: 408-733-1560, Telex: 172541 PULNIX AMERICA; *Sls. Mgr.:* Mary Pomgrey

PULSAR PRODUCTS DIV., 2700 Merced St., San Leandro, CA 94577, Tel: 415-577-7236, TWX: 910-366-7033; Empl.: 24

PULSE ENGRG. INC., A Varian Sub., P.O. Box 12235, San Diego, CA 92112, Tel: 619-268-2400, TWX: 910-335-1527; Empl.: 1200; *Sls. Mgr.:* Leonard M. Luner

PULSE INSTRS. CO., 1234 Francisco, Torrance, CA 90502, Tel: 213-515-5330; Empl.: 20; *Sls. Mgr.:* Ron Perry

PULVER LABORATORIES, INC., 415 S. 8th. St., Boise, ID 83702, Tel: 208-342-1000, Telex: 62135850, TWX: 469834; FSC No.: 208-342-5500; *Sls. Mgr.:* Cindy Christensen

PYLE INDUSTRIES, INC., 501 Center St., P.O. Box 620, Huntington, IN 46750, Tel: 219-356-1200; Empl.: 175; *Sls. Mgr.:* Frank Pyle, Jr.; *Dist. Mgr.:* Mark Pyle

PYLE-NATIONAL, Brand-Rex Company, 1334 N. Kostner Ave., Chicago, IL 60651, Tel: 312-342-6300, Telex: 25251, TWX: 910-221-0335; FSC No.: 49367; Empl.: 800; *Sls. Mgr.:* Mike Carroccia; *Dist. Mgr.:* Neil Buchler(Eastern)/R. Williams(Western)

PYLON ELEX DEVELOPMENT CO. LTD., 2300 Victoria, Lachine, PQ, Canada H8S 1Z3, Tel: 514-637-1186, Telex: 05-821680; *Sls. Mgr.:* Andy Scrimshaw

PYROCOM CO., 924 N. 143rd St., Seattle, WA 98133, Tel: 206-365-3535

PYROFERRIC INTL., INC., 200 Madison St., Toledo, IL 62468, Tel: 217-849-3300, TWX: 910-663-0616; Empl.: 50; *Sls. Mgr.:* S. John Horner

PYROFILM RESISTOR CO., See KDI Electronics

Q-MATIC CORP., 3194-D Airport Loop Dr., Costa Mesa, CA 92626, Tel: 714-545-8233, Telex: 67-8389

Q-S PRODUCTS CO., INC., 3605 S.W. Snoqualmie St., Seattle, WA 98126, Tel: 206-937-5505

Q-SYSTEMS, PO Box 35879, Tucson, AZ 85740, Tel: 602-293-4923, TWX: 910-952-1185; Empl.: 7; *Sls. Mgr.:* M. Lloyd

Q-TECH CORP., 2201 Carmelina Ave., Los Angeles, CA 90064, Tel: 213-820-4921, Telex: 69-6140; FSC No.: 51774; Empl.: 65; *Sls. Mgr.:* H. Phillips ... **A•1420-1422**

Local Sales Offices & Reps
AZ Scottsdale, Western High Tech Mktg. 602-949-0873
CA Cupertino, Dura Elctrn. Sls. 408-255-2084
CA Northridge, Tauber-Dreyer 213-993-0048
FL Melbourne, Reynolds & Assocs. 305-259-7000
IL Northbrook, Allied Comp. Reps., Inc. .. 312-498-6658
MA Malden, J-K Assocs. 617-321-2922
NJ Glen Gardner, F & M Tech. Sls. 201-832-7216
NJ Paramus, Eltech Sls. 201-967-1309
NM Albuquerque, Western High Tech Mktg. 505-262-2461
NY Kings Park, Eltech Sls. 201-967-1309
TX Houston, TCI Elctrns. 713-774-5019

QUADRA SALES CORP., 14825 NE 40th, Suite 340, Redmond, WA 98052, Tel: 206-833-3550

QSI

QUALIDYNE SYS., Unitech Ltd., 3055 Del Sol Blvd., San Diego, CA 92154, Tel: 619-429-7440, 619-575-4400, Telex: ESL227140; FSC No.: 619-429-1011; Empl.: 300; *Sls. Mgr.:* James J. Louden ..... **D•1803-1809**

Local Sales Offices & Reps
AL Huntsville, Beacon Elctrns. 205-881-5031
AZ Phoenix, Thor Engrg. 602-437-1463
AR Little Rock, Beacon Elctrns. 501-224-5449
CA Chatsworth, Raltech, Inc. 818-700-0933
CA Diamond Bar, Raltech, Inc. 714-861-1530
CA Santa Clara, Gagner-Toomey Assocs. 408-244-2200
CO Englewood, Frontier Reps., Inc. 303-799-6063
CT Guilford, O.E.M. Mktg. & Sls. 203-453-5424
FL Boca Raton, Beacon Elctrns. 305-392-3500
FL Clearwater, Beacon Elctrns. 813-796-2378
FL Maitland, Beacon Elctrns. 305-647-3498
FL Melbourne, Beacon Elctrns. 305-724-8010
GA Atlanta, Beacon Elctrns. 404-256-9640
IL Glencoe, Howard Benjamin & Assocs. 312-835-0150
IA Cedar Rapids, Electromec Sls., Inc. ... 319-362-6413
MA Franklin, OEM Mktg. & Sls. 617-528-4460
MN Burnsville, Electromec Sls., Inc. 612-894-8200
NH Salem, O.E.M. Mktg. & Sls. 603-893-0009
NY Great Neck, Tylinski Assocs., Inc. 516-466-9070
NY Rochester, J.G. Welch Assocs., Inc. ... 716-244-1100
NY Utica, J.G. Welch Assocs., Inc. 315-736-7821
NC Raleigh, Beacon Elctrns. 919-787-0330
OH Columbus, Micro Tec, Inc. 614-451-2400
OH Dayton, Micro Tec, Inc. 513-435-0644
OH Highland Heights, Micro Tec, Inc. 216-442-1555
OR Beaverton, Quest Mktg., Inc. 503-641-7377
PA Pittsburgh, Micro Tec, Inc. 412-931-3380
PA Spring House, Deltatronics, Inc. 215-542-0250
TX Richardson, Jim D. Gray & Assocs., Inc. 214-699-9976
UT Ogden, Frontier Reps., Inc. 801-546-4029
WA Bellevue, Quest Mktg., Inc. 206-747-9424

QUALITY THERMISTOR, 2147 Centurion Pl., Boise, ID 83705, Tel: 208-377-3373; FSC No.: 56866; Empl.: 30; *Sls. Mgr.:* John Mahoney

Local Sales Offices & Reps
AZ Scottsdale, ARCOM Sls. 602-947-5745
FL Casselberry, Elctrn. Mktg. Corp. 305-339-7070
IN Ft. Wayne, John F. Kilfoil Co. 219-424-7719
KS Shawnee Mission, Florence & Meyer, Inc. 913-722-5210
MA Needham, Hatch Assocs. 617-444-3310
OH Cincinnati, John F. Kilfoil Co. 513-791-6150

QUAM CORPORATION, 900 W. 128th St. Ste 208, Burnsville, MN 55337, Tel: 612-894-2360, TWX: 910-5762754; Empl.: 20; *Sls. Mgr.:* Larry Blethen

PROBE MASTER

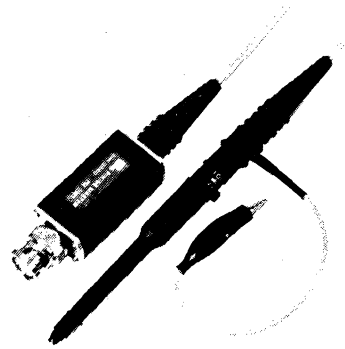
Authorized Distributors

RAG ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



QUAM-NICHOLS CO., 234 E. Marquette Rd., Chicago, IL 60637, Tel: 312-488-5800, Telex: 701676; Empl.: 200; *Sls. Mgr.:* William G. Little; *Dist. Mgr.:* Greg Johns ..... **D•1032-1033**

QUANTRONIX, 225 Engineers Rd., Smithtown, NY 11787, Tel: 516-273-6900, Telex: 967-782; Empl.: 225; *Sls. Mgr.:* R. J. Bruno; *Dist. Mgr.:* R. J. Bruno

QUANTUM, Barnes Indl. Pk., Wallingford, CT 06492, Tel: 203-265-2811, Telex: 953-543; *Sls. Mgr.:* D. Felt

QUANTUM DATA, INC., 455 E. Kehoe, Carol Stream, IL 60188, Tel: 312-668-3301, Telex: 206725; Empl.: 30 ..... **D•1293**

Local Distributors

EXP Japan, Tokyo, Nihon Binary Co. 03-407-9751

QUARTIC SYSTEMS, INC., 3575 South West Temple #7, Salt Lake City, UT 84115, Tel: 801-268-9264, Telex: 887430; Empl.: 5; *Sls. Mgr.:* Jim Elwell

QUARTZITE PROCESSING, INC., 6 Holyoke St., Malden, MA 02148, Tel: 617-322-1380; Empl.: 11; *Sls. Mgr.:* P. S. Yanofsky

QUAY CORP., 22 Meridian Rd., P.O. Box 783, Eatontown, NJ 07724, Tel: 201-542-7340; *Sls. Mgr.:* George Hill

QUME, 2350 Qume Dr., San Jose, CA 95131, Tel: 408-942-4000, TWX: 910-338-0232; Empl.: 3500; *Dist. Mgr.:* Jerry Kaplan, Steve Kadash

Q.V.S., INC., 20 North 15th St., East Orange, NJ 07017, Tel: 201-673-3996; FSC No.: 89820; Empl.: 45

QWINT SYSTEMS, 3693 Commercial Ave., Northbrook, IL 60062, Tel: 312-498-5060, Telex: 27-0498, TWX: 910-686-0625; Empl.: 105; *Sls. Mgr.:* K. S. Berland; *Dist. Mgr.:* Anita Stickling

RACAL-DANA INSTRS. INC., 4 Goodyear St., Irvine, CA 92715, Tel: 714-859-8999; FSC No.: 21793; Empl.: 230

RAYTHEON

FULL LINE
AUTHORIZED DISTRIBUTOR

E S I

ELECTRIC SWITCHES
INCORPORATED

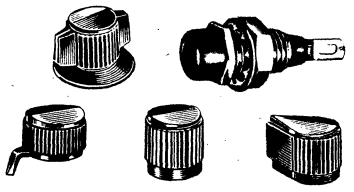
2478 Fletcher Dr. Los Angeles, California 90039

213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971

Industrial, Commercial and MIL Spec (QPL)



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

RACAL-MILGO, 1601 N. Harrison Parkway, Sunrise, FL 33324, Tel: 305-475-1601, TWX: 510-955-4145; Empl.: 3,000; *Sls. Mgr.:* H. Cheli

RACOM CORP., 1028 W. Maude Ave. Ste. 401, Sunnyvale, CA 94086, Tel: 408-737-2460; *Sls. Mgr.:* Ken Mills

RADIAL CONTROLS, 2555 E. 55th Place, Indianapolis, IN 46220, Tel: 317-255-2796; Empl.: 25; *Sls. Mgr.:* R. L. Newsom

RADIATION DEVICES CO., See LeCroy Research Sys. Corp.

RADIO MATERIALS CORP., 4242 W. Bryn Mawr, Chicago, IL 60646, Tel: 312-478-3600, TWX: 910-221-2915

RACET COMPUTES, LTD., 1855 W Katella Ste. 255, Orange, CA 92667, Tel: 714-997-4950, Telex: 701160, TWX: RACET UD; Empl.: 13; *Sls. Mgr.:* Ron Paul

RADIOMETRICS, INC., 12021 South Memorial Pkwy., Huntsville, AL 35803, Tel: 205-881-1272; FSC No.: 62951; *Sls. Mgr.:* W. Shelton Ray

RADIO RESCH. INSTR. CO., INC., Two Lake Ave. Extension, Danbury, CT 06811-5295, Tel: 203-792-6666, Telex: 962444 RADAR DURY; FSC No.: 57174; *Sls. Mgr.:* E. B. Doyle

RADIO SWITCH CORP., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, Tel: 201-462-6100; FSC No.: 74217; Empl.: 40; *Sls. Mgr.:* J. L. Bernard ..... **B•1691**

RADIX MICROELECTRONICS INC., 4182 Sandberg Dr., Colorado Springs, CO 80911, Tel: 303-390-5168

RAF ELCTRN. HARDWARE, 95 Silvermine Rd., Seymour, CT 06483, Tel: 203-888-2133, TWX: 710-472-6216; FSC No.: 55566; Empl.: 120; *Sls. Mgr.:* William R. Bailey, Jr.; *Dist. Mgr.:* Dave Granger/John Capece

Distributor

RAG ELECTRONICS, INC., 21418 Parthenia St., Canoga Park, CA 91304, Tel: 818-998-6500, 800-732-3457

RAG ELECTRONICS, INC., 1 Pollack Ave., Ocean, NJ 07712, Tel: 201-544-0666, 800-922-0945

pgs. **618, 622, 623, 654, 687, 690, 695, 710, 715, 723, 750, 759, 761, 764, 765, 781, 785, 819.**

RAGEN CORP., Systems Div., 9 Porete Ave., N. Arlington, NJ 07032, Tel: 201-997-1000, TWX: 710-995-4752; Empl.: 400; *Sls. Mgr.:* Robert H. Michaels

RAGEN DATA SYSTEMS, INC., 3 Oval Dr., Central Islip, NY 11722, Tel: 516-234-3800, TWX: 510-227-4901; Empl.: 52

RAM CHEMICALS, DIV. WHITTAKER CORP., 210 E. Alondra Blvd., Gardena, CA 90248, Tel: 213-321-0710; Empl.: 65; *Sls. Mgr.:* G. M. Steinman

RAMCOM SYSTEMS, 4141-C Glencoe Ave., Marina Del Rey, CA 90292, Tel: 213-827-4432; *Sls. Mgr.:* Ralph Tisdale

RAMKO RESCH., INC., 11355A Folsom Blvd., Rancho Cordova, CA 95670, Tel: 800-821-2545, Telex: 176493; *Sls. Mgr.:* Jim Lucy; *Dist. Mgr.:* Jim Lucy

RAMTEK, 2211 Lawson Lane, Santa Clara, CA 95050, Tel: 408-988-2211, Telex: 171954, TWX: 910-339-9379; Empl.: 465; *Sls. Mgr.:* Tony Glinskas

R & D CIRCUITS, 2381B S. Clinton Ave. Dept. 1202, Plainfield, NJ 07080, Tel: 201-561-8286

RANSCO INDS., INC., Sub. Despatch Ind., Inc., 2201 Statham Blvd., Oxnard, CA 93033, Tel: 805-487-7777, Telex: 6-59235; Empl.: 280; *Sls. Mgr.:* L. W. Benjamin

RAPIDSYN, 3233 Roymar Rd., Oceanside, CA 92054, Tel: 619-439-7500, Telex: 18-1196; FSC No.: 32423; Empl.: 100; *Sls. Mgr.:* Andrew Boyer

RASTER GRAPHICS, INC., P. O. Box 5157, Bend, OR 97701, Tel: 503-388-2584

RATELCO, 1260 Mercer, Dept. EEM, Seattle, WA 98109, Tel: 206-624-7770, Telex: 888729; FSC No.: 14259; Empl.: 120; *Sls. Mgr.:* D. Terpstra

RATH MICROTECH CORP., Rath Affiliated Cos., 2505 Foster Ave., Janesville, WI 53545, Tel: 608-754-2222, 800-356-9464, Telex: 26-5409; *Sls. Mgr.:* Jim Coenen

RAULAND-ZENITH ELECTRONICS CORP., 2407 W. North Ave., Melrose Pk., IL 60160, Tel: 312-345-4700, Telex: 72-1488; Empl.: 2300

RAWAY BEARING, 8 Melnick Rd., Monsey, NY 10952, Tel: 914-352-4944; FSC No.: 3110-3120; Empl.: 6; *Dist. Mgr.:* Rachel Baskin

RAYCHEM CORP., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025, Tel: 415-361-3860, Telex: 34-8316, TWX: 910-373-1728; *Sls. Mgr.:* Robert Simpson; *Dist. Mgr.:* Joseph Rodgers

RAYCO ELCTRN. MFG., 1625 12th St., Santa Monica, CA 90404, Tel: 213-450-0777

RAYMOND ENGRG. INC., Raycorder Prods. Div., 217 Smith St., Middletown, CT 06457, Tel: 203-632-1000, TWX: 710-428-7944; FSC No.: 92059; Empl.: 550; *Sls. Mgr.:* Bruce Greenfield

RAYOVAC CORPORATION, 101 E. Washington Ave., Madison, WI 53703, Tel: 608-252-7400, Telex: 26-5462, TWX: 910-286-2730; FSC No.: 6135; Empl.: 2400; *Sls. Mgr.:* Ed Peterson

RAYTHEON CO., 465 Centre St., Quincy, MA 02169, Tel: 617-479-5300, TWX: 710-337-1020; *Sls. Mgr.:* R. Whitt

RAYTHEON CO., Laser Products, Fourth Ave., Burlington, MA 01803, Tel: 617-272-6402, Telex: 92-3455, TWX: 710-324-6568; Empl.: 60; *Sls. Mgr.:* D. J. Hoffman

RAYTHEON CO., Microwave & Power Tube Div., 190 Willow St., Waltham, MA 02154, Tel: 617-899-8400, TWX: 710-324-6568; *Sls. Mgr.:* A. F. Vacaro; *Dist. Mgr.:* R. K. Whitt

RAYTHEON CO., Submarine Signal Div., 1847 W. Main Rd., P.O. Box 360, Portsmouth, RI 02871, Tel: 401-847-8000, Telex: 927787, TWX: 710-382-6923; FSC No.: 94404; Empl.: 2600; *Sls. Mgr.:* Jerry K. Martin

RAYTHEON OCEAN SYS. CO., Submarine Signal Div., Risho Ave., Westminster Pk., E. Providence, RI 02914, Tel: 401-438-1780, Telex: 6814078; Empl.: 90

RAYTHEON SEMICONDUCTOR, 350 Ellis St., Mountain View, CA 94043, Tel: 415-968-9211, TWX: 910-379-6481; FSC No.: 07933; Empl.: 950; *Sls. Mgr.:* R. Goedjen; *Dist. Mgr.:* R. Johnson

RAYTHEON/TAG SEMICONDUCTORS LTD., 43 Third Ave., Burlington, MA. 01803, Tel: 617-272-3704 (3705), Telex: 92-3455, TWX: 710-324-6568; Empl.: 7; *Sls. Mgr.:* B. Cavender; *Dist. Mgr.:* Pat Mobilia

RCA DISTR. & SPECIAL PRODS. DIV., RCA Corp., 2000 Clements Bridge Rd., Deptford, NJ 08096, Tel: 609-541-3636; *Sls. Mgr.:* H. L. Craton

RCA SOLID STATE DIV., Route 202, Somerville, NJ 08876, Tel: 201-685-6000, TWX: 710-480-9333; FSC No.: 19089; *Sls. Mgr.:* Mel Morris; *Dist. Mgr.:* Tom Pitera

RCA SOLID STATE DIV., CMOS IC Mktg., Rte. 202, Somerville, NJ 08876, Tel: 201-685-6000, TWX: 710-480-9333

See RCA Solid State Div. for Sls. Reps.

RCA SOLID STATE DIV., Linear Integrated Circuits, Rte. 202, Somerville, NJ 08876, Tel: 201-685-6000, TWX: 710-480-9333

See RCA Solid State Div. for Sls. Reps.

RCA SOLID STATE DIV., Micro Processors/ Memories/Peripherals, Route 202, Somerville, NJ 08876, Tel: 201-685-6000, TWX: 710-480- 9333

See RCA Solid State Div. for Sls. Reps.

RCA SOLID STATE DIV., Thyristors & Rectifiers, Rte. 202, Somerville, NJ 08876, Tel: 201-685-6000, TWX: 710-480-9333

See RCA Solid State Div. for Sls. Reps.

RCA SOLID STATE DIV., Transistors, Rte. 202, Somerville, NJ 08876, Tel: 201-685-6000, TWX: 710-480-9333

See RCA Solid State Div. for Sls. Reps.

RCD COMPONENTS, INC., 330 Bedford St., Manchester, NH 03101, Tel: 603-669-0054, Telex: 943-512 RCD COMP MAN; Empl.: 350 ..... **A•1934-1935**

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg. Inc.	205-830-0498
AZ	Phoenix, Elec-Com Assoc.	602-967-8644
CA	Canoga Park, Cummings & Assocs.	213-340-6035
CA	Santa Clara, Cummings & Assocs.	408-247-8656
CA	Woodland Hills, Cummings & Assocs.	213-340-6035
CO	Denver, Cummings & Assocs.	303-455-6860
FL	Apopka, G. F. Bohman	305-886-1882
GA	Norcross, Montgomery Mktg. Inc.	404-447-6124
ID	Boise, N. R. Schultz Co.	208-377-8686
IL	Elk Grove Village, The John G. Twist Co.	312-593-0200
KS	Overland Park, Ensco-Rep Inc	913-381-7557
MI	Livonia, Electronic Salesmasters	800-321-1848
MO	Maryland Heights, Ensco-Rep Inc	314-423-3935
NJ	Cherry Hill, Trinkle Sales Inc.	609-795-4200
NM	Alburquerque, Elec-Com Assocs.	505-898-6101
NY	Hempstead, Kahgan Sls.	516-538-2300
NY	Kingston, R. P. Kennedy Co., Inc.	914-876-2700
NY	Rochester, R. P. Kennedy Co., Inc.	716-271-6322
NC	Cary, Montgomery Mktg. Inc.	919-467-6319
OH	Beachwood, Electronic Salesmasters	216-831-9555
OR	Beaverton, N. R. Schultz Co.	503-643-1644
PA	Allentown, Trinkle Sls. Inc.	800-257-8210
TX	Dallas, Design Mktg. Inc.	214-680-9767
TX	Irving, Design Mktg.	214-255-2110
TX	Round Rock, Design Mktg.	512-255-9686
WA	Bellevue, N. R. Schultz Co.	206-454-0300
WI	Brookfield, The John G. Twist Co.	414-782-2670

R. C. ELCTRNS. INC., 5386 Hollister Ave., Santa Barbara, CA 93111, Tel: 805-964-6708, Telex: 295281; Empl.: 10; *Sls. Mgr.:* Chao-Sun Pang; *Dist. Mgr.:* Chao-Sun Pang

RCI/DATA, 1992 Lakewood Rd., Toms River, NJ 08753, Tel: 201-341-8361; Empl.: 15; *Sls. Mgr.:* Robert Fierro

RCL/Shallcross
WIREWOUND RESISTORS

RCL ELECTRONICS, INC., 195 McGregor St., Manchester, NH 03102, Tel: 603-627-3831, TWX: 710-220-1876; FSC No.: 01686; Empl.: 300 ... **A•1936-1941**

SHALLCROSS, INC., U.S. 70 East, Smithfield, NC 27577, Tel: 919-934-5181, TWX: 510-939-1463; FSC No.: 54294; Empl.: 150 ..... **A•1936-1941**

Local Sales Offices & Reps

NM	Albuqerque, Nelco, Inc.	505-292-3657
NY	Buffalo, Quality Comps.	716-837-5430
OK	Tulsa, Genzel	918-622-7744
TX	Arlington, Procomp	817-640-4336
Can	Kanata, Ont., Gidden/Morton Assocs.	416-671-8111

Local Distributors

CA	Chatsworth, TTI	818-709-1010
CA	San Jose, Shelley Elctrns.	408-942-9111
IN	Indianapolis, Classic Comps.	317-872-4777
MA	Burlington, TLC	617-273-0140
MI	Grand Rapids, S-F Elctrn. Supp.	616-459-0216
NY	Bohemia, Shelley Elctrns.	516-567-7751
PA	Norristown, Century Elctrn. Comps.	215-631-5400
Can	Scarborough, Ont., Carsten Elctrns.	416-495-9999

RCL-Shallcross Local Sls. Offs. & Reps.

AL	Huntsville, CSR Elctrns.	205-533-2444
AZ	Phoenix, ISDS	602-971-6250
CA	Chatsworth, WCV Co.	818-700-0933
CA	Palo Alto, Mollard Mktg.	415-961-0456
CO	Denver, Elcom	303-337-2300
CT	North Haven, Kitchen & Kutchen	203-239-0212
FL	Ft. Lauderdale, AMP Assocs.	305-565-0056
FL	Longwood, AMP Assocs.	305-869-6831
FL	Merritt Island, APM Assocs.	305-453-4322
FL	Tampa, AMP Assocs.	813-886-2457
GA	Dunwoody, CSR Elctrns.	404-396-3720
IL	Schaumburg, Gassner & Clark	312-882-8608
IA	Cedar Rapids, Lorenz Sls.	319-377-4666
MD	Columbia, Delta III Assocs.	301-730-4700
MA	Burlington, Kitchen & Kutchen	617-229-2660
MI	Livonia, Luebbe Sls. Co.	313-477-3131
MN	Minneapolis, Elec. Comp. Sls.	612-933-2594
MO	Grandview, Harris/Hanson Co.	816-763-6200
MO	St. Louis, Harris/Hanson Co.	312-432-3611
NE	Lincoln, Lorenz Sls. Co.	402-475-4660
NJ	Marlton, BGR Assocs.	609-983-1020
NY	Buffalo, Quality Comps.	716-837-5430
NY	Manlius, Quality Comps.	315-682-8885
NY	Melville, Comtronic Assocs.	516-249-0505
NC	Raleigh, CSR Elctrns.	919-878-9200
OH	Cincinnati, Luebbe Sls. Co.	513-891-5770
OH	Cleveland, Luebbe Sls. Co.	216-333-0425
OH	Columbus, Luebbe Sls. Co.	614-431-0474
OH	Dayton, Luebbe Sls. Co.	513-294-0426
OR	Portland, James J. Backer Co.	503-297-8744
OR	Salem, James J. Backer Co.	503-362-0717
PA	Pittsburgh, Luebbe Sls. Co.	412-931-0414
SC	Taylors, CSR Elctrns.	803-292-2292
UT	Salt Lake City, Elcom	801-532-7940
WA	Seattle, James J. Backer Co.	206-285-1300

RCL-Shallcross Local Distributors

AZ	Phoenix, TTI	602-966-1616
AZ	Tempe, Shelley Elctrns.	602-894-2058
CA	Chatsworth, Shelley Elctrns.	818-998-3333
CA	Fountain Valley, Components Ctr.	714-979-0433
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	San Jose, T.T.I.	408-943-9155
CO	Boulder, Shelley Elctrns.	303-442-2718
CT	Stratford, Utronics	203-378-4201
FL	Ft. Lauderdale, Dielco	305-973-8700
FL	Orlando, TTI	305-859-1000
FL	Tampa, Impala Elctrns.	813-885-4747
IL	Melrose Park, Belford Elctrns.	312-865-2400
IL	Northbrook, Classic Comps.	312-272-9650
CT	Hamden, Almo Elctrns.	203-288-6556
MD	Columbia, Aztech Elctrns.	301-995-1760
FL	Tampa, Shelley Elctrns.	813-884-0946
MA	Woburn, TTI	617-938-8800
MA	Billerica, A. W. Mayer Co.	617-229-2255
NY	Bohemia, TTI	516-567-1500
NY	Farmingdale, Command Elctrns.	516-293-1212
NY	Hauppauge, Jaco Elctrns.	516-273-5500
MN	Minneapolis, Aerospace Computer Supp.	612-884-4725
NY	Rochester, Simcona	716-328-3230
NY	Rome, Rome Elctrns.	315-337-4500
NC	Raleigh, Resco-Raleigh	919-781-5700
OH	Dayton, Stotts Friedman	513-298-5555
OH	Englewood, Argent Inds.	513-836-8633
OH	Solon, REH-Electra	216-248-1636
OK	Tulsa, Altair	918-252-5781
PA	McKean, Advacom	814-476-7774
PA	McKeesport, Barno Radio	412-751-5966
PA	Pittsburgh, Aldertronics	412-821-5565
NY	Rockville Center, Milano Bros. Intl.	516-764-2200
TX	Ft. Worth, TTI	817-831-0441
TX	Houston, Altair	713-462-3029
TX	Richardson, Altair	214-231-5166
WA	Bellevue, Almac Elctrns.	206-643-9992
WI	New Berlin, Classic Comps.	414-786-5300

R-COLUMBIA PRODS. CO., INC., 2008 St. Johns Ave., Highland Park, IL 60035, Tel: 312-432-7915; Empl.: 20

RDF CORPORATION, 23 Elm Ave., Hudson, NH 03051, Tel: 603-882-5195, TWX: 710-228-1882; Empl.: 120; *Sls. Mgr.:* Arthur Di Venuti

RDI/REED DEVICES, INC., 525 Randy Rd., Carol Stream, IL 60188, Tel: 312-682-4100, TWX: 910-252-2118; FSC No.: 53337; Empl.: 85; *Sls. Mgr.:* H. J. Roeser ..... **C•1498-1501**

Local Sales Offices & Reps

AL	Huntsville, Alpha	205-533-0766
AZ	Phoenix, Augat Sls.	602-224-0950
CA	Los Angeles, Wiley Co.	213-666-1611
CA	San Diego, Wiley Co.	619-571-2881
CA	Sunnyvale, Schwerin/Merrill	408-735-7900
CO	Denver, Augat Sls.	303-757-2100
FL	Ft. Lauderdale, APM Assoc.	305-565-0056
FL	Longwood, APM Assoc.	305-869-6831
FL	Tampa, APM Assoc.	813-886-2457
GA	Atlanta, Alpha	404-491-9430
IL	Glen Ellyn, Rockford Controls	312-469-6016
IN	Indianapolis, Rockford Controls	317-248-2518
IA	Davenport, Ensco-Rep., Inc.	319-386-6600
KS	Overland Park, Ensco-Rep., Inc.	913-381-7557
KS	Wichita, Ensco-Rep., Inc.	316-683-1070
MA	Norwood, Augat Sls.	612-792-3164
MI	Novi, Lektronics	313-349-3304
MN	Minneapolis, HMR	612-831-7400
MO	Maryland Hts., Ensco-Rep., Inc.	314-423-3935
NJ	Pitman, Colrud Corp.	609-589-5866
NY	Commack, Augat Metro	516-864-3811
NY	Farmingdale, Augat Metro	516-753-0012
NY	Rochester, H.C. Johnson	716-586-0777
NC	Kernersville, Wallace Elctrn.	919-996-2742
OH	Columbus, K.W. Elec. Sls.	614-888-0483
OH	Dayton, K W Elctrn. Sls.	513-890-2150
OH	Shaker Hts., K.W. Elec. Sls.	216-491-9177
OR	Portland, Augat Sls.	503-253-7172
PA	Allison Park, K.W. Elec. Sls.	412-487-4300
TN	Memphis, Glen White	901-761-5941
TN	Oak Ridge, Alpha Mktg.	615-482-4681
TX	Dallas, Augat Sls.	214-788-4211
TX	Georgetown, Augat Sls.	512-479-9447
TX	Houston, Augat Sls.	713-495-3100
VA	Reston, Colrud Corp	703-620-6612
WA	Augat Sls.	206-455-2846
WI	Westbend, Rockford Controls	800-323-1042

Local Distributors

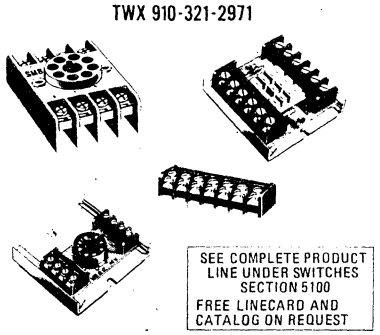
AZ	Phoenix, Dalis	602-275-2885
AZ	Phoenix, Tri-Tek	602-995-9352
AZ	Tempe, Time Elctrns.	602-967-2000
AZ	Tucson, Inland Elec. Supp.	602-889-5301
AR	Little Rock, Carlton-Bates	501-562-9100
CA	Anaheim, Time Elctrns.	714-937-0911
CA	Belmont, Lodan Elctrns.	415-592-4600
CA	Buena Park, Control Des.	714-521-5040
CA	Chatsworth, Time Elctrns.	818-998-7200
CA	Fremont, Term. Sls.	415-656-7722
CA	Gardena, Calif. Switch & Signal	213-538-9830
CA	Los Angeles, Elec. Switches	213-660-1310
CA	San Carlos, Control Des.	415-592-4808
CA	San Diego, Deco Elctrns.	
CA	San Diego, Time Elctrns.	619-586-1331

RDI
Reed Devices Inc.
AUTHORIZED DISTRIBUTOR

E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

CA San Jose, Con. Parts 408-263-9521
CA San Jose, Rose Elec. 408-263-9700
CA Santa Monica, Master Distr. 213-452-1229
CA Sunnyvale, Time Elctrns. 408-734-9888
CA Torrance, Time Elctrns. 213-320-0880
CO Denver, CSID 303-292-9594
CO Englewood, Indl. Elctrns. 303-694-9444
CO Englewood, Time Elctrns. 303-850-7701
CT Cheshire, Time Elctrns. 203-271-3200
CT Stratford, Utronic 203-378-4201
FL Ft. Lauderdale, Comp. Dist. 305-971-4950
FL Ft. Lauderdale, Time Elctrns. 305-974-4800
FL Largo, Lodan Elctrns. 813-595-5811
FL Orlando, Time Elctrns. 305-841-6565
GA Atlanta, Elctrl. Control Prod. 404-455-1216
GA Atlanta, Time Elctrns. 404-351-3545
GA Norcross, Comp. Dist. 404-441-3320
GA Stone Mountain, Control Des. 404-979-3500
IL Addison, Lectro Comps. 312-543-1680
IL Arlington Heights, Lo Dan Elctrns. 312-398-5311
IL Chicago, Otto Frankenbush 312-647-0755
IL Genoa, Control Des. 815-784-6515
IL Oak Park, Newark Elctrns. 312-524-1800
IL Peoria, Klaus Radio 309-691-4840
IL Rockford, Mid-West Assoc. 815-962-8036
IN Ft. Wayne, Graham Elec. 219-423-3422
IN Indianapolis, Control Des. 317-788-4559
IA Cedar Rapids, Deeco 319-365-7551
IA Marion, Control Des. 319-373-2923
KY Louisville, P. I. Burks Co. 502-589-3960
LA Lafayette, Ralph's Indl. Elec. 318-234-4507
LA New Orleans, Southern Radio Supp. 504-524-2343
LA New Orleans, Wm. B. Allen Supp. 800-535-9593
MD Beltsville, Treeko Sls. 301-937-8260
MA Burlington, QPL Elec. Dist. 617-229-2424
MA Middleboro, Glynn Elec. 617-947-4262
MI Farmington Hills, Advent Elctrns. 313-477-1650
MI Southfield, Michigan Lectrols 313-353-1350
MN Bloomington, Time Elctrns. 612-944-9192
MN Minneapolis, Aero-Space Computer Supp. 612-884-4725
MN Minneapolis, Control Des. 612-721-1628
MN Minneapolis, Newark Elec. 612-331-6350
MO St. Louis, Control Des. 314-426-3150
MO St. Louis, Olive Indl. 314-426-4500
MO St. Louis, Time Elctrns. 314-391-6444
NE Lincoln, Scott Elctrn. 402-466-8221
NJ Fairlawn, Relay Specialties 201-797-3313

REDINGTON

AUTHORIZED MASTER DISTRIBUTOR

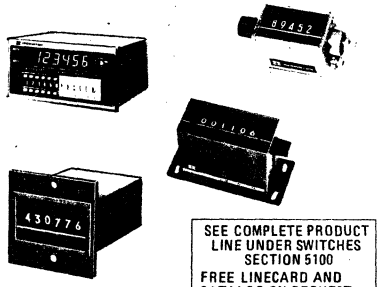
E S I

ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039

213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

NJ Jersey City, Cuny & Gerber 201-653-0222
NY Buffalo, Summit 716-884-3450
NY Lynbrook, Peerless Radio 516-593-2121
NY Mt. Vernon, QAR Indl. Elec. Sls. 914-699-2224
NY Rochester, R. Baker Elctrns. 716-586-9164
NY Rochester, Summit Elctrns. 716-334-8110
NC Charlotte, Control Des. 704-588-4410
NC Raleigh, Southeastern Radio 919-828-2311
NC Winston-Salem, Kirkman Elctrns., Inc. 919-722-9131
OH Akron, Akron Elctrn. 216-762-8818
OH Cincinnati, URI Elctrns. 513-761-4030
OH Columbus, Elctrns. Mktg. Co. 614-299-4161
OH Columbus, Elm Equip. Co. 614-236-0888
OH Dayton, ESCO 513-226-1133
OH Dayton, Scotts-Friedman Co. 513-298-5555
OH Solon, Repco 216-248-8900
OH Warren, Rem Elctrn. Supp. 216-373-1300
OH Wickliffe, Gateway Megatech 216-944-8565
OK Tulsa, Radio 918-587-9123
OR Lake Oswego, Rose Elctrn. 503-635-8823
OR Portland, Platt Elec. Supp. 503-228-3121
OR Portland, Radar 503-232-3404
OR Portland, Time Elctrns. 503-684-3780
OR Tigord, Moore Elctrns. 503-684-3100
PA Broomall, Time Elctrns. 215-359-1200
PA Malvern, Control Des. 215-296-0150
PA McKean, Advacom 814-476-7774
PA Philadelphia, Phila. Elec. 215-568-7400
SC Greenville, Emsco 803-233-4121
SC Greenville, Emsco
TN Memphis, Brownell Electro 901-795-8487
TX Dallas, Control Des. 214-358-1441
TX Dallas, Dallas Meter-Tech. 214-349-6044
TX Dallas, Time Elctrns. 214-385-0566
TX Houston, Angie Elctrns. 713-659-8386
TX Houston, Electronic Packaging Corp. 713-447-5800
UT Salt Lake City, Stuart Elctrns. Supp. 801-466-8603
UT Salt Lake City, Western Controls 801-292-5900
WA Bellevue, Time Elctrns. 206-641-3640
WA Seattle, Pacific Elctrns. 206-575-1050
WA Seattle, Platt Elec. Supp. 206-624-4083
WA Seattle, Radar Elec. 206-282-2511
WI Green Bay, A-A Elec. 414-499-0258
WI New Berlin, Control Des. 414-784-1015
WI West Allis, Marsh Elctrns. 414-475-6000

REACTEL, INC.

REACTEL, INC., 687-D Lofstrand La., Rockville, MD 20850, Tel: 301-279-5535; FSC No.: 60458; Empl.: 20; *Sls. Mgr.:* D. E. Claycomb

Local Sales Offices & Reps
CA North Hollywood, Crown Elctrns. 213-877-3550
CA Sunnyvale, ESCO Assocs. 408-745-1410
VA Fairfax, Beacon North 703-591-1300

REAL TIME SYS., 152 S. MacQuesten Pkwy., Mt. Vernon, NY 10550, Tel: 914-667-0425; *Sls. Mgr.:* A. Citrin

REBLING PLASTICS CO., 150 Franklin Drive, Warrington Ind. Park, Warrington, PA 18976

RECORDER SYS. DIV., See Gulton Inds., Inc., Graphic Instrs. Div.

RECOTON CORP., 46-23 Crane St., Long Island City, NY 11101, Tel: 718-392-6442, Telex: 236047 RCTN; Empl.: 150; *Sls. Mgr.:* George Calvi

RECYCLENE PRODUCTS, 1910 Trade Zone, San Jose, CA 95131, Tel: 408-945-8600; FSC No.: 24496D; *Sls. Mgr.:* Mitch Tuchman

REDINGTON COUNTERS, 130 Addison Rd., Windsor, CT 06095, Tel: 203-688-6205, Telex: 64-3390 REDCO WSOR; *Sls. Mgr.:* Alan Schoenhut; *Dist. Mgr.:* George Angelovich

REED SWITCH DEV. CO. INC., PO Box 1464, Kerrville, TX 78028, Tel: 512-896-4444; Empl.: 1

RE-EL CIRCUITS, INC., See RCI/Data

REEVE ELECTRONICS, Mellish E. Murray, 1720 W. Fulton St., Chicago, IL 60612, Tel: 312-670-0150; Empl.: 25; *Sls. Mgr.:* George Elliott

REEVES-HOFFMAN
Division, Dynamics Corporation of America

REEVES-HOFFMAN DIV., 400 W. North St., Carlisle, PA 17013, Tel: 717-243-5929, TWX: 510-650-3510; Empl.: 391; *Sls. Mgr.:* Daniel V. Kingery ..... **A•1423-1427; C•1619-1621**

Local Sales Offices & Reps
AZ Phoenix, Chaparral Elctrns. 602-252-0897
CA Culver City, Westaironics 213-641-4123
CA Mountain View, Peninsula Tech. Sls. 415-965-3636
CO Boulder, R.G. Entprs. 303-447-9211
FL Apopka, G. F. Bohman Assocs. 305-886-1882
ID Boise, N. R. Schultz 208-377-8686
IL Chicago, ESCO Assocs. 312-763-0800
MD Baltimore, R. A. Wafer Assocs. 301-744-1133
MA Wakefield, H. Jappe Co. 617-245-9359
MN Minneapolis, Intl. Elctrns. 612-571-0000
NY Huntington, Compar N.Y. 516-423-5660
NC Charlotte, JWL Assocs. 704-541-5750
OH Cincinnati, Tri-State Mktg. 513-761-7993
OR Beaverton, N. R. Schultz 503-643-1644
PA Hatboro, Electro Rep Engrg. 215-674-4421
TX Irving, Kite Elctrns. Sls. 214-438-9336
WA Bellevue, N. R. Schultz 206-454-0300
Intl CH, Zurich, Kurt Hirt ..... (01) 51-21-21
Intl FR, Orsay, Cemitronic ..... (6) 907-84-38
Intl FR, Paris, Tekelec Airtronic ..... (1) 534-75-35
Intl GR, Munchen, Tekelec Airtronic ..... (089) 594621
Intl IT, Milano, Tekelec Airtronic ..... (02) 73-80-641
Intl NL, Zoetermeer, Tekelec Airtronic ..... (079) 31-01-00
Can Ontario, R. D. Assocs. 416-444-0959

REFAC ELCTRNS. CORP., P.O. Box 809, Winsted, CT 06098, Tel: 203-379-2731, TWX: 710-449-6464; FSC No.: 28564; Empl.: 80; *Sls. Mgr.:* Chuck Altschul ..... **B•1091**

Local Sales Offices & Reps
AL Huntsville, Montgomery Mktg. 205-830-0498
AZ Scottsdale, Luscombe Engrg. 602-949-9333
CA Campbell, Luscombe Engrg. 408-370-2020
CA Pasadena, Luscombe Engrg. 818-684-2000
CA San Diego, Luscombe Engrg. 619-295-4300
CO Boulder, Luscombe Engrg. 303-772-3342
CT Kensington, Norman Stachelek Co. 203-828-6161
FL Clearwater, Delmac Sls. 813-447-5192
FL Fort Lauderdale, Delmac Sls. 305-739-0016
FL Orlando, Delmac Sls. 305-898-4688
FL Palm Bay, Delmac Sls. 605-724-8377
GA Norcross, Montgomery Mktg. 404-447-6124
IL Mt. Prospect, Interep 312-577-8899
MD Baltimore, Burgin-Kreh Assocs. 301-265-8500
MA Canton, New England Elctrn. Sls. 617-828-4835
MI Madison Heights, Pine Sls. 313-539-0350
MN Minneapolis, Holmgren Assocs. 612-786-7641
MO Kansas City, Delltron Co. 816-436-6445
MO St. Louis, Delltron Co. 314-869-4779
NJ Englewood, Sprung/Nussbaum 201-569-5666
NY E. Syracuse, Nycom Co. 315-437-8343
NY Williamsville, Nycom Co. 716-633-9395
NC Cary, Montgomery Mktg. 919-467-6319
OH Columbus, R. J. Sls. 614-253-2898
OR Beaverton, Luscombe Engrg. 503-636-6664
PA Norristown, Denco Data Equip. Corp. 215-630-8990
TX Dallas, SW Mktg. 214-341-8631
TX Houston, SW Mktg. 713-864-6281
VA Lynchburg, Burgin-Kreh Assocs. 804-239-2626
WI Milwaukee, Interep 414-774-1100
Can Mississauga, Ont., Advanced Sls. Grp. 416-677-8200

Local Distributors
CA Chatsworth, Anthem Elctrns. 818-700-1000
CA San Jose, Anthem Elctrns. 408-946-8000
CA Van Nuys, Pacific Switch Controls 213-873-4802
CA Van Nuys, Patane Avionics 818-988-4455
CO Denver, Integrated Elctrns. 303-292-6121
CT Hartford, Atlantic Switch Controls 203-527-7705
FL Lakeland, Switch Controls, Inc. 813-644-7564
IL Carol Stream, Concetrix, Inc. 312-653-1460
IL Hoffman Estates, Intercomp, Inc. 312-843-2040
IL Lombard, RM Elctrns. 312-932-5150
IN Indianapolis, Advent Elctrns. 317-872-4910
MA Canton, Electronic Pkg. 617-821-2111
NE Lincoln, Scott Elctrn. Supp. 402-466-8221
NH Nashua, Atlantic Switch Co., Inc. 603-800-1971
NJ Milford, Sintec Co. 201-996-4093
NJ Mt. Laurel, Jersey Switch 609-778-8190
NJ Roselle, Lectron Inds. 201-245-5858
NY Buffalo, Summit Distrs. 716-884-3450
NY Farmingdale, SAI 516-293-2710

NY Rochester, Summit Distrs. 716-334-8110
OH Cleveland, Pruitt Energy Sources 216-566-1545
OH Columbus, Ohioswitch, Inc. 614-885-0319
OR Beaverton, Hansen Elctrns. Corp. 503-642-4455
PA Willow Grove, RESCO 215-659-4440
TX Houston, Electronic Pkg. 713-447-5800
Can Point Claire, Que., Future Elctrns. 514-694-7710
Can Scarborough, Ont., Carsten Elctrns. ... 416-751-5095

REGDON CORP., 3713 Grand Blvd., Brookfield, IL 60513, Tel: 312-485-5152, TWX: 910-691-2214; FSC No.: 27190; Empl.: 65 ..... **B•1475**

Local Sales Offices & Reps
San Carlos 415-594-0700
AL Decatur, Tenn Tech 205-350-0630
CA Los Altos, J. W. Wilhoit 415-961-3660
CA Valencia, DJM Elctrns. 818-362-4309
CT Woodbury, Mark-Rep Assocs. 203-263-3047
FL Maitland, EIR, Inc. 305-660-9600
GA Atlanta, Tenn Tech 404-622-5784
IL Downers Grove, Richmar Elect. Corp. 312-968-0118
IN Indianapolis, Richmar Elctrns. 317-846-6383
MN Edina, T.H. Hanson & Co. 612-893-9960
NH Plaistow, Mark-Rep Assocs. 603-382-9563
NJ Florham Park, Varrelman-Gorman Co. 201-992-2505
NY Binghamton, NHA 607-754-3214
NY Pittsford, NHA 716-586-9002
NC Raleigh, Tenn Tech 919-266-3610
OH Cleveland, J. N. Bailey 216-892-1510
OH New Lebanon, J. N. Bailey 513-687-1325
PA Abington, Indl. Mktg. Specialists Co. ... 215-659-0444
TN Chattanooga, Tenn Tech. 615-894-3012
TX Austin, K & H Sales 512-258-8841
TX Plano, K & H Sales 214-423-6520
WI Butler, Richmar Elctrns. 414-781-1730

Local Distributors
CA San Carlos, Logan Elctrn. Supp. 415-594-0700
MA Lynn, Land Elctrns. 617-592-2220
NJ Fairlawn, Relay Specialties 201-797-3313

REGENCY SYSTEMS, INC., 3200 Farber Drive, Champaign, IL 61820, Tel: 217-398-8067, Telex: 27-0486; Empl.: 60; *Sls. Mgr.:* Ken Perry; *Dist. Mgr.:* Jill Koepke

REGENT CONTROLS, 39 Fanny St., P.O. Box 767, Shelton, CT 06484-0767, Tel: 203-736-2924; *Sls. Mgr.:* Wendell E. Carroll

REHLANDER ASSOCS., 118A Bridge St., Beverly, MA 01915, Tel: 617-922-5961; *Sls. Mgr.:* Michael Rehlander ..... **B•1213**

REICH ASSOCS., Rt. 4, Box 4620, Lakehills, TX 78063, Tel: 512-751-3220, Telex: 358048; FSC No.: 55916; Empl.: 10; *Sls. Mgr.:* W. Reich

RE • INSTRUMENTS

Electronics for Test and Communication

RE INSTRUMENTS CORP., 31029 Center Ridge Rd., Westlake, OH 44145, Tel: 216-871-7617, TWX: 810-427-9257; Empl.: 15; *Sls. Mgr.:* P. A. Bosworth ..... **D•1295**

REI SLS., 19525 Business Centre Dr., Northridge, CA 91324, Tel: 617-938-0900; Empl.: 5; *Sls. Mgr.:* T. P. Fitzgerald

RELATIONAL MEMORY SYS., 1650 Berryessa Rd., Ste. B, San Jose, CA 95133-1082, Tel: 408-729-3011, 800-448-4880, TWX: 910-379-0014; Empl.: 10; *Sls. Mgr.:* Jennifer Phipps

LAW, R. E. INSTRUMENT, INC., 7735 W. 112th Pl., Palos Hills, IL 60465, Tel: 312-974-4000; FSC No.: 6685-6695; *Sls. Mgr.:* Harry Booth; *Dist. Mgr.:* R. Gene Law

RELAY SERVICE CO., 1310 N. Pulaski Rd., Chicago, IL 60651, Tel: 312-AL2-2700; Empl.: 30; *Sls. Mgr.:* Chas. H. Badger

RELAY SPECIALTIES, 1300 Plaza Rd., Fair Lawn, NJ 07410, Tel: 201-797-3313, 800-526-5376, Telex: 642751; Empl.: 48; *Sls. Mgr.:* S. R. Gershberg

Local Sales Offices & Reps
CA Los Alamitos, The Rep House 213-598-3379
CT Manchester, Vin-Tech, Inc. 203-646-3007
MD Baltimore, Com Tech Assocs. 301-583-1993
TX Dallas, Art Brawner & Assocs. 214-824-4013

RELCO PRODS., 5594 E. Jefferson Ave., Denver, CO 80237, Tel: 303-756-1143; FSC No.: 14454; Empl.: 7

RELIABILITY, INC., 16400 Park Row, P.O. Box 218370, Houston, TX 77218, Tel: 713-492-0550, TWX: 910-881-1739; FSC No.: 54098; Empl.: 800; *Sls. Mgr.:* J. Marcussen

RELIANCE COMM/TEC, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199, Tel: 800-245-4501, in OH 800-245-4497

RELIANCE ELECTRIC CO., Marketing Info Center, P.O. Box 99502, Cleveland, OH 44199, Tel: 800-245-4501, 800-245-4497 In Ohio

RELIANCE FUSE, 2070 Maple St., Des Plaines, IL 60016, Tel: 312-299-2211, Telex: 726-453; FSC No.: 72076;F15160E; Empl.: 200

For nearest sales office, phone 1-800-245-4501 (in Ohio, 1-800-245-4497)

RELIANCE FUSE, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199, Tel: 800-245-4501, in OH 800-245-4497

RELIANCE PLASTICS & PACKAGING, 225 Belleville Ave., Bloomfield, NJ 07003, Tel: 201-748-2222; Empl.: 35; *Sls. Mgr.:* Hale Smith

RELMS, See Relational Memory Systems, Inc.

REMEE PRODS. CORP., 41 Bridge St., Florida, NY 10921, Tel: 914-651-4431, Telex: 64-6715; Empl.: 135; *Sls. Mgr.:* Ken Pimental; *Dist. Mgr.:* Ken Pimental

REMEX CAM OPERATIONS, Ex-Cell-O Corporation, 1230 S. Lewis Street, Anaheim, CA 92805, Tel: 714-535-4160, Telex: 183-040; Empl.: 105; *Sls. Mgr.:* Stan Vitt; *Dist. Mgr.:* Stan Vitt

RENAISSANCE MARKETING, INC., 463 Union Ave., Westbury, NY 11590, Tel: 516-271-2389

RENBRANDT, INC., 6 Parmelee St., Boston, MA 02118, Tel: 617-445-8910; FSC No.: 99934; Empl.: 25; *Sls. Mgr.:* M. Rogers

RENCO, 26 Coromar Dr., Goleta, CA 93017-3094, Tel: 805-968-1525, TWX: 910-334-1180; FSC No.: 34479; Empl.: 170; *Sls. Mgr.:* Larry Wade ..... **B•1824-1825; D•1131**

Local Sales Offices & Reps
CA Garden Grove, Advanced Digital Group, Inc. 213-598-9645
CA Westlake Village, Electro-Craft Corp. .. 818-889-3631
CO Englewood, Electro-Craft Corp./RENCO 303-762-1754
GA Marietta, Electro-Craft Corp./RENCO 404-971-2669
IL Palatine, Electro-Craft Corp./RENCO 312-991-4570
NH Salem, Electro-Craft Corp./RENCO ... 603-893-5552
NJ Cherry Hill, Electro-Craft Corp./RENCO 609-662-0555
NY Buffalo, Ross Equip. Co., Inc. 716-634-0990
NY Elmira, Ross Equip. Co., Inc. 607-734-4175
NY Rochester, Ross Equip. Co., Inc. 716-271-5660
NY Syracuse, Ross Equip. Co., Inc. 315-463-6691
OH Cincinnati, Electro-Craft Corp./RENCO 513-474-4171
WA Bellevue, Sweo Engrg. 206-644-2725
Can Edmonton, Alb., Hank Mottle Mktg., Ltd. 403-468-1292

RENCO ELCTRNS., 60 Jefryn Blvd., E., Deer Park, NY 11729, Tel: 516-586-5566 ... **A•1274-1276, 2268-2269**

Toll-Free Engineering Hot Line 800-645-5828, in NY State 516-586-5566

REPCO, 2421 N. Orange Blossom Trail, Box 7065, Orlando, FL 32854, Tel: 305-843-8484, Telex: 56-6536

REPRODUCTION TECHNOLOGIES INC., Dept. EM, P.O. Box 815, Bristol, IN 46507-0518, Tel: 219-848-5233, 219-848-5333; Empl.: 8 ..... **D•1034**

Local Sales Offices & Reps
GA Chamblee, Secom Sys. 404-455-0672
IN Indianapolis, Carlton Security Sys. 317-787-8545
KY Louisville, Audio Mktg. Assocs. 502-935-2580
MA Falmouth Heights, R J C Assocs. 617-540-8832
MI Ferndale, Shalco 313-547-4771
MN Minneapolis, KODO Assocs. 612-881-1255
OH Brecksville, Audio Mktg. Assocs. 216-526-2426
OH North Canton, Audio Mktg. Assocs. ... 216-499-1172

REPUBLIC ELCTRNS. CORP., 176 E. 7th St., Paterson, NJ 07524, Tel: 201-279-0300, TWX: 710-988-5908; FSC No.: 93958; Empl.: 125; *Sls. Mgr.:* W. Eisenberger ..... **A•1167**

Local Sales Offices & Reps
CA Los Angeles, Corcoran Assocs. 213-823-2425
CA Sunnyvale, W. W. Posey Co. 408-746-0771
CO Commerce City, Williams Assocs. 303-289-5647
FL Sunrise, Arnold Milrot & Assoc. 305-748-6446
IL Chicago, Ropek, Cahill & Vogt 312-631-0070
IN Ft. Wayne, Given Corp. 219-432-5585
IA Cedar Rapids, Ard Sales Co. 319-393-6392
MD Ellicott City, Nelson Elctrns. 301-747-7887
MA Walthan, Deltech Sls. Inc. 617-894-4550
MN Edina, Grayden & Flemmer 612-941-1120
MO Grandview, R. R. Burton & Assocs. 816-763-5385
MO Maryland Hgts., R. R. Burton & Assocs. 314-434-1678
NJ Hasbrouck Hgts., Comp-Tech Sls. 201-288-7400
NY Liverpool, Precision Sls. 315-451-3480
NY New Hyde Park, Comp-Tech Sls. 516-593-2628
NY Pittsford, Precision Sls. 716-381-2820
NY Pleasant Valley, Precision Sls. 914-635-3233
NC Charlotte, Jake Rudisill Assocs. 704-377-6901
OH Columbus, Tom Mulligan & Assocs. .. 614-457-2242
OK Tulsa, Hugh J. Daly Co. 918-627-4159
PA Lancaster, Electro Rep. 717-299-5877
TX Lewisville, Marathon Assocs. 214-436-8882
WA Lynnwood, Blum & Assocs. 206-777-6656

Local Distributors
CA San Fernando, Petell Elctrns. 213-365-9841
IL Skokie, Kellner Elctrns. 312-677-1120
NJ Perth Amboy, Metuchen Capacitors ... 201-442-0500
NY Hauppauge, Semi Cap Elctrns. 516-582-4400

REPUBLIC ELECTRONICS CO., 575 Broad Hollow Rd., Melville, NY 11747, Tel: 516-249-1414, Telex: 96-1460; FSC No.: 95750; Empl.: 125; *Sls. Mgr.:* William Shaver

REPUBLIC PACKAGING CORP., 9160 S. Green St., Chicago, IL 60620, Tel: 312-233-6530, Telex: 25-4621; *Sls. Mgr.:* Hal Grossman; *Dist. Mgr.:* Herb Fasth

RESDEL ENGRG., 300 E. Live Oak Ave., Arcadia, CA 91006, Tel: 213-684-2600, TWX: 910-582-3219; Empl.: 170

RESEARCH, INC., Box 24064, Minneapolis, MN 55424, Tel: 612-941-3300, Telex: 29-0502; Empl.: 250; *Sls. Mgr.:* Brian Callahan

RESEARCH PRODS., 1015 E Washington Ave., Madison, WI 53701, Tel: 608-257-8801, TWX: 910-286-2781

RESISTANCE TECHNOLOGY INC., 1260 Red Fox Rd., St. Paul, MN 55112, Tel: 612-636-9770; *Sls. Mgr.:* Michael Geraci; *Dist. Mgr.:* Michael Geraci

RESISTORS, INC., 5226 W. 26th St., Chicago, IL 60650, Tel: 312-652-7555; Empl.: 50 ..... **A•1942**

Local Sales Offices & Reps
CT Plantsville, Parnetics Co. 203-628-9343
IL Arlington Hgts., Resistance Specialists 312-259-6571
IA Cedar Rapids, J.R. Sls. Engrg. 319-393-2232
MI Lathrup Village, R.C. Nordstrom & Co. 313-559-7373
NY New York City, Symon Assocs. 212-757-3638
OH Wickliffe, W.J. Brauer & Assocs. 216-943-0601
WI Milwaukee, Honkamp Sls. Co. 414-463-2530

RES-NET, 110 Route 10, Whippany, NJ 07981, Tel: 201-887-2260, out of state 800-526-0704; FSC No.: 55 877; Empl.: 42; *Sls. Mgr.:* David Beck ..... **A•1943**

Local Sales Offices & Reps
CA Palo Alto, Mollard Mktg. 415-961-0456
MA Waltham, Dynasel Assocs. 617-890-6777

Local Distributors
NJ Whippany, ADI American Distributors Inc. 201-428-0510

REVERE CORP. OF AMER., 845 N. Colony Rd., Wallingford, CT 06492, Tel: 203-269-7701, Telex: 96-3482, TWX: 710-476-3197; Empl.: 389; *Sls. Mgr.:* R. Paukstys

REXNORD CHEMICAL PRODS. INC., 6120 E. 58th Ave., Commerce City, CO 80022, Tel: 303-289-5651, Telex: 45-0331; *Sls. Mgr.:* Michael P. Manegold

Local Sales Offices & Reps
CA Glendora, Rexnord Chem. Prods. 818-963-1109
FL South Merritt Island, John Rule Assocs. 305-777-5952

IL Northfield, Special Elec. 312-446-5113
MI Roseville, Special Elec. Co. 800-558-0604
MN Excelsior, JPM Assocs. 612-474-3408
MO St. Louis, Special Elec. Co. 314-962-1150
OH Cleveland, Special Elec. Co. 216-441-5244
PA Doylestown, Rexnord Chem. Prods. ... 215-348-2147
RI Lincoln, Special Elec. Co. 401-727-1136
WI Milwaukee, Special Elec. Co. 414-383-6370

RFD, INC., 5024 Nassau St., Tampa, FL 33607, Tel: 813-872-1502, TWX: 810-876-9146; *Sls. Mgr.:* Thomas W. Facer

RFI CORPORATION, 100 E. Pine Aire Dr., Bay Shore, NY 11706, Tel: 516-231-6400, TWX: 510-227-6233; FSC No.: 13619;15733; Empl.: 250; *Sls. Mgr.:* Robert Fitzpatrick ..... **A•1629**

Local Sales Offices & Reps
AL Huntsville, Murcota Corp. 205-539-8476
AZ Scottsdale, Williams-Assocs. 602-947-4297
CA Monterey Park, M.W. Riedel Co. 213-283-7694
CA Mountain View, Peninsula Tech. Sls. .. 415-965-3636
CO Denver, Williams-Assocs. 303-373-4730
FL St. Petersburg, Tech-Rep Assocs. 813-577-2779
IL North Riverside, J. Popp Sls. 312-447-6124
IN Ft. Wayne, Denton Mktg., Inc. 219-627-5515
IA Davenport, Ensco-Rep 319-386-6600
KS Overland Park, Ensco-Rep 913-381-7557
MD Rockville, Mechtronics Sls. 301-340-2130
MO St. Louis, Ensco-Rep 314-423-3935
NH Hudson, EMC Sls., Inc. 603-880-3671
NJ Cherry Hill, H.J. White Co. 609-428-4544
NM Albuquerque, Williams-Assocs. 505-255-1638
NY Great Neck, Trionic Assocs. 516-466-2300
NC Winston-Salem, Murcota Corp. 919-722-9445
PA McKean, Ecco Elctrn. Sls. 814-476-1376
TX Garland, McBride Sci. Sls. 214-494-5000
WA Seattle, Granville Gillette Assocs. 206-284-3344

RFL INDS., A Dowty Grp. Co./Comms. Div., Powerville Rd., Boonton, NJ 07005, Tel: 201-334-3100, TWX: 710-987-8352; FSC No.: 49673; Empl.: 300

RFL INDS., A Dowty Grp. Co./Instr. Div., Powerville Rd., Boonton, NJ 07005, Tel: 201-334-3100, TWX: 710-987-8352; FSC No.: 49673; Empl.: 300

RFL INDS., Thermocontrol Div., W. Prospect St., Box 250, Brandon, VT 05733, Tel: 802-247-6811, TWX: 710-987-8352; Empl.: 350; *Sls. Mgr.:* Bob Berman; *Dist. Mgr.:* Bob Berman

RF MONOLITHICS, INC., 4441 Sigma Rd., Dallas, TX 75234, Tel: 214-233-2903, TWX: 910-860-5474; Empl.: 90; *Sls. Mgr.:* William Spurgeon

RF POWER LABS, INC., 21820 87th S. E., Woodinville, WA 98072, Tel: 206-481-8833, Telex: 32-1042; FSC No.: 057143; Empl.: 17; *Sls. Mgr.:* Greg Cook

RHG ELECTRONICS LAB., INC., 161 E. Industry Ct., Deer Park, NY 11729, Tel: 516-242-1100, TWX: 510-227-6083; Empl.: 180; *Sls. Mgr.:* Martin D. Markson

RHINO SALES CORP., 620 Andrews Ave., P.O. Box 367, Kewanee, IL 61443, Tel: 309-853-4461

RHOMBUS INDS., 15801 Chemical Ln., Huntington Bch., CA 92649-1595, Tel: 714-898-0960, TWX: 910-596-1826; Empl.: 60 ..... **A•1568-1573**

Local Sales Offices & Reps
CA Irvine, J. V. Earley & Assocs. 714-833-1806
CA Redwood City, James S. Heaton Co. .. 415-367-9000
CO Parker, A-5 Co. 303-841-3651
FL Coral Springs, MTS Assocs. 305-753-3830
MA Malden, J. K. Assocs. 617-321-2922
NC Cary, Engineering Dvcs. 919-469-9323
TX Irving, Space Elctrns. 214-251-3636
PR Caquas, Arami Camacho 809-743-0657

Local Distributors
AZ Phoenix, A-5 Co. 602-943-3941
WA Redmond, Compu-Rep 206-788-3005

RICHARD CALDWELL SOFTWARE, 1617 Whitton Ave., San Jose, CA 95116-2455, Tel: 408-251-3485

RICHARD HIRSCHMANN OF AMERICAN, See Hirschmann

RICHARD-LEE CO., Box 724, New Providence, NJ 07974, Tel: 201-276-0710; Empl.: 8

RICHARDS, ARKLAY S., CO., INC., 72 Winchester St., Newton Highlands, MA 02161-1793, Tel: 617-527-1512; *Sls. Mgr.:* L. K. Richards

RICHCO PLASTIC CO., 5825 N. Tripp Ave., Chicago, IL 60646, Tel: 312-539-4060, TWX: 910-221-1938; FSC No.: 06915; Empl.: 250; *Sls. Mgr.:* Craig Richardson; *Dist. Mgr.:* Ted Pavoris

RI/CONTROL SYSTEMS, Research, Inc., P.O. Box 24064, Minneapolis, MN 55424, Tel: 612-941-3300, Telex: 29-0502; Empl.: 260; *Sls. Mgr.:* Brian Callahan

RIDGE TOOL CO., Sub. Emerson Elec. Co., 400 Clark St., Elyria, OH 44036, Tel: 216-323-5581, Telex: 0243420

RIFA

RIFA, INC., Greenwich Off. Pk. 3, P.O. Box 3110, Greenwich, CT 06836-3110, Tel: 203-625-7300, Telex: 221976 ERIANUR ..... **D•1810-1811**

Local Sales Offices & Reps
CA Cupertino, Pacific Elctrns., Inc. 408-733-9920
FL St. Petersburg, Tech-Rep Assocs., Inc. 813-577-2779
IL Elk Grove Village, Carlson Elctrns. Sls. 312-956-8240
MD Glen Burnie, Macrotech Assocs., Ltd. 301-437-5588
NV Reno, Unitronics 702-825-1978
NH Londonderry, Power Conversion Sys. 603-434-2370
NJ Marlton, Naudain Assocs. 609-983-5300
NJ Parlin, JMR Sls., Inc. 201-254-8484
NY East Setauket, JMR Sls., Inc. 516-689-8871
TX Austin, Tesco, Inc. 512-834-8374
TX Garland, Tesco, Inc. 214-681-1376
WI Milwaukee, Carlson Elctrns., Sls. 414-476-2790
Can Calgary, Alb., Deskin Sls. 403-466-2106
Can Edmonton, Alb., Deskin Sls. 403-466-2106
Can Markham, Ont., Deskin Sls. 416-475-1412
Can Montreal, Que., Deskin Sls. 514-331-2860
Can Ottawa, Ont., Deskin Sls. 613-729-1099
Can Vancouver, B.C., Deskin Sls. 604-273-4963
Can Winnipeg, Man, Deskin Sls. 403-466-2106

Local Distributors
FL St. Petersburg, Tech-Rep Assocs. 813-577-2779

RIL ELCTRNS., INC., 125 Titus Ave., P.O. Box H, Warrington, PA 18976, Tel: 215-EL5-1361; Empl.: 25

RING KING VISIBLES, INC., 2210 Second Ave., Muscatine, IA 52761, Tel: 319-263-8144, Telex: 468559; Empl.: 150; *Sls. Mgr.:* Dave White

RIPLEY, 46 Nooks Hill Rd., Cromwell, CT 06416, Tel: 203-635-2200, TWX: 710-428-9567; Empl.: 100; *Sls. Mgr.:* R. S. Clark

RISK, GEORGE, INDS., GRI Plaza, Kimball, NE 69145, Tel: 308-235-4645, TWX: 910-620-9040; FSC No.: 24229; Empl.: 100; *Sls. Mgr.:* J. Fisher; *Dist. Mgr.:* J. Fisher ..... **B•1737**

Local Sales Offices & Reps
AZ Tempe, Cleveland Entprs. of Ariz. 602-820-1127
CA Anaheim, Galaxie Sales Int'l. 714-752-1580
CA Escondido, Cirolia Elctrn. Sls. 619-743-3015
CA San Carlos, Kafco 415-591-6758
FL Tamarac, Davmik Sls. 305-920-2222
AL Huntsville, Elctrn. Mfr. Agt. 205-830-4030
IL Wheaton, Chadra-Schilke & Assoc. ... 312-653-8126
MA Lexington, Jodan Tech. 617-862-2354
MN St. Paul, Countryman Assocs. 612-645-9151
MO Maryland Heights, Kebco 314-576-4111

Local Distributors
CA Los Angeles, Electric Switches 213-660-1310
CA Santa Ana, Advanced Computer Prods. 714-558-8813

RLC ELCTRNS., INC., 83 Radio Cir., Mt. Kisco, NY 10549, Tel: 914-241-1334, TWX: 710-571-2103; FSC No.: 12598; *Sls. Mgr.:* Philip H. Wright

RMF PRODS., INC., 1275 Paramount Pkwy., P.O. Box 520, Batavia, IL 60510, Tel: 312-879-0020; Empl.: 11; *Sls. Mgr.:* R. Frieders ..... **C•1616**

RMS ELECTRONICS INC., 50 Antin Pl., Bronx, NY 10462, Tel: 212-892-6700; Empl.: 100; *Dist. Mgr.:* Seymour Goldberg

RMS TECHN., 706 Industry Dr., Hampton, VA 23661, Tel: 804-838-2458; Empl.: 7

ROANWELL, 180 Varick St., New York, NY 10014, Tel: 212-989-1090, TWX: 710-581-6555; FSC No.: 82872; Empl.: 200; *Sls. Mgr.:* C. Carl Hilsdorf; *Dist. Mgr.:* C. Carl Hilsdorf

RO
RO ASSOCIATES

RO ASSOCS., 246 Caspian Dr., Box 61419, Sunnyvale, CA 94088, Tel: 408-744-1450, TWX: 910-339-9304; FSC No.: 24230; Empl.: 90; *Sls. Mgr.:* R. D. Okada ..... **D•1812-1814**

Local Sales Offices & Reps
AL Huntsville, Lee Assocs. 205-533-5896
AZ Phoenix, Sigma 602-241-1334
CA Los Angeles, Amasco 213-516-8561
CA San Francisco, Amasco 408-733-8690
CO Denver, F.G. Mktg. 303-795-9176
DC Washington, Gans & Pugh 703-527-3262
FL Orlando, OEM Mktg. 305-299-1000
IL Chicago, John Kennaugh & Assoc. ... 312-980-2570
KS Shawnee Mission, Midtec 913-441-6565
MD Baltimore, Gans & Pugh 703-527-3262
MA Boston, Intersell 617-273-3844
MO St. Louis, Midtec 314-837-5200
NM Albuquerque, Fry-Gates, Inc. 505-262-1525
NY Mt Vernon, Sonkin Assocs. 914-968-8282
NY Utica, B. D. Hummel Co. 315-736-7821
OH Centerville, Omega Sls., Inc. 513-434-5507
OK Tulsa, Cunningham Comp. Corps. 918-492-0390
PA Philadelphia, Gans & Pugh 703-527-3262
TX Dallas, Cunningham Comps. Corp. 214-669-9706
TX Houston, Cunningham Comps. Corp. .. 713-461-4197
WA Seattle, Huntley Assocs. 206-353-1833

ROBBINS & MEYERS, INC., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, Tel: 614-446-9868, Telex: 241353 ..... **B•1184**

ROBERT BOSCH CORP., See Bosch, Robert, Corp.

ROBINSON-HALPERN, One Apollo Rd., P.O. Box 248, Plymouth Meeting, PA 19462-0248, Tel: 215-825-9200, TWX: 510-660-8637; FSC No.: 12400; Empl.: 80; *Sls. Mgr.:* J. Lanza

ROBINSON-NUGENT, INC., 800 East 8th St., New Albany, IN 47150, Tel: 812-945-0211, TWX: 810-540-4082; Empl.: 567; *Sls. Mgr.:* Hap Taylor

ROBISON ELCTRNS., P.O. Box 8121, San Luis Obispo, CA 93403-8121, Tel: 805-544-8000; FSC No.: 19080; Empl.: 45

ROCHESTER INSTR. SYS., 255 N. Union St., Rochester, NY 14605, Tel: 716-263-7700, Telex: 978457; Empl.: 330

ROCKBESTOS CO., P.O. Box 1102, New Haven, CT 06504, Tel: 203-772-2250

ROCKLAND INSULATED WIRE & CABLE, 87 Broadway, Haverstraw, NY 10927, Tel: 914-429-3103; FSC No.: 12111

ROCKLAND SYS. CORP., See Wavetek Rockland Scientific, Inc.

ROCKWELL FILTER PRODS., 2990 Airway Ave., Costa Mesa, CA 92626, Tel: 714-641-5311, Telex: 685532; Empl.: 100; *Sls. Mgr.:* Lee Cornett

ROCKWELL INT'L., 4311 Jamboree Rd., Newport Beach, CA 92660, Tel: 800-854-8099, TWX: 910-591-1654; FSC No.: 34576; Empl.: 1995; *Sls. Mgr.:* K. MacDonald; *Dist. Mgr.:* K. Foster

ROCKWELL INTL., Commercial Elctrns. Opers., 1200 N. Alma Rd., Richardson, TX 75081, Tel: 214-996-5000, Telex: 73-307, 73-2490, TWX: 910-867-4709; Empl.: 15,000

RODALE ELCTRNS. CORP., 603 Chestnut St, Garden City, NY 11530, Tel: 516-222-0050, TWX: 510-222-0274; *Sls. Mgr.:* John B. Clement

RODELCO ELCTRNS. CORP., 356A Comac Rd., Deer Park, NY 11729, Tel: 516-643-5110; Empl.: 28

ROD-L ELECTRONICS, INC., 1098 Hamilton Ct., Menlo Park, CA 94025, Tel: 415-322-0711, TWX: 296210 ..... **D•1296-1301**

Local Sales Offices & Reps

AL	Huntsville, Sci. Svcs. SE	205-536-1969
AZ	Phoenix, Venturesearch	602-894-5216
CA	Carson, Amasco	213-516-8561
CA	Sunnyvale, Amasco	408-733-8690
CO	Conifer, Energy Equip. Sls.	303-674-8111
FL	Orlando, Sci. Dvcs. SE	305-841-8180
IL	Elk Grove, Loren Green Assocs.	312-593-0282
IN	Indianapolis, Loren Green Assocs.	317-293-9827
MD	Baltimore, Sci. Reps.	301-321-1411
MA	Reading, Scheinfein Assocs.	617-944-2304
MN	Minneapolis, Instrmn. Svcs., Inc.	612-544-8916
MO	Florissant, Web Elctrns.	314-921-5720
MO	Kansas City, Paloma Sls. Co.	816-358-7272
NJ	Fairfield, Addem Sls.	201-882-0993
NJ	Pennsauken, Sci. Reps.	609-662-5222
NY	De Witt, DB Assocs.	315-446-0220
NC	Winston-Salem, Sci. Dvcs.	919-765-5776
OH	Centerville, Micro Sls.	513-433-8171
OR	Portland, Control Tek Sls., Ltd.	503-641-8180
TX	El Paso, Venturesearch	915-594-4094
TX	Houston, Spectra Sls.	713-747-2798
TX	Richardson, Spectra Sls.	214-234-3600
VA	Fairfax, Sci. Reps.	703-385-0600
WA	Spokane, Control Tek Sls., Ltd.	509-922-2971

ROEAN INDUSTRIES, INC., 12970 Branford, Ste. C, Pacoima, CA 91331, Tel: 818-767-7047, Telex: 758630 TGMC; Empl.: 8

ROEDERSTEIN ELCTRNS., INC., P.O. Box 5588, Statesville, NC 28677, Tel: 704-872-8101, Telex: 240802, TWX: 301-240802; *Sls. Mgr.:* Frank Acuff

Local Sales Offices & Reps

AL	Hunstville, CSR Elctrns.	205-533-2444
AZ	Tempe, Dowling Tech. Grp.	602-893-7555
CA	PAlo Alto, Abbott Engrg. Co., Inc.	415-968-2265
CA	Sunnyvale, REI	408-866-7950
CA	West Covina, Component Svc., Inc.	213-960-4761
CO	Aurora, Sage Sls., Inc.	303-750-3501
CT	North Haven, Kitchen & Kutchin, Inc.	203-239-0212
FL	Coral Springs, E. P. M. Corp.	305-755-5387
FL	Orlando, E. P. M. Corp.	305-425-6149
GA	Atlanta, CSR Elctrns.	404-396-3720
IL	Rosemont, STC	312-671-4208
IN	Bloomington, John Hershman	812-339-9563
IN	Ft. Wayne, J & B Engrg.	219-483-2813
KS	Kansas City, Delltron	816-436-6445
MA	Burlington, Kitchen & Kutchin	617-229-2660
MA	Lincoln, Kitchen & Kutchin	615-259-9017
MO	St. Louis, Delltron	314-869-4779
NJ	Leonia, Peter E. Schmitt Co., Inc.	201-944-2806
NY	Cazenovia, ST/Woolard	315-655-8145
NC	Raleigh, CSR Elctrns.	919-878-9200
PA	Feasterville, Knowles Assocs.	215-322-7100
TX	Austin, Semco	512-837-0893
UT	Salt Lake City, Sage Sls., Inc.	801-467-5451
VA	Lynchburg, ST/Woolard	804-528-5421
WA	Kirkland, Manon Engrg.	206-827-7449
Can	Concord, Ont., Votron Elctrns., Inc.	416-669-9870

ROGAN, 3455 Woodhead Dr., Northbrook, IL 60062, Tel: 312-498-2300, TWX: 910-686-0008; Empl.: 100; *Sls. Mgr.:* D. Pelletier; *Dist. Mgr.:* D. Pelletier

ROGERS CORP., Bus Products Division, 5750 East McKellips Rd., Mesa, AZ 85205, Tel: 602-830-3370

ROGERS CORP., Box 700, Chandler, AZ 85224, Tel: 602-963-4584, TWX: 910-950-1961; Empl.: 400; *Sls. Mgr.:* Paul Anderson

ROGERS CORP., One Technology Dr., Rogers, CT 06263, Tel: 203-774-9605, TWX: 710-448-0047; Empl.: 2500; *Sls. Mgr.:* Paul L. Anderson ..... **C•1715**

Local Sales Offices & Reps

AL	Huntsville, G. S. Jordan	205-881-7971
AZ	Scottsdale, H.R. Crowder	602-991-8908
AZ	Tempe, M. F. Iosue	602-839-5478
CA	Carlsbad, D. Bergheimer	619-434-1297
CA	Corona, R. A. Forester	714-734-5881
CA	Palo Alto, R. A. Greenman	408-947-7797
CA	Poway, A. W. Riel	619-487-1065
CA	Poway, A.W. Riel	619-487-1065
CA	San Jose, R.H. Jackson	408-947-7797
CA	San Jose, W. J. Stolp	408-947-7797
CT	Bristol, J. F. Witkewicz	203-583-4341
CT	Norwich, G. R. Jessel	203-376-0276
FL	Melbourne Beach, P. R. Pratt	305-725-6105
IL	Hazel Crest, J. R. Menees	312-798-5800
KY	Louisville, G. P. Harris	502-224-9163
MI	Livonia, J. M. Allan	313-427-8228
MN	Northfield, W. P. Kelly	507-663-1050
NH	Londonderry, W. J. Coyne	603-434-5358
NJ	Pitman, R. M. Neidig	609-582-1666
NJ	Springfield, S. D. Wellen	201-944-7777
NY	Poughkeepsie, V. H. Potter	914-485-6763
NY	Rochester, R. C. Bangs	716-454-6520
OH	Shaker Hgts., E. R. Perme	216-283-5486
OH	Xenia, J. L. Forte	513-426-8993
PA	Hermitage, H. A. Harriman	412-983-3742
PA	Holtwood, T. G. Sleasman	717-284-4328
SC	Rock Hill, E. E. Wild	803-366-2952
TX	Round Rock, B.D. Duke	512-244-3074
VA	Lynchburg, L.J. Rodrigue	804-384-9517
VA	Roanoke, J. L. Settles	703-774-8478
WA	Seattle, L. B. Keen	206-575-4175

R-OHM (EASTERN OPER.), 2303 W. Meadowview Rd. # 3, Kingston Bldg., Greensboro, NC 27407, Tel: 919-855-0217

ROHM CORP., 8 Whatney, Irvine, CA 92718, Tel: 714-855-2131, TWX: 910-595-1721; Empl.: 125; *Sls. Mgr.:* Mike Hammel

ROLM MIL-SPEC COMPUTERS, Rolm Corp., 1 River Oaks Pl., San Jose, CA 95134, Tel: 408-942-8000, TWX: 910-338-0247; FSC No.: 14345; Empl.: 1000; *Sls. Mgr.:* Peter Cicata; *Dist. Mgr.:* Peter Cicata

ROLM CORP., 4900 Old Ironsides Dr., M/S 626, Santa Clara, CA 95054, Tel: 408-986-1000; Empl.: 10,000

ROLYN OPTICS CO., 738 Arrowgrand Cir., Covina, CA 91722-2199, Tel: 818-915-5707/5717, Telex: 67-0380

ROME CABLE CORP., P.O. Box 71, Rome, NY 13440, Tel: 315-337-3000

RONOR SYSTEMS, 145 N. Plains Ind. Pk. Rd., Wallingford, CT 06492, Tel: 203-265-2110; Empl.: 12

RONTRON ENGINEERING, 25 Rose St., Branford, CT 06405, Tel: 203-488-5020

ROSE

ROSE ENCLOSURES SYS., INC., 12140 Parklawn Dr., Rockville, MD 20852, Tel: 301-984-1783, Telex: 908-107 Resi Rove; *Sls. Mgr.:* Paul Bruhn ..... **C•1078-1079**

ROSEMONT-NASHVILLE, INC., See Chromalox Instrs. & Controls

ROSEN GRANDON ASSOCIATES INC., 7807 Whittier St., Tampa, FL 33617, Tel: 813-985-4911; Empl.: 1; *Sls. Mgr.:* Jane R. Rosen-Grandon

ROSS ENGRG. CORP., 540 Westchester Dr., Campbell, CA 95008, Tel: 408-377-4621, Telex: 858840, TWX: 910-590-8033; FSC No.: 23598; Empl.: 45; *Sls. Mgr.:* Hugh C. Ross ..... **B•1443**

ROSTONE CORP., P.O. Box 7497, Lafayette, IN 47903, Tel: 317-474-2421, TWX: 810-342-1887; Empl.: 500

Local Sales Offices & Reps

FL	Fern Park, Blair Engrg., Inc.	305-834-1244
MA	Framingham, Petri-Jones, Inc.	617-877-4233
NY	Canandaigua, Brandon Assocs., Inc.	716-394-6080
NY	Liverpool, Brandon Assocs., Inc.	315-652-3954
NC	Greenboro, Blair Engrg., Inc.	919-292-8200
OK	Tulsa, Blair Engrg., Inc.	918-622-3100
PA	Norristown, Brandon Assocs., Inc.	215-278-0500
TX	Austin, Blair Engrg., Inc.	512-458-3107
TX	Dallas, Blair Engrg., Inc.	214-241-5655
TX	Houston, Blair Engrg., Inc.	713-973-8800

ROTEK INSTR. CORP., 390 Main St., Waltham, MA 02254, Tel: 617-899-4611; *Sls. Mgr.:* Eliot Warner

ROTRON, INC., See EG & G Rotron

ROWE INDUSTRIES, INC., 6225 Benore Rd., P.O. Box 6877, Toledo, OH 43612, Tel: 419-729-9761, TWX: 810-442-1734; FSC No.: 82878; Empl.: 89; *Sls. Mgr.:* D. L. Mang; *Dist. Mgr.:* D. L. Mang ..... **C•1502-1504, 1895**

Local Sales Offices & Reps

AZ	Chandler, Blackhart Assocs.	602-831-2566
CA	San Jose, V. C. Robinson	415-969-4831
FL	Fern Park, EIR, Inc.	305-830-9600
KS	Leawood, Thunderbird	913-642-7220
KS	Wichita, Thunderbird	316-684-3941
MD	Baltimore, R. A. Wafer Assocs.	301-744-1133
MA	Burlington, Don C. Richard	617-272-1595
MA	Lowell, Underwood Sls.	617-256-8191
MI	Holland, Com-Tek Sls.	616-399-5719
MN	Hopkins, KITS Co.	612-933-1888
MO	Maryland, Thunderbird	314-567-6488
NM	Albuquerque, Ron-tek	505-299-4124
NC	Winston-Salem, Dula Assocs.	919-768-7166
OH	Beachwood, RC Assocs.	216-292-4954
OH	Cuyahoga Falls, Lee Tronics	216-928-8584

RTE AEROVOX INC., 740 Belleville Ave., New Bedford, MA 02745, Tel: 617-994-9661, TWX: 710-344-6985; FSC No.: 4K459; Empl.: 700; *Sls. Mgr.:* Jack Chmura; *Dist. Mgr.:* Matthew Simon

RTE DELTEC CORP., 2727 Kurtz St., San Diego, CA 92110, Tel: 619-291-4211, 800-854-2658, TWX: 910-335-1246; FSC No.: 52297; Empl.: 200 ..... **D•1959**

Local Sales Offices & Reps

AL	Huntsville, FM Assocs., Ltd.	205-882-0689
AK	Soldotna, Air Tek	907-262-5937
AZ	Scottsdale, Barnhill Assocs.	602-947-7841
CA	Los Altos, Jay Stone & Assocs.	415-948-4563
CA	Vista, Failsafe Power Corp.	619-726-0980
CO	Englewood, Barnhill Assocs.	303-779-3600
CT	Avon, Power Mark	203-678-0123
FL	Jupiter, FM Assocs., Ltd.	305-746-2996
FL	Orlando, FM Assocs., Ltd.	305-851-5710
GA	Atlanta, FM Assocs., Ltd.	404-446-0033
HI	Honolulu, Hawaiian Inds. Instru. Sls. Corp.	808-533-4232
IL	Arlington Heights, Dytec/Central, Inc.	312-394-3380
IN	Indianapolis, Dytec/Central, Inc.	317-247-1316
IA	W. Des Moines, Data Power Technlg. Corp.	515-223-5605
KS	Lenexa, Engineered Equip. Co.	913-492-9221
MI	Madison Heights, WKM Assocs., Inc.	313-588-2300
MN	Golden Valley, JR Assocs.	612-546-4110
MO	St. Louis, Applied Power Sys.	314-383-5858
NE	Omaha, Data Power Tech. Corp.	402-592-7860
NJ	Lodi, SDM Reps.	201-368-0125
NJ	Pennsauken, Scientific Reps.	609-662-5222
NM	Albuquerque, Barnhill Assocs.	505-299-7658
NY	Rochester, SDM Reps.	716-247-8770
NC	Ramseur, FM Assocs., Ltd.	919-824-2196
OH	Dayton, WKM Assocs., Inc.	513-434-7500
OH	Independence, WKM Assocs., Inc.	216-524-5930
PA	Pittsburgh, WKM Assocs., Inc.	412-892-2953
TX	Austin, Barnhill Assocs.	512-451-0217
TX	Houston, Barnhill Assocs.	713-688-9971
TX	Richardson, Barnhill Assocs.	214-231-2573
UT	Murray, Barnhill Assocs.	801-262-3000
VA	Fairfax, Scientific Assocs., Inc.	703-385-0600
WA	Seattle, F/M Sales Co.	206-628-9620
EXP	CA, San Diego, RTE Deltec Corp.	619-291-4211

RTE POWER/MATE

RTE, Power/Mate Co., 514 S. River St., Hackensack, NJ 07601, Tel: 201-440-3100, TWX: 710-990-5023; Empl.: 375; *Sls. Mgr.:* Robert E. Allison ..... **D•1816-1827**

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
AZ	Scottsdale, Luscombe Engrg. Co.	602-949-9333
CA	Campbell, Luscombe Engrg. Co.	408-370-2020
CA	Pasadena, Luscombe Engrg. Co.	213-684-2000
CA	Pasadena, Reaction Comps.	213-648-2000
CA	San Diego, Luscombe Engrg. Co.	619-295-4300
CO	Englewood, Delta Sls.	303-799-0646
FL	Winter Park, EMA, South	305-671-6800
GA	Norcross, Montgomery Mktg.	404-447-6124
IL	Chicago, Data Elctrns. Co.	312-283-0300
IN	Indianapolis, Data Elctrns. Co.	317-359-5368
KS	Overland Pk., Electri-Rep	913-649-2168
MD	Rockville, Marktron	301-251-8990
MA	N. Chelmsford, Power Assocs.	617-251-7756
MI	Southfield, Infinity, Inc.	313-557-7230

MN Plymouth, Data Elctrns. 612-559-1434
MS Jackson, Welch & Doby, Inc. 601-932-5534
MO St. Louis, Electri-Rep 314-878-8209
NJ Lodi, TRC Elctrns. 201-779-8282
NY Buffalo, R. W. Mitscher Co., Inc. 716-633-7970
NC Cary, Montgomery Mktg. 919-467-6319
OH Aurora, EMA, Inc. 216-562-6104
OH Centerville, EMA, Inc. 513-433-2800
OR Beaverton, Luscombe Engrg./NW 503-636-6664
PA Willow Grove, QED Elctrns. 215-657-5600
TX Austin, Beacon Elctrns. Assocs. 512-331-5115
TX Dallas, Beacon Elctrns. Assocs. 214-437-1505
UT Salt Lake City, Delta Sls. Assocs. 801-487-7571
EXP NY, Greast Neck, Auriema, Inc. 516-487-0700
Can Rexdale, Ont., Source Elctrns., Ltd. 416-675-6235

Local Distributors

AZ Scottsdale, Galtec 602-949-9765
CA Campbell, Sierra Comps. 408-370-2242
CA Pasadena, Reaction Comps. 213-648-2000
CO Englewood, Deltex 303-799-1088
IL Chicago, Dalec 312-283-0300
MA North Chelmsford, Power Assocs. 617-251-7756
NJ Lodi, TRC Elctrns. 201-779-8282
NC Cary, Distall Sls. 919-467-2902
OH Centerville, IPD 513-435-2086
OR Lake Oswego, Cesco Distrs. 503-636-6664
PA Willow Grove, QED Elctrns. of PA 215-657-5600
TX Dallas, CDI 214-644-0373

RTRON CORP., 7324 Lawndale, Skokie, IL 60076, Tel: 312-679-7180, TWX: 910-223-0810; FSC No.: 19130; *Sls. Mgr.:* R. McLean

RTS Systems INC.

RTS SYSTEMS, INC., Compact Video, Inc., 1100 W. Chestnut St., Burbank, CA 91506, Tel: 818-840-7119, Telex: 194855, TWX: 910-498-4987; Empl.: 75; *Sls. Mgr.:* Shelley Brown ..... **D•1055**

Local Sales Offices & Reps

AL Birmingham, Gray Comms. Conslt. 205-942-2824
AL Birmingham, Sonics Assocs. 205-942-9631
AL Cropwell, Broadcast Sys. 205-525-5467
AL Huntsville, Central Dynamics Corp. ... 205-837-5180
AL Mobile, Gray Comms. Conslt. 205-343-0662
AK Anchorage, N V S Sys. 907-349-3523
AZ Cottonwood, R I A Corp. 602-634-8065
AZ Phoenix, Siboney Communications Inc. (SCI) 602-252-5992
AZ Tucson, SCI 602-881-5432
CA Berkeley, Curtis M. Karplus, Esq. 415-642-1942
CA Burbank, H N E Inc. 213-508-7543
CA Burbank, Tri Tronics 213-843-2170
CA El Monte, Cetec Vega 213-442-0782
CA Encino, Everything Audio 213-995-4175
CA Glendale, Paramount Sound Sys. Corp. 213-956-3222
CA Inglewood, Audio Visual Hdqtrs. Corp. 213-419-4040
CA Lawndale, Omega Video 213-679-9021
CA Long Beach, K T Elctrns. 213-424-0979
CA Los Angeles, Acromedia Corp. 213-410-4141
CA Los Angeles, Hollywood Sound Sys. .. 213-466-2416
CA Los Angeles, Shoreline Ltd. 213-851-1236
CA Los Angeles, Skaggs Video Los Angeles 213-556-2133
CA Los Angeles, Tourkow & Co. 213-664-8884
CA N. Hollywood, Audio Svcs. Corp. 213-980-9891
CA N. Hollywood, Best Audio 213-763-2378
CA N. Hollywood, Doc Siegel Audio 213-877-2300
CA N. Hollywood, Theatre Vision 213-769-0928
CA Newbury Park, Westlake Audio 213-655-0303
CA Nipomo, Broadcast Sys. 805-929-4476
CA Pasadena, Audio Engrg. Assocs. 213-798-9127
CA San Diego, Centro Corp. 619-560-1578
CA San Diego, Skaggs Video San Diego 619-578-9640
CA San Diego, SCI 714-578-7777
CA Santa Clara, Video Comms. Corp. 408-988-2968
CA Sun Valley, Burns Audio 213-768-1701
CA Sunnyvale, Video Media 408-733-6500
CA Walnut, Video Comms. Corp. 714-594-2442
CO Denver, Film/Video Equip. Svc. 303-778-8616
CO Englewood, Skaggs Video Denver 303-740-9031
CT Shelton, Anton Bauer 203-929-1100
FL Gainesville, Gray Comms. Conslt. 904-376-2435
FL Miami, Gray Comms. Conslt. 305-591-3637
FL Miami, Hubbard Comms. 305-594-0744
FL Miami, Midwest Corp. 305-592-5355
FL Orlando, Gray Comms. Conslt. 305-896-7414
FL St. Petersburg, Hubbard Comms. 813-577-7759
FL Tampa, Gray Comms. Conslt. 813-885-1411
FL Tampa, SCI 813-985-4687
GA Albany, Gray Comms. Conslt. 912-883-2121
GA Doraville/Atlanta, Gray Comms. Conslt. 404-455-3121
GA Norcross, SCI 404-441-3300
GA Norcross/Atlanta, Tech. Video Sys. ... 404-447-6621
GA Union City/Atlanta, Allied Broadcast Equip. 404-964-1464
IL Chicago, Allied Broadcast Equip. 312-794-0224
IL Elk Grove Vlg., Swiderski Elctrns. 312-364-1900
IL Harvey, Bridgewater Custom Sound .. 312-596-0309
IL Morton Grove, Roscor Corp. 312-539-7700
IL Quincy, Harris Corp. 217-222-8200
IN Evansville, Kavco 812-476-6327
IN Indianapolis, Kavco 317-251-0800
IN Indianapolis, Midwest Corp. 317-251-5750
IN Indianapolis, R C A Corp. 317-273-3547
IN Richmond, Allied Broadcast Equip. 317-962-8596
IA Davenport, Video Midwest 319-322-1525
IA Des Moines, Video Midwest 515-244-1447
KY Edgewood, Midwest Corp. 800-543-1584
KY Lexington, Midwest Corp. 606-277-4994
KY Louisville, Midwest Corp. 502-491-2888
LA Harahan/New Orleans, Gray Comms. Conslt. 504-733-7265
MD Bethesda, Professional Prods. 301-657-2141
MD Lanham, Midwest Corp. 301-577-4903
MD Rockville, Peirce Phelps Inc. 301-984-7979
MA Boston, Professional Recording & Sound 617-254-2110
MA Framingham, Landy Assocs. 617-877-9570
MA Needham Hgts., Capron Lighting & Sound Co. 617-444-8850
MA Newton, Lake Sys. Corp. 617-244-6881
MI Ann Arbor, Hy James Audio Professionals 313-994-0934
MI Oak Park, Midwest Corp. 313-399-6361
MI Troy/Detroit, Midwest Corp. 313-689-9730
MN Minneapolis, Todd Comms. 612-941-0556
MN Minneapolis, Video Midwest 612-831-2248
MS Bay St. Louis, Harris Corp. S. Central Reg. 601-255-3337
MO Chesterfield, Television Engrg. Corp. .. 314-532-4700
MO El Dorado Springs, Broadcast Sys. 417-876-6254
MO St. Louis, Antech Labs 314-997-5666
NE Omaha, Todd Comms. 402-341-7600
NV Las Vegas, Acromedia Corp. Las Vegas 702-362-7552
NV Las Vegas, Western Media Entprs. 702-873-2014
NJ Atlantic City, Telemeasurements 609-345-2670
NJ Cherry Hill, Landy Assocs. 609-424-4660
NJ Clifton, Telemeasurements 201-473-8822
NJ Mahwah, Philips Television Sys. 201-529-1550
NJ Mountain Lakes, Turner Engrg. 201-263-0023
NJ Northvale, A F Assocs. 201-767-1000
NM Albuquerque, SCI 505-884-6858
NM Los Lunas, Dyma Engrg. 505-865-6700
NY New York, Adcom Comms. 212-265-1760
NY New York, Camera Mart 212-757-6977
NY New York, M P C S Video Inds. 212-586-3690
NY New York, Martin Audio/Video Corp. 212-541-5900
NY New York, Tech. Video Sys. 212-580-3104
NY New York, Westec Audio Video 212-586-1662
NC Charlotte, Midwest Corp. 704-399-6336
NC Charlotte, Reliable Music 704-375-8662
NC Raleigh, Southeastern Sight & Sound 919-828-2311
NC RTP, Broadcast Sys. 919-851-1956
NC Winston-Salem, Tech. Video Sys. 919-748-0916
OH Cleveland, Midwest Corp. 216-447-9745
OH Columbus, Kavco 614-274-0180
OH Columbus, Midwest Corp. 614-476-2800
OH Dayton, Kavco 513-898-2003
OH Dayton, Midwest Corp. 513-275-3339
OH N. Royalton, Kavco 216-237-1950
OH Parma Hgts., Reddish Sound 216-885-1222
OK Claremore, R I A Corp. 918-341-9066
OK Tulsa, M Z B & Assocs. 918-743-2661
OR Portland, Baldwin Mktg. Co. 503-234-1359
PA Allentown, Daveland Co. 215-439-8701
PA Carnegie, Alpha Video & Elctrns. 412-923-2070
PA Gibsonia, Midwest Corp. 412-443-6720
PA King of Prussia, Maris Equip. Corp. 215-275-9300
PA Philadelphia, Lerro Elctrl. Corp. 215-223-8200
PA Philadelphia, Peirce Phelps Inc. 215-879-7205
PA Pittsburgh, R P C Elctrns. 412-782-3770
TN Knoxville, Gray Comms. Conslt. 615-523-3107
TN Nashville, Consolidated Media Sys. ... 615-244-3933
TN Nashville, Gray Comms. Conslt. 615-883-9175
TX Amarillo, Magnetic Media Corp. 806-358-2468
TX Arlington, Midcom 817-640-4573
TX Austin, Broadcast Sys. 512-836-6014
TX Austin, M Z B & Assocs. 512-837-7240
TX Austin, Magnetic Media Corp. 512-451-0138
TX Austin, SCI 512-454-7194
TX Corpus Christi, SCI 512-883-6688
TX Dallas, M Z B & Assocs. 214-233-5535
TX Dallas, Magnetic Media Corp. 214-931-0404
TX Dallas, Video Sys. 214-349-0951
TX El Paso, SCI 915-598-8538
TX Houston, L D Systems 713-695-9400
TX Houston, M Z B & Assocs. 713-448-0881
TX Houston, Magnetic Media Corp. 713-771-9125
TX Houston, SCI 713-686-9685
TX Houston, Video Sys. 713-686-9651
TX Irving, SCI 214-258-8470
TX Lubbock, Video Sys. 806-792-2325
TX Madison, SCI 615-865-1980
TX Plano, Allied Broadcast Equip. 214-423-8667
TX Plano, Broadcast Sys. 214-867-8775
TX San Antonio, Video Sys. 512-824-2311
UT Salt Lake City, R I A Corp. 801-486-8822
UT Salt Lake City, Skaggs Telecom Svc. 801-539-1420
UT Salt Lake City, Skaggs Video Sls. 801-539-1420
VA Richmond, Professional Prods. 804-794-2585
VA Virginia Beach, Midwest Corp. 804-464-6256
VA Woodbridge, Broadcast Sys. 703-494-4998
WA Federal Way, Allied Broadcast Equip. 206-927-4337
WV Charleston, Midwest Corp. Corporate H/Q 304-343-8874
WV Nitro/Charleston, Midwest Corp. 304-722-2921

RUSH/HOUSTON, INC., 600 Kealrick, Ste C-40, Houston, TX 77060, Tel: 713-682-5151; *Sls. Mgr.:* Fred Murphy

RUSSELL INDS., 3000 Lawson Blvd., Oceanside, NY 11572, Tel: 516-536-5000; Empl.: 20; *Sls. Mgr.:* H. Russell

RUTHERFORD RESCH. PRODS., Box 249, Rutherford, NJ 07070, Tel: 201-933-2091; Empl.: 4; *Sls. Mgr.:* Dr. A. Blanck; *Dist. Mgr.:* Dr. A. Blanck

RVS ELECTRONICS, INC., 40 North St., Middletown, NY 10940, Tel: 914-342-3199, Telex: 820778; Empl.: 15

Local Sales Offices & Reps

CA San Diego, Mesa Engrg. (Rep) 619-268-3500
NY Middletown, RVS Elctrns., Inc. 914-342-3199

Local Distributors

AZ Phoenix, Jensen Tools 602-968-6241
MA Bedford, Continental Resources 617-275-0850
NJ Northvale, Glasgal Comms. 201-768-8082
NY Pleasantville, Electronic Tool 914-769-8070
PA Blue Bell, W.J. Wisely Assocs. 215-275-0658

RYAN INTL. CORP., 4800 Evanswood Dr., Columbus, OH 43229, Tel: 614-885-3303; Empl.: 30 ..... **D•1303**

RYE INDS., INC., 125 Spencer Pl., P.O. Box M, Mamaroneck, NY 10543, Tel: 914-698-0080; Empl.: 50

SABRE COMMS. CORP., 117 Main St., Soiux City, IA 51102, Tel: 712-258-6690; FSC No.: 60348; *Sls. Mgr.:* Bailey Aalfs; *Dist. Mgr.:* Richard Krone

SABRITEC, 16631 Noyes Ave., Irvine, CA 92714, Tel: 714-549-7350, Telex: 678401; *Sls. Mgr.:* M. J. Bennett

SAFEWAY PRODUCTS, 440 Middlefield St., Middletown, CT 06457, Tel: 203-346-6601, TWX: 710-428-7225; Empl.: 241

SAFT AMERICA INC., Box 1886, Valdosta, GA 31601, Tel: 912-247-2331, Telex: 547620, TWX: 810-786-5866

SAFT AMERICA INC., Advanced Battery Sys. Div., 107 Beaver Ct., Cockeysville, MD 21030, Tel: 301-666-3200

SAFT AMERICA, INC., Elctrns. Sys. Div., 2414 W. 14th St., Tempe, AZ 85281, Tel: 602-894-6864

SAFT AMERICA, INC., Portable Battery Division, 711 Industrial Blvd., Valdosta, GA 31601, Tel: 912-247-2331, Telex: 547-620; Empl.: 1300; *Sls. Mgr.:* R. Bartmes ..... **D•1412, 1432-1437**

Local Sales Offices & Reps

CA San Francisco 415-462-6868
CA Woodland Hills 818-884-6151
CO Denver 303-740-7781
FL Orlando 305-282-2245
IL Chicago 815-455-5344
MA Quincy 617-773-7980
MN Minneapolis 612-770-0082
NY New York City 516-249-3777
NC Winston-Salem 919-765-6690
OH Columbus 216-861-1877

PA	Philadelphia	215-831-9520
TX	Dallas	214-436-0757
VT	Rutland	802-773-8748

Local Distributors

AZ	Scottsdale, Electro Mktg.	602-991-0110
CA	Chatsworth, Mill Comm. Distrs., Inc.	818-998-3111
CA	Mountain View, Energy Sls.	415-969-0800
CO	Englewood, Industrial Elctrns.	303-694-9444
FL	Hialeah, Pro Battery	305-944-8800
MA	Billerica, A. W. Mayer Co., Inc.	800-225-6600
MI	Livonia, R. S. Elctrns.	313-525-1155
MN	Minneapolis, D. C. Battery Prods. Inc,	612-721-8547
MO	Maryland Heights, Ensco Distrb. Corp.	314-423-3992
NJ	Clifton, Engineered Assemblies, Inc.	201-340-0600
NY	Deer Park, TWR Tech., Inc.	516-242-4800
NC	Winston-Salem, Kirkman Elctrns.	800-334-8688, 800-672-0109
PA	Bensalem, Avex Elctrns. Corp.	800-345-1295
PA	Philadelphia, Shap Elctrns.	800-523-5248
TN	Mt. Juliet, Batteries Unlimited	617-754-8179
TX	Austin, Kent Elctrns.	512-478-8989
TX	Houston, Kent Elctrns.	713-780-7770
TX	Richardson, Kent Elctrns.	214-669-2600
TX	San Antonio, Kent Elctrns.	512-534-4848
UT	Salt Lake City, Standard Supp. Co.	800-453-7036
VA	Falls Church, Perrott Engrg. Labs, Inc.	703-532-0700
WA	Redmond, Energy Sls.	206-883-2343

SAGE LABORATORIES, INC., 3 Huron Dr., Natick, MA 01778, Tel: 617-653-0844, TWX: 710-346-0390; FSC No.: 07180; *Sls. Mgr.:* Tony Cieri

SAI TECHNLG. CO., Science Applications Inc., 4060 Sorrento Valley Blvd., San Diego, CA 92121, Tel: 619-452-9150, TWX: 756769; FSC No.: 54779; Empl.: 300

SAMARIUS, INC., 300 Seymour Ave., P.O. Box 377, Derby, CT 06418, Tel: 203-735-7405, TWX: 710-451-2495; FSC No.: 18065; Empl.: 90 ..... **A•2035**

SAMTEC, 810 Progress Blvd., P.O. Box 1147, New Albany, IN 47150, Tel: 812-944-6733, TWX: 810-540-4095; FSC No.: 55322; Empl.: 50; *Sls. Mgr.:* B. Shine; *Dist. Mgr.:* C. Roll

S & EI MFG., Box 832, Northridge, CA 91324, Tel: 818-349-4111, TWX: 910-493-1252; FSC No.: 24152; Empl.: 85

SANDERS ASSOCS., INC., DEFENSE, 95 Canal St., Nashua, NH 03061, Tel: 603-885-3833

SANDERS ASSOCS., INC., Electromagnetic, EMC Dept., 95 Canal St., Nashua, NH 03061, Tel: 603-885-3602; *Sls. Mgr.:* (EMC) R. Despathy

Local Sales Offices & Reps

MA	Scituate, New Eng. Area Reps.	617-545-6327
NJ	Princeton, Murtronic Assocs.	609-394-3737
NJ	Teaneck, Budd-Tronics Sls.	201-837-9057
NY	Guilderland, Nu-Tekeenex Mktg.	518-355-1829

SANDERS

Infrared detectors, lasers, pulsed laser diodes and accessories.

Sanders Associates, Inc.
Defense and Information Systems Division
95 Canal Street
Nashua, NH 03061
(603) 885-3833

AVEX ELECTRONICS CORP.

MASTER CONTRACT DISTRIBUTOR & ASSEMBLER

SAFT

FORMERLY

GOULD

BATTERIES

- INSTRUMENT REPLACEMENT
- WIDE RANGE OF SIZES CUSTOM PACKS (48 HOURS OR LESS)
- SAME DAY SHIPMENTS
- CYLINDRICAL CELLS
- MODULAR PAKS
- BUTTON CELLS - LITHIUM
- GELYTE® LEAD ACID
- RECHARGEABLE NICADS®

1-800-345-1295
215-638-1515
P.O. Box 1026
Bensalem, PA 19020

TNR TECHNICAL, INC.

DISTRIBUTORS, MANUFACTURERS AND ENGINEERING SUPPORT FOR

SAFT BATTERIES

- CYLINDRICAL CELLS
- MODULAR PAKS
- BUTTON CELLS - LITHIUM
- GELYTE® LEAD-ACID
- RECHARGEABLE NICADS®
- CUSTOM PACKS

TOLL FREE 800-842-0035
IN N.Y. CALL (516) 242-4800
45 Jefryn Blvd. West
Deer Park, New York 11729

SoLiCo

FULL LINE AUTHORIZED DISTRIBUTOR

E S I

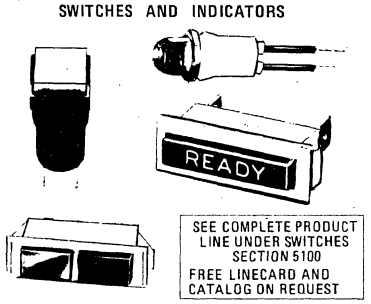
ELECTRIC SWITCHES INCORPORATED

2478 Fletcher Dr, Los Angeles, California 90039

213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971
SWITCHES AND INDICATORS



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

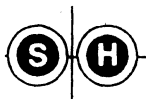
SANDERS

Electro-magnetic interference filters, power line filters; analysis, custom filter design, testing, and consulting services.

Sanders Associates, Inc.
EMC Department
95 Canal Street
Nashua, NH 03061
(603) 885-3602

SANDERS ASSOCS., Flexprint Prods. Div., Grenier Fld., Manchester, NH 03103, Tel: 603-669-4615, TWX: 710-220-9999; FSC No.: 4L 277; Empl.: 500; *Sls. Mgr.:* Martin S. Schwartz

SANDERS ASSCOS., INC., MICROWAVE, 955 Perimeter Rd., Manchester, NH 03108, Tel: 603-645-4299



S & H INDUSTRIES, INC.

S & H INDS., 119 Glen Cove Dr., Glen Head, NY 11545, Tel: 516-671-5600; Empl.: 50; *Sls. Mgr.:* R. Smith ..... **D•1829, 1984**

SAN DIEGO INSTR. LAB, See SANLAB

SAN FERNANDO ELEC. MFG., See SFE Techn.

SANFORD-MILLER CORP., 8 John St., Lynbrook, NY 11563, Tel: 516-593-2025, Outside NY 800-645-5900; Empl.: 10

SANGAMO WESTON
Schlumberger

SANGANO WESTON-SANGAMO COMPONENTS DIV., Fairchild Semiconductor, Box 128, Pickens, SC 29671, Tel: 803-878-6311, Telex: 57-0441, TWX: 810-397-2496; FSC No.: 00853; *Sls. Mgr.:* Gary Luthi ..... **A•2056-2064**

Local Sales Offices & Reps

AZ	Scottsdale, Ray Morton & Assocs.	502-947-1514
CA	Irvine, Earley & Assocs.	714-833-1806
CA	Mountain View, Westmark Assocs.	415-969-1700
CA	San Diego, CK Assocs.	619-279-0420
CO	Denver, Quorum 3 Sls. Grp.	303-696-8480
FL	Clearwater Beach, Perrott Assocs., Inc.	813-443-5214,813-443-5414
FL	Orlando, Perrott Assocs., Inc.	305-298-7748
FL	Sunrise, Perrott Assocs., Inc.	305-792-2211
GA	Norcross, Mountain Electro Prods., Inc.	404-448-5594
IL	Rolling Meadows, Sumer, Inc.	312-991-8500
IA	Marion, MSB Assocs., Inc.	319-377-6261
KS	Shawnee Mission, MSB Assocs., Inc.	913-432-2131
MA	Westwood, Mass Tech Sls.	617-329-8820
MI	Warren, DEM Elctrn. Sls.	313-575-9444
MN	Minneapolis, Components Grp. Corp.	612-374-1250
MO	St. Charles, MSB Assocs., Inc.	314-946-5577
NJ	Leonia, Peter E. Schmitt Co., Inc.	201-944-2806
NY	Albany, Reagan Compar, Inc.	518-489-4777
NY	Cazenovia, S. T. Woolard, Inc.	315-655-8145
NY	Endwell, Reagan Compar, Inc.	607-723-8743
OH	Rocky River, John Hill	216-331-5222
OR	Beaverton, LD Elctrns.	503-649-8556,503-649-6177
PA	Springhouse, P. W. C.	215-643-2550
TX	Austin, Delta Comps.	512-458-4288
TX	Seagoville, Delta Comps.	214-287-6333
UT	Salt Lake City, Quorum 3 Sls. Grp.	801-943-9227
VA	Fairfax, Beacon North	703-591-1300
VA	Forest, Beacon North	804-239-8486
WA	Snohomish, LD Elctrns.	206-568-0511
WA	Spokane, LD Elctrns.	509-922-4883
WI	Brookfield, Sumer, Inc.	414-784-6641
PR	Playa Ponce, Ditributronics, Inc.	943-395-9311

Local Distributors

AZ	Phoenix, Arizona Comps. Co.	602-269-5655
AZ	Tempe, Circuit Specialists, Inc.	602-966-2878
CA	Belmont, Arndt	415-592-6718
CA	Chatsworth, Diplomat Elctrns.	213-700-8700
CA	Chatsworth, Integrated Elcrns., Inc./JACO	213-998-2200
CA	Chatsworth, Shelly Elctrns., Inc.	213-998-3333
CA	Costa Mesa, Diplomat Elctrns.	714-549-8401
CA	Garden Grove, Hi Rel Distr. Sls., Inc.	213-594-9571
CA	Gardena, Bell Inds.	213-515-1800
CA	Irvine, Kelex, Inc.	714-863-1230
CA	San Diego, Bell Inds.	619-268-1277
CA	San Diego, Diplomat Elctrns.	619-292-5693
CA	San Diego, DECO	619-693-1595
CA	San Diego, Park/West, Inc.	619-277-8433
CA	San Fernando, Petell Elctrns., Inc.	213-365-9841
CA	Santa Clara, Pyramid Elctrns.	408-727-9810
CA	Santee, Mouser Elctrns.	619-449-2222
CA	Sunnyvale, Diplomat Elctrns.	408-734-1900
CA	Van Nuys, Electronic Expediters	213-781-1910
CO	Denver, Ragon-Elctrns. Parts Co.	303-744-1992
CO	Englewood, Diplomat Elctrns.	303-740-8300
CT	Danbury, Diplomat Elctrns.	203-797-9674
CT	Norwalk, Park Distrs.	203-853-2011,212-931-1680
FL	Clearwater, Diplomat Elctrns.	813-443-4514
FL	Longwood, Intertec	305-834-7777
FL	Miami, Electronic Equip. Co., Inc.	305-871-3500
FL	Tampa, Impala Elctrns., Inc.	813-885-4747
GA	Norcross, Diplomat Elctrns.	404-449-4133
ID	Spirit Lake, Al Elctrns.	208-623-3111
IL	Bensenville, Diplomat Elctrns.	312-595-1000
IL	Chicago, Bell Inds.	312-982-9210
IL	Elk Grove Village, GBL/Goold Elctrns.	312-593-3220
IL	Skokie, Marcon Assocs., Inc.	312-675-6450
IN	Indianapolis, Graham Elctrns., Inc.	317-634-8202
IN	Indianapolis, Meunier Elctrn. Supp., Inc.	317-635-3511
KY	Louisville, Peerless Elctrn. Equip. Co., Inc.	502-637-7674
MD	Columbia, Diplomat Elctrns.	301-995-1226
MD	Timonium, Zebra Elctrns., Inc.	301-252-6576
MA	Canton, Impact Sls. Co., Inc.	617-821-1500
MA	N. Chelmsford, Pilgrim Elctrns.	617-251-8746
MA	Woburn, Diplomat Elctrns.	617-935-6611
MI	Grand Rapids, RM Elctrn. Co., Inc.	616-531-9300
MN	St. Paul, Ragon Elctrns., Inc.	612-642-2828
MO	St. Louis, Olive Elctrns., Inc.	314-246-4500
NJ	Audubon, Action Elctrns.	609-858-2450
NJ	Denville, Hi-Rel Elctrns.	201-627-3800
NJ	Mountainside, Enox	201-654-7600
NJ	Nutley, Vantage Elctrns.	201-667-1840
NJ	Totowa, Diplomat Elctrns.	201-785-1830
NY	Bohemia, Justin Elctrns. Corp.	516-589-4000
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Dobbs Ferry, Gemini Elctrn. Co.	914-693-6363
NY	East Farmingdale, Tri-Start Elctrns., Inc.	516-293-0400
NY	Farmingdale, Command Elctrns. Corp.	516-293-1212
NY	Farmingdale, Milgray Elctrns., Inc.	516-420-9800
NY	Hauppauge, Fairmont Elctrn. Sls. Corp.	516-231-3313
NY	Hauppauge, JACO Elctrns.	516-273-5500
NY	Liverpool, Diplomat Elctrns.	315-652-5000
NY	Melville, Diplomat Elctrns.	516-454-6400
NY	New York, Centaur Elctrns. Corp.	212-695-6984
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Valley Stream, L & S Elctrns., Inc.	516-561-2474
NY	West Babylon, Delmar Elctrns., Inc.	516-420-1234
OH	Cincinnati, Hughes Peters, Inc.	513-351-2000
OH	Cleveland, Pruitt Energy Sources, Inc.	216-566-1545
OH	Dayton, Micro-Mil, Inc.	513-434-8231
OH	Dayton, Stotts Friedman Co.	513-298-5555
PA	Montgomeryville, Pyttronic Inds., Inc.	215-643-2850
PA	Philadelphia, Encore Elctrns., Inc.	215-676-7200
PA	Philadelphia, Herbach & Rademan	215-426-1700
PA	Philadelphia, Shap Elctrns.	215-969-3300
PA	Pittsburgh, Alder-Tronics, Inc.	412-821-5565
PA	Willow Grove, Resco Elctrns.	215-659-4575
PA	York, Electronic Comps. for Ind., Inc.	717-843-8971
TX	El Paso, International Elctrns.	915-778-9761
TX	Fort Worth, Allied Elctrns.	817-336-5401
TX	Fort Worth, TTI	817-831-0441,817-429-1440
TX	Stafford, Southwest Elctrns., Inc.	713-491-4900
UT	Salt Lake City, Diplomat Elctrns.	801-486-4134
UT	Salt Lake City, Standard Supp. Co.	801-486-3371
VA	Charlottesville, Virginia Radio Supp. Co., Inc.	804-296-4184
WA	Seattle, Pacific Elctrns.	206-575-1050

SANKEN ELEC. CO., 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan, Tel: 03-986-6151, Telex: 272-2323; Empl.: 4,300; *Sls. Mgr.:* K. Imaizumi; *Dist. Mgr.:* T. Hara

SANKEN ELEC. U.S.A. CORP., 3848 Carson St., Ste. 105, Torrance, CA 90503, Tel: 213-540-2209, Telex: 181839; Empl.: 5; *Sls. Mgr.:* Mr. Tack Kunimi; *Dist. Mgr.:* Mr. Tack Kunimi

SAN-O INDUSTRIAL CORP., 85 Orville Dr., Bohemia, NY 11716, Tel: 516-567-5556, TWX: 510-228-7701; Empl.: 50; *Sls. Mgr.:* M. Castellano

SANTA BARBARA RESCH. CTR., 75 Coromar Dr., Goleta, CA 93117, Tel: 805-968-3511, Telex: 910-334-1885, TWX: Hacsbar; Empl.: 2025; *Sls. Mgr.:* D.K. Smith

SANTA FE TEXTILES, Barcel Wire & Cable, 3151 W. Adams St., Santa Ana, CA 92704-5863, Tel: 714-751-7733, Telex: 910-595-1959; FSC No.: 31415; Empl.: 20; *Sls. Mgr.:* Mike Ross

SANYO ELEC. INC., 200 Riser Rd., Little Ferry, NJ 07643, Tel: 201-641-2333, Telex: 134-394; Empl.: 500; *Sls. Mgr.:* H. Matsuoka

Local Sales Offices & Reps

CA	Compton, Sanyo Elec. Inc.	213-537-5830
IL	Bensonville, Sanyo Elec., Inc.	312-595-5600

SANYO SEMICONDUCTOR CORP., 7 Pearl Ct., Allendale, NJ 07401, Tel: 201-825-8080, Telex: 135138 SANYOSEMI ALNJ; Empl.: 16; *Sls. Mgr.:* Koichi Takahashi; *Dist. Mgr.:* Aki Goto

SAPHIKON, 51 Powers St., Milford, NH 03055, Tel: 603-673-5831, Telex: 95-3067; Empl.: 45; *Sls. Mgr.:* K. G. Lonie

..SaRonix....

SARONIX, 4010 Transport at San Antonio, Palo Alto, CA 94303, Tel: 415-856-6900, Telex: 348465; FSC No.: 61441; Empl.: 35; *Sls. Mgr.:* Michael N. Blewett; *Dist. Mgr.:* Michael N. Blewett ..... **A•1428-1431**

Local Sales Offices & Reps

CA	Culver City, Bestronics, Inc.	213-870-9191
CA	Fallbrook, Matronix/Chilcote	619-728-7678
CA	Irvine, Bestronics, Inc.	714-261-7233
CA	Southern California, Bestronics, Inc.	213-704-5616
CA	Woodland Hills, Bestronics, Inc.	213-704-5616
CO	Denver, Lindberg Co.	303-758-9033
GA	Marietta, Rick Burns Assocs.	404-951-1181
IL	Elk Grove Vlg., John G. Twist Co.	312-593-0200
IN	South Bend, Schillinger Assocs., Inc.	219-291-6258
KS	Overland Park, EPI, Inc.	314-962-1411
MN	Bloomington, John G. Twist Co.	612-835-2120
MN	Bloomington, The John G. Twist Co.	612-835-2120
MO	St. Louis, EPI, Inc.	314-962-1411
NJ	Cherry Hill, Trinkle Sls.	609-795-4200
NJ	Englewood, Harold Gray Assocs.	201-894-0894
NM	Albuquerque, Lindberg Co.	505-881-1006
NC	Raleigh, Rick Burns Assocs.	919-876-2224
OH	Dayton, J. C. Hofstetter	513-296-1010
OH	Medina, J. C. Hofstetter	216-241-4880
TX	Austin, Logic 1 Sls.	512-459-1297
TX	Houston, Logic 1 Sls.	713-462-0641
TX	Richardson, Logic 1 Sls.	214-234-3375
UT	Salt Lake City, Lindberg Co.	801-969-2400
WI	Brookfield, John G. Twist Co.	414-782-2670
WI	Milwaukee, The John G. Twist Co.	414-782-2670

SANDERS ASSOCIATES, INC.
MICROWAVE DIVISION
955 Perimeter Road, Manchester, NH 03108-8500, (603) 645-4299, Telex 094-3430
Microwave subsystems and integrated modules for air, surface and subsurface systems: radar systems for surveillance, navigation and threat warning; on-board satellite receiver/transmit systems; antenna arrays; satellite ground receiver/transmitter stations, and point-to-point microwave telemetry networks.
SANDERS

EXP CA, Palo Alto, SaRonix 415-856-6900

Local Distributors

AZ Tempe, Anthem Elctrns. 602-244-0900
CA Chatsworth, Anthem Elctrns. 213-700-1000
CA Costa Mesa, Deco Elctrns. 714-754-1322
CA Manhattan Beach, Prime Electro Prods. 213-379-3642
CA San Diego, Anthem Elctrns. 619-279-5200
CA San Diego, Deco Elctrns. 619-693-1595
CA San Jose, Anthem Elctrns. 408-946-8000
CA Tustin, Anthem Elctrns. 714-730-8000
CO Englewood, Anthem Elctrns. 303-790-4500
CT North Haven, Coakley, Boyd & Abbett 800-225-8402
FL Lighthouse Point, Sales Engrg. Concepts., Inc. 305-781-4800
IN Indianapolis, MAR Elctrns., Inc. 317-875-4510
MA Andover, R2 Elctrns. 617-475-3777
MA Needham Heights, Coakley, Boyd & Abbett 617-444-5470
NH Plainstow, Coakley, Boyd & Abbett 617-444-5470
OR Lake Oswego, Anthem Elctrns. 503-684-2661
OR Portland, Northwest Mktg. Assocs. 503-620-0441
TX Addison, Active Comp. Technlg. 214-980-1888
TX Austin, Active Comp. Technlg. 512-452-5254
TX Houston, Active Comp. Technlg. 713-496-4000
UT Salt lake City, Anthem Elctrns. 801-973-8555
WA Redmond, Anthem Elctrns. 206-881-0850
Intl France, St. Quentin En Yveline, A S A P. ... 604 7878
Intl Germany, Munich, LSI-Electronic Vertriebs 089 310-7272
Intl Switzerland, Duebendorf-Zueric, Compona 01 821-3737

SAVOY ELCTRNS., P.O. Box 5727, Ft. Lauderdale, FL 33310, Tel: 305-563-1333, 800-327-1282, TWX: 510-955-9766; FSC No.: 59-1672492; Empl.: 60; *Sls. Mgr.:* Lorayne Beardsley

Local Sales Offices & Reps

CA San Diego, Qualtronics 619-560-8955
CA Santa Clara, Fisher Assocs. 408-733-7350
IL Barrington, Omni Elctrns. 312-381-9087
MA Sharon, Howard Haffer 617-784-2420

SAWTEK INCORPORATED

SAWTEK INC., P.O. Box 18000, Orlando, FL 32860, Tel: 305-886-8860, Telex: 514083, TWX: 810-862-0835; FSC No.: 58068; Empl.: 140 ..... **A•1432**

Local Sales Offices & Reps

AL Huntsville, L & D, Inc. 205-837-1469
AZ Scottsdale, Faser Tech. Sls. 602-948-4404
CA Los Altos, Cain-White & Co. 415-948-6533
CA Van Nuys, R-L Assocs. 213-782-7826
FL Maitland, D. J. Ellis & Assocs. 305-645-1101
GA Atlanta, L & D 404-455-3483
IL Palatine, R-Tek 991-222-1830
IN Fort Wayne, R-Tek 219-432-8783
KS Overland Park, Barnes-Midwest Sls. .. 913-341-9317
MD Burtonsville, Eastern Instr. Corp. 301-384-8500
MN Chanhassen, Barnes Sls. Assocs. 612-934-2907
NH Amherst, Callahan & Tremblay, Inc. ... 603-883-9000
NJ East Windsor, Micro-Lambda 609-443-3113
NY Buffalo, Quality Comps. 716-837-5430
NY Great Neck, Phase 4 Technical Rep., Inc. 516-482-1790
NY Manlius, Quality Comps. 315-682-8885
NC Greensboro, L & D 919-292-3201
NC Raleigh, L & D 919-876-5301
TX Richardson, Vector Sls. 214-234-4291

SAXTON WIRE & CABLE

SAXTON WIRE AND CABLE, 215 N. Rte. 303, Congers, NY 10920, Tel: 914-268-6848, 800-431-2774, Telex: 13-1538; FSC No.: 16164; Empl.: 130; *Sls. Mgr.:* Bill Cullen; *Dist. Mgr.:* Steve Shelley ..... **C•1896-1903**

Local Sales Offices & Reps

CA Pico Rivera, Saxton West 213-948-4066, 800-331-WIRE
CO Denver, Tele-Electric Sls., Ltd. 303-969-9239
CT Guilford, Phil Orzell Assocs. 203-453-6488
FL Tampa, Griffin & Assocs. Elctrn. Sls., Inc. 813-887-1945
GA Marietta, Communication Mktg. 404-424-9097
IN Angola, Waid Assocs. 219-833-3523
MA Milford, Jonel Sales Assocs. 617-478-4650
MN Burnsville, Strong & Assocs. 612-890-3168
MN Maple Grove, R. C. Sls. 612-425-5543
MO Kansas City, Ron Forristal 816-358-6771
NY Mohegan Lake, Travano & De Palma Assocs. 914-245-5269, 914-968-1084
NC Oxford, Winston Elctrn. Sls. Assocs. ... 919-693-1561
OH Cleveland, Hank Miller Sls. Assocs. ... 216-329-3900
PA Collegeville, Steve Linton 215-489-9473
TN Knoxville, John Dickens 615-947-8068
TX Corwley, David Tuggle 817-294-0850
VA Arlington, Howard Golen Paul & Assocs. 703-525-5898

Local Distributors

CA Downey, David Levy Co. 213-869-2539
CA Montebello, Atlas Wire & Cable 213-723-2401
CT Manchester, Inventory Mgt. Svs. 203-649-4415
CT Meriden, New England Insulated Wire 203-204-8927
GA Atlanta, Atlanta Cable Sls. 404-448-6311
MS Hattiesburg, Wright Elctrn. 601-545-2545
NY Brooklyn, Ceco Comm. 212-646-1617
NC Greenville, Pair Elctrns. 919-756-8007
PA Broomwall, Omni Cable 215-544-7766
SC Columbia, Hesco 803-254-4575
VA Arlington, Arlington Elctrn. 703-524-2412
VA Leesburg, Elctrn. Wire & Cable 703-777-3551

SAYLOR ELECTRONICS INT'L, INC., 1824 Calash Dr., Carson City, NV 89701, Tel: 702-883-4184; Empl.: 4

SCANBE DIV., 3445 Fletcher Ave., El Monte, CA 91731, Tel: 213-579-2300, TWX: 910-587-3437; Empl.: 125

SCANNING DEVICES, 108 Elm St., Waltham, MA 02154, Tel: 617-891-8991; Empl.: 25; *Sls. Mgr.:* Louis Goldenberg

SCHAEVITZ ENGRG., U.S. 130, Union Ave., Pennsauken, NJ 08110, Tel: 609-662-8000, TWX: 710-892-0714; FSC No.: 93190; Empl.: 325; *Sls. Mgr.:* F. R. Pisaro

SCHAFFNER EMC, INC., 825 Lehigh Ave., Union, NJ 07083, Tel: 201-851-0644, Telex: 685-3444; FSC No.: 201-467-1330; *Sls. Mgr.:* Thomas Pate; *Dist. Mgr.:* Tom Morrone

Local Sales Offices & Reps

CA Buena Park, RPS Elctrns., Inc. 213-744-8400
CA Costa Mesa, Berman Gravley Co., Inc. 714-549-2122
CA Palo Alto, Mollard Mktg. 415-961-0456
CA San Jose, Cypress Elctrns. 408-945-8400
IL Arlington Heights, ZMS Elctrn. Sls., Inc. 312-394-4422
KS Overland Park, Guernsey/Web Assocs. 913-381-2225
MA Burlington, Kitchen & Kutchin Inc. 617-229-2660
MA Hopkington, Interface Elctrns., Inc. 617-435-6858
NJ Marlton, BGR Assocs. 609-983-1020
NJ Palmyra, Marlac Elctrns., Inc. 609-786-1991
NY Commack, JL Sls. Assocs. 516-462-5666
NY Rochester, H.C. Johnson Agy., Inc. 716-586-0777
NC Raleigh, Tingen Tech. Sls., Inc. 919-781-1100
TX Arlington, Comptech Sls., Inc. 817-265-6007
WI Brookfield, ZMS Elctrn. Sls. 414-782-2222

Local Distributors

CA Buena Park, RPS Elctrns., Inc. 213-744-0355
CA San Jose, Cypress Elctrns. 408-945-8400
MA Hopkington, Interface Elctrns., Inc. 617-435-6858

SCHAFFNER EMC, INC., Instr. Div., 825 Lehigh Avenue, Union, NJ 07083, Tel: 201-851-0644, Telex: 685-3444

Local Sales Offices & Reps

CA Fullerton, GRU Assocs. 714-738-0903
CO Boulder, Herb Bass Assocs. 303-530-7509
IL Elk Grove Village, Loren F. Green Assocs./Cen. 312-593-0282
IN Indianapolis, Loren F. Green Assocs. of Indiana 317-293-9827
MI Northville, Micro Sls. Corp. 315-459-1670
MN Minneapolis, Loren F. Green Assocs. of Minn. 612-571-6666
OH Centerville, Micro Sls. Corp. 513-433-8171
OH N. Olmstead, Micro Sls. Corp. 216-734-3080
OR Portland, Harry Levinson Co. 503-245-1902
WA Seattle, Harry Levinson Co. 206-382-1300

Local Distributors

AL Huntsville, Scientific Dvcs. SE 205-536-1969
CA San Jose, D. P. Assocs. 408-296-1492
CT Higganum, Intersell 203-528-5357
FL Orlando, Scientific Dvcs. SE 305-841-8180
MA Burlington, Intersell 617-273-3844
NJ Woodcliff Lake, Eastern Instrmn. 201-664-0907
NC Winston-Salem, Scientific Dvcs. SE, Inc. 919-765-5776
PA Melrose Park, Robert Meyers Assocs. 215-224-1663
WA Seattle, Harry Levinson Co. 206-382-1300

SCHAUER MFG., 4500 Alpine Ave., Cincinnati, OH 45242, Tel: 513-791-3030, Telex: 21-4576; Empl.: 195; *Sls. Mgr.:* A. A. Groenewold; *Dist. Mgr.:* Dan Shaw

SCHLAGE ELECTRONICS, 3260 Scott Blvd., Santa Clara, CA 95051, Tel: 408-727-5170, Telex: 171122; Empl.: 150; *Sls. Mgr.:* Steve Burt

SCHNEIDER INSTR., 8115 Camargo Rd., Cincinnati, OH 45243, Tel: 513-561-6803; Empl.: 23; *Sls. Mgr.:* C. A. Schneider, Pres.

SCHONSTEDT INSTR. CO., 1775 Wiehle Ave., Reston, VA 22090, Tel: 703-471-1050, TWX: 710-833-9880; Empl.: 45

SCHOTT CORP., 1000 Parkers Lk. Rd., Wayzata, MN 55391, Tel: 612-475-1173, TWX: 910-576-2964; FSC No.: 80023; Empl.: 325; *Sls. Mgr.:* A. Schmitt

Local Sales Offices & Reps

IL Des Plaines, Electro-Comp. Sls. 312-577-3788
MA Needham, Hatch Assocs. 617-444-3310

SCHOTT ELCTRNS., Hershey Dr., Ansonia, CT 06401, Tel: 203-736-2677, Telex: 170 451 8911; Empl.: 240; *Sls. Mgr.:* Don Davis

SCHOTT GLASS TECHNOLOGIES, INC., 400 York Ave., Duryea, PA 18642, Tel: 717-457-7485, TWX: 510-671-4535; FSC No.: 23-169-1403; Empl.: 600; *Sls. Mgr.:* D. Dougherty

the connection for...

SCHRACK RELAYS

distributor specialists
632 Santa Monica Blvd.
Santa Monica,
California 90401
(213) 393-9666
A regional distributor of quality electronic components

SCHRACK NORTH AMERICA, INC.

SCHRACK NORTH AMERICA CORP., 3 Westchester Plaza, Elmsford, NY 10533, Tel: 914-592-1305, Telex: 646149; Empl.: 4; *Sls. Mgr.:* Zach Zager ..... **B•1444-1446**

Local Sales Offices & Reps

AL Athens, Effective Mktg. Force 205-233-2947
CA Livemore, O'Rielly Elctrn. Sls. 415-443-5343
CA Panorama City, Viking Sls. 818-788-5501
CO Boulder, Stratford Grp. 303-530-3194
CT Manchester, Vin-Tech 203-646-3007
FL Tampa, J-R Controls, Inc. 813-961-9478
GA Atlanta, Effective Mktg. Force 404-948-6023
IL Barrington, Richard Fisk Mktg. 312-381-0653
IN Indianapolis, C.C. Elctrns. 317-255-1508
KS Shawnee Mission, Microtronics (K&M) 913-262-1444
MA Framingham, Bengal Assocs. 617-877-2639
MA Randolph, Bengal Assocs. 617-961-4120
MI Pontiac, C.C. Elctrns., Inc. 313-338-7400
MN Roseville, TLC Controls 612-483-2226
NJ Paramus, Jarms Elctrn. 201-265-2032
NY Melville, Jarms Elctrn. 516-752-0404
OH Gallion, C.C. Elctrns., Inc. 419-468-3253
TX Irving, Kite Elctrns. Sls. Co., Inc. 214-438-9336
OR Portland, Pacific Elec. Sls. 503-235-3456
NY Syracuse, PI1 Tronics 315-455-7346

Local Distributors

AK Anchorage, Electronics Supp. Ctr. 907-274-0603
AZ Phoenix, Capitol Elctrns. 602-252-5897
CA Santa Monica, Distributor Specialist 213-393-9666
CA Santa Monica, Master Distrs. 213-452-1229
CA Tustin, Caltronics Sls. 714-730-0350
CA Van Nuys, Hurley Elctrns. 818-781-8410
CT Danbury, Green Elec. 203-748-5644
CT New Haven, Hatry Elctrns. 203-755-1181
CT Norwalk, Delta Elctrns. 203-847-7285
CT Norwalk, Park Distr. 203-853-2010
FL Lakeland, AA Elec. 813-665-6941
FL Lakeland, Switch Controls 813-644-7564
FL Miami, B & R Elctrns. 305-255-4510
FL Oakland Park, Zelgon, Inc. 305-565-2555
FL Orlando, Sun Elctrns. 305-841-4650
FL Tampa, Leader Elctrns. 813-870-3315
FL W. Palm Beach, Dolphin Elec. 305-659-7166
HI Honolulu, Industrial Elctrns. 808-533-6095
IL Arlington Hgts., Lodan Elctrns. 800-323-5207
IN Bloomington, Hoosier Elctrns. 812-332-9435
IN Bloomington, Stansifer Radio 812-336-6339
IN Indianapolis, Mar Elctrns. 317-875-4510
IA Cedar Rapids, Iowa Radio Supp. 319-393-4510
KS Salina, Electronics, Inc. 913-827-7377
KY Mayfield, Pickens Supp. 502-247-6041
MD Beltsville, PSI 301-937-4960
MD Gaithersburg, Axis Elctrns. 301-840-9640
MD Salisbury, Artcraft 301-749-6151
MA Norwood, Emtel Elctrns. 617-769-9500
MA Pittsfield, Cash & Carry Elec. Supp. 413-499-9500
MA Waltham, Standard Elec. Supp. 617-890-1050
MA Wilmington, Aved Elctrns. 617-245-7406
MA Woburn, Abbott Elctrns. 617-935-2040
MI Flint, Advance Whsle. Distr. 313-238-5611
MI Troy, Empire Elctrns. 313-585-8130
MN New Brighton, Chris Elctrns. 612-631-2647
NE Lincoln, Scott Elctrns. 402-466-8221
NJ Brick, Electronic Entprs. 212-442-1046
NJ E. Rutherford, AA Elec. 800-228-0131
NJ Fair Lawn, Relay Specialties 201-797-3313
NJ Plainfield, Propac 201-755-4940
NY Bohemia, Omntec Mfg., Inc. 516-567-8685
NY Buffalo, Summit Elctrns. 716-334-8110
NY Commack, Choice Comps. 516-543-6060
NY Elmsford, Ancar Elec. 914-592-7100
NY Mt. Vernon, Janesway Elctrns. 914-699-6710
NY Nanuet, Andrea Elec. 914-623-3447
NY New Rochelle, Derf Elctrns. 914-235-4600
NY Port Washington, Bradtronics 201-641-6118
NY Rochester, Masline Elctrns. 716-546-5373
NY Rome, Rome Security 315-336-0148
NY Sodus, AED 315-483-6561
NY Stony Brook, Bomark Elctrns. 516-689-8999
NY W. Babylon, Septronics 516-643-4990
NY Wheatfield, EEC 716-693-3970
NY White Plains, Benfield Pro Shop 914-948-6650
NY Yonkers, Kintronics 914-968-7736
NC Knightdale, Systems Elctrns. 919-266-9908
NC Pineville, Control Design Supps. 702-588-4410
OH Columbus, Thompson Elec. 614-228-6191
OH Dayton, Carver Supp. 513-461-9673
OH Dayton, Industrial Sls. & Svc. 513-439-4131
OH Zanesville, Thompson Radio Supp. 614-452-8473
OR Clackamus, Amfac Elec. 503-657-3020
OR Medford, Medford Elec. Whlsr. 503-773-6656
OR Ontario, Interstate Elctrn. Corp. 503-889-9679
OR Pendleton, Round Up Elctrns. 503-276-3152
OR Portland, O-Four Controls 503-231-8058
PA Bloomsburg, E. R. Beers 717-784-1600
PA Philadelphia, Jan Indl. 215-922-1321
PA Redding, R.A.M. Motor Control 215-376-7102
TX Brownsville, Carden Inds. 512-541-3660
TX Dallas, Rawlinson Elec. Supp. 214-741-1721
TX Ft. Worth, Industrial Equip. 817-831-6151
TX Garland, Industrial Equip. 214-271-5494
TX Houston, Commercial Equip. 713-237-8682
TX Houston, Ralph's Elctrns. 713-748-4902
TX Hurst, Industrial Equip. 817-595-1814
UT Provo, Central Utah Elctrns. 801-373-7522
UT Provo, Omega Elctrns. 801-375-4664
UT Salt Lake City, Ballard Supp. 801-972-2430
VA Norfolk, Radio Parts Distr. Co. 804-461-8095
WA Port Angeles, Alphase Elec. 206-452-9705
WA Spokane, Consolidated Elctrl. Distr. 509-535-8891
WA Tacoma, Amfac Elec. 206-383-4303

Schroff®

19" Systems for Electronics Packaging

SCHROFF INC., 170 Commerce Dr., Warwick, RI 02886, Tel: 401-732-3770, Telex: 952175; *Sls. Mgr.:* Thomas Kennedy ..... **C•1080**

Local Sales Offices & Reps

AZ Scottsdale, Luscombe Engr. 602-949-9333
CA Campbell, Luscombe Engr. 408-370-2020
CA Pasadena, Luscombe Engr. 213-684-2000
CA San Diego, Luscombe Engr. 619-295-4300
FL Pompano Beach, EMA 305-943-3732
FL Winter Park, EMA 305-671-6800
GA Atlanta, CRS Elctrns. 404-396-3720
IL Berkeley, Cadre Tech. Rep. 312-449-3900
MI Troy, C. B. Jensen 313-643-0506
MN Minneapolis, D. A. Case Assoc. 612-869-3700
MO Brigeton, DY-Tronix 314-291-4777
NH Salem, Sales Engr. 603-893-5521
NJ Englewood, Sprung-Nussbaum 201-569-5666
NY Central Sqare, Bastian Sls. 315-437-1482
NY Fairport, Bastian Sls. 716-223-0237
NY Port Crane, Bastian Sls. Agency Inc. 607-722-3421
OH Aurora, EMA 216-562-6104
OH Centerville, EMA 513-433-2800
PA Huntington Valley, Omega Elctrn. Sls. 215-947-4135
TX Austin, CMZ 512-255-1663
TX Garland, CMZ 214-681-1414
TX Houston, CMZ 713-771-1500

SCHROFF UK LTD., Maylands Ave., Hemel Hempstead, Herts, England HP2 4SG, Tel: 0442-40471/6, Telex: 825658; *Sls. Mgr.:* Mr. B-U Kaupisch

SCHULZ CONTROLS, INC., P.O. Box 9555, New Haven, CT 06511, Tel: 203-562-2555; Empl.: 35; *Sls. Mgr.:* Paula Calabrese; *Dist. Mgr.:* Paula Calabrese

SCHURTER, INC., 1016 Clegg Ct., Petaluma, CA 94952, Tel: 707-778-6311, Telex: 176-084; FSC No.: 61935; *Sls. Mgr.:* Bruno H. Schurter

Local Sales Offices & Reps

CA Fullerton, Gru Assocs. 714-738-0903
CA San Jose, Ruppert Sls. & Engrg. 408-998-8717
CO Lakewood, Cristee-Meade Co. 303-232-0287
FL Ft. Lauderdale, IMR, Inc. 305-741-2449
GA Lithia Springs, Effective Mktg. Force 404-948-6023
IL Arlington Hgts., MJ Petersen & Assoc., Ltd. 312-577-8200
IN Noblesville, W. G. Brouillette & Assocs., Inc. 317-845-8157
MN Minnetonka, Frank Anthony Mktg. 612-934-0773
MS Jackson, Doby Assocs. 601-981-1138
NH Nashua, Bell Controls 603-882-6984
NJ Ho-Ho-Kus, D. J. Fisher Co. 201-652-0090
NJ Medford, Champion Elctrn. Sls. Co. 609-983-0932
NY Fairport, TAC Sls, Inc. 716-425-1070
OH Beachwood, Electronic Salesmasters 216-831-9555
OR Portland, Dussault & Associates Inc. 503-641-8780
TX Austin, OM Assocs., Inc. 512-452-1838
TX Dallas, OM Assocs., Inc. 214-241-3876
TX Houston, OM Assocs., Inc. 713-789-4426
WA Seattle, Dussault & Associates Inc. 206-527-5454

Local Distributors

CA Fremont, Fusecom, Inc. 415-657-FUSE
CA San Jose, Dansco Comp. Sls., Inc. 408-288-9740
CA San Jose, Quail Elctrns. 408-995-0812
IL Elk Grove Village, Nu-Way Elctrn. Distrbs. Inc. 312-437-7120
MD Rockville, FIC Corp. 800-638-6594
OH Strongsville, Fuse World 216-238-1330
TX Dallas, Fuses, Inc. 214-341-6407
WA Redmond, Fusecom, Inc. 206-881-2442
Can Markham, Ont., Lenbrook Elctrns. 416-777-7722

SCHWEITZER, DIV., Kimberly Clark Corp., Lee, MA 01238, Tel: 413-243-1000, TWX: 413-243-2121; Empl.: 750

SCIENCE ACCESSORIES CORP., 970 Kings Hwy. W., Southport, CT 06490, Tel: 203-255-1526, Telex: 964300 SAC SPRT; *Sls. Mgr.:* H. A. Cleveland

SCIENCE/ELCTRNS., 1224-26 McCook Ave., Dayton, OH 45404, Tel: 513-228-6011, Telex: 288-004; Empl.: 25; *Sls. Mgr.:* E. E. Pohl; *Dist. Mgr.:* J. Tanksley

SCIENTECH, INC., 5649 Arapahoe Ave., Boulder, CO 80303, Tel: 303-444-1361, 800-525-0522, TWX: 910-940-0994; Empl.: 57

SCIENTIFIC-ATLANTA, INC., P.O. Box 105600, Atlanta, GA 30348, Tel: 404-441-4000, Telex: 0542898, TWX: 810-766-4912

SPECTRAL DYNAMICS, Scientific-Atlanta, Inc., 4255 Ruffin Rd., San Diego, CA 92123-0575, Tel: 619-268-7100, TWX: 910-335-2022; Empl.: 370; *Sls. Mgr.:* Ram Waney

SCIENTIFIC-ATLANTA, INC., See Optima Enclosures

SCIENTIFIC COLUMBUS, INC., Esterline Corp., 1900 Arlingate La., Columbus, OH 43228, Tel: 614-274-7160, Telex: 245-426; Empl.: 210; *Sls. Mgr.:* Don Yore; *Dist. Mgr.:* Don Yore

SCIENTIFIC COMMUNICATIONS, INC., 3425 Kingsley Rd., Garland, TX 75041, Tel: 214-271-3685, TWX: 910-860-5172; *Sls. Mgr.:* Donald G. Luiken

SCIENTIFIC RADIATION CORP., 1201 San Antonio Rd., Mountain View, CA 94043, Tel: 415-965-0910, Telex: 345506; *Dist. Mgr.:* James A. Lazzara

SCIENTIFIC RESEARCH CORP., See TRAK Microwave Corp.

SCIENTIFIC TECHNLG., 1201 San Antonio Rd., Mountain View, CA 94043, Tel: CA 415-965-0910, 800-221-7060, Telex: 34-5506; Empl.: 50

SCITEQ ELECTRONICS, INC., 7380 Clairemont Mesa Blvd., San Diego, CA 92111, Tel: 619-292-0500, Telex: 882008; *Sls. Mgr.:* Henry Eisenson; *Dist. Mgr.:* David Norman

SCOPE, INC., 1860 Michael Faraday Dr., Reston, VA 22090, Tel: 703-471-5600, TWX: 710-883-1178; Empl.: 225; *Sls. Mgr.:* David Bess

SCOTT AVIATION, Figgie International Inc., 123 East Montecito Ave., Sierra Madre, CA 91024, Tel: 213-355-4281

SCREEN DATA CORP., 80 S. Jefferson Rd., Whippany, NJ 07981, Tel: 201-887-7713, 800-248-1212, Telex: 710-387-209; *Sls. Mgr.:* Michael A. Kling

SCREENPRINT/DOW, 271 Ballardvale St., Wilmington, MA 01887, Tel: 617-935-6395, Telex: 948227; *Sls. Mgr.:* W. F. Donovan Jr.

SEABOARD ELCTRNS., 70 Church St., New Rochelle, NY 10805, Tel: 914-235-8073, Telex: 646289; Empl.: 78; *Sls. Mgr.:* Dr. Richard Ader; *Dist. Mgr.:* Dr. R. Ader

SEACOR, INC., 123 Woodland Ave, Westwood, NJ 07675, Tel: 201-666-5600, Telex: 135-354; Empl.: 45

SEA DATA CORP., One Bridge St., Newton, MA 02158, Tel: 617-244-3216, Telex: 951107; Empl.: 40; *Sls. Mgr.:* W. Hill

SEALECTRO, 225 Hoyt St., Mamaroneck, NY 10543, Tel: 914-698-5600; Empl.: 1600; *Sls. Mgr.:* T. Lynn; *Dist. Mgr.:* N. Buonanno

SEALTRON, INC., 9705 Reading Road, Cincinnati, OH 45215, Tel: 513-733-8400, Telex: 21-4609; Empl.: 120; *Sls. Mgr.:* James Dawson

SEASTROM MFG. CO., INC., 701 Sonora Ave., Glendale, CA 91201, Tel: 213-245-9121, TWX: 910-497-2271; FSC No.: 86928; Empl.: 75

SEATTLE COMPUTER PRODUCTS, INC., 1114 Ind. Dr., Seattle, WA 98188, Tel: 206-575-1830, 800-426-8936; *Sls. Mgr.:* Max Gerdts

SECTOR MOTOR IND. INC., 999 Grand Blvd., Deer Park, NY 11729, Tel: 516-242-2300, TWX: 510-227-6075; *Sls. Mgr.:* Victor Nelson

secoinsa
digi-power

SECOINSA/DIGI POWER, 686 E. Gish Rd., San Jose, CA 95112, Tel: 408-288-5600, Telex: 910-338-0579; Empl.: 90; *Sls. Mgr.:* Ron Murphy; *Dist. Mgr.:* Ron Murphy ..... **D•1830-1832**

Local Sales Offices & Reps

CA	Inglewood, Basic Sys. Corp.	213-673-4300
KS	Shawnee Mission, Panatek Tech. Sls.	913-362-3349
MD	Rockville, J-4 Computer Sys.	301-424-0700
MN	Spring Lake Park, Holmgren Assocs.	612-786-7641
NJ	Boonton, Winter Assocs.	201-334-3434
OK	Tulsa, Genzal Sls. & Assocs.	918-622-7744
OR	Portland, Power Sources Unlimited, Office 2	503-292-0918
TX	Fort Worth, El Tech Sls., Inc.	817-268-2896
VA	Front Royal, Eltron Sls., Ltd.	703-635-7201
WA	Lynwood, Power Sources Unlimited, Ofice 1	206-743-6641

SECURITY PLASTICS, INC., 14427 N.W. 60th Ave., Miami Lakes, FL 33014, Tel: 305-823-5440, Telex: 803303; Empl.: 400; *Sls. Mgr.:* J. Licht

SEEQ TECHNLG., 1849 Fortune Dr., San Jose, CA 95131, Tel: 408-942-1990, TWX: 9103382313; Empl.: 650; *Sls. Mgr.:* J. Daniel McCranie; *Dist. Mgr.:* J. Daniel McCranie

SEIKO INSTRUMENTS

SEIKO INSTRS. U.S.A., INC., 2990 W. Lomita Blvd., Torrance, CA 90505, Tel: 213-530-8777, TWX: 910-347-7307; *Sls. Mgr.:* John Hawkins, Lee Guio; *Dist. Mgr.:* Lee Guio, John Hawkins ..... **A•1433; B•1092; D•1071**

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech	205-533-2100
AZ	Scottsdale, Fred Board Assocs.	602-994-9388
AZ	Tucson, Fred Board Assocs.	602-299-1508
CA	Los Alamitos, Santana Sls.	714-827-9100
CA	San Diego, CK Assocs.	619-279-0420
CA	San Jose, Exis, Inc.	408-287-6680
CO	Golden, Candal, Inc.	303-233-0155
FL	Plantation, Gallagher & Assocs.	305-473-2101
GA	Norcross, Electro-Mech	404-447-6478
IL	Elk Grove Village, The John G. Twist Co., Inc.	312-593-0200
IN	Greenwood, Valentine & Assocs.	317-888-2260
IN	South Bend, Valentine & Assocs.	219-288-7070
IA	Cedar Rapids, Tech. Elctrns.	319-366-5443
KS	Overland Park, Kebco	913-541-8431
KS	Wichita, Kebco	316-733-1301
MD	Annapolis, Vince Iorio Assocs.	301-465-8150
MA	Brockton, Forsberg Sls.	617-522-6300
MI	Grosse Pointe Pk., Greiner Assoc.	313-499-0188
MN	Bloomington, Quantum Sls.	612-884-4700
MO	Maryland Hgts., Kebco	314-576-4111
NJ	Manville, DynoRep, Inc.	201-685-0135
NJ	Mt. Laurel, Comtek, Inc.	609-235-8505
NM	Albuquerque, Fred Board Assocs.	505-293-1399
NY	Kingston, R. P. Kennedy Co.	914-876-2700
NY	Rochester, R. P. Kennedy Co.	716-271-1910
NY	Rochester, R. P. Kennedy Co.	716-271-6322
NC	Raleigh, Electo-Mech	919-851-8165
OH	Wadsworth, Imtech	216-239-2202
OR	Tigard, Components West	503-684-1671
TN	Jonesboro, Electro-Mech	615-753-2964
TX	Austin, TL Mktg.	512-453-4586
TX	Dallas, TL Mktg.	214-357-1752
UT	Salt Lake City, Aspen Sls., Inc.	801-467-2401
WA	Liberty Lake, Components West	509-255-6224
WA	Redmond, Components West	206-885-5880
WI	Brookfield, John G. Twist Co., Inc.	414-782-2670
Can	Pointe Claire, Que., Tech-Trek, Ltd.	514-697-3385
Can	Rexdale, Ont., Tech-Trek, Ltd.	416-674-1717
Can	Richmond, B.C., Tech-Trek, Ltd.	604-271-3149

Local Distributors

AL	Huntsville, Contact Elctrns.	205-881-9321
AZ	Phoenix, Sterling Elctrns.	602-268-2121
CA	San Jose, Eric Elctrns.	408-262-1111
CA	Santa Ana, Pacesetter Elctrns. USA	714-777-4711
CA	Sunnyvale, Pacesetter Elctrns. USA	408-734-5470
CA	Tustin, Added Value Elctrns.	714-730-5848
CO	Denver, Diplomat Elctrns.	303-422-9229
CO	Englewood, Sterling Elctrns.	303-796-7338
CT	Wallingford, Sterling Elctrns.	203-265-9535
IL	Elmhurst, Semi-Conductor Specialists	312-279-1000
IL	Northbrook, Classic Comps.	312-272-9650
IN	Indianapolis, Classic Comps.	317-872-4777
KS	Overland Park, Sterling Elctrns.	913-236-5589
LA	Metairie, Sterling Elctrns.	504-887-7610
MD	Middletown, Current Comps.	301-473-5333
MA	Norwood, Emtel	617-769-9500
MA	Waltham, Sterling Elctrns.	617-894-6200
MN	Bloomington, Semi-Conductor Specialities	612-854-8841
NJ	Perth Amboy, Sterling Elctrns.	201-442-8000
NM	Albuquerque, Sterling Elctrns.	505-884-1905
OH	Cincinnati, Schuster	513-489-1400
OH	Cleveland, Schuster	216-425-8134
OK	Tulsa, Sterling Elctrns.	918-663-2410
OR	Lake Oswego, Moore Elctrns.	503-684-3100
PA	Allentown, Lehigh Elctrns. Comps.	215-433-3045
TX	Austin, Sterling Elctrns.	512-836-1341
TX	Dallas, Sterling Elctrns.	214-243-1600
TX	Houston, Sterling Elctrns.	713-627-9800
UT	Salt Lake City, Diplomat Elctrns.	801-487-8131
VA	Richmond, Sterling Elctrns.	804-226-2190
VA	Sterling, Sterling Elctrns.	703-450-2373
WA	Bellevue, Moore Elctrns., Inc.	206-644-0101
WI	New Berlin, Classic Comps.	414-986-5300
Can	Downsview, Westburne Indl. Entprs.	416-635-2950
Can	Markman, Semad Div. DEW Elctrns.	416-475-8500
Can	Montreal, Semad Div. DEW Elctrns.	514-636-4614
Can	Ottawa, Semad Div. DEW Elctrns.	613-729-6145
Can	Vancouver, Semad Div. DEW Elctrns.	604-438-2515

SEIKO INSTRUMENTS U.S.A., INC., Robotics/Automation Div., 2990 W. Lomita Blvd., Torrance, CA 90505, Tel: 213-530-8777; *Sls. Mgr.:* John Dudley

SEKAI ELCTRNS. OF AMER., INC., 14700 E. Firestone Blvd., Suite 122, La Mirada, CA 90638, Tel: 714-670-1854, Telex: 685521; FSC No.: 8V398; Empl.: 4; *Sls. Mgr.:* Larry Klementowski

SELCO PRODUCTS CO., SEL Sales, Inc., 7580 Stage Rd., Buena Park, CA 90621, Tel: 714-521-8673, Telex: 65-5457; Empl.: 18; *Sls. Mgr.:* Bill Wilkinson; *Dist. Mgr.:* Ray McDowell

SELEC-KEY, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103, Tel: 312-837-7970; *Sls. Mgr.:* Charles Stelzner

SEL-REX DIV., OMI Intl. Corp., 75 River Rd., Nutley, NJ 07110, Tel: 201-667-5200, Telex: 133-320, TWX: 710-989-1423; Empl.: 250; *Sls. Mgr.:* Larry Price

SEMCO, Rte. 6, No. Windham, CT 06226, Tel: 203-423-6316; *Sls. Mgr.:* Alan Giordano

SEMICOA, 333 McCormick Ave., Costa Mesa, CA 92626, Tel: 714-979-1900, Telex: 678-315, TWX: 910-595-1961; FSC No.: 34156; Empl.: 65; *Sls. Mgr.:* Mark Ellsberry

SEMICON, 10 North Ave., Burlington, MA 01803, Tel: 617-272-9015, TWX: 710-332-1919; Empl.: 550; *Sls. Mgr.:* Tom Le Blanc; *Dist. Mgr.:* L. Le Bow

SEMICONDUCTOR CIRCUITS, 49 Range Rd., Windham, NH 03087, Tel: 603-893-2330, TWX: 710-366-0505; Empl.: 300; *Sls. Mgr.:* J. Muckenhoupt; *Dist. Mgr.:* Marc Gauthier

SPM
SPM

SEMICONDUCTOR PACKAGING MATLS. CO. INC., 431 Fayette Ave., Mamaroneck, NY 10543, Tel: 914-698-5353, TWX: 710-566-1103 ..... **C•1097**

Local Sales Offices & Reps

AZ	Tempe, Spectrum Assoc., S.W.	602-966-1788
CA	Anaheim, California Tech Svcs.	714-630-8470
CA	Santa Clara, California Tech. Svcs.	408-496-1155
CA	Tarzana, California Tech. Svcs.	213-343-3131
CT	Southington, Libby Assocs.	203-747-5601
IL	Northfield, Imex, Ltd.	312-446-8934
PA	Franconia, Scharas Assocs.	215-368-2017
WA	Bellevue, Mars	206-747-3292

SEMICONDUCTOR TECHNLG., INC., 3131 S.E. Jay St., Stuart, FL 33497, Tel: 305-283-4500, TWX: 510-953-7511; Empl.: 45

SEMIKRON, INC., 11 Executive Dr., P.O. Box 66, Hudson, NH 03051, Tel: 603-883-8102, 1-800-258-1308, Telex: 6711011; FSC No.: 58687; Empl.: 45; *Sls. Mgr.:* Frank Haase; *Dist. Mgr.:* Bruce Sessler

Local Sales Offices & Reps

AL	Huntsville, R. W. Mitscher	205-882-6050
AZ	Phoenix, Trembly Assocs.	602-967-2058
CA	Downey, Trimarco	213-861-8244
CA	Redwood City, Ault Assocs.	415-367-1710
CO	Denver, Trembly Assocs.	303-233-9544
FL	Oldsmar, Boggs & Assocs.	813-855-1812
GA	Atlanta, R. W. Mitscher	404-923-3239
IL	Chicago, Ropek, Cahill & Vogt	312-631-0070
KS	Kansas City, Harris-Hanson Co.	816-763-6200
MI	Detroit, Favco	313-644-0173
MN	Eden Prairie, Bohlig & Assocs.	612-944-8404
MO	St. Louis, Harris-Hanson Co.	314-432-3611
NV	Las Vegas, Trembly Assocs.	702-369-8700
NH	Amherst, Eva-Tec Mktg.	603-673-4830
NM	Albuquerque, Trembly Assocs.	505-266-8616
NY	Albany, Lynn Assocs.	518-459-1239
NY	Buffalo, Lynn Assocs.	716-631-0054
NC	Raleigh, R. W. Mitscher	919-848-0941
OH	Hamilton, B & J Entprs.	513-863-1353
OR	Portland, Doran Sls. Assocs.	503-357-3333
PA	Pittsburgh, Lynn Assocs.	412-468-8811
TX	Richardson, Barry Sls.	214-234-0255
UT	Salt Lake City, Trembly Assocs.	801-486-5292
WA	Seattle, Doran Sls. Assocs.	206-885-1885

Local Distributors

FL	Hollywood, MRO Elctrn. Distrs.	305-966-4847
GA	Atlanta, Cleveland Elec. Co.	404-696-4550
MI	Detroit, Osborne Transformer Co.	313-368-4136
MN	New Brighton, Chris Elctrns. Distrs.	612-631-2647
NJ	Roselle, Lectron Inds.	201-245-5858
NC	Gastonia, JMT Elctrns. & Controls	704-867-4401
TX	Dallas, Wilkinson Bros. Co., Inc.	214-941-9963
TX	Houston, Industrial Drives Mtce.	713-681-6942
WA	Seattle, Pacific Elctrns.	206-575-1050
WA	Seattle, Radar Elec. Co., Inc.	206-282-2511

SEMTECH, 652 Mitchell Rd., Newbury Park, CA 91320, Tel: 213-628-5392, TWX: 910-336-1264; FSC No.: 14099;Multiple; Empl.: 350; *Sls. Mgr.:* John Mitchell; *Dist. Mgr.:* Will Fiske

SEMTRONICS CORP., 310 Hwy 7 74 S, P.O. Box 2248, Peachtree City, GA 30269, Tel: 404-487-6681, Telex: 8107662244; Empl.: 20; *Sls. Mgr.:* Larry Fowler

SENCORE, 3200 Sencore Dr., Sioux Falls, SD 57107, Tel: 605-339-0100, TWX: 910-660-0300; Empl.: 250 ..... **D•1399**

SENSITEK CORPORATION, See Biddle Instruments

Sensitive Research

SENSITIVE RESEARCH INSTRS., 25 Dock St., Mt. Vernon, NY 10550, Tel: 914-699-9717; FSC No.: 32590;16034A; Empl.: 35 ..... **D•1304-1306**

Local Sales Offices & Reps

AZ	Scottsdale, Williams Assocs.	602-947-4297
CO	Commerce City, Williams Assocs.	303-289-5647
DC	Washington, Whitcomb Assocs.	202-737-0763
IL	Lincolnwood, Saffro & Assocs.	312-677-9720
KS	Shawnee Mission, Comtel - Midwest	913-722-1030
MD	Baltimore, Whitcomb Assocs.	301-889-1245
MA	Lexington, Zieco	617-861-8300
MI	Southfield, Comtel Instrs. Co.	313-358-2505
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
MO	St. Louis, Comtel - Midwest	314-991-5363
NM	Albuquerque, Williams Assocs.	505-255-1638
NY	Mount Vernon, Elctrl. Instr. Svc.	914-699-9717
OH	Cleveland, Comtel Instrs. Co.	216-442-8080
OH	Dayton, Comtel Instrs. Co.	513-298-7573

OH Hilliard, Comtel Instrs. Co. 614-876-8305
OK Tulsa, Data Mktg. Assocs. 918-438-4911
PA Pittsburgh, Comtel Instrs. Co. 412-922-5720
TX Austin, Data Mktg. Assocs. 512-451-5174
TX Dallas, Data Mktg. Assocs. 214-661-0300
TX Houston, Data Mktg. Assocs. 713-780-2511
TX San Antonio, Data Mktg. Assocs. 512-342-3031
UT Salt Lake City, Williams Assocs. 801-532-7701
WI Lake Mills, Saffro & Assocs. 414-648-2605

SENSOR CORP., Box 140, Scottdale, PA 15683, Tel: 412-887-4080; Empl.: 6

SENSOR ELECTRONICS, INC., 105 Fairway Terrace, Mt. Laurel, NJ 08054, Tel: 609-778-0850; Empl.: 7; *Sls. Mgr.:* J. M. Langberg; *Dist. Mgr.:* J. M. Langberg

SENSOR SCIENTIFIC, INC., 1275 Bloomfield Ave., Fairfield, NJ 07006, Tel: 201-227-7790; *Sls. Mgr.:* Bob Brinley

SENSOR SYSTEMS, INC., 8929 Fullbright Ave., Chatsworth, CA 91311, Tel: 818-341-5366, Telex: 69-1583; *Sls. Mgr.:* E. Schneider

SENSORTEK, INC., 154 Em Huron Ave., Clifton, NJ 07013, Tel: 201-779-5577, Telex: 238790; Empl.: 26

SENSOR TECHN., 21012 Lassen St., Chatsworth, CA 91311, Tel: 213-882-4100, TWX: 910-494-4776; Empl.: 350; *Sls. Mgr.:* Robert Bryden

SENSOTEC, INC., 1200 Chesapeake Ave., Columbus, OH 43212, Tel: 614-486-7723, TWX: 810-482-1188; FSC No.: 29927; *Sls. Mgr.:* Jack Feil

SENSYM, INC., 1255 Reamwood Ave., Sunnyvale, CA 94089, Tel: 408-744-1500, Telex: 176376, TWX: 910-339-9625; *Sls. Mgr.:* Tom Johnson; *Dist. Mgr.:* Tom Johnson

SENTRY MFG., Crystal Park, Chickasha, OK 73018, Tel: 405-224-6780, 800-654-8850, TWX: 910-830-6425; Empl.: 150; *Sls. Mgr.:* R. Stephens

SENTRY SAFES, John D. Brush Co., Inc., 900 Linden Ave., Rochester, NY 14625, Tel: 716-381-4900, TWX: 510-253-6049; Empl.: 220; *Sls. Mgr.:* Ted Brush

SEQUENTIAL INFO. SYS., 249 N. Saw Mill River Rd., Elmsford, NY 10523, Tel: 914-592-5930, TWX: 710-567-1212; Empl.: 90; *Sls. Mgr.:* Murray E. Vinarub

Local Sales Offices & Reps

AL Jasper, Smith Lake Automation 205-221-2492
CA Campbell, Sedillo Co. 408-374-5220
CA Huntington Beach, Wheatcroft Engrg. 714-964-4681
CO Westminister, RMS Sls., Inc. 303-429-1111
FL Melbourne, Reynolds Assocs. 305-259-7000
IL Park Ridge, Mr. V. Kitty Mid-West Mgr. 312-698-5918
MD Baltimore, Mid States 301-583-8252
MA Bedford, Datasource, Inc. 617-275-8460
MI Detroit, Automatic Controls 313-533-8890
MN Minneapolis, Busch Elctrns. 612-835-2044
MO St. Charles, Prod. Automation 314-441-6600
NM Albuquerque, Vermillion Co. 505-883-3668
NY Melville, Carnes Assocs. 516-694-1600
NY Millbrook, Mr. R. DiMarso, East Sls. Mgr 914-677-9966
NY Moravia, Electrotech Sys. 315-497-1598
OH Cincinnati, Murray & Assocs., Inc. (ATR) 513-574-8500
OH Cleveland, Automatic Controls 216-631-0333
PA King of Prussia, Freedman & Malta ... 215-337-9211
TX Richardson, Spectra Sls. 214-234-3600
VA Springfield, Mid-States Mktg. 703-569-2700
WA Medical Lake, Calvert Controls 509-224-3601
WI Shorewood, Werking Indl. Sls. 414-964-2225
Can Lachine, Que., Electrodesign 514-636-4838

SERCOMP CORP., 20721 Superior St., Chatsworth, CA 91311, Tel: 818-341-1680, TWX: 4932014; Empl.: 100; *Sls. Mgr.:* John Marthens; *Dist. Mgr.:* John Marthens

SERIAL LAB PRODS., INC., 162 Cook Lane, P.O. Box 766, Marlboro, MA 01752, Tel: 617-481-1684, Telex: 955318 Attn: SERIAL LAB; Empl.: 12; *Sls. Mgr.:* R. L. Wiedeman; *Dist. Mgr.:* D. Kreck

SERMETEL, 155 Limerick Rd., Limerick, PA 19468, Tel: 215-948-5100, Telex: 84-6335, TWX: 710-637-1263; Empl.: 177; *Sls. Mgr.:* Luke McLaughlin

SERVO-INSTRS. CORP., See Valley Electromagnetics

SERVOMETER CORP., 501 Little Falls Rd., Cedar Grove, NJ 07009, Tel: 201-785-4630, Telex: 384233; FSC No.: 18469; Empl.: 105; *Sls. Mgr.:* D. Walker

SERVO-TEK PRODS. CO., 1086 Goffle Rd., Hawthorne, NJ 07506, Tel: 201-427-3100, Telex: 130273; Empl.: 60; *Sls. Mgr.:* J. Duffy ..... **B•1185**

SETRA SYSTEMS, INC., 45 Nagog Park, Acton, MA 01720, Tel: 617-263-1400, Telex: 948440; FSC No.: 53367; Empl.: 85; *Sls. Mgr.:* William R. Stern ... **B•1826**

Local Sales Offices & Reps

AL Huntsville, Burnette Techno Metrics .. 205-533-9073
CA Los Altos, Qcon, Inc. 415-941-5530
CA Los Angeles, Dynasales Co. 213-268-1175
CO Westminster, RMS Sls. 303-429-1111
FL Orlando, Datarep 305-843-5224
GA Atlanta, Craft Assocs. 404-256-0420
IL Chicago, Data Elctrns. 312-283-0300
IN Indianapolis, Data Elctrns. 317-359-5368
LA Metairie, Slaton & Assocs., Inc. 504-455-3855
MA Framingham, J. M. Lancaster Co. 617-875-8893
MI Hazel Park, Tiby Co. 313-547-3550
MN Plymouth, Data Elctrns. 612-559-1434
MO St. Louis, Adelphi, Inc. 314-821-1232
NJ Cedar Grove, KLS Assocs. 201-785-4450
NY E. Rochester, A & D Dvcs. 716-385-2778
OH Cleveland, Tiby Co. 216-371-5335
OH Tulsa, Inotek Corp. 918-622-8570
OR Portland, McLaren, Inc. 503-297-2248
PA Cheltenham, Stein Instrm. 215-379-1990
TX Dallas, Inotek Corp. 214-243-7000
TX Houston, Inotek Corp. 713-688-7000
WA Bellevue, McLaren, Inc. 206-454-3400

SEVEN MOUNTAINS SCI. INC., P.O. Box 650, Boalsburg, PA 16827, Tel: 814-466-6559; Empl.: 4; *Sls. Mgr.:* Josephine Chesworth

SFE TECHNOLOGIES

SFE TECHNOLOGIES, 1501 1st St., San Fernando, CA 91340, Tel: 213-365-9411, TWX: 910-496-1535; FSC No.: 96733; Empl.: 2000; *Sls. Mgr.:* Ron Modugno; *Dist. Mgr.:* Ron Modugno ... **A•1168-1171, 1277, 1434, 1630-1631**

Local Sales Offices & Reps

AL Huntsville, Electronic Sls., Inc. 205-533-1735
AZ Tucson, West-Cap Arizona 602-294-2646
CA Milpitas, SFE Technlgs. 415-825-5133
CA Newport Beach, SFE Technlgs. 714-953-8064
CA San Diego, SFE Technlgs. 619-747-2789
CA San Fernando, San Fernando Elec. Div. 818-365-9411
CO Parker, Parker Webster 303-841-4888
CT Stratford, Gerald Rosen Co. 203-375-5456
FL Orlando, Perrott Assocs. 305-298-7748
GA Norcross, Electronic Sls., Inc. 404-448-6554
IL Downers Grove, Splon Assocs. 312-963-7011
IA Cedar Rapids, Stan Clothier Co. 319-395-0245
KS Shawnee Mission, Electro Dynamics .. 913-262-2500
LA New Orleans, SFE Technlgs. 504-254-5070
MD Baltimore, Micro-Comp 301-247-0400
MA Framingham, Gerald Rosen Co. 617-879-5505
MI Southfield, Lepofsky & Assocs. 313-569-6080
MN Minneapolis, Stan Clothier Co. 612-944-3456
NY Bethpage, SFE Technlgs. 212-245-7292
NY Chester, SFE Technlgs. 914-469-9620
NC Concord, Orchard Elctrns., Inc. 312-625-8400
OH Dayton, SFE Technlgs. 513-434-8212
OK Tulsa, Bonser Philhower 918-744-9964
OR Beaverton, General Elctrns. 503-641-5288
PA King of Prussia, SFE Technlgs. 215-265-1628
TX Austin, Bonser Philhower 512-346-9186
TX Richardson, Bonser Philhower 214-234-8438
UT Salt Lake City, Parker Webster 801-266-9939
VA Huddleston, Micro Comp 703-297-7614
Can Willowdale, Ont., SFE Technlgs. 416-491-0993

Local Distributors

AZ Tempe, Time Elctrns. 602-967-2000
CA Chatsworth, Shelley Elctrns. 818-998-3333
CA Compton, Harper S.I.D. 213-979-5090
CA Garden Grove, National Capacitor 213-598-9611
CA Westlake Village, Distel 805-495-9998
CO Englewood, Time Elctrns. 303-850-7701
CT Danbury, Diplomat Elctrns. 203-797-9674
FL Orlando, TTI, Inc. 305-859-1000
GA Norcross, Diplomat Elctrns. 404-449-4133
IL Chicago, Nep Elctrns. 312-625-8400
IL Elk Grove, Diplomat Elctrns. 312-640-1910
IA Cedar Rapids, Bell Inds. 319-395-0730
MD White Marsh, Radio Elec. Svc. Co. 301-529-0500
MA New Haven, Green Shaw 203-397-0710
MN Plymouth, Diplomat Elctrns. 612-559-2500
NJ Audubon, Action Elctrns. 609-858-2450
NJ Maple Shade, Zebra Elctrns. 609-779-8073
NY Central Islip, Semi Cap 516-582-4400
NY E. Farmingdale, Tri-Start 516-293-0400
NY Hauppauge, Fairmont 516-231-3313
NY Melville, Diplomat Elctrns. 516-454-6400
OH Fairborn, Aschbacher & Assocs. 513-252-7785
OR Portland, Time Elctrns. 503-684-3780
PA Broomall, Time Elctrns. 215-359-1200
TX Dallas, Diplomat Elctrns. 713-975-8447
TX Richardson, Jaco Elctrns. 214-235-9575
UT Salt Lake City, Diplomat Elctrns. 801-486-4134
WA Redman, Time Elctrns. 206-882-1600
WI Racine, Badger Elctrn. Parts 414-637-1256

S. F. PRODUCTS CORPORATION, P. O. Box 369, Southport, CT 06490, Tel: 203-929-6180, Telex: 220883 TAUR; Empl.: 8; *Sls. Mgr.:* Norman W. Johanson; *Dist. Mgr.:* R. S. Johanson

SL PLASTICS, Route 248, Nazareth, PA 18064, Tel: 215-759-0280; Empl.: 60; *Sls. Mgr.:* W. Tomko

SL PRINTED CIRCUITS, 827 Black Oak Ridge Rd., Wayne, NJ 07470, Tel: 201-835-2765; Empl.: 34; *Sls. Mgr.:* R. J. Puzo

SGS-ATES SEMICONDUCTOR CORP., 240 Bear Hill Rd, Waltham, MA 02154, Tel: 617-890-6688, Telex: 923495; Empl.: 9000

SGS SEMICONDUCTOR CORPORATION, 1000 E. Bell Road, Phoenix, AZ 85022, Tel: 602-867-6100, Telex: 249976,667479(Western Union), TWX: 910-950-4654; FSC No.: 7X328; Empl.: 200

SHALLCO, Box 1089, Smithfield, NC 27577, Tel: 919-934-3135, TWX: 510-939-1479; Empl.: 35; *Sls. Mgr.:* M. D. Sutton ..... **B•1692-1695; D•1036-1037**

Local Sales Offices & Reps

CA Chatsworth, WCV/RALTECH 818-700-0933
CA Santa Clara, Fischer Assocs. 408-733-7350
IL Northfield, Imex 312-446-8934
IA Cedar Rapids, S & O Sls. 310-393-1845
KS Shawnee Mission, Tech. Sls. 913-888-3330
MD Towson, Holden Engrg. Sls. 301-823-3763
MA Norwood, MPS Elctrn. 617-769-8700
MO Ferguson, Tech. Sls. 314-725-5361
NY Lynbrook, HLJ 516-599-2999
NY Manhattan, Lothar Sanford Corp. 212-757-3881
NY Pittsfield, D. Hurley Sls. 716-586-6159
OH Englewood, Allen Nace Co. 513-836-0931

Local Distributors

FL Jacksonville, Southeast Elctrns. 904-356-3007
MI Grand Rapids, Audio Distr. 616-452-1596
OH Cincinnati, United Radio 513-761-4030
PA Philadelphia, Philadelphia Elctrns. 215-568-7400
TN Bristol, Broadcast Equip. & Supp. 615-878-2531
TX Dallas, Wholesale Elctrns. 214-824-3001
Can Montreal, Que., Braydon Electro 514-332-5650

SHALLCROSS, INC., See RCL-Shallcross

SHALLTRONIX CORP., Preston St., P.O. Box 235, Selma, NC 27576, Tel: 919-965-6346; FSC No.: 58258; *Sls. Mgr.:* Joe Deans ..... **D•1307**

Local Sales Offices & Reps

TX Arlington, Electronic Prod. Reps. 817-467-0377

SHAPE MAGNETRONICS, INC., 901 DuPage Ave., Lombard, IL 60148, Tel: 312-620-8394, TWX: 910-991-2352; *Sls. Mgr.:* J. Hilgenberg ..... **D•1960-1961**

SHAPIRO SCIENTIFIC INST., 3500 E. Coast Hwy., Corona del Mar, CA 92625, Tel: 714-675-1024; Empl.: 7

SHELLY associates

SHELLY ASSOCIATES, INC., 14281 Chambers Road, Tustin, CA 92680, Tel: 714-669-9850, Telex: 85-2263; FSC No.: 00303; Empl.: 30; *Sls. Mgr.:* Chuck Feeney; *Dist. Mgr.:*

Chuck Feeney ..... **B•1093**

Local Sales Offices & Reps

AL Mobile, Hollingsworth & Still, Inc. 800-241-5712
CA Mountain View, Leddy Assocs. 415-969-6313
CA Redondo Beach, Vedax, Inc. 213-540-1255
FL Ft. Lauderdale, Hollingsworth & Still, Inc. 800-241-5712
FL Tampa, Hollingsworth & Still, Inc. 800-241-5712
GA Norcross, Hollingsworth & Still, Inc. ... 800-241-5712
IL Chicago, Electro-Tech Mktg. Assocs. .. 312-676-3151
IN Ft. Wayne, Scott Elctrns. 219-484-7865
IN Indianapolis, Scott Elctrns. Inc. 317-897-9976
LA Covington, HBT Assocs. Inc. 504-892-4045
MA Plainville, Enterprise Technlg. 617-695-4700
MN Mound, Allyn Assocs. 612-472-4784
MO Grandview, R. R. Burton & Assocs. 816-763-5385
MO St. Louis, R. R. Burton & Assocs. 314-647-6353
NJ Boonton, TMA 201-263-2946
NJ Sicklerville, Brown Assocs. 609-629-2240
NY Port Washington, TMA 516-883-2432
NC Charlotte, Hollingsworth & Still, Inc. ... 800-241-5712
NC Kernersville, Hollingsworth & Still, Inc. 800-241-5712
OH Cincinnati, Scott Elctrns. 513-791-2513
OH Cleveland, Scott Elctrns. Inc. 216-473-5050
OH Dayton, Scott Elctrns. Inc. 513-294-0539
OH Reynoldsburg, Scott Elctrns. 614-863-1281
OR Dallas, Ecco Mktg. 503-228-6401
PA Pittsburgh, Scott Elctrns. 412-963-6116
TX Austin, Milco Mktg., Inc. 713-723-5003
TX Dallas, Milco Mktg., Inc. 214-783-2716
TX Houston, Milco Mktg., Inc. 713-723-5003
WA Seattle, Ecco Mktg. 206-364-0200
WI Brookfield, Electro-Tech Mktg. Assocs. 414-785-9554

Local Distributors

CA Anaheim, Bisco Inds. Inc. 714-635-0380
CA San Jose, Bisco Inds. Inc. 408-946-8980
CT Norwalk, Park Distrs. Inc. 203-853-2010
CT Wallingford, Midstate Elctrns. Co. 203-265-9900
FL Clearwater, Jenkins Supp. Co., Inc. 813-584-5282
IL Franklin Park, Bisco Inds. Inc. 312-451-1230
IN Indianapolis, Mar Elctrns., Inc. 317-875-4510
IA Cedar Rapids, Iowa Radio Supp. Co. .. 319-393-4510
LA Harvey, AFG Elctrns. Supp. 504-368-9696
MA Chelmsford, Pilgrim Elctrns. 617-251-8746
MA Woburn, Elctrn. Packaging Comps. 617-935-0400
NJ Cranford, Garden State Indl. Elctrns. .. 201-272-6400
NJ East Brunswick, Brothers Elctrns. 201-238-2200
NJ Fair Lawn, Relay Specialties 201-797-3313
NJ Saddle Brook, Tide Elctrns. 201-794-9660
NY Elmsford, White Plains Elctrl. Supp. Co. 914-592-9555
OH Dayton, Televox, Inc. 513-294-4499
OH Strongsville, Roberts Elctrns. Co., Inc. 216-238-1711
OK Tulsa, Radio, Inc. 918-587-9123
TX Dallas, Wilkinson Brothers Co. 214-941-9963
WI Mequon, Lakeview Elctrns. 414-377-8250

SHIELDING TECHNOLOGY, INC., 120 Ethel Rd. West, Piscataway, NJ 08854, Tel: 201-985-8800, TWX: 710-480-6297; *Sls. Mgr.:* Mason Carter

SHINANO KENSHI CORP. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, Tel: 818-764-4266; Empl.: 5; *Sls. Mgr.:* William F. Dowis ..... **B•1187**

Local Sales Offices & Reps

CA North Hollywood, Shinano Kenshi Corp. 818-764-4266
CA Santa Clara, Logan Sales 408-496-0660
CO Denver, Tech Rep Sls. Co. 303-758-7031
CT Bloomfield, SIR Assocs. 203-243-9343
FL Sarasota, Phoenix Comps., Inc. 813-371-1163
IL Barrington, Richard Fisk Mktg. 312-381-0653
MA Bedford, SIR Assocs. 617-275-5550
MI Southfield, Fred Gehrke & Assoc. 313-559-5363
MN Eagan, J. Jorgenson & Assoc. 612-452-9541
NJ Hatboro, PA, Electro Rep 215-674-4421
NJ Oxford, Malin Assocs. 201-689-7398
NC Greenville, Ranico Representatives ... 615-639-7696
OK Oklahoma City, Precision Technlg. Assocs. 405-755-3103
OR Portland, Intertech Sls. 503-775-7885
TN Greenville, Lamons Sales Co. 615-639-8711
TX Austin, Precision Technlg. Assocs. 512-250-0201
TX Richardson, Precision Technlg. Assoc. 214-234-8071

SHOGYO

SHOGYO INTL. CORP., 287 Northern Blvd., Great Neck, NY 11021, Tel: 516-466-0911, Telex: 4758024, TWX: 12218 ..... **A•2037, 2270-2271; B•1094-1096; C•1506-1508, 1905; D•1038, 1376**

SHOKAI FAR EAST, LTD., 280 North Central Ave., Hartsdale, NY 10530, Tel: 914-681-0700, Telex: 22-4219; Empl.: 362; *Sls. Mgr.:* Bob Craig ..... **D•1039**

SHOW 'N TELL PRODUCTS, AMG, Inc., 155 Franklin Street, Dayton, OH 45402, Tel: 513-223-8211; *Sls. Mgr.:* Jon A. Bloyd

OPTIMEM, 435 Oakmead Parkway, Sunnyvale, CA 94086, Tel: 408-737-7373, TWX: 910-339-9615; Empl.: 140; *Sls. Mgr.:* Tom Jarrett; *Dist. Mgr.:* Tom Jarrett

SHURE BROS., 222 Hartrey Ave., Evanston, IL 60204, Tel: 312-866-2200, Telex: 72-4381, TWX: 910-231-0048; *Sls. Mgr.:* R. T. Murphy

SHURITE METERS, INC., 577 Grand Ave., P.O. Box 1848, New Haven, CT 06508, Tel: 203-624-1188; Empl.: 30; *Sls. Mgr.:* Joseph V. LeBlanc; *Dist. Mgr.:* Joseph V. LeBlanc

SIDAC ENCLOSURES, Div. of Triac Electronic Systems, Inc., 87-27 Myrtle Ave., Glendale, NY 11385, Tel: 718-441-4728; Empl.: 14; *Sls. Mgr.:* Victor Botnick ..... **C•1082**

SIDEREAL CORP., 9600 S.W. Barnes Rd., Portland, OR 97225, Tel: 503-297-5531, Telex: 36-0640, TWX: 910-464-6139; *Sls. Mgr.:* Jim Miller & Jeff Gretz; *Dist. Mgr.:* Joy Sakata

SIECOR CORP., Box 489, Hickory, NC 28603, Tel: 704-328-2171, Telex: 800-510, TWX: 510-934-1204; Empl.: 600; *Sls. Mgr.:* J. English

SIEMENS COMPS., INC., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014, Tel: 408-257-7910, Telex: 352084, TWX: 910-338-0022; FSC No.: 50579; Empl.: 1100; *Sls. Mgr.:* Gary Durgin; *Dist. Mgr.:* Kathy Renz

SIEMENS COMPONENTS, INC., 186 Wood Ave., S., Iselin, NJ 08830, Tel: 201-321-3400, TWX: 710-998-0588/0529; Empl.: 800

Sierracin/Magnedyne

SIERRACIN/MAGNEDYNE, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008, Tel: 619-438-3321, Telex: 910 322-1391; Empl.: 190 ..... **B•1188-1189**

Local Sales Offices & Reps

AZ Scottsdale, Terry Thatford 602-998-3009
CA Campbell, Luscombe Engrg. Co. 408-370-2020
CA Laguna Beach, Comar Co. 714-250-0140
CA Palos Verdes, Clay Walters 213-541-6361
CA San Diego, Comar Co., Inc. 619-565-6097
CA Torrance, Carl J. Aguirre 213-541-6361
CT Tolland, Don Fontaine 203-875-0720
FL Deerfield Beach, Electrocomp Assocs. 305-429-0802
FL St. Petersburg, Electro Comp. Assocs. 813-327-9677
GA Atlanta, L & D Inc. 404-455-3483
IL Rolling Meadows, KMA Sls. Co. 312-398-5300
MD Churchville, Atlantic Tech. Sls. 301-879-2236
MI Troy, Xanthus, Inc. 313-528-2000
MN Minneapolis, North Star Motion & Controls 612-545-0586
MN St. Paul, North Star Motion & Controls 612-770-5311
NY Hasbrouck Hgts., Carnes Diamond Assocs. 516-694-1600
NY Melville, Carnes Assocs. 315-446-2346
NY Pittsford, Controlled Motion Prods. Co. 716-381-1933
NY Syracuse, Controlled Motion Prods. ... 315-424-0839
NC Greensboro, L & D Inc. 919-292-3201
OH Cleveland, Servo-Mark 216-871-2353
PA Morristown, Rivco January 215-631-1414
TX Austin, The Thorson Co. 512-451-7527
TX Dallas, Thorson Co. 214-233-5744
TX Houston, The Thorson Co. 713-771-3504
VA Richmond, L & D, Inc. 804-257-7717
WA Bellevue, Quest Mktg. 206-747-9424
WI Milwaukee, KMA Sls. Co. 414-259-1771

Sierracin/Power Systems

SIERRACIN/POWER SYSTEMS, 20500 Plummer St., Chatsworth, CA 91311, Tel: 818-998-9873, TWX: 910-494-4830; FSC No.: 58999; Empl.: 450; *Sls. Mgr.:* Nick Freyling; *Dist. Mgr.:* Julius Hirsh ..... **D•1834-1836**

Local Sales Offices & Reps

AZ Scottsdale, Fred Board Assocs. 602-994-9388
AZ Tucson, Fred Board Assocs. 602-299-1508
CA Huntington Beach, J. J. Riley Assocs. 714-841-1411
CA San Jose, Fahrner-Miller Assocs. 408-727-9800
CO Denver, Wm. J. Purdy Co. 303-753-6800
CT Meriden, Whitehead Assocs. 203-634-1280
FL Altamonte Springs, Semtronic 305-831-8233
FL Clearwater, Semtronic 813-461-4675
IL Elk Grove Village, John G. Twist Co. .. 312-593-0200
IN Noblesville, KW Elctrns. Sls. 317-773-5536
IA Cedar Rapids, Comstrand 319-377-1575
KS Merriam, Midwest Tech. Sls. 913-236-8555
KS Wichita, Midwest Tech. Sls. 316-262-7240
KY Louisville, KW Elctrn. Sls. 502-451-1860
MD Columbia, Delta III Assocs., Inc. 301-730-4700
MA Wakefield, Whitehead Assocs. 617-246-5070
MI Novi, Lektronics 313-349-3304
MN Bloomington, John G. Twist Co. 612-835-2120
MN Minneapolis, Comstrand 612-788-9234
MO St. Charles, Midwest Tech. Sls. 314-441-1012
NJ Franklin Lake, Hansen & Hughes 201-848-8900
NJ Marlton, BGR Assocs. 609-983-1020
NM Albuquerque, Fred Board Assocs. 505-293-1399
NY Batavia, Tech-Mark, Inc. 716-343-2568
NY Endicott, Tech-Mark, Inc. 607-748-7473
NY Greenlawn, Hansen & Hughes 516-754-3608
NY Mendon, Tech-Mark, Inc. 716-624-3840
NY Utica, Tech-Mark, Inc. 315-733-0575
NC Raleigh, J & B Sls. 919-878-8600
OH Dayton, K. W. Elctrn. Sls. 513-890-2150
OH Shaker Heights, K. W. Elctrn. Sls. 216-491-9177
OH Worthington, K. W. Elctrn. Sls. 614-888-0483
OR Beaverton, Wm. J. Purdy Co. 503-641-9373
PA Allison Park, K. W. Elctrn. Sls. 412-487-4300
TN Tullahoma, J & B Sls. 615-455-7487
TX Austin, Kruvand Assocs. 512-441-6777
TX Dallas, Kruvand Assocs. 214-437-3355
TX Houston, Kruvand Assocs. 713-780-9710
UT Salt Lake City, Wm. J. Purdy Co. 810-486-8557
WA Redmond, Wm. J. Purdy Co. 206-882-3144
WI Brookfield, John G. Twist Co. 414-782-2670

Local Distributors

AL Huntsville, Hall-Mark Elctrns. Corp. 205-837-8700
AZ Phoenix, Hallmark Elctrns. Corp. 602-437-1200
CA Canoga Park, Hallmark Elctrns. Corp. 818-716-7300
CA Chatsworth, Priority One 818-709-6789
CA Citrus Heights, Hall-Mark Elctrns. Corp. 916-722-8600
CA Costa Mesa, FLW 714-751-7512
CA El Segundo, Hall-Mark Elctrns. Corp. .. 213-643-9101
CA Hayward, FLW, Inc. 415-786-9070
CA San Diego, FLW 619-277-0993
CA San Diego, Hall-Mark Elctrns. Corp. ... 619-268-1201
CA San Jose, Hallmark Elctrns. Corp. 408-946-0900
CA Tustin, Hall-Mark Elctrns. Corp. 714-359-0330
CA Van Nuys, FLW, Inc. 818-989-5237
CO Englewood, Hall-Mark Elctrns. Corp. .. 303-694-1662
CT Wallingford, Hallmark Elctrns. Corp. ... 203-269-0100
FL Clearwater, Hall-Mark Elctrns. Corp. ... 813-530-4543
FL Orlando, Hall-Mark Elctrns. Corp. 305-855-4020
FL Pompano Beach, Hall-Mark Elctrns. Corp. 305-971-9280
FL Tampa, Reptron 813-855-4656
GA Norcross, Hall-Mark Elctrns. Corp. 404-447-8000
GA Norcross, Reptron Elctrns. 404-446-1300
IL Schaumburg, Reptron Elctrns. 312-882-1700
IL Woodale, Hall-Mark Elctrns. Corp. 312-860-3800
KS Lenexa, Hall-Mark Elctrns. Corp. 913-888-4747
MD Columbia, Hall-Mark Elctrns. Corp. 301-988-9800
MA Billerica, Hallmark Elctrns. Corp. 617-935-9777
MI Grand Rapids, Calder Elctrns. 616-949-2900

MI Livonia, Reptron Elctrns. 313-525-2700
MN Bloomington, Hall-Mark Elctrns. Corp. 612-854-3223
MO Earth City, Hall-Mark Elctrns. Corp. 314-291-5350
NJ Fairfield, Hall-Mark Elctrns. Corp. 201-575-4415
NJ Mt. Laurel, Hall-Mark Elctrns. Corp. 609-235-1900
NY Ronkonkoma, Hall-Mark Elctrns. Corp. 516-737-0600
NC Raleigh, Hall-Mark Elctrns. Corp. 919-872-0712
OH Cincinnati, Schuster Elctrn. Co. 513-489-1400
OH Solon, Hall-Mark Elctrns. Corp. 216-349-4632
OH Worthington, Hall-Mark Elctrns. Corp. 614-888-3313
OH Worthington, Reptron Elctrns. 614-888-3313
OK Tulsa, Hall-Mark Elctrns. Corp. 918-665-3200
OR Wilsonville, Zepher-Ragon 503-682-2929
TX Austin, Hall-Mark Elctrns. Corp. 512-258-8848
TX Dallas, Hall-Mark Elctrns. Corp. 214-343-5000
TX Dallas, HallMark Elctrn. Corp. 214-553-4300
TX Houston, Hall-Mark Elctrns. Corp. 713-781-6100
UT Murray, Hallmark Elctrns. Corp. 801-268-3779
UT Salt Lake City, Standard Supp. Co. 810-268-3779
WA Seattle, Zepher-Ragon 206-241-1980
WI New Berlin, Hall-Mark Elctrns. Corp. .. 414-797-7844
Can Dorval, Que., Semad 514-636-4128
Can Markham, Ont., Semad 406-475-3922

SIERRACIN/THERMAL SYS., 13920 S. Broadway, Los Angeles, CA 90061, Tel: 213-321-4350, TWX: 910-346-6774; FSC No.: 11416; Empl.: 175

SIERRA ELEC., See Pass & Seymour, Inc.

SIGMA ELECTRONICS INC., 10830 Kinghurst Dr., Houston, TX 77099, Tel: 713-933-4700; FSC No.: 60767; Empl.: 75; *Sls. Mgr.:* W. N. Dickey

SIGMA INSTRS., 170 Pearl St., Braintree, MA 02184, Tel: 617-843-5000, Telex: 94-0645, TWX: 710-348-1161; Empl.: 1,500

SIGMA INSTRS., Intl. Instr. Div., 88 Marsh Hill Rd., Orange, CT 06477, Tel: 203-795-4711, Telex: 714-465-2897; Empl.: 150; *Dist. Mgr.:* J. Connolly

SIGMA-NETICS, INC., One Washington Ave., Fairfield, NJ 07006, Tel: 201-227-6372

SIGMA PLASTRONICS, P.O. Box 649, Whitmore Lake, MI 48189, Tel: 313-426-3903; Empl.: 3

SIGMAPOWER, INC., 20790 Leapwood Ave., Carson, CA 90746, Tel: 213-32-Sigma; FSC No.: 55196; Empl.: 61; *Sls. Mgr.:* Bill Adams

SIGMA SYSTEMS CORP., 3163 Adams Ave., San Diego, CA 92116, Tel: 619-283-3193; Empl.: 14; *Sls. Mgr.:* T. Stewart ..... **D•1172**

Local Sales Offices & Reps
CA San Carlos, Electronic Engrg. Assocs. 415-593-2189
CT Fairfield, Wexler-Court Sls. Co. 203-334-1122
IL Elgin, R.K. Elctrns., Inc. 312-695-8552
MA Brookline, Boston Elctrns. 617-566-3821

SIGNAL SYS. INTL., P.O. Box 198, Holmdel, NJ 07733, Tel: 201-741-1120; Empl.: 7; *Sls. Mgr.:* D. Roy

SIGNAL TRANSFORMER, 500 Bayview Ave., Inwood, NY 11696, Tel: 516-239-4510, Telex: 96-8112, TWX: 510-225-8440; FSC No.: 08779; Empl.: 280; *Sls. Mgr.:* G. Carlin ..... **A•1632-1633, 2272-2287**

Direct sales only. Inwood, NY 516-239-4510 or 516-239-7200

SIGNATRON, A Unit of Sundstrand Corp., 12 Hartwell Ave., Lexington, MA 02173, Tel: 617-861-1500, Telex: 955329XTLSRVC ATTN:SIGNATRON; FSC No.: 59371; Empl.: 120; *Sls. Mgr.:* Joseph T. McNamara

SIGNETICS, U.S. Philips Corp., 811 E. Arques Ave, P.O. Box 3409, Sunnyvale, CA 94088-3409, Tel: 408-739-7700, TWX: 910-338-2104; Empl.: 12,000; *Sls. Mgr.:* J. Luke; *Dist. Mgr.:* J. Abram

SIGNUM SYSTEMS, 726 Santa Monica Blvd., Santa Monica, CA 90401, Tel: 213-451-5382; Empl.: 7

SILICON DETECTOR CORP., 855 Lawrence Dr., Newbury Park, CA 91320, Tel: 805-498-6737, Telex: 182229; *Sls. Mgr.:* F. W. Sullivan

SILICON GENERAL, 11861 Western Ave., Garden Grove, CA 92641, Tel: 714-898-8121, Telex: 692-411, TWX: 910-596-1804; FSC No.: 34333; Empl.: 150; *Sls. Mgr.:* Joe Castellano; *Dist. Mgr.:* Larry Baumgardner

Local Sales Offices & Reps
AL Huntsville, R. O. Whitesell and Assoc. 205-883-5100
AZ Phoenix, I.S.D.S. 602-971-6250
CA Cupertino, Thresum Assoc. 408-996-9889
CA Newport Beach, Leading Concept Technlgs. 714-851-0654
CO Littleton, Lange Sls. 303-795-3600
CT North Haven, Kitchen & Kutchin, Inc. .. 203-239-0212
FL Clearwater, H.H.P 813-797-4447
FL Ft. Lauderdale, H.H.P. 305-971-5750
FL Maitland, H.H.P. 305-831-2474
GA Norcross, Glen White Assoc. 404-441-1447
ID Boise, N. R. Schultz 208-377-8686
IL Rolling Meadows, Sumer 312-991-8500
IN Ft. Wayne, R. O. Whitesell and Assoc. 219-432-5591
IN Indianapolis, R. O. Whitesell and Assoc. 317-359-9283
IN Kokomo, R. O. Whitesell and Assoc. .. 317-457-9127
IA Cedar Rapids, Rep Assoc. 319-373-0152
KS Overland Park, PMR 913-381-0004
KS Wichita, PMR 316-684-4141
KY Louisville, R. O. Whitesell and Assoc. 502-426-7696
MD Baltimore, Conroy Sls. 301-296-2444
MA Burlington, Kitchen & Kutchin, Inc. 617-229-2660
MI Grand Rapids, R. O. Whitesell and Assoc. 616-942-5420
MI Southfield, R. O. Whitesell and Assoc. 313-559-5454
MI St. Joseph, R. O. Whitesell and Assoc. 616-983-7337
MN Minneapolis, Comstrand 612-788-9234
MO Maryland Hgts., PMR 314-569-1220
NJ Belmar, T. A. I. Corp. 215-627-6615
NJ Teaneck, R. T. Reid Assocs. 201-692-0200
NM Albuquerque, Straube Assoc. 505-292-0428
NY Melville, Reid Assocs. 516-351-8833
NY Rochester, Ontec 716-464-8636
NC Raleigh, Glen White Assoc. 919-848-1931
OH Cincinnati, R. O. Whitesell and Assoc. 513-521-2290
OH Cleveland, R. O. Whitesell and Assoc. 216-447-9020
OH Columbus, R. O. Whitesell and Assoc. 614-888-9396
OH Dayton, R. O. Whitesell and Assoc. 513-298-9546
OK Tulsa, Ion Associates Inc. 918-664-0186
OR Beaverton, N. R. Schultz 503-643-1644
PA Pittsburgh, R. O. Whitesell 412-963-6161
TN Knoxville, R. O. Whitesell and Assoc. 615-694-9476
TX Austin, Ion Associates Inc. 512-346-7251
TX Grand Prairie, Ion Associates Inc. 214-647-8225
TX Houston, Ion Associates Inc. 713-977-4354
UT Salt Lake City, Lange Sls. 801-478-0843
VA Lynchburg, Glen White Assoc. 804-237-6291
WA Bellevue, N. R. Schultz 206-454-0300
WI Brookfield, Sumer 414-784-6641

SILICON POWER CUBE CORP., 2725 Seaboard Lane, Long Beach, CA 90805, Tel: 213-634-9390, Telex: 650427; *Sls. Mgr.:* Don Penn

SILICONIX, INC., 2201 Laurelwood Rd., Santa Clara, CA 95054, Tel: 408-988-8000, TWX: 910-338-0227; Empl.: 1000; *Sls. Mgr.:* Walter Senges; *Dist. Mgr.:* Richard Otsuka

SILICON SENSORS, Hwy. 18 East, Dodgeville, WI 53533, Tel: 608-935-2707, Telex: 910-997-0072; FSC No.: 54822; Empl.: 26; *Sls. Mgr.:* Robert L. Bachner

SILICON SYSTEMS INC., 14351 Myford Rd., Tustin, CA 92680, Tel: 714-979-0941, TWX: 910-595-2809; Empl.: 92; *Sls. Mgr.:* Jim Meyer

SILICON TRANSISTOR CORP., Katrina Rd., Chelmsford, MA 01824, Tel: 617-256-3321, TWX: 710-343-0576; FSC No.: 07256; Empl.: 200; *Sls. Mgr.:* Bernard Rothman; *Dist. Mgr.:* Bernard Rothman

SILONEX INC., 331 Cornelia St., Plattsburgh, NY 12901, Tel: 518-561-3160, TWX: 610-421-3362; Empl.: 140; *Sls. Mgr.:* Carol Larsen ..... **B•1215**

Local Sales Offices & Reps
AL Huntsville, Glen White Assocs. 205-883-7938
CA Arcadia, Van Gott & Assocs. 818-445-9728
CA San Mateo, Service Inds. 415-573-1816
IL Buffalo Grove, Hill Sls. Corp. 312-541-0661
MD Timonium, Glen White Assocs. 301-252-6360
MA Topsfield, RFC Assocs. 617-887-8545
MI Farmington, Amtech Reps. 313-474-8300
MN Bloomington, Northport Engrg. 612-854-5556
NJ Fairfield, T. J. Saes Inc. of N.J. 201-667-5900
TX Dallas, J. Clay Co. 214-350-1281
VA Lynchburg, Glen White Assocs. 804-237-6291
WA Kent, Rhodes Sls. Corp. 206-251-5396

SILTRAN DIGITAL, 2250 Monterey Rd., Atascadero, CA 93422, Tel: 805-466-3209; *Sls. Mgr.:* M. F. Hordeski

SILTRONICS LTD., P.O. Box 456, Dover, MA 02030, Tel: 617-329-4068; Empl.: 55; *Sls. Mgr.:* G. Urban

SILVERED ELECTRONIC MICA CO., INC. (SEMCO), Route 6 N. Windham Rd., Williamantic, CT 06226, Tel: 203-423-6316

SIMCO CO., 2257 North Penn Rd., Hatfield, PA 19440, Tel: 215-822-2171, Telex: 846130; Empl.: 71; *Sls. Mgr.:* Merle Roberts

SIMMONDS PRECISION, P.O. Box 310, Norwich, NY 13815, Tel: 607-335-5000, TWX: 510-261-7776; Empl.: 750; *Sls. Mgr.:* J. A. Bartlom

Simpson®

SIMPSON ELEC. CO., 853 Dundee Ave., Elgin, IL 60120, Tel: 312-697-2260, Telex: 72-2416; Empl.: 1500; *Sls. Mgr.:* M. O. Buehring; *Dist. Mgr.:* George Oskandy ..... **D•1308, 1377**

Local Sales Offices & Reps
AL Huntsville, Cartwright & Bean 205-830-1540
AK Anchorage, H. J. Lang 907-279-5741
CA Burlingame, Wm. J. Purdy Co. 415-347-7701
CA Downy, Simpson Elec. Co. 213-862-4259
CA Sacramento, Wm. J. Purdy Co. 303-753-6800
CO Denver, Wm. J. Purdy Co. 303-753-6800
CT Hartford, Sturgeon Co. 203-249-7800
FL Lauderdale Lakes, Seacom Sls. Co. ... 305-486-0260
GA Atlanta, Cartwright & Bean 404-233-2939
IN Carmel, Technlg. Mktg. Corp. 317-844-8462
LA Covington, Cartwright & Bean 504-892-1780
MD Lisbon, Samuel K. Macdonald 301-982-1088
MA Needham, Sturgeon Co. 617-444-6603
MI Farmington Hills, R. C. Merchant Co. .. 313-476-4600
MI St. Joseph, R. C. Merchant Co. 616-983-7378
MN Edina, M. Foster Tech. Sls. 612-941-9790
MS Jackson, Cartwright & Bean Co. 601-981-1170
MO Blue Springs, Kathrinus-Kelly-Baumhauer Co. 816-229-0001
MO St. Louis, Kathrinus-Kelly-Baumhauer & Co. 314-647-2400
NM Albuquerque, C. T. Carlberg 505-888-3883
NY Buffalo, L. D. Allen, Inc. 716-837-1955
NY Fairport, L. D. Allen, Inc. 716-377-3530
NY Great Neck, Simpson Instrs. Sls. 516-482-3103
NY Syracuse, L. D. Allen, Inc. 315-437-8387
NC Charlotte, Cartwright & Bean 704-377-5673
NC Raleigh, Cartwright & Bean 919-876-4130
OH Cleveland, Baehr-Greenleaf & Assocs. 216-221-9030
OH Columbus, Baehr-Greenleaf & Assocs. 614-486-4046
OH Dayton, Baehr-Greenleaf & Assocs. ... 513-439-0724
OK Oklahoma City, J. Y. Schoonmaker Co. 214-349-1650
OR Portland, Earl & Brown 503-245-2283
PA Philadelphia, Samuel K. Macdonald ... 215-545-1205
PA Pittsburgh, Samuel K. Macdonald 412-366-2643
TN Knoxville, Cartwright & Bean 615-693-7450
TN Memphis, Cartwright & Bean Co. 901-276-4442
TX Dallas, J. Y. Schoonmaker Co. 214-349-1650
TX Houston, J. Y. Schoonmaker Co. 214-349-1650
UT Salt Lake City, Wm. J. Purdy Co. 801-486-8557
WA Seattle, Earl & Brown 206-284-1121
WI Milwaukee, D. Dolin Sls. Co. 414-482-1111
EXP IL, Elgin, Simpson Elec. 312-697-2260

SIMULASER CORP., 15703 E. Valley Blvd., City of Industry, CA 91744, Tel: 818-369-1355; FSC No.: 8T239; Empl.: 12

SINCLAIR & RUSH, 6900 S. Broadway, St. Louis, MO 63111, Tel: 314-481-2450, Telex: 442564; Empl.: 100; *Sls. Mgr.:* Bradley Stack; *Dist. Mgr.:* Fred Hogenkamp

SINCLAIR RADIO LABS., 122 Rayette Rd., Concord, Ont, Canada L9W2Y8, Tel: 416-669-1244, Telex: 06-964598;

Simpson
INSTRUMENTS THAT STAY ACCURATE

AUTHORIZED DISTRIBUTOR

SUNSHINE

THE SOURCE FOR METERS & TEST EQUIPMENT

Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT
(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area
(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

Simpson®
INSTRUMENTS THAT STAY ACCURATE

PANEL METERS, VOM's & DIGITAL TEST EQUIPMENT

AUTHORIZED DISTRIBUTORS

METERMASTER

FOR

Panel Meters • Test Equipment • Components
Sales, Modifications, Repair and Calibration

METERMASTER LOCATIONS:

ARIZONA	
Phoenix	(602) 437-1425
Tucson	(602) 792-3411
CALIFORNIA	
Los Angeles	(213) 685-4340
Palo Alto	(415) 960-8500
San Diego	(619) 560-4841
GEORGIA	
Atlanta	(404) 446-0166
ILLINOIS	
Chicago	(312) 250-0606
MASSACHUSETTS	
Boston	(617) 523-2580
MINNESOTA	
Minneapolis	(612) 332-6117
MISSOURI	
St. Louis	(314) 454-0241
NEW MEXICO	
Albuquerque	(505) 292-3330
OHIO	
Cleveland	(216) 651-4100
OKLAHOMA	
Tulsa	(918) 582-1444
PENNSYLVANIA	
Pittsburgh	(412) 261-4548
TEXAS	
Austin	(512) 473-8876
Dallas	(214) 271-5671
Houston	(713) 733-9814
WISCONSIN	
Milwaukee	(414) 643-0554
ALL OTHER STATES	**(800) 962-8128**

Empl.: 100; *Sls. Mgr.:* J. M. Colthart

Local Sales Offices & Reps

NY Tonawanda, Sinclair Radio Labs, Inc. 716-874-3682

SINGER CO., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424, Tel: 201-785-6000, Telex: 133340, TWX: 710-988-5700; FSC No.: 88818; Empl.: 6000; *Sls. Mgr.:* C. H. Wheatley

SINGER CO., Librascope Div., 833 Sonora Ave., Glendale, CA 91201, Tel: 818-244-6541, Telex: 674912; Empl.: 1600

SINGER DATA PRODUCTS, INC., 790 Maple Lane, Bensenville, IL 60106, Tel: 312-860-6500; Empl.: 40; *Sls. Mgr.:* Ken Krohmer

S.I.R. ATLANTA, 331 Luckie St., N.W., Atlanta, GA 30313, Tel: 404-522-6317; FSC No.: FSCM 62151; Empl.: 15

SITCO ANTENNAS, 10330 N.E. Marx St., Portland, OR 97220, Tel: 503-253-2000, Telex: 360-836; Empl.: 18; *Sls. Mgr.:* G. Berliner

SIVERS IMA, 5669 Selmaraine Drive, Culver City, CA 90230, Tel: 213-390-7477, TWX: 910-343-6583; Empl.: 300; *Sls. Mgr.:* Marshall Cleland

SJOBERG, C., & SON, INC., 415 Station St., Cranston, RI 02910, Tel: 401-461-8220; Empl.: 20

SKAN-A-MATIC, Box S, Elbridge, NY 13060, Tel: 315-689-3961, TWX: 710-545-0220; Empl.: 175

Advertisement

Manufacturer of photoelectric/bar code components and systems. Photoelectric line includes thru-beams, reflective, and special purpose sensors, electronic controls and custom industrial systems. Bar code products include fixed and moving beam and hand held scanners, utilizing incandescent, LED and laser light sources. Also, a mini reader, a data entry terminal/reader, microcomputer decoders and reading systems designed for all popular bar codes. National and international sales representative network.

SKYDYNE DIVISION, AAR/Brooks & Perkins, River Rd., Port Jervis, NY 12771, Tel: 914-856-6655, TWX: 510-260-1249; Empl.: 45 ..... **C•1081**

SLAUGHTER CO., Moore & Hailey Sts., P.O. Box 1805, Ardmore, OK 73402, Tel: 405-223-4773; FSC No.: 05611 ..... **D•1309**

SL ELECTRONICS, 300 Harvard Ave., Westville, NJ 08093, Tel: 609-456-7300, Telex: 844509, TWX: 710-944-0758; Empl.: 60; *Sls. Mgr.:* Dan Holdstein

Local Sales Offices & Reps

AZ	Phoenix, Conductors & Dielectrics, Inc.	602-263-0042
CA	S. Pasadena, Deniston/JDA	213-289-2844
CA	San Francisco, Conductors & Dielectrics, Inc.	415-494-1044
FL	St. Petersburg, K-Square	813-381-1893
IL	Hanover Park, J. R. Ripley Assocs.	312-289-5365
MA	Newton Upper Falls, Anchor Engrg. Corp.	617-964-6205
MN	Minneapolis, Charles D. Atwater Assocs.	612-925-1672
NJ	Berkeley Heights, Cambridge Allen Assocs.	201-464-0203
NY	Camillus, Ontec Elctrn. Mktg. Inc.	315-672-5626
NY	Rochester, Ontec Elctrn. Mktg. Inc.	716-464-8636
NY	Wappingers Falls, Ontec Elctrn. Mktg. Inc.	914-462-7188
NC	Raleigh, Candor Co., Inc.	919-779-1855
OH	Akron, Augnat Assocs.	216-273-1211
OR	Portland, Conductors & Dielectrics, Inc.	503-242-1456
SC	Myrtle Beach, Candor Co., Inc.	803-448-8361
TX	Dallas, Southwest Elctrns. Ind.	214-690-9881
TX	Houston, Dunkel Elctrns. Assocs.	713-729-1670
VA	Blacksburg, The Candor Co., Inc.	703-953-2197
WA	Seattle, Conductors & Dielectrics, Inc.	206-282-5032
Can	Montreal, Anbak Sls. Canada, Ltd.	514-683-6554
Can	Toronto, Anbak Sls. Canada, Ltd.	416-842-6630

SL HOMALITE, Div. of SL Inds., 11 Brookside Dr., Wilmington, DE 19804, Tel: 302-652-3686, TWX: 510-666-3450; Empl.: 35

SIMPSON

FULL LINE
AUTHORIZED DISTRIBUTOR

E S I

ELECTRIC SWITCHES
INCORPORATED

2478 Fletcher Dr, Los Angeles, California 90039

213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

Simpson
INSTRUMENTS THAT STAY ACCURATE

VOM's & Digitals

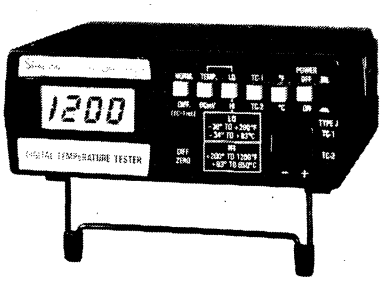
Authorized Distributors

RAG ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



Model 383

SLEPIAN, ARTHUR, & CO., 412 Housatonic Ave., Bridgeport, CT 06608, Tel: 203-366-5294; Empl.: 5; *Sls. Mgr.:* M. Madow

SL INDUSTRIES, 76 Euclid Ave, Haddonfield, NJ 08033

SLAN SLOAN INDICATOR LIGHTS

SLOAN CO., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, Tel: 213-875-1123, TWX: 910-498-2250; Empl.: 25; *Sls. Mgr.:* John E. Bailey ..... **B•1098-1101**

Local Sales Offices & Reps

CA Saratoga, Testco 408-253-1900
CA Westminster, West Elctrns. Sls. 714-739-2487
CO Commerce City, Williams Assoc. 303-289-5647
FL Pompano Beach, Cole-Tek Assocs. 305-781-8110
GA Norcross, Mountain Electro Prods., Inc. 404-962-2530
MD Glen Burnie, Macrotech Assoc. 301-437-5588
MA Andover, Crawford Assocs. 617-470-2122
MN Minneapolis, Loren Green Assoc. of Minn. 612-571-6666
MO St. Charles, Microtronics 314-946-8500
NJ Cherry Hill, Quality Comps. 609-428-6226
NJ Englewood Cliffs, E. Glass Assocs. 212-586-8440
OH Cleveland, Allan Scraga 216-662-6080
TX Dallas, IBL Engrg. & Sls. 214-363-2921
WA Bellevue, N. R. Schultz Co. 206-454-0300

Local Distributors

AL Huntsville, Powell Elctrns. 205-529-2731
CA Hawthorne, Radio Hardware 213-679-3381
CA San Jose, Powell Elctrns. 408-943-9020
CA Santa Clara, Patane Santa Clara 408-496-6151
CA Torrance, Cypress Elctrns. 213-533-6005
CA Van Nuys, Patane Avionics 818-988-4455
CT W. Hartford, Signal Inds. 203-236-6005
FL Ft. Lauderdale, Peerless Radio Corp. 305-973-4141
FL Ft. Lauderdale, Powell Elctrns. 305-979-5000
FL Miami, Elctrn. Equip. 305-871-3500
IL Des Plaines, Edmar Elctrns. 312-298-8580
KS Wichita, Lee Prods. 316-264-2172
MD Columbia, Powell Elctrns. 301-621-4070
NY Buffalo, Genesee Radio & Parts 716-873-9661
NY Lynbrook, Peerless Radio Corp. 516-593-2121
OH Solon, R.E.H. Elctrns. 216-264-2172
OH Solon, Repco 216-248-8900
OK Tulsa, Altair Co. 918-252-5781
PA Philadelphia, Powell Elctrns. 215-365-1900
TX Houston, Altair Co. 713-462-3029
TX Richardson, Altair Co. 214-231-5166
VT South Burlington, Hooker Elctrns. 802-864-0885
WA Bellevue, Powell Elctrns. 206-641-4446

SLOAN TECHNOLOGY, 602 E. Montecito St., Santa Barbara, CA 93103, Tel: 805-963-4431, TWX: 910-334-4901; Empl.: 100; *Sls. Mgr.:* Leonard Cardoza

SL WABER
A Division of SL Industries, Inc.

SL WABER, 300 Harvard Ave., Westville, NJ 08093, Tel: 609-456-5400, 800-257-8384; Empl.: 170; *Sls. Mgr.:* R. C. Waldron ..... **C•1692; D•1963**

Local Sales Offices & Reps

AL Huntsville, Hollingsworth & Still 205-859-5562
CA Burlingame, Carelli-EMA 415-342-5546
CA Gardena, Ungar Sls. Assocs. 213-538-2811
CO Denver, Walter Engrg. 303-777-5585
FL Miami, Hollingsworth & Still 305-431-1631
FL Orlando, Hollingsworth & Still 305-859-9423
FL Winter Park, Hollingsworth & Still 305-678-2858
GA Norcross, Hollingsworth & Still 404-447-1700
HI Honolulu, Lee Gabor Co. 808-536-2457
IL Northbrook, Wm. M. Linz Assocs. 312-498-9600
MD Silver Spring, David S. Linz Co. 301-593-2477
MA Scituate, K. J. Walsh & Assocs. 617-545-3145
MI Southfield, Robert Milsk Co. 313-354-3310
MN Minneapolis, Hei-Lite Sls. 612-861-6051
MO Blue Springs, Kathrinus-Kelly-Baumhauer 816-229-0001
MO St. Louis, Kathrinus-Kelly-Baumhauer 314-627-2400
NM Albuquerque, C. T. Carlberg & Assocs. 505-888-3883
NY Rochester, Warren Kaufman & Assocs. 716-266-2728
NY Whitestone, Jack Brown Sls. 212-769-1979
NC Kernersville, Hollingsworth & Still 919-996-4622
OH Beachwood, Elctrn. Salesmasters 216-831-9555
OR Beaverton, Wm. J. Purdy Co. 503-641-9373
PA Philadelphia, David S. Linz Co. 215-379-0734
PA Pittsburgh, Covert & Newman Co. 412-531-2002
WA Redmond, Wm. J. Purdy Co. 206-882-3144

Local Distributors

AL Huntsville, Mock Elctrns. 205-539-2401
AZ Phoenix, Parts Elctrn. 602-258-6476
AZ Tucson, Inland Elect. 602-889-5301
AR Little Rock, Carlton Bates Co. 501-562-9100
CA Berkeley, Al Lasher's Dealer Elect. 415-843-5915
CA Canoga Park, Sandy's Elctrn. Supp. 213-346-8353
CA Costa Mesa, MarVac Elctrns. 714-540-3280
CA El Monte, Claude Michael 213-696-0141
CA Fullerton, Orvac Elctrns. 714-871-1020
CA Gardena, California Switch & Signal 213-770-2330
CA Glendale, Western Elctrns. 213-246-4861
CA Hollywood, Pacific Radio Exch. 213-462-1393
CA Hollywood, Yale Radio 213-465-3186
CA Mountain View, Abacus Elctrns. 415-961-1500
CA Oakland, Brill Elctrns. 415-834-5888
CA Palo Alto, Zack Elctrns. 415-326-5432
CA Pasadena, Dow Radio 213-793-1195
CA Riverside, Electronic Supp. 714-836-7300
CA San Diego, Shanks & Wright 714-239-0176
CA San Francisco, Zack Elctrns. 415-626-1444
CA San Jose, Quement Elctrns. 408-998-5900
CA Sunnyvale, Com-Kyl 408-734-9660
CO Denver, Denver Wintronics 303-934-2406
CO Denver, Elctrn. Parts 303-744-1992
CT Stamford, Mar Le Co. 203-348-2645
CT Waterbury, Suburban Supp. 203-757-1251
FL Miami, Elctrn. Equip. 305-871-3500
FL Miami, ESL Elctrn. Distrs. 305-633-6973
FL Orlando, Hammond Elctrns. 305-849-6060
FL Pensacola, Grice Elctrns. 904-434-2481
GA Atlanta, Ack Radio Supp. 404-351-6340
GA Atlanta, Specialty Distrib. 404-873-2521
IL Chicago, Newark Elctrns. 312-638-4411
IL Elk Grove Village, GBL Elctrns. 312-593-3220
IL Niles, Joseph Elctrns. 312-297-4200
IL Northbrook, Classic Comps. 312-272-9650
IL Palatine, Ohm Elctrns. 312-359-5500
IL Peoria, Klaus Radio & Elctrns. 309-691-4840
IL Rockford, Mid-West Associated 815-962-8036
IN East Chicago, Acro Elctrns. 312-357-1269
IN Ft. Wayne, Ft. Wayne Elctrns. 219-423-3422
IN Indianapolis, Graham Elctrns. 317-634-8202
IN Indianapolis, Meunier Elect. 317-635-3511
IN Indianapolis, Radio Distrib. 317-257-2231
IN Terre Haute, Midwest Supp. Elec. 812-232-0187
KY Lexington, Radio Elctrn. Equip. 606-255-6661
KY Louisville, P.I. Burks Co. 502-589-3960
KY Louisville, Peerless Elctrn. Equip. 502-637-7674
LA Lafayette, Ralphs of Lafayette 318-234-4507
LA Shreveport, Industrial Elect. 318-222-9459
MD Baltimore, ASI Elctrns. 301-265-5100
MD Baltimore, Radio Elctrn. Svc. Co. 301-823-0700
MD Gaithersburg, Pioneer/Wash. Elect. 301-948-0710
MD Rockville, Capitol Radio Whlsrs. 301-881-2270
MA Hingham, Sager Elec. Supp. 617-749-6700
MA Lynn, Land Elec. Supp. 617-592-2220
MA Needham, You-Do-It Elctrns. 617-449-1005
MA Newton Upper Falls, In-Stock Prods. Co. 617-964-6200
MA Norwood, Gerber Elctrns. 617-769-6000
MA W. Newton, A. W. Mayer Co. 617-965-1111
MI Ann Arbor, Wedemeyer Elect. Supp. 313-665-8611
MI Detroit, RS Elctrns. 313-491-1012
MN Minneapolis, Electronics Ctr. 612-371-5200
MN Minneapolis, Stark Elctrns. 612-332-1325
MS Jackson, Ellington Elect. Supp. 601-355-0561
MO Kansas City, Electronic Supp. Co. 816-921-0250
MO Kansas City, Walters Radio Supp. 816-531-7015
MO St. Louis, Olive Indl. Elect. 314-863-7800
MO St. Louis, Van Sickle Radio 314-621-5000
NE Lincoln, Scott Elec. Supp. 402-466-8221
NE Omaha, Radio Equip. 402-341-7700
NH Hudson, C & H Elctrns. 603-882-1133
NJ Camden, General Radio Supp. 609-964-8560
NJ Hanover, State Elctrn. Parts 201-887-2550
NJ Springfield, Federated Purchaser 201-376-8900
NJ Springfield, Route Elctrns. 201-467-0166
NM Albuquerque, Electronic Parts 505-293-6161
NM Albuquerque, Walker Radio Co. 505-247-2288
NY Buffalo, Summit Distrib. 716-884-3450
NY Farmingdale, Fordham Radio 516-752-0500
NY Hauppauge, Broadline Elctrns. 516-420-8320
NY Hempstead, Davis Elctrns. 516-483-9200
NY Long Island City, H. L. Dalis, Inc. 212-361-1117
NY New York, Argil Elctrns. 212-691-8111
NY Portchester, Wise Comps. 203-531-4880
NY Rochester, Masline Elctrns. 716-546-5373
NY Rochester, Simcona Elctrns. 716-328-3230
NY Rome, Rome Elctrns. 315-337-5400
NY Schenectady, Adirondack Elctrns. 518-842-8350
NC Raleigh, Southeastern Radio Supp. 919-828-2311
OH Akron, Akron Elctrn. Supp. 216-762-8818
OH Cincinnati, Hughes-Peters 513-351-2000
OH Cincinnati, United Radio 513-662-2610
OH Cleveland, Pattison Supp. 216-441-3000
OH Cleveland, Pioneer-Standard Elect. 216-587-3600
OH Columbus, Hughes-Peters 614-294-5351
OH Dayton, Becker Elctrns. 513-226-1341
OH Dayton, ESCO, Inc. 513-226-1133
OH Dayton, Pioneer Elctrns. 513-236-9900
OH Dayton, Stotts-Friedman 513-298-5555
OH Solon, Repco 216-248-8900
OH Toledo, Warren Radio 419-248-3364
OK Oklahoma City, Trice Whlsl. Elect. 405-524-4411
OK Tulsa, Radio, Inc. 918-587-9123
OR Portland, EOFF Elec. 503-222-9411
PA Allentown, A. A. Peters 215-434-5237
PA Huntingdon Valley, Shap Elctrns. 215-322-7150
PA Philadelphia, Almo Elctrns. 215-698-4000
PA Philadelphia, Herbach & Rademan 215-426-1700
PA Philadelphia, Philadelphia Elctrns. 215-568-7400
PA Plymouth Meeting, Techni-Tool 215-825-4900
PA Reading, Barbey Elctrns. 215-376-6116
RI Providence, Wm. Dandreta & Co. 401-861-2800
SC Charleston, Wholesale Radio Supp. 803-747-9672
TN Chattanooga, Curle Elctrns. 615-266-4727
TN Kingsport, Radio Elect. Supp. 615-247-8111
TN Nashville, Electra Distrib. 615-329-3971
TN Nashville, Randolph & Rice 615-255-5602
TX Austin, Harrison Ind. Elctrns. 512-458-3555
TX Corpus Christi, Douglas Elctrns. 512-883-5103
TX Dallas, KA Elect. Sls. 214-634-7870
TX Dallas, Wallace Elctrns. 214-340-0400
TX Dallas, Wholesale Elect. Supp. 214-824-3001
TX Ft. Worth, Sweico 817-335-6521
TX Houston, City Electronic Supp. 713-621-1060
TX Houston, Electrotex 713-941-7016
TX Houston, Harrison Ind. Elctrns. 713-652-4700
TX Houston, Lenert Co. 713-225-1465
TX San Antonio, Sherman Elect. Supp. 512-224-1001
UT Salt Lake City, Standard Supp. 801-486-3371
VA Arlington, Arlington Elctrn. 703-524-2412
VA Portsmouth, Distributors 804-399-2446
VA Richmond, Avec Elctrns. 804-359-6071
VA Roanoke, Peoples Radio & TV Supp. 703-342-8933
WA Seattle, Radar Elect. 206-282-2511
WI Madison, Satterfield Elctrns. 608-257-4801
WI Milwaukee, Marsh Elctrns. 414-475-6000

SMC SOFTWARE SYS., Science Management Corp., P. O. Box 0600, Basking Ridge, NJ 07920, Tel: 201-647-7000; Empl.: 35; *Sls. Mgr.:* Edwin J. Schnell; *Dist. Mgr.:* Margaret Langsett

SMD TECHNOLOGY SVC. CTR., A North American Philips Co., 5855 N. Glen Pk. Rd., Milwaukee, WI 53209, Tel: 800-431-4444; *Sls. Mgr.:* F. Funk

HHSmith

KULKA SMITH, INC., 1913 Atlantic Ave., Manasquan, NJ 08736, Tel: 201-223-9400, TWX: 244536; FSC No.: 83330; Empl.: 500; *Sls. Mgr.:* S. Fleischman; *Dist. Mgr.:* S. Fleischman ..... **C•1509, 1693**

Local Sales Offices & Reps

AZ Phoenix, Shefler-Kahn 602-257-9015
CA Los Angeles, E.E. Strassner Co. 213-242-8823
CA Santa Clara, Warren Assocs. 408-988-7762
CO Denver, Lindberg Co. 303-758-9033
CT North Haven, Coakley, Boyd & Abbett 203-239-6217
FL Ft Lauderdale, Hollingsworth & Still 404-447-1700
FL Miami, Hollingsworth & Still 404-447-1700
FL Tampa, Hollingsworth & Still 404-447-1700
IL Chicago, RMP/McBride Sls. 312-932-9090
IN Indianapolis, Elctrn. Reps. 317-894-1414
KS Shawnee Mission, Lowell Kangas & Assocs. 913-631-3515
TX Dallas, J. Y. Schoonmaker 214-349-1650
MA Needham Hgts, Coakley, Boyd & Abbett 617-444-5470
MA Woburn, W&D Mktg. 617-935-5610
MI Farmington Hills, R. C. Merchant 313-476-4600

MN Minneapolis, Electric Comp. Sls. 612-933-2594
MO St. Louis, Lowell Kangas & Assoc. 314-821-4050
NH Plaistow, Coakley, Boyd & Abbett 617-444-5470
NM Albuquerque, Shefler-Kahn 505-296-0749
NY Buffalo, L.D. Allen 716-837-1955
NY N. Syracuse, L.D. Allen 315-437-8387
NY Rochester, Warren Kaufman 716-266-2728
NY Whitestone, Jack Brown Elctrn. 212-767-1977
OH Richfield, Bear Mktg. 216-659-3131
OR Portland, Weber, Dale 503-234-7671
PA Trevose, P.S.A., Inc. 215-245-0513
MA Needham, Coakley, Boyd & Abbett 617-444-5470
TX Dallas, J. Y. Schoonmaker 214-349-1650
WA Seattle, Weber, Dale 206-623-5990

SMK ELCTRNS. CORP., U.S.A., 1901 Nancita Cir., Placentia, CA 92670, Tel: 714-996-0960, Telex: 18-3081; FSC No.: 637-7400; Empl.: 84; *Sls. Mgr.:* Charles Sochalec; *Dist. Mgr.:* Rudy Cicciarelli

SMOKE SIGNAL, 31336 Via Colinas, Westlake Vlg., CA 91362, Tel: 818-889-9340, Telex: 9104044065; Empl.: 20; *Sls. Mgr.:* Don Simonsen; *Dist. Mgr.:* Colleen Kirkpatrick

SOFTWARE DYNAMICS, 2111 W. Crescent Ave-G, Anaheim, CA 92801, Tel: 714-635-4760

SOHIO ENGINEERED MATERIALS CO., Unit of Sohio, P. O. Box 156, Niagara Falls, NY 14302, Tel: 716-278-2000; Empl.: 2000 ... **A•1172, 1944-1947; B•1772**

SOKOL CRYSTAL PRODS. DIV., 6050 N. 52nd Ave., Glendale, AZ 85301, Tel: 602-934-2108

SOKOL CRYSTAL PRODS., INC., 121 Water St., Mineral Point, WI 53565, Tel: 608-987-3363, Telex: 467581; FSC No.: 56187; Empl.: 150; *Sls. Mgr.:* Steven M. Sokol ..... **A•1435-1437**

Local Sales Offices & Reps
CA Pinole, Ron May 415-724-1203
FL Clearwater, Brennan & Assocs. 813-446-5006
IL Medinah, Wavan Assocs. 312-893-0210
IN Fort Wayne, John Kilfoil Co. 219-436-7233
IA Marion, Rep. Assocs. 319-373-0152
KS Parker, S. W. Wollard Co. 913-898-6552
MA Millis, Selmark Assocs. 617-376-2914
MN Bloomington, V. J. Gensmer Assocs. .. 612-888-2492
MO St. Louis, Abrams & Assocs. 314-569-0447
NJ Flanders, K & R Engrg. Sls. Corp. 201-584-5235
TX Dallas, Stevens Sls. Co. 214-350-2476
WA Kirkland, Manon Engrg., Inc. 206-827-7449

SOLA, A Unit of General Sign., 1717 Busse Rd., Elk Grove Village, IL 60007, Tel: 312-439-2800, Telex: 280538; *Sls. Mgr.:* Fred Lemke ..... **D•1838-1839, 1964-1967**

Local Sales Offices & Reps
AL Huntsville, Cartwright & Bean, Inc. 205-830-1540
AZ Phoenix, Zeus Elctrns., Inc. 602-263-6022
AR Little Rock, Erickson Sls., Inc. 501-225-7379
CA Los Angeles, Wiley Co. 213-666-1611
CA Pleasanton, Moulthrop Sls., Inc. 415-463-0450
CA San Diego, Wiley Co. 619-571-2881
CT Mystic, J.M.G., Inc. 203-599-5373
FL Orlando, Cartwright & Bean, Inc. 305-422-4531
GA Atlanta, Cartwright & Bean, Inc. 404-233-2939
IL Chicago, Industrial Reps. 312-647-7755
IN Indianapolis, Green-Wissler Sls. 317-872-9981
IA Cedar Rapids, R. W. Kunz & Assocs. .. 319-396-5386
KS Kansas City, R. W. Kunz & Assocs. ... 913-648-3535
LA Chalmette, Erickson Sls., Inc. 504-271-1976
MI Farmington Hills, R. C. Merchant 313-476-4600
MN Minneapolis, Boerger & Assocs. 612-560-3435
NJ Cherry Hill, Trinkle Sls. 609-795-4200
NJ East Orange, Willgold Sls. 201-678-7700
NY Rochester, LMar Assocs. 716-323-1000
NC Raleigh, Cartwright & Bean, Inc. 919-876-4130
OH Columbus, Baehr, Greenleaf & Assocs. 614-486-4046
OH Dayton, Baehr, Greenleaf & Assocs. .. 513-439-0724
OH Lakewood, Baehr, Greenleaf & Assocs. 216-221-9030
OK Broken Arrow, Erickson Sls., Inc. 918-455-4276
TN Knoxville, Cartwright & Bean, Inc. 615-693-7450
TX Austin, Erickson Sls. 512-244-3068
TX Dallas, Erickson Sls. 214-739-5833
TX Houston, Erickson Sls. 713-266-1604
WI Milwaukee, Industrial Reps. 414-259-0965

SOLARCON TECHNOLOGY, INC., P.O. Box 4715, Hayward, CA 94544, Tel: 415-489-3141; Empl.: 9; *Sls. Mgr.:* Rose Ferguson

Local Sales Offices & Reps
CA Laguna Hills, Reese Riley & Assocs. .. 714-859-9827
CA San Ramon, Reese Riley & Assocs. .. 415-961-0565
MI Southfield, Infinity, Inc. 313-557-7230
OH Solon, Infinity, Inc. 216-248-9377
PA Pittsburgh, Infinity, Inc. 412-821-6389
WA Belview, Reese Riley & Assocs. 206-462-8088

SOLAR ELCTRNS. CO., 901 N. Highland, Hollywood, CA 90038, Tel: 213-462-0806; FSC No.: 13222; Empl.: 15

SOLAREX CORP., 1335 Piccard Dr., Rockville, MD 20850, Tel: 301-948-0202, TWX: 710-828-9709; *Sls. Mgr.:* Ted Blumemstock

SOLARTRON INSTRUMENTS, Sangamo Weston, Inc., 2 Westchester Plaza, Elmsford, NY 10523, Tel: 914-592-9168, Telex: 145-487; FSC No.: 1T316; Empl.: 21; *Sls. Mgr.:* Malcolm J. Swanson

SOLATRON ENTERPRISES, 421 E. Beach Ave., Inglewood, CA 90302, Tel: 213-678-4981; Empl.: 20

SOLDER ABSORBING TECHNOLOGY (SAT), South End Bridge Circle, Agawam, MA 01001, Tel: 800-628-8862, TWX: 710-350-6466; Empl.: 8

SOLDER REMOVAL, P.O. Box 1678, Covina, CA 91722, Tel: 213-967-3681, TWX: 910-584-1820; FSC No.: 34605; *Sls. Mgr.:* Frank Hennessy; *Dist. Mgr.:* Frank Hennessy

SOLID STATE, INC., 46 Farrand St., Bloomfield, NJ 07003, Tel: 201-429-8700, TWX: 710-994-4780; Empl.: 110; *Sls. Mgr.:* T. King

SOLID STATE CIRCUITS, 3300 S. Golden, Springfield, MO 65807, Tel: 417-887-0823, TWX: 910-775-4762; Empl.: 260; *Sls. Mgr.:* Dennis Stead

SOLID STATE DEVICES, 14830 Valley View Ave., La Mirada, CA 90638, Tel: 213-921-9660, TWX: 910-583-4807; FSC No.: 30043; Empl.: 100; *Sls. Mgr.:* D. Peden

SOLID STATE ELCTRNS. CORP., 18646 Parthenia St., Northridge, CA 91324, Tel: 818-993-8257; FSC No.: 11911; Empl.: 15

SOLID STATE RELAYS, 213 Eisenhower Lane So., Lombard, IL 60148, Tel: 312-932-1660; *Sls. Mgr.:* D. E. Wienke

SOLID STATE SCIENTIFIC, 3900 Welsh Rd., Willow Grove, PA 19090, Tel: 215-657-8400, Telex: 476-1101, TWX: 510-661-7267; Empl.: 650

SOLID STATE SYSTEMS, 1990 Delk Industrial Blvd., Marietta, GA 30067, Tel: 404-952-9401; Empl.: 150; *Sls. Mgr.:* Jason Schloss; *Dist. Mgr.:* J. Schloss

SOLID STATE TESTING, INC., 56 Middlesex Tpke., Burlington, MA 01803, Tel: 617-272-0972, TWX: 710-332-1620; Empl.: 150; *Sls. Mgr.:* James Roberts; *Dist. Mgr.:* James DiGiacomo

SOLITRON DEVICES, 8808 Balboa Ave., San Diego, CA 92123, Tel: 619-278-8780, TWX: 910-335-1221; Empl.: 900

SOLITRON DEVICES, INC., Semiconductor Group, 1177 Blue Heron Rd., Riviera Beach, FL 33404, Tel: 305-848-4311, Telex: 51-3435, TWX: 510-952-7610

SOLITRON/MICROWAVE, Box 278, Port Salerno, FL 33492, Tel: 305-287-5000, TWX: 510-953-7500; FSC No.: 95077; Empl.: 300; *Sls. Mgr.:* James J. McCann

SOLTEC CORP., 11684 Pendelton St., Sun Valley, CA 91352, Tel: 818-767-0044, 800-423-2344, Telex: 494-3094; Empl.: 46; *Sls. Mgr.:* Gary A. Purser

SONIC INTERNATIONAL CORP., 2515 N.E. Riverside, Portland, OR 97211, Tel: 503-665-0187, Telex: 36-0325; Empl.: 130

SONNENSCHEIN BATTERIES INC., 300 E. Johnson Ave., P.O. Box 339, Cheshire, CT 06410, Tel: 203-271-0091, Telex: 510-100-7052; *Sls. Mgr.:* R. J. McCarthy ..... **D•1438**

Local Sales Offices & Reps
AL Huntsville, Raycom, Inc. 205-859-2017
CA Anaheim, Impact Elctrns. 714-533-1351
CO Golden, J. F. Hurlbut Co. 303-279-7796
CT Manchester, G/M Assocs. 203-646-4443
IL Park Ridge, Metcom Assocs. Corp. 312-696-1490
MA Framingham, G/M Assocs. 617-872-4871
MI Southfield, R. C. Merchant & Co. 313-354-4300
MI St. Joseph, R. C. Merchant & Co. 616-983-7378
NH Exeter, G/M Assocs. 603-778-7472
NC Raleigh, Raycom, Inc. 919-847-8276
TX Austin, Delta Comps. 512-458-4288
TX Seagoville, Delta Comps. 214-287-6333
WA Portland, Harry Levinson Co. 503-245-1902
WA Seattle, Harry Levinson Co. 206-382-1300
WI West Allis, Metcom Assocs. Corp. 414-476-1300

SONICOR INSTRUMENT CORP., 1365 Marconi Blvd., Copiague, NY 11726, Tel: 516-842-3344, Telex: 649494; FSC No.: 31605; *Sls. Mgr.:* Arthur Liers; *Dist. Mgr.:* Arthur Liers

SONOBOND, 200 E. Rosedale Ave., West Chester, PA 19380, Tel: 215-696-4710, Telex: 834511; Empl.: 50; *Sls. Mgr.:* John Harper

SONY CORP. OF AMERICA, Component Prods. Div., 15 Essex Road, Paramus, NJ 07652, Tel: 201-368-5000

SORENSEN CO., 676 E. Island Pond Rd., Manchester, NH 03103, Tel: 603-668-4500, Telex: 94-3459, TWX: 710-220-1339; Empl.: 850; *Sls. Mgr.:* Roy Allman

SORENSON LIGHTED CONTROLS, 75 Locust St., Hartford, CT 06114, Tel: 203-527-3092, TWX: 710-425-4093; Empl.: 100; *Sls. Mgr.:* Tom D'Allesantro ..... **B•1102-1103**

Local Sales Offices & Reps
CA Anaheim, Galaxie Sls. 714-752-1580
CA Mt. View, Del Bucchia & Assoc. 415-965-8045
CT Hartford, Atlantic Switch Co. 203-527-7705
FL Lakeland, Switch Controls 813-644-7564
IL Wheaton, Chadra-Schilke 312-653-8126
IN Fort Wayne, Menze Sls. 219-747-5616
MA Canton, Comtek Assoc. 617-828-2948
MI Birmingham, Favco 313-644-0173
MN Edina, Monroe/Hanna 612-566-1324
MO Clayton, Mertens Co. 314-993-6600
NY Great Neck, Pacent Eng. Co. 516-482-4678
NC Raleigh, Rick Hadley 919-362-4099
TX Dallas, Texaswitch 214-357-1768

Local Distributors
CA Los Angeles, Electric Switches 213-660-1310
CA Tustin, Western Switches 714-731-4333
CA Van Nuys, Pacific Switch Controls 213-873-4802
CT Hartford, Atlantic Switch Controls 203-527-7705
FL Lakeland, Switch Controls 813-644-7564
GA Augusta, Dixie Elctrns. 404-722-2055
IL Wheaton, Conectrix 312-653-1460
MI St. Clair Shores, Specialties Mfg. 313-771-2700
MN Minneapolis, Carl Berquist 612-835-2322
NJ Mt. Laurel, Jersey Switch 609-778-8190
NY Woodside, Switches Unltd. 212-478-5000
NC Charlotte, Dixie Elctrns. 704-377-5413
OH Columbus, Ohio Switch 614-885-0319
SC Columbia, Dixie Elctrns. 803-779-5332
TX Dallas, Texaswitch 214-357-1768
WA Seattle, Evergreen Mktg. 206-633-3160
EXP NJ, Ft. Lee, Joseph Gross 201-944-3609

SOSHIN ELEC. CO., 1-18-18 Nakamagome, Ota-Ku, Tokyo, Japan, Tel: (03) 775-2111, Telex: 246-6377; Empl.: 800; *Sls. Mgr.:* N. Hiraide, Exp. & Imp. Dept.

SOUNDCOAT CO., INC., 1 Burt Dr., Deer Park, NY 11729, Tel: 516-242-2200, Telex: 12-5514; *Sls. Mgr.:* Mr. Carl Wolaver

SOUNDLIER, American Trading & Prod. Corp., 9380 Watson Ind'l. Pk., St. Louis, MO 63126, Tel: 314-962-9870, Telex: 910-760-1650; Empl.: 350; *Sls. Mgr.:* Paul Grote; *Dist. Mgr.:* Tony Dalba

SOURIAU, INC., 25158 Avenue Stanford, Valencia, CA 91355, Tel: 805-257-4830, Telex: 4720328, TWX: 910-336-1553; Empl.: 70; *Sls. Mgr.:* Richard Monstein; *Dist. Mgr.:* Alan Rubin

SOUTH AMERICAN DEV. CORP., Rte. 9, G.R.D. Box 413, Hyde Park, NY 12538, Tel: 914-229-8866, Telex: 4990035; Empl.: 80; *Sls. Mgr.:* L. Faber

SOUTHCO, INC., 210 N. Brinton Lake Rd., Concordville, PA 19331, Tel: 215-459-4000, Telex: 83-1485, TWX: 710-760-1715; *Sls. Mgr.:* R. W. Dougherty

SOUTHERN COMPUTER CORP., 3720 N. Stratford Rd. N.E., Atlanta, GA 30342, Tel: 404-231-5363, Telex: 317867; *Sls. Mgr.:* Redd N. Mann; *Dist. Mgr.:* Robert Morris

SOUTHERN ELECTRONICS, F-Dyne, 726 So. Flower St., Burbank, CA 91502, Tel: 213-845-2458, TWX: 910-498-5707; Empl.: 100; *Sls. Mgr.:* Ron Head

SOUTH SHORE METAL PRODS., 88 E Allen Blvd., Farmingdale, NY 11735, Tel: 516-249-3322; Empl.: 30; *Sls. Mgr.:* A. G. Bauer

SOUTHWEST TECH PRODS CORP., 219 W. Rhapsody, San Antonio, TX 78216, Tel: 512-344-0242; Empl.: 34

SPACE ELECTRONICS, INC., Box 2166, Meriden, CT 06450, Tel: 203-235-7755; Empl.: 16; *Sls. Mgr.:* Richard Boynton

SPACE POWER ELCTRNS., Jeffrey Lane, RD 1, Glen Gardner, NJ 08826, Tel: 201-537-2184

SP America, Inc.

SP AMERICA INC., Shin-Etsu Polymer, 1181 N. 4th St., San Jose, CA 95112, Tel: 408-947-0311, TWX: 910-338-2229; *Sls. Mgr.:* R. L. Bucholtz ..... **B•1739; C•1510-1511**

Local Sales Offices & Reps

FL	Ft. Lauderdale, Tek-Rep	305-793-5334
GA	Atlanta, Tek-Rep Mktg.	404-963-1600
IN	Carmel, Technlg. Mktg. Corp.	317-844-8462
KY	Louisville, Technlg. Mktg. Corp.	502-499-7808
MA	Needham, Ray Perron & Co.	617-695-6179
MI	Plymouth, Jay Mktg. Assoc.	313-459-1200
PA	Broomall, TCA Assoc.	215-353-2022
TX	Dallas, TL Mktg.	214-357-1752

SPANTA, INC., Box 193, Franklin Lakes, NJ 07417, Tel: 201-337-0044, Telex: 13-6011; Empl.: 10; *Sls. Mgr.:* W. Phifer; *Dist. Mgr.:* W. Phifer

SPARKOMATIC, Rte. 6 & 209, Milford, PA 18337, Tel: 717-296-6444, TWX: 510-260-2682; Empl.: 300; *Sls. Mgr.:* Robert Schuler

SPATIAL DATA SYSTEMS, A DBA Systems Co., 508 S. Fairview, Goleta, CA 93117, Tel: 805-967-2383, Telex: 658-336; Empl.: 30; *Dist. Mgr.:* S. Schlosser

SPECIALIZED ELCTRN. MAGNETIC PRODS., INC., 272 Loudon Ridge Rd. Route 8, Loudon, NH 03301, Tel: (603) 267-6892; *Sls. Mgr.:* Eugene C. Avery

SPECIALTY CONNECTOR CO., 2620 Endress Place, Greenwood, IN 46142, Tel: 317-535-5353

SPECIALITY ELECTRONICS, INC., 208 E. Rutherford St., Landrum, SC 29356, Tel: 803-457-3824; Empl.: 10; *Sls. Mgr.:* Mary A. Galli

SPECO DIV., Components Specialties, Inc., P.O. Box 624, 1172 Rte. 109, Lindenhurst, NY 11757, Tel: 516-957-8700, 800-645-5516, Telex: 96-7754; Empl.: 33; *Sls. Mgr.:* Mel Hulkower; *Dist. Mgr.:* Stan Hulkower

SPECTRACOM, 101 Despatch Drive, East Rochester, NY 14445, Tel: 716-381-4827, Telex: 9103509587

SPECTRAGRAPHICS CORP., 10260 Sorrento Valley Rd., San Diego, CA 92121, Tel: 619-450-0611; Empl.: 100

SPECTRAL DYNAMICS DIV., Scientific-Atlanta, Box 671, San Diego, CA 92112, Tel: 619-268-7100, TWX: 910-335-2022; Empl.: 600; *Sls. Mgr.:* Robert N. Saunders

SPECTRA LUX CORP., 12840 N.E. 21 St. Pl., Bellevue, WA 98005, Tel: 206-747-0560; FSC No.: 51896; *Sls. Mgr.:* Ron Bustad

Local Sales Offices & Reps

AZ	Tempe, Cantec Sls., Inc.	602-829-0191

SPECTRAN CORP., 50 Hall Road, Sturbridge, MA 01566, Tel: 617-347-2261; FSC No.: 6V569; Empl.: 175

SPECTRAN INSTRUMENTS, INC., Box 891, La Habra, CA 90631, Tel: 213-694-3995

SPECTRA SONICS, 3750 Airport Rd., Ogden, UT 84403, Tel: 801-392-7531; Empl.: 35

SPECTRA-STRIP OPERATIONS, Ampheral Prods., 7100 Lampson Ave., Garden Grove, CA 92642-0415, Tel: 714-892-3361, TWX: 910-596-1314; Empl.: 300

SPECTRO EQUIPMENT, INC., 13821 Progress Pkwy., N. Royalton, OH 44133, Tel: 216-237-8910; Empl.: 25

SPECTROLAB, INC., 12500 Gladstone Ave., Sylmar, CA 91342, Tel: 213-365-4611, TWX: 910-496-1488; Empl.: 250

SPECTROL ELCTRNS., 17070 East Gale Ave., City of Industry, CA 91749, Tel: 818-964-6565, TWX: 910-584-1314; Empl.: 600; *Sls. Mgr.:* R. Shackelford ..... **A•2039-2047**

Local Sales Offices & Reps

AL	Huntsville, Beacon Sls.	205-881-5031
AZ	Phoenix, Thom Luke Sls.	602-941-1901
CA	San Diego, Hadden Assocs.	619-565-9444
CA	Santa Clara, I2	408-988-3400
CA	Westlake Village, Astralonics	818-706-3936
CO	Denver, Spectrum Sls.	303-696-1601
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Clearwater, Beacon Sls.	813-796-2378
FL	Ft. Lauderdale, Beacon Sls.	305-491-1054
IL	Downers Grove, Momak Sls.	312-963-6400
IA	Hiawatha, Gassner & Clark	319-393-5763
KS	Shawnee Mission, Lowell-Kangas	913-631-3515
MD	Baltimore, Component Sls.	301-484-3647
MA	Burlington, Kitchen & Kutchin	617-229-2660
MI	Livonia, Luebbe Sls.	313-477-3131
MN	St. Paul, Murnco	612-484-8200
MO	St. Louis, Lowell-Kangas	314-821-4050
NJ	Haddonfield, Sunday-O'Brien	609-429-4013
NY	Commack, E.R.A.	516-543-0510
NY	Liverpool, Gen Tech	315-451-3480
NY	Syracuse, L Mar	315-437-7779
NC	Raleigh, Beacon Sls.	919-787-0330
OH	Cincinnati, Luebbe Sls.	513-891-5770
OH	Cleveland, Luebbe Sls.	216-333-0425
OH	Columbus, Luebbe Sls.	614-431-0474
OH	Dayton, Luebbe Sls.	513-294-0426
OR	Beaverton, Eclipse Mktg.	503-642-1661
PA	Pittsburgh, R. F. Clark	412-242-9500
TX	Arlington, Pro Comp	817-640-4336
TX	Houston, Pro Comp	713-556-9622
WA	Redmond, Eclipse Mktg.	206-885-6991

SPECTRON CORP., 344 New Albany Rd., Moorestown, NJ 08057, Tel: 609-234-5700, Telex: 83-1488, TWX: 710-897-1359

SPECTRONICS CORP., 956 Brush Hollow Rd., Westbury, NY 11590, Tel: 516-333-4840, TWX: 510-222-5877; Empl.: 125; *Sls. Mgr.:* Henry K. Lee; *Dist. Mgr.:* James J. Weglarz

SPECTRONICS, DIV. HONEYWELL, See Honeywell Optoelctrns.

SPECTRUM CONTROL, INC., 8061 Avonia Rd., Fairview, PA 16415, Tel: 814-474-1571

SPECTRUM CONTROL, INC., 2185 W. 8th St., Erie, PA 16505, Tel: 814-455-0966, TWX: 510-699-6871; FSC No.: 33095;5733; Empl.: 450; *Sls. Mgr.:* R. Greer; *Dist. Mgr.:* C. Pirro ..... **A•1635-1637; C•1513-1517**

Local Sales Offices & Reps

CA	Sunnyvale, Spectrum Control	408-735-9015
CA	Valencia, Spectrum Control	805-257-2280
FL	Melbourne, Spectrum Control	305-724-4900
IL	Elgin, Spectrum Control	312-888-8011
MA	Chelmsford, Spectrum Control	617-458-9079
NJ	Brielle, Spectrum Control	201-528-8420
NJ	Fairfield, Pantronics	201-575-1177
NY	New York, Landseas	212-265-8323
TX	Irving, Spectrum Control	214-251-1669
EXP	PA, Erie, Spectrum Control	814-455-0966

Local Distributors

CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Torrance, Cypress Elctrns.	213-533-6005
FL	Dania, Summit Distrs.	305-920-6253
IL	Chicago, Newark Elctrns.	312-784-5100
NJ	Perth Amboy, Metuchen Capacitors	201-442-0500
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Rochester, Summit Distrs.	716-334-8110
OH	Dayton, Aschbacher	513-252-7785
Intl	Australia, Rifa	03-480 1211
Intl	Denmark, E.V.J. Johanssen Elektronics	01-839022
Intl	Eng., Birmingham, Steatite Insulations	021 454-6961-2
Intl	France, Gentilly, Radio Television Franchise S.A.	664.11.01
Intl	Israel, Tel-Aviv, Landseas, Ltd.	247291-4
Intl	Japan, Tokyo, Stauffer Japan, Ltd.	Tokyo (81) 3239-0661
Intl	Netherlands, Zaandam, Bodamer Intl. BV	075-351521
Intl	Norway, H.C.A. Melbye/AS	02-106050
Intl	S. Africa, Bryanston, Taltronics Pty. Ltd.	618-2014/5
Intl	Sweden, Farsta, Traco AB	08-93-0960
Intl	Switzerland, Ebmatingen, EME, Ernst Egli	01-980-11-11
Intl	W. Germany, Ettlingen, Bodamer GmbH	(07243) 79263
Intl	W. Germany, Hamburg, Bodamer GmbH	(040) 7111091
Intl	W. Germany, Munchen, Bodamer GmbH	(089) 641801

SPECTRUM TECHNOLOGY, INC., 300 Lopez Rd., Goleta, CA 93116, Tel: 805-964-7791, TWX: 910-334-1163; FSC No.: 32464; Empl.: 100; *Sls. Mgr.:* Wm. L. Bishop ..... **A•1438-1439**

Local Sales Offices & Reps

AZ	Tempe, Sedco Sls.	602-835-6281
AZ	Tucson, Sedco Sls.	602-298-1758
CA	San Jose, Frequency Control Assocs.	408-446-0200
CT	Milford, Todino Engrg. Sls.	203-874-6643
FL	Ft. Myers, Rainbow Sls.	813-332-2210
FL	Melbourne, Rainbow Sls.	305-727-3305
IL	Elgin, R.K. Elctrns.	312-695-8552
MA	Needham, Todino Engrg. Sls.	617-444-7925
NJ	Haddonfield, Mesa Tech. Assocs.	609-429-9531
NM	Albuquerque, I.M.E.C.	505-883-9010
NY	Huntington, Compar N.Y.	516-423-5660
OK	Tulsa, Ion Assocs.	918-664-0186
TX	Austin, Ion Assocs.	512-458-2108
TX	Grand Prairie, Ion Assocs.	817-640-8282
TX	Houston, Ion Assocs.	713-461-5311

Spellman
High Voltage Electronics Corporation

SPELLMAN HIGH VOLTAGE ELCTRNS. CORP., 7 Fairchild Ave., Plainview, NY 11803, Tel: 516-349-8686, TWX: 510-221-2155; Empl.: 200; *Sls. Mgr.:* Russell E. Posser ..... **D•1840-1842**

Local Sales Offices & Reps

FL	Orlando, Gra-Mar, Inc.	305-894-3351
MA	Concord, Nortech Engrg. Sls.	617-259-0032
MA	Medfield, Nortech Engrg.	617-359-6063
MN	St. Paul, Knox Assocs.	612-488-5402

SPEMCO SWITCHES, 23425 Harper, Box 386, St. Clair Shores, MI 48080, Tel: 800-482-2828; Empl.: 9

SPERRY, A. W., INSTRS., P.O. Box 9300, Smithtown, NY 11787, Tel: 516-231-7050, Telex: 645104; Empl.: 40; *Sls. Mgr.:* Dennis W. Carroll

SPERRY UNIVAC, Mini-Computer Operations, Box C-19504, Irvine, CA 92713, Tel: 714-754-6900, TWX: 910-596-1358; Empl.: 500

SPIRICON, INC., 2600 North Main, Logan, UT 84321, Tel: 801-753-3729; Empl.: 5; *Sls. Mgr.:* Steve Teare

SPLIT BALL BEARING, MPB Corp., Highway 4, Lebanon, NH 03766, Tel: 603-448-3000, TWX: 710-366-1661; *Sls. Mgr.:* Lew Peterson; *Dist. Mgr.:* Jack F. Barker

SPRAGUE ELEC. CO., 481 Marshall St., No. Adams, MA 01247, Tel: 413-664-4411, Telex: 92-6415, TWX: 710-369-1360; FSC No.: 56289; Empl.: 10,500; *Dist. Mgr.:* J. J. Judge

SPRAGUE ELECTRIC COMPANY, Distribution Division, 481 Marshall St., No. Adams, MA 01247, Tel: 413-664-4481, TWX: 710-369-1363; FSC No.: 56289; *Sls. Mgr.:* J. Judge; *Dist. Mgr.:* Lyle Pirnie

SPRAGUE ELEC. CO., Integrated Circuit Div., 115 Northeast Cutoff, Worcester, MA 01606, Tel: 617-853-5000, TWX: 710-340-6304; FSC No.: 56289; Empl.: 700

SPRAGUE-GOODMAN ELCTRNS., INC., 134 Fulton Ave., Garden City Pk., NY 11040, Tel: 516-746-1385, Telex: 14-4533; FSC No.: 52769; Empl.: 80; *Sls. Mgr.:* David Taub; *Dist. Mgr.:* David Taub ..... **A•1173**

Local Sales Offices & Reps

AZ	Phoenix, Sanford Sls. Assocs.	602-957-3570
CA	Burlingame, W. J. Purdy Co.	415-347-7701
CA	Garden Grove, Megacap	714-891-5176
CA	Garden Grove, National Capacitor	800-854-2451
CA	Los Angeles, R.F. Assocs.	213-478-1586
CA	San Diego, R. D. Miner, Inc.	619-566-9891
CO	Denver, W. J. Purdy Co.	303-753-6800
FL	Pompano Beach, Cole-Tek	305-781-8110
GA	Smyrna, Spartech	404-446-7300
IL	Chicago, B.N.I. Elctrns.	312-775-1717
IN	Ft. Wayne, Denton Mktg., Inc.	219-627-5515
IA	Marion, M.S.B. Assocs.	319-377-6261
KS	Shawnee Mission, M.S.B. Assocs.	913-432-2131
MD	Pikesville, Imagitron Sls.	301-521-2020
MA	Southboro, KSA of New England	617-485-9432
MI	Southfield, Fred H. Gehrke & Assocs.	313-559-5363
MN	Marion, M.S.B. Assocs., Inc.	319-377-6261
MO	St. Charles, M.S.B. Assocs.	314-946-5577
NJ	Wayne, Richman Salesco - Kagan	201-694-1115
NY	Commack, Richman Salesco	516-543-5532
NY	Utica, Sweetco Assocs.	315-797-6721
OH	Cincinnati, Stegman Blaine Mktg.	513-729-1969
TX	Austin, Delta Comps.	512-458-4288
TX	Seagoville, Delta Comps.	214-287-6333
WA	Seattle, Sprague Elec. Co.	206-632-7761
WA	Vancouver, Sprague Elec. Co.	206-892-0361

Local Distributors

CA	Garden Grove, National Capacitor	714-891-5179
CA	Santa Ana, Projections Unlimited	714-641-1472
MA	Burlington, T.L.C.	617-273-0140
MA	Needham, Cronin Elctrns.	617-449-5000
NY	Lynbrook, Varitech Elctrns.	516-593-9300
PA	State College, ALVO Elctrns.	814-238-0505
TX	Addison, Captronics	214-980-0123
TX	Garland, J & S Elctrns.	214-487-8808
WA	Seattle, KAM Elctrns.	206-382-1300

SPRINGFIELD MOULDERS, INC., See ITT Thermotech

SPRUCE PINE MICA CO., Mtn. Laurel Dr., Spruce Pine, NC 28777, Tel: 704-765-4241; Empl.: 45; *Sls. Mgr.:* Hugh M. Wiseman

SPS SOFTWARE PRODUCTS & SERVICES, INC., 14 E. 38th Street, 14th Fl., New York, NY 10016, Tel: 212-686-3790, Telex: 852616; *Sls. Mgr.:* Dr. Alex Rainer

SPUR PRODUCTS CORP., 13649 Beach Ave., Marina Del Rey, CA 90292, Tel: 213-822-7100; Empl.: 12; *Sls. Mgr.:* Ray Lorenz

SQUARE D CO., Executive Plaza, Palatine, IL 60067, Tel: 312-397-2600, Telex: 255274; Empl.: 21100; *Sls. Mgr.:* R. M. O'Neal; *Dist. Mgr.:* T. W. Wilbor

SR ENGINEERING, INC., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643, Tel: 714-554-4200, Telex: 364412INTR-871; FSC No.: 21441; *Sls. Mgr.:* Coleman W. Conrad

S S A C, Box 395, Liverpool, NY 13088, Tel: 315-622-1000, Telex: 646221, TWX: SSAC LIPL; FSC No.: 16-0985719; Empl.: 220; *Sls. Mgr.:* G. Weeks

STACKBIN CORP., Albion Road, Lincoln, RI 02865, Tel: 401-333-1600; Empl.: 75; *Sls. Mgr.:* J. J. Patterson

STACKPOLE (THE STACKPOLE CORP.), Stackpole St., St. Marys, PA 15857, Tel: 814-781-1234, Telex: 914-514, TWX: 510-693-4511; FSC No.: 78488

STACKPOLE, CARBON DIV., 201 Stackpole St., St. Marys, PA 15857, Tel: 814-781-1234, Telex: 914-514, TWX: 510-693-4511; *Sls. Mgr.:* T. M. Eynon; *Dist. Mgr.:* B. E. Speedy

STACKPOLE, ELECTRONIC COMPONENTS DIV., 201 Stackpole St., St. Marys, PA 15857, Tel: 814-781-1234, Telex: 914-514, TWX: 510-693-4511; *Sls. Mgr.:* Ronald E. Braund

STACKPOLE, MAGNET DIV., 700 Elk Ave., Kane, PA 16735, Tel: 814-837-7000, TWX: 510-695-8360; *Sls. Mgr.:* V. D. Venigni

STACO, INC., See Staco Transpower

STACO ENERGY PRODS. CO., 301 Gaddis Blvd., Dayton, OH 45403, Tel: 513-253-1191, Telex: 288-032, TWX: 810-459-1798; FSC No.: 83008; Empl.: 146; *Sls. Mgr.:* Robert Simpson

STACOSWITCH, 1139 Baker St., Costa Mesa, CA 92626, Tel: 714-549-3041, TWX: 910-595-1507; FSC No.: 12522;Multiple; Empl.: 100; *Sls. Mgr.:* D. Sugg

Local Sales Offices & Reps

AL	Huntsville, 20th Century Mktg., Inc.	205-533-9281
CA	Los Altos, Recht Assocs.	415-964-6321
CO	Golden, J. F. Hurlbut Co.	303-279-7796
CT	Marion, Sands Co.	203-628-4363
FL	Orlando, EMA, Inc.	305-671-6800
GA	Stone Mountain, 20th Century Mktg., Inc.	404-292-7088
IL	Oak Brook, MSL Assocs.	312-655-8977
IN	Richmond, EMA, Inc.	513-433-2800
IA	Cedar Rapids, H. R. Brown Sls.	319-366-0635
KS	Kansas City, B-C Elctrn. Sls.	913-342-1211
MD	Silversprings, Youth & Nelson	301-598-5740
MA	Woburn, Sands Co.	617-935-7495
MI	Livonia, Lowell-Wendt Mktg. Co.	313-464-2722
MO	St. Louis, B-C Elctrn. Sls.	314-731-1255
NJ	Wayne, G.T. Assocs.	201-694-6040
NY	Syracuse, Lenard Co.	315-479-9191
OH	Cleveland, C.A. Robinson Co.	216-381-9049
OH	Dayton, C.A. Robinson	513-278-7969
OR	Portland, Frank Jackson Assocs.	503-292-2638
PA	Media, W. Reeves Assocs.	215-566-6709
TN	Knoxville, 20th Century Mktg., Inc.	615-690-1618
TX	Austin, Delta Comps.	512-458-4288
TX	Dallas, Delta Comp.	214-358-4288
TX	Houston, Delta Comps.	713-664-6777
UT	Salt Lake City, J. F. Hurlbut Co.	801-973-4443
WA	Redmond, Frank Jackson Assocs.	206-881-7277

STACO TRANSPOWER

STACO TRANSPOWER, 301 Gaddis Blvd., Dayton, OH 45403, Tel: 513-253-1191, Telex: 288-032, TWX: 810-459-1798; FSC No.: 83008; Empl.: 100; *Sls. Mgr.:* T. D. McNulty ..... **A•2288**

Local Sales Offices & Reps

AL	Huntsville, Remco	205-533-3763
AZ	Scottsdale, Power Specialists	602-996-4100
CA	Buena Park, Chuck Cooper Co.	714-739-8526
CA	Los Altos, Frauman Assoc.	415-941-0660
CT	Natick, Benchmark Assoc.	617-899-3390
FL	Tampa, J R Controls	813-961-9478
GA	Atlanta, Remco	404-447-6937
IA	Cedar Rapids, Di-tronix, Inc.	319-377-8275
KY	Cinci, Tri-State Mktg.	513-761-7993
MA	Natick, Benchmark Assocs.	617-655-9333
MI	Southfield, Fred Gehrke & Assocs.	313-559-5363
MN	Arlington Hgts., Diethert-Angel	312-593-7600
MN	Minneapolis, Diethert Angel	612-546-6099
MO	Kansas City, Di-tronix, Inc.	816-356-6340
MO	St. Louis, Di-tronix, Inc.	314-291-4777
NJ	King of Prussia, Freeman-Malta Assoc.	215-337-9211
NJ	Mountain Lakes, Levison Sls. Co. Inc.	201-334-2921
NC	Raleigh, Remco	919-847-5079
OH	Cleveland, Marlow Assocs.	216-991-6500
OH	Columbus, Marlow Assocs.	614-885-7643
PA	Pittsburgh, Marlow Assocs.	412-367-8886
TX	Richardson, Jim D. Gray & Assocs.	214-699-9976
WI	Menomonee Falls, Walter M. Braun & Assocs.	414-251-8685

STAFFALL INC., 7 Woodland St., Providence, RI 02908, Tel: 401-351-8282, TWX: 710-381-6964; Empl.: 25

STAINLESS, INC., 3rd St., N. Wales, PA 19454, Tel: 215-699-4871, TWX: 510-661-8097; Empl.: 80; *Sls. Mgr.:* Jess C. Rodriguez

STANCOR/HAMILTON STANDARD CONTROLS, 131 Godfrey St., Logansport, IN 46947, Tel: 219-722-2244, TWX: 810-295-0699; FSC No.: 80089; *Sls. Mgr.:* Hubert Daubs ..... **A•2289-2297; B•1447**

STANDARD CONDENSER CORP., 1065 W. Addison St., Chicago, IL 60613, Tel: 312-327-5440; FSC No.: 97419; *Sls. Mgr.:* B. P. McLean

STANDARD ENERGY, Div. WBH Scientific, Inc., Rte. 32, Greenville, NY 12083, Tel: 518-966-4197, Telex: 754180; *Sls. Mgr.:* Gary Hanington ..... **D•1844-1845**

Local Sales Offices & Reps

CT	Cheshire, Meco Co.	203-271-0026
TX	Dallas, P.J. Scanlon Co.	214-231-4661

STANDARD ENGRG., 44800 Industrial Dr., Fremont, CA 94538, Tel: 415-657-7555, TWX: 910-381-6048; Empl.: 40

STANDARD ENVIRONMENTAL SYSTEMS, INC., 383 Minnisink Rd., Totowa, NJ 07512, Tel: 201-256-2200, TWX: 710-988-5722; Empl.: 50

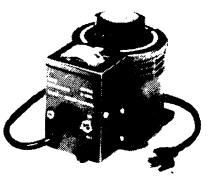
STANDARD GRIGSBY, INC., Gordos International Corp., 920 Rathbone Ave., Aurora, IL 60507, Tel: 312-844-4300, TWX: 910-232-3138; Empl.: 350; *Sls. Mgr.:* Lou Falco; *Dist. Mgr.:* Ed Barry ..... **B•1568-1570**

Local Sales Offices & Reps

AZ	Tempe, Gassner & Clarke Co.	602-968-9037
CA	Laguna Hills, Jack Fitch & Assocs.	714-951-0196
CA	Milpitas, Maxim Elctrn. Sls.	408-946-6001
NJ	Mountain Lakes, Components for Elctrns.	201-334-2921
NC	Peachland, D. P. McDonald	704-272-8747
CT	East Haven, Eagle Assocs.	203-467-6542
FL	Casselberry, Southern Elctrn. Mktg.	305-831-2822
IN	Indianapolis, Wilson Tech. Sls.	317-298-3345
IA	Marion, Rep Assocs.	319-373-0152
KS	Parker, S. W. Wollard	918-898-6552
LA	Hammond, Design Mktg.	504-294-3076
MI	Ann Arbor, R. L. Rowe & Assocs.	313-995-8711
MI	Livonia, Luebbe Sls.	313-477-3131
MN	Bloomington, Murnco	612-854-4161
NY	East Northport, Comps. for Elctrncs.	516-266-5020
OH	Cincinnati, Luebbe Sls.	513-891-5770
OK	Tulsa, Design Mktg.	918-622-7744
OR	Aloha, Micro Sls.	513-642-1818
PA	Pittsburgh, Luebbe Sls.	412-931-0414
TX	Dallas, Design Mktg.	214-680-9767
WA	Bellevue, Micro Sls.	206-451-0568

Refer to Gordos Corporation, Bloomfield, New Jersey for Authorized Distributor information.

STANDARD GRIGSBY INC., W. Gunther GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 51, West Germany, Tel: 0911-65521, Telex: 622351

STACO ENERGY PRODUCTS CO.
Variacs
Authorized Distributors
RAG ELECTRONICS, INC.
New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing
21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500
CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225

Model 3PN1010V

the connection for...

Stantel Components

distributor specialists
632 Santa Monica Blvd.
Santa Monica,
California 90401

(213) 393-9666

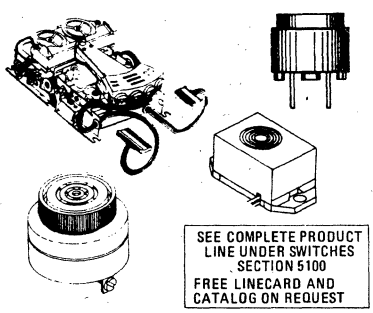
A regional distributor of quality electronic components

star micronics·inc
FULL LINE
AUTHORIZED DISTRIBUTOR

E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

STANDARD LOGIC, 2215 S. Standard Ave., Santa Ana, CA 92707, Tel: 714-979-4770, TWX: 910-595-1707; Empl.: 150; *Sls. Mgr.:* B. L. Billington

STANDARD MICROSYSTEMS, 35 Marcus Blvd., Hauppauge, NY 11788, Tel: 516-273-3100, TWX: 510-227-8898; FSC No.: 53848; Empl.: 700; *Sls. Mgr.:* J. P. Chalmin; *Dist. Mgr.:* Steve Brander

STANDARD PNEUMATIC MOTOR, Box 10530, Reno, NV 89510, Tel: 702-329-6311, TWX: 910-935-6031; FSC No.: 53623; Empl.: 125

STANDARD POWER, INC., 1400 S. Village Way, Santa Ana, CA 92705, Tel: 714-558-8512, TWX: 910-595-1760; *Sls. Mgr.:* Sydele M. Petch; *Dist. Mgr.:* Sydele M. Petch

STANDARD WIRE & CABLE CO., 2345 Alaska Ave., El Segundo, CA 90245, Tel: 213-536-0006, Telex: 65-3423, TWX: 910-340-6758; FSC No.: 04946; Empl.: 125; *Sls. Mgr.:* J. Gaither; *Dist. Mgr.:* Jerry Gaither

STANDEX ELCTRNS., 4538 Camberwell Rd., Cincinnati, OH 45209, Tel: 513-871-3777, Telex: 212066; Empl.: 1,039; *Sls. Mgr.:* Charles C. Johnson ..... **A•1638-1639; B•1448**

Local Sales Offices & Reps

AL	Hunstville, Rob Radkley/Mitscher Co.	205-882-6050
CA	Los Altos, Frauman Assocs.	415-941-0660
CA	Los Angeles, Ellard Strassner Co.	818-242-8823
FL	Altamonte Springs, Jack Alexander/Mitscher Co.	305-788-6844
GA	Lawrenceville, Tom Hill/Mitscher Co.	404-923-3239
IL	Arlington Hts, Brainard-Wilson Mktg.	312-437-2700
IN	Brownsburg, William Deem	317-852-8006
IA	W. Des Moines, Jerry Skinner/Nevco	515-225-9866
MA	Southboro, KSA of New England	617-485-9432
MI	Farmington Hills, WR Hummon	313-474-0661
MN	Bloomington, Quantum Sls.	612-884-4700
MO	N.Kansas City, Nevco, Inc.	816-421-1751
NY	Buffalo, RW Mitscher	716-633-7970
NY	Jamaica, S-J Sls.	718-291-3232
NY	Rochester, Jim Baker/Mitscher Co.	716-227-0839
NY	Utica, Doug Hendrick/Mitscher Co.	315-733-0171
NC	Raleigh, RW Mitscher Co.	919-848-0941
OH	Cincinnati, Standex	513-871-3777
OH	Dayton, JC Hofstetter	513-296-1010
OR	Portland, Components Tech.	503-292-1518
PA	Wynnewood, Metz-Benham Assoc.	215-896-7300
TN	Johnson City, Peg Pickens/Mitscher Co.	615-929-7258
TX	Arlington, Hite Electonic Sls.	817-265-2912
VA	Midlothian, Jeff Ward/Mitscher Co.	804-744-4676
WI	Waukesha, Brainard-Wilson Mktg.	414-797-7940
Can	Oakville, Anbak Sls.	416-842-6630

Local Distributors

CA	San Carlos, Logan Electrn. Supp.	415-594-0700
CA	Santa Ana, Norstan Elctrns. Inc.	714-250-4903
CT	North Haven, Elm State Elctrns. Inc	800-243-0049
IL	Crystal Lake, Sub-Sem, Inc.	815-459-4139
MA	Westford, Electronic Specialties	617-486-8495
NJ	Nutly, Vantage Comp.	201-667-1840
SC	Florence, Anco Elctrns.	803-669-3956

STANFORD APPLIED ENGRG. INC., 3520 De La Cruz Blvd., Santa Clara, CA 95050, Tel: 400-988-0700, Telex: 4990877; Empl.: 500; *Sls. Mgr.:* Dick Hudspeth/Dick Foley/Iver Sonderby; *Dist. Mgr.:* Dick Hudspeth

Local Sales Offices & Reps

Filter/Power Devices

CA	San Diego, Stanford Applied Engrg.	619-569-6959
NY	Nelville, Stanford Applied Engrg.	516-420-8027

Interconnections & Packaging

CA	Santa Clara, Stanford Applied Engrg.	408-988-0700
CO	Boulder, Stanford Applied Engrg.	303-530-1900
CT	Farmington, Stanford Applied Engrg.	203-677-6046

STANFORD TELECOMMUNICATIONS, INC., 2421 Mission College Blvd., Santa Clara, CA 95054, Tel: 408-748-1010, TWX: 910-339-9531; FSC No.: 61362; Empl.: 300 +; *Sls. Mgr.:* J. A. Kirby

STANLEY/AC INTERFACE, 17911 Sampson Lane, Costa Mesa, CA 92647, Tel: 714-841-6090, Telex: 655328; Empl.: 24; *Sls. Mgr.:* R. D. Henwood; *Dist. Mgr.:* Wayne Neal

STANLEY ELCTRNS., INC., 592 Oak St., Copiague, NY 11726, Tel: 516-842-8866; FSC No.: 61544; Empl.: 6; *Sls. Mgr.:* Isabel Goldberg

Local Sales Offices & Reps

CA	Santa Ana, Electrotechnical Sls.	714-546-9305
MD	Baltimore, R. A. Wafer Assocs.	301-744-1133
MN	Edina, J. H. Hanson Co.	612-893-9960
NY	Great Neck, M C S Assocs.	516-487-3966
OH	Dayton, L. D. Bruno Co.	513-434-1847

STANLEY-VIDMAR, Stanley Works, 11 Grammes Rd., Allentown, PA 18103, Tel: 215-797-6600; *Sls. Mgr.:* Ernie Gitlin

STANPAT PRODS., 366 Main St., Port Washington, NY 11050, Tel: 516-883-8400; Empl.: 25

STANTEL COMPONENTS, 636 Remington Rd., Schaumburg, IL 60195, Tel: 312-490-7150, TWX: 910-291-1280

STANTON MAGNETICS, INC., Terminal Dr., Plainview, NY 11803, Tel: 718-445-0063, 516-349-0235, TWX: 510-221-1845; Empl.: 300; *Sls. Mgr.:* Joseph S. Woodstock

STANTRON

STANTRON DIV., 6900 Beck Ave., N. Hollywood, CA 91605, Tel: 818-875-0800, TWX: 910-499-2177; FSC No.: 06514; Empl.: 125; *Sls. Mgr.:* G. A. Tessier ..... **C•1083**

Local Sales Offices & Reps

	Bradenton	813-792-7899
AZ	Phoenix, Shefler-Kahn Co.	602-257-9015
AZ	Tucson, Shefler/Kahn Co.	602-293-7181
CA	Los Angeles, Landa/Minyard	213-879-0770
CA	Pleasanton, Moulthrop Sls.	415-463-0450
CA	San Diego, Landal Minyard	619-942-1086
CA	Santa Ana, Landal Minyard	714-543-7805
CO	Golden, J. F. Hurlbut Co.	303-279-7796
CT	Farmington, Ray Perron & Co.	203-673-4825
CT	New Melford, Ray Perron & Co.	203-355-0082
GA	Jonesboro, Wallace Elctrn. Sls.	800-334-3578
HI	Honolulu, J.C. Elctrns.	808-841-5526
IL	Chicago, Berndt Assocs.	312-283-0713
IN	Carmel, Berndt Assocs.	317-844-0114
MA	Needham, Ray Perron & Co.	617-449-6162, 800-225-4280
MN	Minneapolis, Berndt Assocs.	612-546-2021
MS	Hazelwood, Stone & Assocs.	314-895-4565
NH	Dover, Ray Perron & Co.	603-742-2321
NJ	Pennsauken, Sci-Rep	609-662-5222
NJ	Wayne, G.T. Assocs.	201-694-6040
NM	Albuquerque, Shefler-Kahn Co.	505-265-7049
NY	Rochester, Gislason Sls.	716-328-7400
NC	Kernersville, Wallace Elctrn. Sls.	919-996-2742
OH	Cincinnati, Kenneth C Hoffman Jr., Co.	513-931-1686
OR	Beaverton, Don Smith Sls.	503-643-8020
TX	Austin, Barry Sls.	512-837-3616
TX	Houston, Barry Sls. Co.	713-784-5860
TX	Richardson, Barry Sls. Co.	214-234-0255
VA	Fairfax, Sci-Rep	703-385-0600
WA	Seattle, D. Smith Sls.	206-633-3160

STAR-KITS, P.O. Box 209, Mt. Kisco, NY 10549, Tel: 914-241-0287

star micronics·inc
COMPONENTS DIVISION

STAR MICRONICS, INC., Components Div., 70-D Ethel Rd. W., Piscataway, NJ 08854, Tel: 201-572-9512; Empl.: 120; *Sls. Mgr.:* R. Messer .. **D•1040-1044, 1072**

Local Sales Offices & Reps

AL	Huntsville, REMCO	205-533-3763
AZ	Phoenix, MacDonald Assocs.	602-998-1848
CA	Fullerton, Groh Assocs.	714-738-7105
CA	San Diego, Groh Assocs.	619-696-0054
CA	San Jose, G. R. McKnight Co.	408-942-0880
CO	Englewood, Martec Assocs.	303-741-2704
FL	Casselberry, Southern Elctrn. Mktg.	305-831-2822
FL	Ft. Lauderdale, Southern Elec. Mktg.	305-475-3686
GA	Atlanta, REMCO	404-447-6937
IL	Elk Grove Village, Parcom, Inc.	312-338-6360

IN Indianapolis, Midstates Mktg. 317-639-9999
IA Cedar Rapids, Elctrn. Innovators 319-362-2217
KS Shawnee Mission, Microtronics 913-262-1444
MD Baltimore, Adcour 301-521-3536
MA Sharon, Adcour 617-784-8123
MI Southfield, Component Assocs. 313-557-3232
MN Eden Prairie, Elctrn. Innovators 612-941-0830
MO St. Charles, Microtronics, Inc. 314-946-8500
NJ Sparta, Instr. & Equip. 201-729-4293
NY Rockaway Park, Metropolitan Sls. 718-634-3100
NC Greensboro, Magaro & Assocs. 919-294-4783
OH Bedford, A.S.A. Assocs. 216-662-6080
OR Portland, Controltek Sls. 503-641-0877
TX Houston, Repmaster-Houston 713-692-8204
TX Richardson, McCoy Assocs. 214-238-1017
UT Bountiful, Martec Assocs. 801-298-9341
WA Seattle, Controltek 206-467-0622
WV Spokane, Controltek 509-922-2971
Can Markham, Lenbrook 416-477-7722
Can Calgary, Alberta, Lenbrook 403-252-3577

Local Distributors

CA Costa Mesa, Marvac 714-540-3280
CA Hayward, Kea Elec., Inc. 415-887-2900
CA Los Angeles, Elect. Switches 213-660-1301
CA San Diego, Tauber Elctrns. 619-274-7242
CA Santa Clara, Waltronics Sls. 408-727-1200
FL Davie, Arco Dist, Inc. 305-473-2550
IL Chicago, NEP Elctrns. 312-625-8400
IL Wheeling, Hawk Elctrns. 312-459-4030
MA Sharon, Adcour 617-784-8123
MI Brighton, AP Sls. Co. 313-229-6550
MI Grand Rapids, S. F. Elec. Supp., Inc. ... 616-459-0126
NJ Sparta, Instr. & Equip. 201-447-3525
NJ Sparta, Instrument & Equip. 201-729-4293
NJ Waldwick, Production Supp. & Equip. 201-447-3525
NY Rockaway Park, Metropolitan Sls. 212-634-3100
OH Cincinnati, United Radio Inc. 513-761-4030
OR Portland, United Radio Supp. 503-233-7151
TX Channelview, R. T. Henry Elctrns. 713-452-4451
TX Dallas, Foxfire 214-353-9543
TX Dallas, Wholesale Elec. Supp. 214-824-3001
TX Houston, Copper Alarm Supp. Co. 713-868-1794
WI New Berlin, NEP Elctrns. 414-785-9100
Can Markham, Ont., Lenbrook Elctrns. 416-477-7722

STAR PORCELAIN, 71 Muirhead Ave., Trenton, NJ 08638, Tel: 609-392-3154; Empl.: 100; *Sls. Mgr.:* Art Hobson

STAR-TRON CORP., 58 Curtis St., Providence, RI 02909, Tel: 401-274-5090, Telex: 929490; FSC No.: 32494; Empl.: 50; *Sls. Mgr.:* Anna Coski

STATEK

STATEK CORP., 512 N. Main St., Orange, CA 92668, Tel: 714-639-7810, Telex: 67-8394, TWX: 910-593-1355; FSC No.: 51791; Empl.: 100; *Sls. Mgr.:* J. Ownby ..... **A•1441-1445**

Local Sales Offices & Reps

AL Huntsville, MacKay Smith & Assocs. .. 205-539-8000
AZ Phoenix, Eltron 602-266-2164
CA El Toro, Martronix 714-858-0632
CA Mountain View, Weseloh/Swanson & Assocs. 415-961-0565
CA San Diego, Mesa Engrg. & Sls. Assocs. 619-278-8021
CO Denver, Elcom 303-337-2300
FL Madeira Beach, MacKay, Smith & Assocs. 813-393-7144
FL Orlando, MacKay, Smith & Assocs. ... 305-423-4353
GA Norcross, MacKay, Smith & Assocs. .. 404-449-7444
IL Northbrook, Raines & Assocs. 312-498-0890
IN Fort Wayne, M/S Sls. & Assocs. 219-436-3023
IN Indianapolis, M/S Sls. & Assocs. 317-257-8916
KS Overland Park, Thomas L. Dowell & Assocs. 913-648-7373
MD Columbia, Professional Reps. 301-992-7460
MA Woburn, Radian Assocs. 617-933-7386
MO St. Louis, Thomas L. Dowell & Assocs. 913-648-7373
NJ Bellmawr, TAI Corp. 609-933-2600
NJ Manhasset, Win-Cor Elec. Sls. Corp. .. 516-627-9474
NY Syracuse, PI' Tronics 315-455-7346
NC Charlotte, MacKay, Smith & Assocs. .. 704-372-1188
NC Raleigh, MacKay, Smith & Assocs. 919-851-5000
TX Austin, Norcom 512-451-2757
TX Dallas, Norcom 214-386-4888
TX Houston, Norcom 713-778-0392
UT Salt Lake City, Elcom 801-485-7415
WA Redmond, Halbar Assocs. 206-882-0990
WA Vancouver, Halbar Assocs. 206-696-0170

Local Distributors

AL Huntsville, Contact Elctrns. 205-881-9321
CA Irvine, Ryno Elctrns. 714-261-2500
CA Mountain View, Target Elctrns. 415-961-1170
CA San Diego, Ryno Elctrns. 619-453-8430
FL Longwood, Intertec 305-834-7777
IL Palatine, OHM Elctrns. 312-359-5500
IN Indianapolis, Mar Elctrns., Inc. 317-875-4510
MD Columbia, Aztech Elctrns. 301-995-1760
MA Woburn, First Frequency 617-935-3885
MO St. Louis, Olive Elctrns. 314-426-4500
NY Buffalo, Summit Distrs. 716-884-3450
TX Richardson, Ewing Elctrns., Inc. 214-231-6725

STATE OF THE ART, INC., 2470 Fox Hill Rd., State College, PA 16801, Tel: 814-355-8004 ... **A•1949-1951**

STATIC, INC., Rte. 113 & Mensch Rd., P.O. Box 80, Skippack, PA 19474, Tel: 215-584-9600, Telex: 846079; Empl.: 50; *Sls. Mgr.:* H. L. Cauffman

STAVER CO., INC., 47 Saxon Ave., Bay Shore, NY 11706, Tel: 516-666-8000, TWX: 510-227-6142; Empl.: 140; *Sls. Mgr.:* Arnold Lazarus ..... **B•1105-1107**

Local Sales Offices & Reps

CA Woodland Hill, R. H. McDonald & Assocs. 213-348-3766
IL Lombard, RMP/McBride Corp. 312-932-9090
MA Scituate, Jack Goss 617-545-6327
MI Ann Arbor, Elliott Sls. 313-662-4087
MN St. Louis Park, Lestronix 612-926-8466
NH Hancock, Eisenbeis Sls. 603-357-4892
NY East Northport, Levison Sls. Co. 516-266-5020
NY Manlius, Bowser & Sapecky Assocs. .. 315-682-8885
NC Cary, Tom G. Santel 919-467-7595
OK Tulsa, Jerry Robinson & Assocs. 918-492-0390
OR Beaverton, Quest Mkgt. 503-641-7377
PA Colmar, Eastern Scientific Mktg. 215-822-0157
PA Sewickley, T. H. Stewart Co. 412-741-8665
SC Mauldin, Carl Hart 803-288-2323
TX Houston, Cunningham Co. 713-461-4197
VA Portsmouth, F.B.D. Sls. 804-484-3162
WA Bellevue, Quest Mkgt. 206-747-9424

STD MICROSYSTEMS, 399 Sherman Ave., Palo Alto, CA 94306, Tel: 415-327-6800; *Sls. Mgr.:* Gary Whittaker; *Dist. Mgr.:* Gary Whittaker

STENNING INSTRMENTS, INC., 671 Enchanted Way, Pacific Palisades, CA 90272, Tel: 213-459-2930; *Sls. Mgr.:* Charles Stenning

STEP ENGINEERING, P.O. Box 61166, Sunnyvale, CA 94088, Tel: 408-733-7837, TWX: 910-339-9506; Empl.: 30; *Sls. Mgr.:* Stan Trumbull

STERLING INSTR., Div. Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040, Tel: 516-328-3300, TWX: 510-223-0642; Empl.: 150

STERLING TRANSFORMER CORP., 510 Driggs Ave., Brooklyn, NY 11211, Tel: 718-782-4200; FSC No.: 97102; Empl.: 45; *Sls. Mgr.:* P. H. Odessey ..... **A•2299-2303**

STETTNER ELCTRNS., 6135 Airways Blvd., Chattanooga, TN 37421, Tel: 615-892-0291, TWX: 810-573-5224; FSC No.: 52763; *Sls. Mgr.:* Ralph S. Souders ..... **A•1175**

Local Sales Offices & Reps

AZ Scottsdale, Western High Tech. Mktg. 602-949-0873
CA Cupertino, F & F Assocs., Inc. 408-446-2349
CA San Marcos, Stettner California, Inc. 619-471-0124
CO Aurora, Mountain View Mktg. 303-360-9641
CT Ridgefield, Phoenix Sls. Co. 203-438-9644
FL Orlando, Stettner Elctrns.-Florida 305-291-7756
IL Rosemont, Stettner Central, Inc. 312-671-4208
IN Fort Wayne, J & B Engrg. Sls. 219-483-2813
MA Stow, Today Comp. Sls. Corp. 617-897-7500
MO Kansas City, Delltron Co., Inc. 816-436-6445
MO St. Louis, Delltron Co., Inc. 314-769-4779
NJ Englewood, Sprung & Nussbaum, Inc. 201-569-5666
NJ Medford, Champion Elctrn. Sls. Co. 609-983-0932
NM Albuquerque, Western High Technlg. Mktg. 505-262-2461
NY Cazenovia, S.T. Woolard Co. 315-655-8145
OR Beaverton, Luscombe Engrg. Co., NW 503-636-6664
TN Chattanooga, Stettner Elctrn Sls. 615-892-0291
TX Richardson, Lelko-Paulsen Sls. Co. 213-680-9588
UT Murray, Mountain View Mktg. 801-264-8488
Can Concord, Ont., Stettner Canada, LTD. 416-661-5190

Local Distributors

AZ Phoenix, Arizona Comps. 602-269-5655
CA Garden Grove, National Capacitor Corp. 213-598-9611
CA San Jose, Capacitors Comps. 408-946-7676
CA San Marcos, California Comps. 619-471-0123
CA Sunnyvale, Capsco Sls., Inc. 408-734-3020
CA West Covina, Component Svc., Inc. ... 818-960-4761
CO Englewood, Industrial Elctrns., Inc. 303-694-9444
FL Orlando, South-East Comps. 305-298-0321
IL Rosemont, Central Comps. 312-671-4787
MO St. Louis, RIC-Tronics 314-576-9816
NJ Garfield, B & R Elctrns., Inc. 201-825-1304
NJ Rockaway, Tonar Inds., Inc. 201-586-9000
NY Lynbrook, Varitech Elctrns. 516-593-9300
NY Rochester, Masline Elctrns. 716-546-5373
PA Norristown, Century Elctrn.-Comps., Inc. 215-631-5400
PA York, Electronic Comps. for Inds. 717-843-8971
TX McKinney, Prime Distrb. Co. 214-231-0170
UT Salt Lake City, Standard Supp. Co. 801-486-3371
Can Concord, Ont., Stettner-Canada 416-661-5190

COMPUTER PRODUCTS™
POWER CONVERSION

STEVENS-ARNOLD DIV., Computer Prods., Inc., 7 Elkins St., So. Boston, MA 02127, Tel: 617-268-1170, Telex: 95-1465 STEARCO, TWX: 710-339-0855; FSC No.: 80640; Empl.: 334; *Sls. Mgr.:* John T. Parent ..... **D•1446, 1552-1553, 1573-1585**

Refer to Computer Products, Inc., Pompano Beach, FL for sls. offices and reps. and for distrs. listings.

STEVENS PRODUCTS, INC., 128 N. Park St., E. Orange, NJ 07019, Tel: 201-672-2140; Empl.: 50; *Sls. Mgr.:* John Thomson

STEWARD, D. M., MFG. CO., P.O. Box 510, Chattanooga, TN 37401, Tel: 615-867-4100, Telex: 558490; Empl.: 185; *Sls. Mgr.:* Arlin Grant

STOCK DRIVE PRODS., Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040, Tel: 516-328-0200, 328-3300, TWX: 510-223-0642; Empl.: 228; *Sls. Mgr.:* Murray Ores ..... **B•1191; C•1674**

Local Sales Offices & Reps

AL Huntsville, Par Marketing, Inc. 205-837-6534
CA Chatsworth, Western Comp. Sls. 818-882-6226
CO Wheatridge, Manufacturers Mktg. 303-425-9569
FL St. Petersburg, Tech-Rep Assoc., Inc. 813-577-2779
IL Glen Ellyn, Rockford Controls Co. 312-469-6016
MD Randallstown, Imagitron Sls. Co. 301-521-2020
MA Lowell, Underwood Sls. 617-256-8191
MI Southfield, R.C. Nordstrom & Co. 313-559-7373
MN St. Paul, Northstar Motion & Control .. 612-770-5311
NY Clark Mills, KLM-Garner, Inc. 315-853-6126
NY New Hyde Park, SDP 516-328-3300
OH Euclid, Rockford Controls Ohio, Inc. ... 216-731-5250
TX Richardson, Zonk & Associates 214-238-7651
WA Seattle, Northmar Inc. 206-524-5170

Local Distributors

CA San Carlos, Logan Elctrns. 415-594-0700

STOELTING CO., 1350 S. Kostner Ave., Chicago, IL 60623, Tel: 312-522-4500; Empl.: 50; *Sls. Mgr.:* D. A. Peterson

STOLZBERG RESEARCH, INC., 3 Seabrook Court, Stony Brook, NY 11790, Tel: 516-751-4277; Empl.: 4; *Sls. Mgr.:* Bruce Davis; *Dist. Mgr.:* Bruce Davis

STONE CITY PRODUCTS CO., 1206 Seventh Street, Bedford, IN 47421, Tel: 812-275-3373, Telex: 810-350-0321; FSC No.: 09166; Empl.: 85

STORM PRODUCTS CO., 116 Shore Drive, Hinsdale, IL 60521, Tel: 312-323-9121, TWX: 910-651-0850; *Sls. Mgr.:* John W. Holland

STOW LABS., INC., Kane Ind'l. Dr., Hudson, MA 01749, Tel: 617-562-9347, Telex: 94-8330; Empl.: 15

STRATEGIC SYS. DIV. POWER SYS. OPERATIONS, GTE Prods. Corp. Sylvania Sys. Grp., 520 Winter St., Waltham, MA 02254, Tel: 617-466-3000, Telex: 951-953, TWX: 710-290-0376

STRAWBERRY TREE COMPUTERS, 949 Cascade Dr., Sunnyvale, CA 94087, Tel: 408-736-3083

STREET ELECTRONICS CORP., 1140 Mark Ave., Carpinteria, CA 93013, Tel: 805-684-4593; *Dist. Mgr.:* Rich Jenkins

STROBE, INC., 897 Independence Ave., Mountain View, CA 94043, Tel: 415-969-5130

STRONGBOX, P.O. Box 84508, Los Angeles, CA 90073, Tel: 213-204-0472; FSC No.: 2T043; Empl.: 3; *Sls. Mgr.:* Larry Martinek ..... **C•1084-1085**

Local Sales Offices & Reps

NM	Albuquerque, Betatron	505-344-2381

STRUCTURED DESIGN, INC., 1700 Wyatt Dr. # 7, Santa Clara, CA 95054, Tel: 408-988-0725, Telex: 172931; *Sls. Mgr.:* Noel C. Hendricks; *Dist. Mgr.:* Noel C. Hendricks

STRUTHERS-DUNN, INC., Lamb's Rd., Pitman, NJ 08071, Tel: 609-589-7500, TWX: 510-686-7510; FSC No.: 78290;78290; Empl.: 700; *Sls. Mgr.:* W.L. Capewell; *Dist. Mgr.:* Walter Woodward ..... **B•1449**

Local Sales Offices & Reps

AL	Huntsville, Rep, Inc.	205-881-9270
AZ	Phoenix, Hecht, Henscher & Assocs.	602-275-4411
AR	Little Rock, Controls & Power	501-851-3048
CA	Culver City, DeAngelo, Rothman & Co.	213-827-2202
CA	Palo Alto, Mollard Mktg.	415-961-0456
CA	San Diego, Struthers-Dunn	619-560-9922
CO	Denver, Lindberg Co.	303-758-9033
CT	Bloomfield, Zaslow Sls. Co.	203-242-7781
FL	Miami, Ludlum Assocs.	305-592-6524
FL	Orlando, Ludlum Assocs.	305-894-7761
GA	Tucker, Rep, Inc.	404-938-4358
IL	Glen Ellyn, Rockford Controls Co.	312-469-6016
IN	Indianapolis, Rockford Controls Co.	317-248-2518
IA	Bettendorf, BSI, Ltd.	319-355-5623
KS	Wichita, Avionics Engrg.	316-264-6201
LA	Lafayette, Kemp Engrg.	318-269-9452
MD	Baltimore, Struthers-Dunn, Inc.	609-589-7500
MI	Southfield, L. H. Dickelman Co.	313-353-8210
MN	Minneapolis, HMR, Inc.	612-888-2122
MO	Maryland Heights, Hitt & Assocs.	314-878-5404
NJ	Pitman, Struthers-Dunn, Inc.	609-585-7500
NJ	West Caldwell, Grimm, Siegel Assocs.	201-575-9300
NM	Albuquerque, Hecht, Henschen & Assocs., Inc.	505-821-3979
NY	Buffalo, H. C. Zang Agency	716-877-3677
NC	Charlotte, J. Rudisill Assocs.	704-377-6901
OH	Cincinnati, Struthers-Dunn	513-772-3108
OH	Strongsville, Struthers-Dunn	216-572-1333
PA	Pittsburgh, R. F. Clark Co.	412-242-9500
TX	Bedford, W. Pat Fralia Co.	817-267-3577
TX	Houston, W. Pat Fralia Co	713-772-1572
WA	Seattle, Eicher-Richards Co.	206-523-7888
Can	Scarborough, Ont., Renfrew Elec. Co., Ltd.	416-752-4611

ST-SEMICON, 415 N. College Ave., P.O. Box 609, Bloomington, IN 47402, Tel: 812-332-1435, TWX: 810-351-1384; Empl.: 100; *Sls. Mgr.:* Robert Muldoan

SUCKLE CORP., 733 Davis St., Dept. EM, Scranton, PA 18505, Tel: 717-346-3871; Empl.: 200; *Sls. Mgr.:* M. H. Brenner

SULLINS ELCTRNS. CORP., P.O. Box 189, 801 Mission Rd., San Marcos, CA 92069, Tel: 619-744-0125, TWX: 910-322-1472; Empl.: 100; *Sls. Mgr.:* Chip Bruss; *Dist. Mgr.:* Chip Bruss ..... **C•1518-1521**

Local Sales Offices & Reps

AL	Decatur, Tenn Tech, Inc.	205-350-0630
AZ	Scottsdale, Harris & Croy Sls.	602-951-9121
AZ	Tucson, Harris & Croy Sls.	602-575-5109
CA	Canoga Park, K.C.P. Ent.	818-340-8086
CA	La Canada, K.C.P. Ent.	818-790-3939
CA	San Diego, Sun Harbor Mktg.	619-695-2994
CA	Sunnyvale, Schwerin & Merril, Inc.	408-735-7900
CO	Arvada, Cluff & Assocs.	303-423-9354
CT	New Canaan, Impact Sls.	203-972-1458
GA	Atlanta, Tenn Tech., Inc.	404-622-5784
IL	Elmhurst, Utronix Sls., Inc.	312-834-1100
IN	Indianapolis, Sukup & Cox	317-253-5501
IA	Marion, M-S-B Assoc.	319-377-6261
KS	Shawnee Mission, M-S-B Assoc.	913-432-2131
MD	Laurel, CSDS, Inc.	301-490-3800
MA	Canton, Impact Sls.	617-821-1500
MN	Minneapolis, RK Sls. Assocs., Inc.	612-786-5713
MO	St. Charles, M-S-B Assoc.	314-946-5577
NJ	Medford, Comp. Consultants	609-654-5300
NY	Lynbrook, HLJ Comp-Tech	516-599-2999
NC	Tenn Tech., Inc.	919-266-3610
OH	Beachwood, Elctrn. Salesmasters, Inc.	216-831-9555
OR	Portland, Electronic Mktg. Grp.	503-252-0610
TX	Austin, T.L. Mktg.	512-453-4586
TX	Dallas, T.L. Mktg.	214-357-1752
UT	Salt Lake City, Cluff & Assocs.	801-486-7297
WA	Redmond, Elctrn. Mktg. Grp.	206-882-0962
WI	Mequon, Artmor Ltd.	414-241-4040

Local Distributors

AL	Huntsville, Contact Elctrns., Inc.	205-881-9321
AL	Huntsville, RM Elctrns.	205-852-1550
AZ	Phoenix, Arizona Comps.	602-279-9446
AZ	Phoenix, Camco Elctrn. Dist.	602-269-6201
AZ	Scottsdale, Comp. Tech., Inc.	602-998-1484
CA	Burbank, Atwater Elctrns.	818-841-9050
CA	San Diego, Sigma Elctrns.	619-565-2000
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Torrance, Cypress Elctrns.	213-533-6005
CO	Arvada, Denver Wintronics	303-431-7161
CO	Denver, C.S.I.D.	303-292-9594
CO	Wheatridge, Cypress Elctrns.	303-431-2622
FL	Hialeah Gardens, Baron Elctrns. Sls. Co.	305-556-1300
FL	Miami, Elctrn. Equip.	305-871-3500
FL	Winter Park, Deanco	305-671-5100
GA	Atlanta, Ack Radio Supp.	404-351-6340
GA	Marietta, Deanco	404-429-0126
IL	Carol Stream, Lectro Comps.	800-323-2282
IL	Chicago, NEP Elctrns.	312-625-8400
IL	Melrose Pk., Belford Elctrns.	312-865-2400
IL	Wheeling, Hawk Elctrns.	312-459-4030
IN	Ft. Wayne, Graham Elctrns.	317-634-8202
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	Indianapolis, RM Elctrns.	317-291-7110
KS	Shawnee Mission, M-S-B Assocs., Inc.	913-432-2131
MD	Gaithersburg, Axis Elctrns., Inc.	301-840-9640
MD	Gaithersburg, Deanco	301-948-5444
MD	Timonium, M x 4 Elctrns., Inc.	301-251-1192
MA	Canton, Impact Sls.	617-821-1500
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MI	St. Clair Shores, Spemco	313-771-2700
MN	Minneapolis, Glenmark	612-941-4825
MO	Independence, Ragon Elctrns.	816-254-3410
NJ	Audobon, Action Elctrns.	609-858-2450
NJ	Bellmawr, Mid-Atlantic Elctrns.	609-931-5303
NJ	Fairfield, Deanco	609-325-8292
NM	Albuquerque, Electronic Parts	505-293-6161
NM	Las Cruces, Electronic Parts	505-523-4578
NY	Ithaca, Deanco	607-257-4444
NY	Lynbrook, Forejay Assocs.	516-599-2999
NC	Charlotte, Southeastern Elctrns.	704-523-1122
NC	Durham, Southeastern Elctrns., Inc.	919-688-8204
NC	Fayetteville, Southeastern Elctrns., Inc.	704-523-1122
NC	Raleigh, Southeastern Elctrns., Inc.	919-828-2311
OH	Cincinnati, Schuster Electr.	513-489-1400
OH	Solon, REH Elctrns.	216-248-1636
OH	Twinsburg, Schuster Elec. Co.	216-425-8134
OR	Portland, Dunn Elctrns.	503-285-0214
RI	Warwick, Cal-Greg Comps., Inc.	401-738-6170
TN	Chattanooga, Indl. Elctrns. Dist.	615-698-3413
TN	Knoxville, Indl. Electrns.	615-573-7135
TX	Addison, Connec/Tek, Inc.	214-733-4411
TX	Dallas, Cypress Elctrns.	214-869-1435
TX	Dallas, Off the Shelf Comps.	214-247-0052
TX	Dallas, RM Elctrns.	214-869-2080
TX	Garland, J&S Elctrns.	214-487-8808
UT	Salt Lake City, Kimball Elctrns.	801-328-2075
UT	Salt Lake City, Standard Supp. Co.	801-486-3371
VA	Annadale, Arcade Elctrns., Inc.	703-256-4610
WA	Seattle, Carlyle Techn. Sls.	206-575-6750
WI	Mequon, Lake-View Elctrns.	414-377-8250
WI	Milwaukee, Industrial Elctrns. Corp.	414-276-1212
WI	Oconomowoc, G.W. Elctrns., Ltd.	414-367-6003
Can	Pointe Claire, Que., A. R. Gray & Assocs.	514-694-6378

SUMITA OPTICAL GLASS MFG. CO., LTD., Box 105, 1766 Front Street, Yorktown Heights, NY 10598, Tel: 914-962-2055; FSC No.: 914-245-8706; *Sls. Mgr.:* Sy Berman

SUMITRONICS, INC., Sumitomo Corporation, 1270 Oakmead Pkwy. Ste. 201, Sunnyvale, CA 94086, Tel: 408-737-7683, Telex: 278869; FSC No.: 408-737-9189; *Sls. Mgr.:* Tak Kimoto

SUMMAGRAPHICS CORP., 35 Brentwood Ave., Fairfield, CT 06430, Tel: 203-384-1344, Telex: 964348; *Sls. Mgr.:* Anthony Joyce; *Dist. Mgr.:* Ron McClure

SUMMIT CAD CORP., 5222 FM 1960 W100, Houston, TX 77069, Tel: 713-440-1468, Telex: 792831; *Sls. Mgr.:* Gregg Young; *Dist. Mgr.:* Harold Thornton

SUMMIT ELCTRNS., 750 S. Sherman, Richardson, TX 75081, Tel: 214-231-1456; *Sls. Mgr.:* Jack W. Barry ..... **D•1846-1847**

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech	205-533-2100
AZ	Phoenix, MacDonald Assoc.	602-998-1848
CA	Agoura, Cal Rep	213-991-1940
CA	Sunnyvale, Sourcetronics	408-773-1931
CA	Sunnyvale, SourceTronics	408-773-1931
CA	Woodland Hills, Craig Assoc.	213-887-2444
CA	Woodland Hills, Craig Assocs.	213-887-2444
CO	Broomfield, Wescom Mktg.	303-741-4900
FL	Pompano Beach, Electrocraft	
FL	Winter Park, Electrocraft	305-628-4705
GA	Atlanta, Electro-Mech	404-447-6478
IL	Barrington, Omni Elctrns. Mktg.	312-381-9087
IL	Roselle, Omni Elctrns. Mktg.	312-351-2507
IN	Indianapolis, Wilson Tech. Sls.	317-298-3345
MD	Timonium, Heller Sales	301-252-4780
MD	Timonium, Heller Sls.	301-252-4780
MA	Braintree, R. F. Duffy	617-848-3550
MA	Braintree, R. F. Duffy & Assocs.	617-848-3550
MI	Detroit, Jack M. Thorpe	313-779-6363
MI	E. Detroit, Jack M. Thorp	317-779-6363
MN	Minneapolis, Electro Serve	612-338-3475
MN	Minneapolis, Electro-Serv	612-338-3475
MO	Hazelwood, Stone & Assoc.	314-895-4564
MO	Hazelwood, Stone & Assocs.	314-895-4564
NJ	N. Plainfield, T & K Sls.	201-755-2878
NJ	Upper Sadle River, Bob Cameron	201-825-1304
NM	Albuquerque, McDonald & Assoc.	505-883-0500
NY	Smithtown, T & K Sales	516-724-3456
NY	Smithtown, T & K Sls.	516-724-3456
NC	Raleigh, Electro-Mech	919-851-8165
OH	Cleveland, Arthur Baier Co.	216-461-6161
OH	Dayton, Arthur Baier Co.	513-276-4128
OK	Tulsa, Barry Sls.	918-749-7775
PA	Horsham, TMI	215-441-4300
TN	Nashville, Electro-Mech	615-885-0073
TX	Austin, Barry Sls.	512-837-3616
TX	Houston, Barry Sls.	713-784-5860
TX	Richardson, Barry Sls.	214-234-0255
Can	Mississauga, ON, T. W. Wilson Sls.	

SUMMIT ENGINEERING CORP., Box 938, Bozeman, MT 59715, Tel: 406-587-4511, TWX: 910-975-1950; Empl.: 300; *Sls. Mgr.:* Marty Connor

SUMX CORP., Box 14864, Austin, TX 78761, Tel: 512-835-0330, Telex: 910-350-5536; Empl.: 30; *Sls. Mgr.:* Wood Bouldin

SUNBANK ELCTRNS., 1740 Commerce Way, Paso Robles, CA 93446, Tel: 805-238-2840, TWX: 910-351-5805; FSC No.: 07418; Empl.: 260; *Sls. Mgr.:* Lou F. Holland; *Dist. Mgr.:* Robert Haldeman

SUNDSTRAND DATA CONTROL, Overlake Ind'l. Pk., Redmond, WA 98052, Tel: 206-885-3711, Telex: RCA 286144; Empl.: 2000

SUN ELECTRONIC SYSTEMS, INC., 1601 NW 38th Ave., Ft. Lauderdale, FL 33311, Tel: 305-587-5577; Empl.: 10; *Sls. Mgr.:* Ralph Raymond

SUN-FLEX CO., INC., 20 Pimentel Ct., Novato, CA 94947, Tel: 415-883-1221, Telex: 172-208; *Sls. Mgr.:* David Render; *Dist. Mgr.:* David Render

SUNOL SYSTEMS, 1187 Quarry Lane, Pleasanton, CA 94586, Tel: 415-484-3322, Telex: 703175; Empl.: 43; *Sls. Mgr.:* Sam Giarmo/Brad Baucus/Virginia Wurts; *Dist. Mgr.:* Dan McKenzie

SUN RESEARCH, INC., Box 210, Old Bay Rd., New Durham, NH 03855, Tel: 603-859-7110, TWX: 510-297-4444; *Sls. Mgr.:* Harvey D. Fox

SUNRISE ELECTRONICS, INC., 524 S. Vermont Ave., Glendora, CA 91740, Tel: 818-914-1926, TWX: 910-584-3847; *Sls. Mgr.:* Richard K. Armstrong

Distributor

SUNSHINE SCI. INSTR., 1810 Grant Ave., Philadelphia, PA 19115, Tel: 215-673-5600; *Sls. Mgr.:* Al Stiles ..... **D•1302**

pgs. **612, 618, 622, 624, 680, 690, 695, 701, 715, 723, 760, 781, 789, 805, 824.**

151 Ludlow St., Yonkers, NY 10705, Tel: 914-965-6906, Telex: 13-1584; Empl.: 112; *Sls. Mgr.:* M. Solomon, Mktg

SUPERIOR CABLE CORP., See Siecor Corp.

SUPERIOR CARBON PRODS., INC., 9115 George Ave., Cleveland, OH 44105, Tel: 216-883-4880; Empl.: 105; *Sls. Mgr.:* Paul Merrill Kling

SUPERIOR ELEC. CO., 383 Middle St., Bristol, CT 06010, Tel: 203-582-9561, Telex: 962-446, TWX: 710-454-0682; FSC No.: 58474; Empl.: 1000; *Sls. Mgr.:* H. W. Lorenson; *Dist. Mgr.:* A. Nicholson ... **A•2304-2305; B•1192-1193; C•1523; D•1968**

Local Sales Offices & Reps

CA	Burlingame, W. J. Purdy Co.	415-347-7701
CA	Carson, Superior Elec.	213-830-7750
CA	Santa Clara, Superior Elec.	408-748-7772
CO	Denver, W. J. Purdy Co.	303-753-6800
CT	Bristol, Superior Elec.	203-582-9561
FL	Apopka, G. F. Bohman Assocs.	305-886-1882
FL	Deerfield Beach, Power Solutions	305-428-8330
FL	Ft. Lauderdale, Bredesen & Assocs.	305-566-3289
HI	Honolulu, B. F. Wittenberg Co.	808-833-1602
IL	Glen Ellyn, Superior Elec.	312-858-2960
IA	W. Des Moines, JPS Assoc. Ltd.	515-225-0607
MA	Wellesley Hills, Superior Elec.	617-237-0750
MI	Detroit, Superior Elec.	313-229-2381
NY	Rochester, R. L. Kistler, Inc.	716-436-1940
NY	Rochester, Ross Equip. Co. Inc.	716-271-5660
NY	Smithtown, Superior Elec.	516-361-9177
NC	Charlotte, Superior Elec.	704-535-7777
OH	Medina, Superior Elec.	216-725-8887
PA	Blue Bell, Superior Elec.	215-825-9123
TX	Dallas, Superior Elec.	214-350-1368
TX	Plano, B & R Elctrn. Sls. Corp.	214-985-0028
WA	Issaquah, Superior Elec.	206-392-8559
Can	Toronto, Ont., American Superior Elec. Co., Ltd.	416-255-2318

SUPERIOR FLUX & MFG. CO., 95 Alpha Pk., Cleveland, OH 44143, Tel: 216-461-3315; Empl.: 5

SUPERIOR MFG. & INSTR., 19-36 38th St., Long Island City, NY 11105, Tel: 212-932-1800, TWX: 710-582-2626; Empl.: 120; *Sls. Mgr.:* C. J. Robison

SUPERTEX, INC., 1225 Bordeaux Dr., P.O. Box 3607, Sunnyvale, CA 94088, Tel: 408-744-0100, TWX: 6839143 SUPTX; *Sls. Mgr.:* Richard Siegel

Local Sales Offices & Reps

AL	Huntsville, Macro Mktg.	205-883-9630
AZ	Scottsdale, SMS & Assocs.	602-998-0831
CA	El Toro, Supertex, Inc.	714-533-0481
CA	Glendale, Orion Sls.	818-240-3151
CA	Los Altos, Ewing-Foley	415-941-4525
CA	San Diego, Earle Assocs.	619-278-5441
CA	Tustin, Orion Sls.	714-832-9687
CO	Denver, Elcom	303-337-2300
CT	Englewood, Ed Glass Assocs.	201-592-0200
FL	Clearwater, Dyne-A-Mark	813-441-4702
FL	Ft. Lauderdale, Dyne-A-Mark	305-771-6501
FL	Maitland, Dyne-A-Mark	305-831-2097
FL	Palm Bay, Dyne-A-Mark	305-727-0192
IL	Des Plaines, Janus	312-298-9330
IN	Indianapolis, Sai Mktg.	317-241-9276
KS	Overland Park, Advanced Tech. Sls.	913-642-6675
MA	Burlington, Mill-Bern Assocs.	617-273-1313
MI	Brighton, Sai Mktg.	313-227-1786
MN	Bloomington, Smiley-Scott Assocs.	612-888-5551
MO	St. Louis, Advanced Tech. Sls.	314-878-2921
NJ	Englewood Cliffs, Supertex, Inc.	201-947-3844
NJ	Haddonfield, Tritek Sls.	609-429-1551
NY	Hauppague, Calita	516-582-5432
NY	Binghamton, Gen-Tech Elctrn. Sls.	607-648-8833
NY	Liverpool, Gen-Tech Elctrn. Sls.	315-451-3480
NY	Pittsford, Gen-Tech Elctrn. Sls.	716-381-2820
NY	Pleasant Valley, Gen-Tech Elctrn. Sls.	914-635-3233
OH	Centerville, Omega Sls.	513-434-5507
OH	Centerville, Sai Mktg.	513-435-3181
OH	Shaker Heights, Sai Mktg.	216-751-3633
OR	Tigard, Electronic Comp. Sls.	503-245-2342
TX	Austin, T. L. Mktg.	512-453-4586
TX	Dallas, T. L. Mktg.	214-357-1752
TX	Fort Worth, Supertex, Inc.	817-457-5677
UT	Salt Lake City, Elcom, Inc.	801-532-7940
VA	Columbia, Delta III Assocs.	301-730-4700
VA	Midlothain, Delta III Assocs.	804-379-1816
WA	Mercer Island, Elctrn. Comp. Sls.	206-232-9301
WI	Milwaukee, Janus	414-476-9104

SUPPORT SYSTEMS INTL. CORP., 150 South Second St., Richmond, CA 94804, Tel: 415-234-9090, TWX: 910-382-8130; Empl.: 105; *Sls. Mgr.:* Greg Richey; *Dist. Mgr.:* Greg Richey

SURGEONICS LTD., 344 Main St., Mt. Kisco, NY 10549, Tel: 914-241-3203; *Sls. Mgr.:* R. Diaz

SWEDA INT'L, See WESTREX

SWITCH CONTROLS, INC., 3815 Industry Blvd., Lakeland, FL 33803, Tel: 813-644-7564

Switchcraft
A **Raytheon** Company

SWITCHCRAFT, INC., 5555 N. Elston, Chicago, IL 60630, Tel: 312-792-2700, TWX: 910-221-5199; FSC No.: 82389;multiple; Empl.: 1100; *Sls. Mgr.:* E. F. Larrabee; *Dist. Mgr.:* J. J. Weber ..... **B•1696-1697; C•1524-1527**

Local Sales Offices & Reps

AZ	Phoenix, Howe & Hoew Sls.	602-264-7971
CA	San Diego, Wiley Co.	213-666-1611
CA	Santa Clara, Ross Mktg. Assoc.	408-988-8111
CO	Denver, Moss Mktg.	303-455-7205
CT	Stamford, Unesco/Genex	203-322-9308
FL	Orlando, Delmac Sls.	305-898-4688
FL	Tamarac, Delmac Sls.	305-726-1330
GA	Marietta, Rick Burns & Assocs.	404-951-1160

Superior Electric

AUTHORIZED DISTRIBUTOR

SSI **SUNSHINE**

THE SOURCE FOR METERS & TEST EQUIPMENT

Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT
(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area
(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

SUPERIOR ELECTRIC
(POWERSTAT STABILINE)
•
STANCOR/ESSEX
•
DORMEYER

IN STOCK • IN STOCK

Franchised Distributor

LOGICOMP
ELECTRONICS, INC.

1009 W. BOSTON POST ROAD
MAMARONECK, NEW YORK 10543
PHONE: (914) 698-9332

TOLL FREE
(Outside N.Y.)
800/431-2625

SWITCHCRAFT
MILITARY SPECIFICATION
INDUSTRIAL AND COMMERCIAL

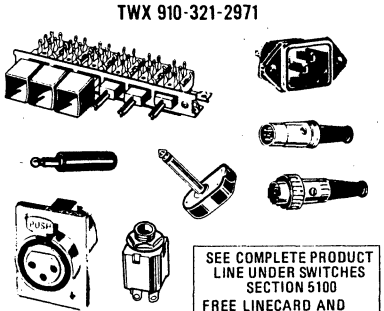
FULL LINE
AUTHORIZED DISTRIBUTOR

E S I

ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

HI Honolulu, Ross Mktg. Assocs. 408-988-8111
IL Park Ridge, Bob Burns & Assoc. 312-823-9360
IN Carmel, Marketing Engrs. 317-872-5665
IA Des Moines, Thomas L. Dowell & Assoc. 515-225-1620
KS Overland Park, Thomas L. Dowell & Assoc. 913-648-7373
MA Waltham, Unesco/Genex 617-890-1535
MI Southfield, R. C. Merchant & Co. 313-354-4300
MI St. Joseph, R. C. Merchant & Co. 616-983-7378
MN Edina, Mel Foster Tech. Sls. 612-941-9790
MS Jackson, Welch & Doby Mktg. 601-932-5534
MO St. Louis, Thomas L. Dowell & Assoc. 314-849-4234
NJ Cherry Hill, Trinkle Sls. 609-795-4200
NJ Englewood Cliffs, Masin-Esco 201-569-8868
NM Albuquerque, Moss Mktg. 505-292-7505
NY E. Rochester, Ossmann Comp. Sls. ... 315-437-7052
NY Syosset, Masin-Esco 201-569-8868
NY Syracuse, Ossmann Comp. Sls. 716-424-4460
NY Vestal, Ossmann Comp. Sls. 607-754-3264
NC Raleigh, Rick Burns & Assocs. 919-876-2224
OH Dayton, J. C. Hofstetter Co. 513-296-1010
OH Medina, J. C. Hofstetter Co. 216-241-4880
OK Tulsa, J. Y. Schoonmaker Co. 918-446-0373
TX Dallas, J. Y. Schoonmaker Co. 214-349-1650
TX Houston, J. Y. Schoonmaker Co. 713-738-2427
UT Bountiful, Moss Mktg. 801-292-8660
WA Bellevue, Comtec 206-453-1188

SWITCHES INC., 949 Stierlin Rd., Mountain View, CA 94043, Tel: 415-962-8649

Distributor

SWITCHES UNLIMITED, INC., 34-11 56th St., Woodside, NY 11377, Tel: 212-478-5000 ..... **B•1682**

SWITCHING SYSTEMS INTL., 1827 No. Case St., Orange, CA 92665, Tel: 714-921-1153; Empl.: 35; *Sls. Mgr.:* Chris Edman

SYLVANIA CHEMICALS/METALS, Hawes St., Towanda, PA 18848, Tel: 717-265-2121; Empl.: 1400; *Sls. Mgr.:* J.F. Barnyak

SYLVANIA CONNECTOR PRODS. OPER., GTE Prods. Corp., Box 29, Titusville, PA 16354, Tel: 814-589-7071, TWX: 510-692-6763; *Sls. Mgr.:* R. Sanders

SYLVANIA GTE CONTROL DEVICES, Rte. 35, Standish, ME 04084, Tel: 207-642-4535, TWX: 710-365-0145; Empl.: Over 1,000; *Sls. Mgr.:* J. T. Dougherty; *Dist. Mgr.:* J. T. Dougherty ..... **B•1773**

Local Sales Offices & Reps

AL Huntsville, Rakes Engrg. & Mktg. Corp. 205-533-3763
CA Hayward, Pacific Mktg. Inc. 415-887-1620
FL Melbourne, Southeastern First Rep, Inc. 305-259-6373
GA Atlanta, Rakes Engrg. & Mktg. Corp. ... 404-447-6937
IL Arlington Heights, Thermek Inc. 312-577-6900
MD Glen Burnie, Macrotech Assocs. 301-437-5588
MA Hingham, Northeast Reps., Inc. 617-749-8700
MI Dearborn 313-582-8754
NJ Haddonfield, G. L. Williams Assocs. ... 609-428-6060
NJ Manville, Dynorep Inc. 201-685-0135
NY Albany, H. C. Johnson Agencies, Inc. .. 518-459-1239
NY Buffalo, H. C. Johnson Agencies, Inc. .. 716-632-7880
NY Rochester, H. C. Johnson Agencies, Inc. 716-586-0777
NC Raleigh, Rakes Engrg. & Mktg. Corp. .. 919-847-5079
OH Dayton 513-223-6227
OR Portland, SPS Elctrns. 503-297-6919
PA Glenshaw, H. C. Johnson Agencies, Inc. 412-961-0414
WA Redmond, SPS Elctrns. 206-323-4140

SYLVANIA ELECTRONIC, Box 360, Muncy, PA 17756, Tel: 717-546-3191; Empl.: 395; *Sls. Mgr.:* A. M. Serang; *Dist. Mgr.:* S. R. Sisak

PhilipsECG

SYLVANIA ELECTRONIC COMPONENTS, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254, Tel: 617-890-6107; Empl.: 4213; *Sls. Mgr.:* D. R. Kronenwetter; *Dist. Mgr.:* E. H. Frost ..... **A•2090-2091**

Local Sales Offices & Reps

CA Costa Mesa, Philips ECG, Inc. 714-557-3100
CA Pleasanton, Philips ECG, Inc. 415-846-2427
FL Clearwater, Philips ECG, Inc. 813-446-8602
GA Atlanta, Philips ECG, Inc. 404-491-6003
IL Buffalo Grove, Philips ECG, Inc. 312-459-1180
MD Ellicott City, Philips ECG, Inc. 301-531-6423
MO Kansas City, Philips ECG, Inc. 816-741-4019
NJ Norwood, Philips ECG, Inc. 201-768-3280
NY Seneca Falls, Philips ECG, Inc. 315-568-5432
NC Greensboro, Philips ECG, Inc. 919-299-6204
OH Dayton, Philips ECG, Inc. 513-890-4421
OH Rocky River, Philips ECG, Inc. 216-331-1088
TX Dallas, Philips ECG, Inc. 214-239-9370

Local Distributors

AL Albertville, Electronic Part & Supp. Co. 205-878-3041
AL Andalusia, Wholesale Elctr. Supps. Co. 205-222-5100
AL Anniston, Radio Dist. & Sup. Co. 205-236-8654
AL Birmingham, Forbes Distributing Co. .. 205-251-4104
AL Birmingham, JLS Indl. Elctrns., Inc. ... 205-322-2486
AL Decatur, Forbes Distributing Co. 205-353-4762
AL Dothan, Carmichael Elctrns. Inc. 205-793-7066
AL East Gadsden, Radio Dist. & Supp. Co. 205-547-1636
AL Huntsville, Forbes Distrbg. Co. 205-533-4150
AL Mobile, Electronic Supp. Co. 205-478-0455
AL Mobile, Forbes Elctrn. Distrs. Inc. 205-479-4535
AL Mobile, Specialty Distributing Co. 205-344-0450
AL Montgomery, Forbes-Godfrey TV Elctrns. Inc. 205-263-0283
AL Muscle Shoals, Jones Elctrns. 205-383-1241
AL Opelika, Southern Elctrns. Corp. 205-745-5298
AK Anchorage, Alaska Elctrn. Supp. 907-563-3774
AK Juneau, Juneau Elctrns. 907-586-2260
AZ Phoenix, Dalis Elctrn. Supp. 602-275-2885
AZ Phoenix, Elctrn. Parts Co. Inc. 602-277-7281
AZ Phoenix, Electronic Distrs. 602-955-8303
AZ Phoenix, Parts Elctrn. of AZ 602-258-6476
AZ Tucson, Elliott Elctrns., Inc. 602-884-7394
AZ Tucson, Inland Elctrn. Supp. 602-889-5301
AR El Dorado, Electra Inc. 501-862-4901
AR Ft. Smith, Carlton Bates Co. 501-646-8201
AR Ft. Smith, Wise Wholesale Elctrns. 501-783-8925
AR Hot Springs, Prince Elctrns. Co. 501-624-2825
AR Little Rock, Bluff City Elctrns. 501-376-7044
AR Little Rock, Carlton Bates Co. 501-562-9100
AR Little Rock, David White Elctrns. 501-375-8887
AR Little Rock, Lavender Elctrn. Supp. Inc. 501-372-0248
AR Little Rock, Southern Elctrns. Co. 501-372-4196
AR Mt. Home, Show-Me Elctrns., Inc. 501-425-8979
AR Paragould, Martin Wholesale Radio Supp. 501-236-6049
AR Pine Bluff, Carlton Bates Co. 501-535-1354
AR Pine Bluff, David White Elctrns. 501-534-0612
AR Springdale, Carlton Bates Co. 501-756-5012
AR Springdale, Wise Wholesale Elctrns. .. 501-751-4814
AR Texarkana, Lavender Elctrns. Inc. 501-773-4631
CA Anaheim, Ball Elctrns. 714-828-1310
CA Berkeley, Al Lasher Elctrns. 415-843-5915
CA Calexico, Hurley Elctrns., Inc. 714-357-3148
CA Canoga Park, Tri-Valley Elec. Supp. ... 213-348-6210
CA Concord, Pacific Radio Supp. Inc. 415-682-4700
CA Downey, Net Elctrns. 213-923-4591
CA Dublin, Pacific Radio Supp. Inc. 415-829-5960
CA Eureka, Redwood Elctrn. Supp. 707-443-3107
CA Fresno, B. J. De Jarnatt Wholesale Co., Inc. 209-268-8544
CA Fullerton, Orvac Elctrns. 714-871-1020
CA Garden Grove, Sav-On 714-530-0555
CA Huntington Park, Martin Distributing Co. 213-582-7111
CA Inglewood, Hurley Elctrns., Inc. 213-678-7644
CA Long Beach, Hurley Elctrns., Inc. 213-537-5375
CA Los Angeles, Radio Equip. Distrs. 213-668-1100
CA Modesto, Inland Elctrns. 209-524-7945
CA Mtn. View, Associated Radio 415-968-1689
CA Oakland, Cass Elctrns. 415-834-4225
CA Oakland, Chuck Hurley Elctrns. 415-834-9185
CA Oceanside, Hurley Elctrns., Inc. 619-722-7694
CA Ontario, Hurley Elctrns., Inc. 714-986-6638
CA Oxnard, Dow Radio, Inc. 805-486-6353
CA Oxnard, Hurley Elctrns., Inc. 805-483-0133
CA Pasadena, Dow Radio, Inc. 213-681-3416
CA Redding, North Valley Elctrns. 916-222-1500
CA Sacramento, Chuck Hurley Elctrns. Inc. 916-927-5891
CA Sacramento, Dunlap Elctrns. Inc. 916-442-5801
CA Sacramento, Popkey Distributing 916-448-8848
CA Salinas, Ardco Elctrns. Supp. 408-422-5318
CA San Bernadino, Hurley Elctrns., Inc. ... 714-885-0721
CA San Diego, Hurley Elctrns. 619-235-6245
CA San Diego, Steren Elctrns. Intl. 619-274-4120
CA San Francisco, Associated Radio 415-431-0212
CA San Jose, John E. Schad Inc. 408-275-6484
CA San Jose, Peninsula Elec. Supp. 408-294-8781
CA San Luis Obispo, Midstate Wholesale Elctrns. 805-543-2770
CA San Rafael, Beaver Elctrns. 415-453-1130
CA Santa Ana, Hurley Elctrns., Inc. 714-971-2203
CA Santa Maria, Electronics Parts Supermart 805-925-8604
CA Santa Rosa, Associated Radio Distrs. 707-527-6000
CA Santa Rosa, Chuck Hurley Elctrns. Inc. 707-542-5423
CA Stockton, Cal-Centron 209-942-2094
CA Torrance, Cash Elctrns. 213-373-6333
CA Vallejo, Associated Radio 707-552-2363
CA Van Nuys, Hurley Elctrns., Inc. 818-781-8410
CO Colorado Springs, Walker Colorado Springs Elect. 303-636-1661
CO Denver, Elliott Elctrn. Supp. Inc. 303-778-0333
CO Denver, Walker Denver Elctrns. 303-935-2401
CO Englewood, Roth Distrbg. Co. 303-761-6531
CO Grand Junction, Walker Grand Junction Elctrns. 303-242-4435
CO Greeley, Walker Greeley Elctrns. Co. .. 303-353-3241
CO Pueblo, Walker Pueblo Elctrns. 303-542-1924
CT Greenwich, Wise Comps., Inc. 203-531-4880
CT Hartford, Signal Center, Inc. 203-233-8551
CT New London, Aikins Elctrn. Supp. 203-442-4406
CT New London, Jan Elctrn. Supps., Inc. .. 203-442-4386
CT South Windsor, Sceli Elctrns. 203-289-6853
CT West Haven, Amerling Co. 203-934-7901
DE Wilmington, Wholesale Elctrns. 302-656-9988
FL Bradenton, Leader Elctrns. 813-756-9571
FL Cocoa, Cape Elctrns. 305-636-6331
FL Daytona Beach, C & S Elctrn. Supp. Co. 904-253-8131
FL Ft. Lauderdale, Leader Dixie Elctrns., Inc. 305-561-2544
FL Ft. Lauderdale, Southeastern Elctrns. 305-563-4131
FL Ft. Lauderdale, Vance Baldwin Inc. 305-523-3461
FL Ft. Myers, Dow Elctrns. 813-334-6577
FL Ft. Walton Beach, Key Elctrn. Supp. ... 904-863-2191
FL Gainesville, Dow Elctrns. Inc. 904-376-3231
FL Homestead, United Elctrn. Supp. Inc. .. 305-245-0955
FL Jacksonville, Mitchell Elctrns. 904-356-8427
FL Jacksonville, The Bay Co. 904-255-2614
FL Lakeland, Leader Elctrns. 813-686-8193
FL Largo, Chester Elctrn. Supp. Co. 813-585-4736
FL Melbourne, Leader Elctrn. Distributing Inc. 305-254-5274
FL Miami, Central Elctrns. Distrs., Inc. 305-635-1080
FL Miami, Elctrn. Equip. Co., Inc. 305-871-3500
FL Miami, Gulf Elctrn. Supp., Inc. 305-592-6583
FL Miami, Southeastern Wholesalers Inc. 305-634-6591
FL Miami, Vance Baldwin Inc. 305-769-0225
FL Miami, Walder Elctrn. Distr. Co. 305-379-9393
FL Naples, Joe Coomes Distr. Inc. 813-775-4442
FL Orlando, C & S Elctrn. Supp. Co., Inc. .. 305-299-4300
FL Orlando, Dow Elctrns. Inc. 305-299-2771
FL Panama City, Central Elctrn. Supp. Co. 904-785-0237
FL Pensacola, Elctrn. Supp. Co. 904-432-6916
FL Pensacola, Forbes Elctrn. Distributing Inc. 904-944-5551
FL Pensacola, Pensacola Elctrns. 904-478-3771
FL Sarasota, Dow Elctrns. 813-365-3393
FL St. Petersburg, Dow Elctrns. 813-525-1131
FL Tallahassee, Dell Elctrns. Inc. 904-224-5145
FL Tallahassee, Fouraker Elctrns. Inc. 904-224-5101
FL Tampa, Dow Elctrns., Inc. 813-626-5191
FL Tampa, Leader Elctrns. Distrs. 813-870-3315
FL Tampa, Sunex Elctrns. Supp., Inc. 813-885-4074
FL Tampa, Vance Baldwin, Inc. 813-870-2606
FL Venice, Ferguson Elctrns. Co. 813-493-0000
FL W. Palm Beach, Dolphin Elctrn. Supp. Inc. 305-659-7166
FL W. Palm Beach, Vance Baldwin Inc. ... 305-832-5671
GA Albany, Specialty Distributing Co. 912-435-1711
GA Athens, Specialty Distributing Co. 404-458-1334
GA Atlanta, Specialty Distributing Co. 404-458-6341
GA Atlanta, Specialty Distributing Co. 404-873-2521
GA Atlanta, Wholesale Indl. Elctrns. 404-447-8431
GA Augusta, Specialty Distributing Co. 404-722-1526
GA Brunswick, Specialty Distributing Co. .. 912-265-1927
GA College Park, Specialty Distributing Co. 404-763-3828
GA Columbus, Specialty Distributing Co. .. 404-327-7414
GA Macon, Specialty Distributing Co. 912-743-5421
GA Marietta, Specialty Distributing Co. 404-422-4333
GA Savannah, Specialty Distributing Co. .. 912-234-1684
GA Valdosta, Specialty Distributing Co. 912-242-4910
HI Honolulu, Admor Distr. Corp. 808-537-4501
HI Honolulu, Electrical Equip. Co., Ltd. 808-533-3884
HI Honolulu, Industrial Elctrns. 808-533-6095
HI Honolulu, Precision Radio Ltd. 808-537-5291
ID Boise, Kimball Elctrns. 208-342-3559
ID Pocatello, Kimball Elctrns. 208-232-2201
IL Alton, Ebinger Radio Co. 618-462-9783

IL Belleville, Deltronics Distrbg. Co. 618-398-2183
IL Benton, Lampley Radio Co. 618-435-8194
IL Berwyn, B-B & W Inc. 312-749-1710
IL Chicago, Alpha Elctrns. 312-561-0300
IL Chicago, Howard Elctrn. Sls. 312-254-1777
IL Chicago, Newark Elctrns. Corp. 312-638-4411
IL Chicago, U. S. Electronics 312-925-4111
IL Elgin, Mainline Supp. Co., Inc. 312-697-6746
IL Evergreen, Beaty Elctrns. Inc. 312-423-5500
IL Franklin Park, Richardson Elctrns. 312-456-0600
IL Geneva, Melvin Elctrns., Inc. 312-232-8050
IL Harrisburg, Standard Distrs. 618-252-1478
IL Jacksonville, Baptist Elctrn. Supp. Co., Inc. 217-243-6464
IL Joliet, Mainline Supp. Co., Inc. 815-436-3900
IL Kankakee, S&S Elctrn. Supp. Co. 815-933-5595
IL Mattoon, Mattoon Radio & TV Supp. Co. 217-235-5457
IL Moline, Lofgren Distributing Co. 309-764-7436
IL Niles, Joseph Elctrns. Inc. 312-297-4200
IL Peoria, Warren Radio Co. 309-674-5998
IL Quincy, Show Me Elctrns. 217-223-9880
IL Rockford, Jay-tronics 815-965-8786
IL Rockford, Midwest Associated 815-962-8036
IL Salem, Laco Elctrns. Inc. 618-548-3150
IL Springfield, Baptist Elctrn. Supp. Co., Inc. 217-753-0111
IL Sterling, Warren Radio Co. 815-625-6253
IL Waukegon, Chester Elctrn. Supp. 312-623-5000
IN Angola, Lakeland Elctrn. Supp. 219-665-6311
IN Bloomington, Stansifer Radio Co. 812-336-6339
IN Chesterton, Chesterton Elctrn. Supp. .. 219-926-2109
IN Elkhart, Warren Radio Co. 219-295-4205
IN Evansville, Hutch & Son, Inc. 812-425-7201
IN Evansville, Ohio Valley Sound 812-425-6173
IN Ft. Wayne, Pembleton Elctrns. 219-426-1812
IN Ft. Wayne, Warren Radio Co. 219-426-5344
IN Gary, B&B Elctrn. Supp. 219-980-8200
IN Gary, Calumet Elctrn. Supp. Inc. 219-887-4961
IN Indianapolis, Elctrn. Svc. Parts 317-632-8586
IN Indianapolis, Graham Elctrns. Supp. Inc. 317-634-8202
IN Indianapolis, ROBCO Distrs., Inc. 317-788-0857
IN Indianapolis, Warren Radio Co. 317-634-5566
IN Jasper, Elex Mart 812-482-3535
IN Kokomo, Television Radio Distr. 317-457-5942
IN Logansport, Television Radio Distr., Inc. 219-753-2879
IN Marion, J&W Elctrns. Inc. 317-662-1114
IN Mishawaka, Television Supp., Inc. 219-255-4720
IN Peru, Television Radio Distr., Inc. 317-472-2005
IN Terre Haute, Mid West Supp. 812-232-0187
IN Vincennes, Ohio Valley Sound, Inc. ... 812-882-3615
IA Ames, Electronic Supp. Inc. 515-232-7020
IA Ames, Mid-State Distrbg. Co. 515-232-2104
IA Burlington, Union Supp. Co. 319-754-5745
IA Burlington, Warren Radio Co. 319-752-1842
IA Carroll, Mid-State Distrbg. Co. 712-792-2177
IA Cedar Rapids, Deeco, Inc. 319-365-7551
IA Cedar Rapids, Iowa Radio Supp. Co. .. 319-364-6154
IA Cedar Rapids, Mid-State Distrbg. Co. .. 319-365-9411
IA Clinton, Union Supp. Co., Inc. 319-242-4572
IA Davenport, Union Supp. Co. 319-322-3531
IA Davenport, Warren Radio Co. 319-322-5301
IA Des Moines, Gifford-Brown of Des Moines 515-243-1257
IA Des Moines, Mid State Distributing Co. 515-244-7231
IA Dubuque, Warren Radio Co. 319-582-4300
IA Iowa City, Union Supp. Co. 319-338-6165
IA Mason City, Mid State Distributing Co. 515-423-8012
IA Ottumwa, Mid-State Distrbg. Co. 515-682-5407
IA Sioux City, Molstad Dist. 712-255-8023
IA Waterloo, Gifford-Brown, Inc. 319-234-2603
KS Great Bend, RSC Elctrns., Inc. 316-793-3507
KS Kansas City, Video Elctrn. Supp. Co. .. 913-371-5731
KS Salina, RSC Electronics 913-823-6353
KS Wichita, RSC Electronics 316-267-5213
KY Ashland, Electronic Supp. Inc. 606-325-1511
KY Bowling Green, Randolph, Hale & Meredith 602-781-1460
KY Hopkinsville, Randolph & Hale 502-885-5357
KY Lexington, Service Elctrn. Supp. 606-254-5786
KY Louisville, P. I. Burks & Co. 502-589-3960
KY Newport, Holub Dist. Co. 606-431-4211
KY Paducah, Warren Radio Co. 502-442-4367
LA Alexandria, Elctrn. Svc. Supp. 318-443-8483
LA Alexandria, Ralph's Indl. Elctrns. 318-443-8483
LA Baton Rouge, Industrial Elec. Supp., Inc. 504-357-4249
LA Baton Rouge, Menard Elctrns. 504-355-0232
LA Baton Rouge, Ralph's of Baton Rouge 504-344-3761
LA Baton Rouge, Southern Radio Supp. Co., Inc. 514-355-0396
LA Broussard, Menard Elctrns., Inc. 318-837-9204
LA Gretna, Pelican Elctrn. Supp. Inc. 504-361-4187
LA Harahan, United Distrs., Inc. 504-733-7920
LA Harvey, AFG Elctrn. Supp., Inc. 504-368-9696
LA Houma, Pelican Elctrn. Supp. Inc. 504-868-1285
LA Lafayette, Lafayette Radio Equip. 318-234-2364
LA Lafayette, Ralph's of Lafayette 318-234-4507
LA Lake Charles, Ralph's of Lake Charles 318-439-2493
LA Lake Charles, Sparton Elctrns. Supp., Inc. 318-491-9223
LA Lake Charles, Wholesale Radio Equip. 318-439-2431
LA Metairie, Pelican Elctrn. Supp. 504-888-4720
LA Monroe, Martin Elctrns. Inc. 318-388-4224
LA Monroe, Tri-State Elctrns. 218-387-9711
LA Morgan City, Ralph's of Morgan City .. 504-384-9831
LA New Iberia, Ralph's of New Iberia 318-369-9861
LA New Orleans, Radio Parts 504-581-5959
LA New Orleans, Southern Radio Supp. Co. 504-524-2343
LA New Orleans, Wm. B. Allen, Inc. 504-525-8222
LA Opelousas, Opelousas Radio Equip. .. 318-942-5702
LA Shreveport, Elctrn. Supp. of Shreveport 318-227-9080
LA Shreveport, Indl. Elctrn. Supp. Inc. 318-222-9459
LA Shreveport, Wholesale Elec. Supp., Inc. 318-422-2063
LA West Monroe, Brooks Supp. of La 318-323-0344
ME Lewiston, Stark Wholesale Elctrns. 207-784-6979
ME Portland, LAD Elctrns. Distrs. 207-772-2174
MD Baltimore, Fairway Elctrns. of MD Inc. 301-247-8383
MD Baltimore, Modern Elctrns. 301-282-5300
MD Baltimore, Tritronics 301-256-4400
MD Beltsville, Radio Elec. Svc. Co. 301-937-5890
MD Bethesda, Empire Elec. Supp. 301-656-3300
MD Frederic, Hankey's Radio Inc. 301-662-1381
MD Hagerstown, Fairway Elctrns. Inc. 301-791-0200
MD Kensington, Fairway Elctrns. Inc. 301-564-1440
MD Towson, Baynesville Elctrns. 301-823-0082
MD White Marsh, Radio Elec. Svc. Co. 301-529-0500
MA Billerica, A. W. Mayer Co. 617-667-6900
MA Boston, Tee Vee Supp. Co. 617-522-9330
MA Brockton, Ware Radio Supp. Corp. 617-583-0810
MA Fall River, E. A. Ross Co. 617-673-0921
MA Lawrence, Lawrence Elctrn. Distrs. 617-683-0257
MA Lowell, Frank P. McCartin Co. 617-454-9101
MA New Bedford, Burns Elctrn. Supp. Co. 617-998-3344
MA New Bedford, C. E. Beckman Co. 617-994-9674
MA New Bedford, E. A. Ross Co. 617-673-0921
MA Norwood, Morrison Elctrn. Supp. 617-769-7280
MA Peabody, Tee Vee Supp. Co. 617-531-5777
MA Quincy, Electronic Dists. Corp. 617-328-7800
MA Springfield, Signal Electr. Ctr. of Springfield 413-739-3893
MA Waltham, MIL Elctrns. Inc. 617-891-6730
MA Woburn, Abbott Elctrns., Inc. 617-935-2040
MA Woburn, Semtex 617-935-2150
MA Worcester, Stark Wholesale Elctrns. Inc. 617-756-7136
MI Adrian, Wedemeyer Elctrn. Supp. Co. 313-263-2925
MI Battle Creek, Warren Radio Co. 616-965-3338
MI Bay City, Kinde Distributing 517-892-1594
MI Dearborn, West Side Radio 313-933-6972
MI Detroit, Elctrn. Parts Co. 313-891-7400
MI Detroit, S & S Elctrns. 313-521-3610
MI Detroit, Top Radio Supp. Corp. 313-366-9088
MI East Detroit, Electronic Parts Co. 313-773-0030
MI Flint, Electronic Parts Specialists 313-238-7311
MI Flint, Shand Elctrns. 313-743-8940
MI Grand Rapids, T & W Elctrns. 616-241-3645
MI Grand Rapids, Warren Radio Co. 616-456-5385
MI Kalamazoo, Warren Radio Co. 616-381-4203
MI Lansing, Wedemeyer Elctrns. 517-489-9047
MI Livonia, Norwest Elctrns. 313-261-4551
MI Livonia, RS Electronics 313-525-1155
MI Madison Hgts., Warren Radio Co. 313-588-3327
MI Muskegon, T & W Elctrns., Inc. 616-759-7666
MI Niles, Niles Radio Supp. Co. 616-684-0550
MI Oak Park, Remcor Elctrns., Inc. 313-541-5666
MI Owasso, Warren Radio Co. 517-723-5239
MI Pontiac, Joe Coomes 313-334-1526
MI Saginaw, Ryder Distributing 517-799-2411
MI Traverse City, Traverse City Elctrns. .. 616-946-5153
MN Minneapolis, Electronic Center 612-371-5200
MN Minneapolis, Ness Elctrns. Inc. 612-824-2646
MN Minneapolis, Stark Elctrn. Supp. Co. ... 612-332-1325
MN Rochester, Pace Elctrns. Inc. 507-288-1853
MN St. Cloud, Team Elctrns. #4 612-251-1335
MN St. Paul, Electronics Ctr., Inc. 612-371-5260
MN St. Paul, Ness Elctrns. 612-224-5411
MS Biloxi, Electronic Parts Co. 601-435-3221
MS Columbus, Bluff City Elctrns. 601-328-6212
MS Greenville, Tri-State Elctrns. Co. 601-335-3594
MS Hattiesburg, N & H Elctrn. Distr. Co. ... 601-582-5571
MS Jackson, Tri-State Elctrns. Co. 601-355-3431
MS McComb, Risher Radio Supp. Co. 601-684-3731
MS Meridian, Hooper Elctrn. Supp. Co., Inc. 601-693-2668
MS Pascagoula, Hooper Elctrn. Supp. Co. 601-762-9383
MS Philadelphia, Risher Whls. Co. 601-656-8802
MS Tupelo, Bluff City Elctrns. 601-842-6832
MO Columbia, Show-Me Elctrns. 314-449-2944
MO Flat River, Show-Me Elctrns. 317-431-4816
MO Jefferson City, Central Missouri Distributing Co. 314-636-3149
MO Jefferson City, Show-Me Elctrns. 314-636-2191
MO Joplin, Show-Me Elctrns., Inc. 417-623-1608
MO Kansas City, Elctrn. Supp. Co. 816-931-0250
MO Kirkville, Mid State Distrbg. Co. 816-665-5625
MO Rolla, Show-Me Elctrns. 314-364-1515
MO Sedelia, Show-Me Elctrns., Inc. 816-826-3044
MO Sikeston, Baileys Elect. Supp. 314-471-6142
MO Springfield, Mason Elect. Supp. 417-865-5542
MO Springfield, Show-Me Elctrns. 417-869-0752
MO St. Charles, Deltronics Distrbg. Co. 314-723-0210
MO St. John, Ralph Toler Radio Co. 314-426-3260
MO St. Joseph, Show-Me Elctrns., Inc. 816-233-3118
MO St. Louis, City Refrigeration Co., Inc. ... 314-427-3420
MO St. Louis, Deltronics Distributing Co. .. 314-725-6060
MO St. Louis, Ebinger Elctrns. 314-353-8818
MO St. Louis, M C Distrs., Inc. 314-231-6350
MO St. Louis, Olive Elctrns. Inc. 314-426-4500
MO St. Louis, Show-Me Elctrns., Inc. 314-781-7643
MT Billings, Television & Elec. Supp. Co. .. 406-252-7193
MT Great Falls, The Source Inc. 406-761-2420
MT Havre, Northern Elctrns. 406-265-5568
MT Kalispell, Professional Elctrns. Ctr. 406-257-4545
NE Hastings, Meyerson Distrbg. Co. 402-463-3145
NE Lincoln, Leuck Radio Co. 402-476-2797
NE Norfolk, Radio Equip. Co. 402-371-2728
NE Omaha, Meyerson Distrbg. Co. 402-342-3088
NE Omaha, Omaha Elctrns. Co. 402-341-3440
NE Omaha, Radio Equip. Co. 402-341-7700
NE Scottsbluff, D&H Elctrns. Supp. Inc. ... 308-632-2181
NV Las Vegas, Hurley Elctrns. 702-384-5666
NV Reno, Bennett Elctrn. Supp. Co. 702-322-2127
NV Reno, Nevada Elctrns. 702-329-1308
NH Dover, American Radio Corp. 603-742-6800
NH Manchester, Stark Wholesale Elect. of N.H. Inc. 603-688-7611
NH Nashua, Tee Vee Supp. Co. 603-889-4171
NJ Eatontown, Atkinson & Smith Co. 201-542-2447
NJ Edison, William Elctrn. Supp. Inc. 201-985-3700
NJ Hillside, Leader Elctrn. Supp. Corp. 201-354-4200
NJ Pleasantville, Kearns Elctrn. Prods. Co. 609-646-7010
NJ Raritan, Masters Elctrn. Supp. 201-725-3583
NJ Trenton, Service Parts & Supp. Co. ... 609-393-7135
NJ Union City, NIDISCO, Inc. 201-863-2111
NM Albuquerque, Elctrn. Parts Co. 505-293-6161
NM Albuquerque, Southwest Elctrns. 505-345-8611
NM Albuquerque, US Module 505-345-7968
NM Farmington, Walker Farmington Elctrns. Inc. 505-327-9138
NM Hobbs, Trice Wholesale Elctrns. 505-393-5107
NM Las Cruces, Electronic Parts, Inc. 505-523-4578
NM Roswell, R & R Elctrn. Supp. Co. 505-622-0670
NM Santa Fe, Sepco Inc. 505-982-1621
NY Albany, Troy Television of Albany 518-428-7801
NY Amherst, Standard Elctrns. Inc. 716-691-3061
NY Binghamton, Help Elctrns. 607-729-3528
NY Bronx, CAM Elctrns. Distr. Co., Inc. 212-893-8300
NY Brooklyn, Alpha Elctrns., Inc. 212-633-2800
NY Brooklyn, Mill Elctrns. Supp. Co. 212-336-4575
NY Brooklyn, Saco Elctrns. 212-783-7288
NY Buffalo, Genesee Radio Parts Co. 716-873-9661
NY Buffalo, Goldcrest Elctrn. Supp. 716-885-5878
NY Buffalo, Summit Distrbg. Co., Inc. 716-884-3450
NY Centereach, GTE Elctrn. Supp. 516-585-8111
NY Commack, Spartan Elctrns. Inc. 516-499-9500
NY Corning, Corning Elctrns., Inc. 607-962-0555
NY Cortland, Cortland Elctrn. Supp. 607-756-2523
NY East Rockaway, Temtron Elctrns. 516-599-6400
NY Elmira, Brady Supp. Corp. 607-733-6591
NY Freeport, Hygrade Elctrns., Inc. 516-379-8900
NY Hempstead, Davis Elctrns. Corp. 516-483-9200
NY Herkimer, Herkimer Elctrns., Inc. 315-866-1680
NY Hicksville, Elctrn. City 516-938-8330
NY Hornell, Hornell Elctrns., Inc. 607-324-2451
NY Horseheads, Southern Tier Elctrns. Inc. 607-734-4138
NY Jamaica, All Parts Elctrns. Whlers., Inc. 212-291-3388
NY Jamestown, Warren Radio Co. 716-484-1141
NY Johnson City, Goldcrest Elctrns. Supp. 607-797-2389
NY Johnson City, Help Elctrns. 607-729-3528
NY Kingston, Greylock Elctrn. Distrs. 914-338-5300
NY Lackawanna, Metromill Distrs. Inc. 716-826-2600
NY Long Island City, Avtech Elctrns. 212-937-9200
NY Massapequa, A&P Elctrns. Corp. 516-541-4200
NY Middletown, Greylock Elctrns. 914-343-7900
NY New Hyde Park, Electronic City 516-352-7145
NY New York, Consolidated Radio Sls. ... 212-865-4900

NY New York, Dale Elctrns. Corp. 212-255-3660
NY New York, State Labs, Inc. 212-807-9400
NY New York, United Teletronic Parts Corp. 212-569-2330
NY Olean, Standard Elctrns. Inc. 716-372-1800
NY Plainview, ACI Elctrns. Corp. 516-293-6630
NY Plattsburgh, Champlain Elctrns. 518-563-2323
NY Port Chester, Wise Comps. 914-939-3940
NY Poughkeepsie, Greylock Elctrns. 914-452-0550
NY Richmond Hill, Anchor Elctrns. Distr. Co. 212-846-2421
NY Rochester, Goldcrest Elctrns. Supp. ... 716-546-8464
NY Rochester, Masline Elctrns. Inc. 716-546-5373
NY Rochester, Standard Elctrns. Inc. 716-254-7590
NY Rochester, Summit Distrs. of Rochester 716-334-8110
NY Rome, Rome Security Dvcs., Inc. 315-336-0148
NY Schenectady, Goldcrest Elctrns. Supp. 518-377-6424
NY Syracuse, Goldcrest Elctrns. Supp. 315-471-7115
NY Syracuse, Standard Elctrns. Inc. 315-422-0421
NY Syracuse, Stewart W. Smith, Inc. 315-422-0323
NY Troy, Troy Television 518-235-1521
NY Utica, Grapac Elctrns. Co. 315-732-4674
NY Watertown, Gateway Elctrns. 315-788-7251
NC Burlington, Womack Elc. Supp. 919-227-7486
NC Charlotte, United Elctrns. Supp. 704-372-2650
NC Concord, Mac Victor Elctrns. 704-786-4175
NC Durham, Knight Elctrns. 919-682-9371
NC Fayetteville, Brantley Elctrns. 919-868-8038
NC Fayetteville, Eastern Radio Supp. 919-485-2161
NC Gastonia, JMT Elctrns. 704-867-4401
NC Goldsboro, Womack Elctrns. 919-734-3221
NC Greensboro, Guilford Elctrns. 919-275-1385
NC Greenville, Pair Elctrns. 919-756-2291
NC Highpoint, Guilford Elctrns. 919-889-8024
NC Lumberton, Knight Elctrns. 919-739-2870
NC Raleigh, Knight Elctrns. 919-833-6417
NC Sanford, Knight Elctrns. 919-776-4249
NC Statesville, Mills Elctrns. Inc. 704-872-8949
NC Wilmington, Buck's Elctrns. 919-392-4262
NC Winston Salem, Electronic Distributing Inc. 919-723-1097
NC Winston Salem, Kirkman Elctrns. 919-722-9131
ND Fargo, RSC Elctrns. 701-232-8993
ND Fargo, S/S Elctrns., Inc. 701-237-5003
OH Akron, Akron Elctrn. Supp., Inc. 216-762-8818
OH Akron, Main TV Supp. Co. 216-253-8161
OH Akron, Sun Radio 216-434-2171
OH Akron, Warren Radio Co. 216-434-6668
OH Alliance, Glasska Elctrns. 216-823-5780
OH Canton, Canton Elctrn. Supp. 216-454-7048
OH Canton, Electronic Ctr. Inc. 216-456-7133
OH Canton, Srepco Elctrn. Div. 216-455-0271
OH Canton, Srepco Elctrn. Div. 216-445-0271
OH Cincinnati, United Radio Inc. 513-761-4030
OH Cleveland, Warren Radio Co. 216-888-5225
OH Cleveland, Winteradio Elctrn. Supp. Corp. 216-621-9383
OH Columbus, Srepco Elctrn. Div. 614-486-9483
OH Columbus, Thompson Elctrn. Supp., Inc. 614-228-6191
OH Columbus, Whitehead's 614-224-1186
OH Dayton, Srepco Electrns., Pioneer Std. Electrns. 513-293-0871
OH Dover, TV Specialties, Inc. 216-364-6678
OH Elyria, EL-A-Co 216-323-1805
OH Fairfield, Srepco Elctrn. Div. 513-863-4301
OH Fremont, J & B Elctrns. 419-332-9334
OH Lancaster, Electronic Supp. Co. 614-653-9344
OH Lima, LRP Elctrns., Inc. 419-228-1220
OH Lima, Warren Radio Co. 419-228-1691
OH Lorain, Srepco Elctrn. Div. 216-277-1228
OH Marion, Mid Ohio Elctrns. Co. 614-383-1101
OH Newark, Turner Wilson Co. 614-323-1340
OH Parma, Superior Elctrn. Parts Co. 216-842-7940
OH Piqua, Srepco Elctrn. Div. 513-773-5120
OH Portsmouth, Fullers Sound Elctrn. Supplier 614-353-0965
OH Steubenville, World Radio & Elctrns. .. 614-283-2051
OH Willowick, Euclid Radio Parts Co. 216-585-5115
OH Youngstown, Glen Elctrns. 216-743-1119
OH Youngstown, Ross Radio Co. 216-746-8881
OK Ada, Trice Whls. Elctrns. 405-332-3022
OK Ardmore, Trice Wholesale Elctrns. 405-223-8540
OK Enid, Enid Walker Elctrns. 405-234-2218
OK Enid, Trice Wholesale Elctrns. 405-234-6078
OK Lawton, Trice Wholesale Elctrns. 405-355-3953
OK Lawton, Walker Lawton Elctrns. Inc. ... 405-355-0603
OK McAlester, Trice Wholesale Elctrns. ... 918-423-6716
OK McAlester, Wise Whls. Elctrns. 918-423-2282
OK Muskogee, Sooner Radio & TV Supp. 918-682-1384
OK Muskogee, Trice Wholesale Elctrns. .. 918-682-2457
OK Oklahoma City, Miller-Jackson Co. 405-235-8426
OK Oklahoma City, Radio Supp. Co. 405-232-6127
OK Oklahoma City, Radio, Inc. 405-789-0741
OK Oklahoma City, Trice Wholesale Elctrns. 405-232-2291
OK Oklahoma City, Wholesale Elctrn. Supp. Co. 405-528-2391
OK Okmulgee, Trice Whls. Elctrns. 918-756-2060
OK Tulsa, Carlton Bates Co. 918-250-1626
OK Tulsa, Radio, Inc. 918-587-9124
OK Tulsa, Trice Wholesale Elctrns. 918-585-5718
OR Pendleton, Round-Up Elctrns. 503-276-3152
OR Portland, Radar Elec. 503-232-3404
OR Portland, United Radio Supp., Inc. 503-233-7151
OR Salem, JW Elctrns. 503-399-8565
PA Allentown, A. A. Peters, Inc. 215-434-5237
PA Allentown, Barbey Elctrns. 215-821-5551
PA Altoona, Hollenback Radio Supp. 814-944-6171
PA Ambridge, Television Parts Co. 412-266-7700
PA Braddock, D & D Radio & Television Parts Co. 412-351-3600
PA Braddock, M Leff Radio Parts Co. 412-351-5000
PA Butler, Bacher Elctrns. 412-283-2095
PA Carlisle, Cumberland Elctrns., Inc. 717-243-6169
PA Clifton Heights, Lazar Elctrns. 215-284-2440
PA Drexel Hill, Kass Elctrn. Distr. 215-449-2300
PA Elkins Park, AG Radio Inc. 215-886-5100
PA Erie, J. V. Duncombe Co. 814-454-5278
PA Erie, Warren Radio Co. 814-454-5285
PA Harrisburg, Cumberland Elctrns. 717-233-5883
PA Hazelton, Moyer Elctrn. Supp. Co., Inc. 717-455-3631
PA Lancaster, Barbey Elctrns. 717-393-5637
PA Lancaster, Cumberland Elctrns. 717-393-8304
PA Lewiston, Cumberland Elctrns. 717-248-9631
PA Marcus Hook, Linwood Wholesale 215-485-0777
PA New Brighton, Television Parts Co., Inc. 412-846-3000
PA Philadelphia, Arlen Supply Co. 215-472-3810
PA Philadelphia, HBF Elctrns. Inc. 215-338-1100
PA Philadelphia, JEM Elctrns. 215-743-3030
PA Philadelphia, Shap Elctrns. 215-969-3300
PA Pittsburgh, CRS Elctrns. 412-431-7700
PA Pittsburgh, Graybar Elec. 412-323-0600
PA Pittsburgh, South Hills Elctrns. 412-281-6640
PA Pittsburgh, South Hills Elctrns. 412-341-6200
PA Pittsburgh, Triangle Elctrn. Co. 412-441-9659
PA Pottsville, Moyer Elctrn. Supp. Co., Inc. 717-622-7866
PA Reading, Barbey Elctrns. 215-376-7451
PA Scranton, Key Radio & Supp. Co. 717-342-0161
PA St. Marys, B & R Elec. Co. 814-834-2814
PA State College, University Elctrns. 814-238-3093
PA Sunbury, Moyer Elctrn. Supp. Co., Inc. 717-286-6707
PA Tarentum, Huston Elctrn. Distrs. 412-224-8002
PA Trevose, Trevose Elctrns. 215-357-1400
PA Uniontown, State Elctrns. 412-437-6110
PA Wayne, Peak Elctrns. Corp. 215-293-9000
PA West Chester, West Chester Elec. Supp. Co. 215-696-7500
PA Wilkes-Barre, Wallco Inc. Elctrn. Dist. .. 717-823-6181
PA York, Cumberland Elctrns. 717-848-1511
RI Providence, A&J Distrs. Inc. 401-421-0991
RI Providence, Hope Elctrn. Supp. 401-521-5600
RI Providence, William Dandreta & Co. .. 401-861-2800
RI Woonsocket, Lectronic Supp. Co. 401-762-0131
SC Charleston, Wholesale Indl. Elctrns. ... 803-747-9672
SC Charleston, Wholesale Indl. Elctrns., Inc. 803-723-3626
SC Columbia, Hesco Inc. 803-254-4575
SC Columbia, Wholesale Indl. Elctrns. 803-256-0746
SC Florence, J&M Supply Co. 803-662-7281
SC Greenville, Sawyer Elctrns. 803-235-0438
SC Greenville, Wholesale Indl. Elctrns. 803-235-8334
SC Taylors, Cantrell Wholesale 803-268-1194
SD Watertown, Burghardt Supp. Co. 605-886-5754
TN Chattanooga, Specialty Distributing Co. 615-267-9460
TN Columbia, Randolph & Williams 615-388-7566
TN Cookeville, Randolph & Parks 615-526-6184
TN Dyersburg, Warren Radio 901-285-3850
TN Jackson, Bluff City Elctrns. 901-424-0236
TN Jackson, Lavender Elctrns. Inc. 901-422-6585
TN Johnson City, L & S Elctrns. 615-926-3021
TN Knoxville, Bondurant Bros. Co. 615-573-9151
TN Knoxville, Roden Electrical Supp. Co. 615-546-8755
TN Memphis, Bluff City Elctrns. 901-345-9500
TN Memphis, Frank G. Uffer Co. 901-725-6743
TN Memphis, Warren Radio 901-274-2460
TN Morristown, L & S Elctrns. 615-581-7983
TN Nashville, Bluff City Elctrns. 615-242-8000
TN Nashville, Curreys Inc. 615-242-4221
TN Nashville, Randolph & Rice 615-255-5602
TN Paris, Lavender Elctrns., Inc. 901-642-7354
TN Tullahoma, Randolph Vandergriff Inc. 615-455-4531
TX Abilene, R & R Elctrn. Supp. Co. 915-677-2974
TX Amarillo, R & R Elctrn. Supp. Co. 806-374-2866
TX Amarillo, Trice Wholesale Elctrns. 806-372-5668
TX Austin, C&M Elctrns. Inc. 512-451-6595
TX Austin, Harrison Equip. Co. 512-458-3555
TX Austin, Wholesale Elctrn. Supp. Co. ... 512-478-9568
TX Beaumont, Buddy's Wholesale Elctrn. Inc. 713-842-5019
TX Beaumont, Covington Distr. 713-835-5392
TX Borger, Trice Wholesale Elctrns. 806-274-5281
TX Brownsville, Rio Radio Supp., Inc. 512-423-1959
TX Bryan, Mid-State Elctrns. 713-822-0884
TX Carrollton, Curtis Mathes Corp. 214-484-4941
TX Corpus Christi, Elctrn. Suppliers Inc. .. 512-993-1303
TX Corpus Christi, Leader Elctrn. Supp. Co. 512-884-5527
TX Dallas, Banner TV Supp. 214-943-9742
TX Dallas, Harrison Equip. Co., Inc. 214-239-2750
TX Dallas, R & R Elctrn. Supp. Co. 214-742-1431
TX Dallas, United Distr. of Texas, Inc. 214-631-3980
TX Dallas, Wallace Elctrns. Co., Inc. 214-340-0400
TX Dallas, Wholesale Elect. Supp. Co. 214-824-3001
TX Denison, Denison Radio Supp. 214-465-2336
TX El Paso, Midland Specialty Co. 915-533-9555
TX El Paso, R & R Elctrn. Supp. Co. 915-566-9693
TX Ft. Worth, Allied Elctrns. 817-336-5401
TX Ft. Worth, Apollo Whls. Elctrns. 817-877-5854
TX Ft. Worth, Wholesale Elctrn. Supp. 817-336-0461
TX Greenville, Lavender Elctrns. Inc. 817-335-9515
TX Harlingen, Elctrn. Suppliers, Inc. 512-423-5895
TX Harlingen, Rio Radio Supp., Inc. 512-423-1959
TX Houston, Angie Elctrn. Supp. Co. 713-659-8386
TX Houston, Electronic Comps. Distrs. 713-528-1543
TX Houston, Harrison Equip. Co. 713-652-4750
TX Houston, Houston Wholesale 713-644-8320
TX Houston, L & O Elctrn. Supp. 713-862-7454
TX Houston, Lenert Co. 713-225-1465
TX Houston, Ralph's Indl. Elctrns. 713-641-0267
TX Irving, Apollo Whls. Elctrns., Inc. 214-399-8195
TX Laredo, Guarantee Radio Supp. Co. ... 512-723-6913
TX Longview, Texas Indl. Elctrn. Supp. ... 214-793-0919
TX Longview, Wholesale Elctrn. Supp. 214-757-3961
TX Lubbock, R & R Elctrns. Supp. Co. 806-765-7727
TX Lubbock, Trice Wholesale Elctrns. 806-747-2888
TX McAllen, Richards Elctrns. 512-682-6337
TX McAllen, Rio Radio Supp. Inc. 512-682-5224
TX Midland, Trice Wholesale Elctrns. 915-563-0666
TX Odessa, R & R Elctrn. Supp. Co. 915-332-9166
TX Paris, Lavender Elctrns. Inc. 214-785-1711
TX Pasadena, Angie Elctrn. Supp. 713-473-4428
TX Port Arthur, Diehl Radio & TV Supp. .. 713-985-8888
TX Richardson, Martin Whls., Inc. 214-231-1826
TX Richardson, Trice Wholesale Elctrns. 214-690-4646
TX San Antonio, M-Tronics Inc. 512-736-2481
TX San Antonio, Sherman Elctrns. 512-224-1001
TX Sherman, Lavender Elctrns. Inc. 214-892-9155
TX Sherman, Trice Wholesale Elctrns. 214-893-7421
TX Stafford, Harrison Equip. Co. 713-879-2600
TX Temple, L & M Wholesale Elctrns. 817-778-7679
TX Texarkana, Carlton-Bates Co. of Texarkana 214-792-6923
TX Texas City, Elctrn. Supp. Co. 713-945-4401
TX Tyler, East Texas Elctrn. Inc. 214-593-8253
TX Tyler, Lavender Elctrns. Inc. 214-597-6315
TX Victoria, Lavender Elctrns. Inc. 512-575-4738
TX Waco, L & M Wholesale Elect. 817-754-4644
TX Wichita Falls, R & R Elctrns. Supp. Co. 817-322-0731
TX Wichita Falls, Trice Wholesale Elctrns. 817-322-2151
TX Wichita Falls, Wholesale Elect. Supp. Co. 817-723-8106
UT Provo, Central Utah Elctrns. 801-373-7522
UT Salt Lake City, Kimball Elctrns. 801-328-2075
VT Burlington, Greylock Elctrns. 802-863-3100
VT Burlington, Vermont Appliance Co. 802-864-9831
VT Rutland, Rutland Elctrn. 802-775-4690
VT White River Jct., Vermont Appliance .. 802-295-3143
VA Alexandria, Certified Elctrns. 703-548-5115
VA Arlington, Arlington Elctrn. Wholesale 703-524-2412
VA Charlottesville, Graves Elctrns. 804-296-0125
VA Charlottesville, Virginia Radio Supp. Co., Inc. 804-296-4184
VA Danville, State Elctrns., Inc. 804-793-5131
VA Lynchburg, State Elctrns., Inc. 804-845-5983
VA Martinsville, State Elctrns., Inc. 703-638-2327
VA Norfolk, Radio Parts Dist. Co. 804-461-8095
VA Portsmouth, Distrs. Inc. 804-399-2446
VA Richmond, Banner Elctrns. Inc. 804-321-7255
VA Staunton, Southern Elec. Corp. 703-886-6218
WA Bellingham, Seattle Radio Supp. 206-734-3400
WA Everett, JW Electronics 206-258-4339
WA Seattle, Electronic Supp. Co. 206-632-2222
WA Seattle, Pearl Elctrns. 206-622-6200
WA Seattle, Radar Elec. 206-282-2511
WA Seattle, Westlake Elctrn. Supp. 206-622-6600
WA Spokane, Amfac Elec. Supp. 509-534-0611
WA Spokane, JW Elctrns., Inc. 509-535-5800
WA Spokane, Radar Elec., Inc. 206-282-2511
WA Tacoma, C & G Elctrns. 206-272-3181
WA Tumwater, JW Elctrns. 206-943-1071

WA Yakima, JW Electronics 509-575-1234
WV Beckley, Halley Elctrns. 304-253-2561
WV Bluefield, Mason-Dixon Distrs. 304-325-8106
WV Charleston, Elctrn. Materials 304-344-3577
WV Fairmont, State Elctrns. 304-366-4520
WV Huntington, Electronic Supp., Inc. 304-523-6443
WV Morgantown, Electro Distributing Co. .. 304-296-5637
WV Morgantown, State Elctrns. 304-292-1641
WI Appleton, Appleton Radio 414-734-5767
WI Eau Claire, Indianhead Elctrns. 715-834-3606
WI Fond du Lac, Fedco Elctrns. Inc. 414-922-6490
WI Green Bay, G. M. Popkey Co. 414-437-5445
WI Kenosha, Chester Elctrn. Supp. 414-658-4616
WI Madison, G. M. Popkey Co. 608-257-2266
WI Madison, Superior Elctrn. Parts Co. ... 608-257-1477
WI Milwaukee, G. M. Popkey Co. 414-444-4730
WI Onalaska, Stark Elctrn. Supp. Co. 608-783-0800
WI Racine, Superior Racine, Inc. 414-632-5142
WI Wausau, G. M. Popkey Co. 715-845-4255
WY Casper, Walker Casper Elctrn. Co. 307-237-1943

SYLVANIA MINIATURE LIGHTING, GTE Corporation, W. Main St., Hillsboro, NH 03244, Tel: 603-464-5533, TWX: 710-366-0387; FSC No.: 88204; Empl.: 1000; *Sls. Mgr.:* Tom Izbicki; *Dist. Mgr.:* Tom Izbicki ..... **B•1109-1111**

Local Sales Offices & Reps

AL Huntsville, R. O. Whitesell 205-883-5110
AZ Scottsdale, Bill Earl & Assocs. 602-994-3813
AR Little Rock, Erickson Sls. 501-225-7379
CA Laguna Hills, English/Damco 714-837-3801
CA Sunnyvale, W.W. Posey Co. 408-746-0771
CO Arvada, Cluff & Assocs. 303-425-6604
CT No. Haven, Coakley, Boyd & Abbett ... 800-225-8402
FL Brandon, Hutto, Hawkins, Peregoy 305-831-2474
FL Clearwater, Hutto, Hawkins, Peregoy .. 813-797-4447
FL Maitland, Hutto, Hawkins, Peregoy 305-831-2474
FL Pompano Beach, Hutto, Hawkins, Peregoy 305-971-5750
GA Atlanta, Millar Elctrns. 404-261-6160
IL Chicago, I.R.I. 312-647-7755
IN Ft. Wayne, R.O. Whitesell & Assocs. .. 219-432-5591
IN Indianapolis, R.O. Whitesell & Assocs. 317-359-9283
IN Kokomo, R. O. Whitesell 317-457-9127
IA Cedar Rapids, R. W. Kunz 319-396-5386
KS Prairie Village, R.W. Kunz 913-648-3535
KY Louisville, R.O. Whitesell & Assocs. ... 502-426-7696
LA Chalmette, Erickson Sls. 504-271-1976
LA Covington, Cartwright & Bean 504-892-1780
MA Needham, Coakley, Boyd & Abbett 617-444-5470
MI Grand Rapids, R.O. Whitesell & Assocs. 616-942-5420
MI Southfield, R. O. Whitesell 313-559-5454
MI St. Joseph, R.O. Whitesell & Assocs. .. 616-983-7337
MN Minneapolis, Stoss & Assocs. 612-925-2757
MS Jackson, Cartwright & Bean 601-981-1170
MO St. Louis, R.W. Kunz 314-966-4977
NJ Long Valley, Paul A. Sweeney 201-852-1434
NY Rochester, Electra Sls. 716-461-5252
NY Syracuse, Electra Sls. 315-463-1248
NC Raleigh, Millar Elctrns. 919-787-9585
OH Cincinnati, R.O. Whitesell & Assocs. ... 513-521-2290
OH Cleveland, R.O. Whitesell & Assocs. .. 216-447-9020
OH Columbus, R.O. Whitesell & Assocs. .. 614-888-9396
OH Dayton, R.O. Whitesell & Assocs. 513-298-9546
OR Tigard, Electronic Sources Inc. 503-684-0040
PA Pittsburgh, R.O. Whitesell & Assocs. .. 412-963-6161
PA Trevose, P.S.A. Inc. 215-245-0513
TN Knoxville, R. O. Whitesell 615-694-9476
TN Memphis, Cartwright & Bean 901-276-4442
TX Austin, Erickson Sls. 512-244-3068
TX Dallas, Erickson Sales 214-739-5833
TX Houston, Erickson Sales 713-266-1604
UT Salt Lake City, Cluff & Assocs. 801-486-7297
WA Bellevue, Electronic Sources Inc. 206-451-3500
WI Milwaukee, F.C. DuBois & Assocs. 414-774-3100

SYLVANIA PARTS, 816 Lexington Ave., Warren, PA 16365, Tel: 814-723-2000, 800-221-3333; Empl.: 1880; *Sls. Mgr.:* R. F. Scalise

G.T.E. GOV'T SYS. CORP., Comm. Sys. Div., 77 A St., Needham Hgts., MA 02194, Tel: 617-449-2000, Telex: 92-2497; Empl.: 4000; *Sls. Mgr.:* Ken Tong

SYMBEX CORP., 72 Corwin Dr., Box 938, Painesville, OH 44077, Tel: 216-354-0925, TWX: 810-425-2256; Empl.: 130 ..... **C•1528-1529**

Local Sales Offices & Reps

AL Huntsville, Elctrn. Sls. 205-533-1735
AZ Tempe, Elctrn. Dev. and Sls. 602-438-1547
CA Anaheim, West Rep. 714-527-2822
CA Chico, Symbex Corp. 916-893-5010
CA San Diego, Westrep, Inc. 619-566-6580
CA Santa Clara, Westrep, Inc. 408-988-8833
CO Littleton, Lange Sls., Inc. 303-795-3600
FL Ft. Lauderdale, Interface Dynamics ... 305-565-5075
FL Plant City, Interface Dynamics 813-754-1329
GA Norcross, Elctrn. Sls. 404-448-6554
IL Crystal Lake, Symbex Corp. 815-455-3362
IN Angola, Waid & Assocs. 219-833-3522
IN Indianapolis, M & L Elctrn. Sls. 317-359-4742
MA Canton, Symbex Corp. 617-828-8114
MI Franklin Village, I.E. Hampton & Assocs. 313-851-0820
MI St. Joseph, I.E. Hampton & Assocs. ... 616-983-0862
MN Chanhassen, Parker Shoap & Assocs. 612-934-8127
MN Minneapolis, Parler, Shoap & Assocs. 612-755-6904
MO Blue Springs, Kathrinus Kelly Baumhauer 816-229-0001
MO St. Louis, Kathrinus Kelly Baumhauer 314-647-2400
NJ Commack, Axelrod, Busch, Sullivan ... 201-871-0020
NJ Englewood, Axelrod, Busch, Sullivan Assoc. 201-871-0020
NJ Medford, Champion Elctrn. Sls. 609-983-0932
NJ Sayreville, Axelrod, Busch, Sullivan ... 201-871-0020
NY Bainbridge, R. W. Mitscher 607-967-7192
NY Buffalo, R.W. Mitscher Co. 716-633-7970
NY Lindenhurst, Axelrod, Busch, Sullivan 212-594-4090
NY North Syracuse, R.W. Mitscher Co. 315-458-1321
NY Pittsford, R.W. Mitscher Co. 716-586-4012
NY Red Hook, R. W. Mitscher Co., Inc. 914-758-8375
NY Rochester, R. W. Mitscher Co., Inc. 716-227-0839
NC Cary, Elctrn. Sls. 919-467-8486
OH Columbus, Norm Case Assocs. 614-863-5686
OH Painesville, Symbex Corp. 216-354-0925
OH Rocky River, Norm Case Assocs. 216-333-0400
OR Falls City, Ecco Mktg. 503-787-3509
PA Southampton, Symbex Corp. 215-322-8040
TX Houston, Symbex Corp. 713-776-8468
UT Salt Lake City, Lange Sls., Inc. 801-487-0843
WA Seattle, Ecco Mktg. 206-364-0200
WI Colgate, Rep. 1 & Assoc. 414-628-4016

Local Distributors

AZ Phoenix, Arizona Comps. 602-269-5655
CT Danbury, Pilgrim Elctrns 203-792-7274
MA Danvers, Criterion 617-777-4725
MA Middleboro, Glynn Elctrns. 617-947-4262
OK Tulsa, Combined Tech. Comps. 918-665-3002
WI Madison, Schrenk Sls. 608-255-7400
WI Milwaukee, Marsh Elctrns. 414-475-6000

SYMBICON, 89 Route 101A, Amherst, NH 03031, Tel: 603-673-8898, Telex: 953059; *Sls. Mgr.:* S. Harrington; *Dist. Mgr.:* W. Ferrier

SYM-TEK SYS., INC., 3912 Calle Fortunada, San Diego, CA 92123, Tel: 619-569-6800, Telex: 249036; Empl.: 325; *Sls. Mgr.:* John Robinson

Local Sales Offices & Reps

AZ Phoenix, Scientific Dvs. 602-957-0401
CA Huntington Beach, Scientific Dvcs. 714-840-3501
CA San Diego, Scientific Dvcs. 619-268-9635
CA San Jose, Scientific Dvs. 408-554-0455
CO Broomfield, Scientific Dvcs. 303-469-5145
FL Longwood, Richard Schoonover, Inc. 305-788-3344
GA Marietta, MoRe 404-992-5172
MA E. Longmeadow, System Sls. 413-525-3679
MA Hudson, System Sls. 617-562-9777
NM Albuquerque, Scientific Dvcs. 505-883-3668
NY Valley Stream, Levison Sls. 516-266-5020
OH Brecksville, WRR Assocs. 216-526-2023
TX Richardson, Sym-Tek Sls. 214-680-3004
UT W. Valley City, Scientific Dvcs. 801-966-0105
WA Marysville, Scientific Dvcs. 206-653-6031
Can Montreal, Interfax Sys., Inc. 514-336-0392

SYMTRON CORP., 2415 E. Charleston Rd., Mountain View, CA 94043, Tel: 415-965-4500, TWX: 910-379-5002; Empl.: 350; *Sls. Mgr.:* Don Atkins

SYNEKTRON CORPORATION, 12000 S. W. Garden Place, Portland, OR 97223, Tel: 503-684-3090, Telex: 517441; Empl.: 72

SYNERGETICS INTL., INC., 6565 Odell Pl., P.O. Box E, Boulder, CO 80306-1236, Tel: 303-530-2020; *Sls. Mgr.:* Mike Sharkey

SYNERTEK, 3001 Stender Way, Santa Clara, CA 95051

SYNTEL DIV., Tegam, Inc., 7230 North Ridge Rd., Madison, OH 44057, Tel: 216-428-7505; Empl.: 15

SYNTEST CORP., 40 Locke Dr., Marlboro, MA 01752, Tel: 617-481-7827, TWX: 710-390-7659; *Sls. Mgr.:* Curtis P. Hoffman ..... **D•1073**

Local Sales Offices & Reps

CA Encino, King Engrg. 818-981-8677
CA Fullerton, King Engrg. 714-525-6782
CT Hamden, Digital Sls. 203-248-3641
IL Arlington Heights, Coombs Assocs. ... 312-439-9810
MD Silver Spring, Source Assoc. 301-725-5330
MA Waltham, Digital Assocs. 617-899-4300
NY Canandaigua, Burt Mamula 716-394-5560
NY White Plains, Cane Tech. Sls. 914-694-9240
PA Newtown Square, SWR Assoc 215-356-8550
TX Waller, Vital Process Sys. 713-463-6811

SYNTRONIC INSTRUMENTS, INC., 100 Industrial Rd., Addison, IL 60101, Tel: 312-543-6444, TWX: 910-651-2191; FSC No.: 99409; Empl.: 175; *Sls. Mgr.:* Paul Evans

SYRACUSE ELCTRNS., P.O. Box 4770, Syracuse, NY 13221, Tel: 315-488-4911, Telex: 937-232; Empl.: 150

SYSCON INTL., INC., 1108 So. High St., So. Bend, IN 46618-1096, Tel: 219-232-3900, 800-348-2993, TWX: 810-299-2523; Empl.: 40; *Sls. Mgr.:* Les Barney

SYSTEK, 1023 N. Kellogg St., Kennewick, WA 99336, Tel: 509-735-1200; Empl.: 5

SYSTEMS DATA, INC., 2830 Copley Road, P.O. Box 4297, Akron, OH 44321, Tel: 216-666-0085; Empl.: 12; *Sls. Mgr.:* John C. Hall

SYSTEMS FURNITURE CO., 2727 Maricopa St., Torrance, CA 90503, Tel: 213-533-1212, TWX: 910-349-7518; *Sls. Mgr.:* Rick Labowitz

SYSTEMS PLUS, 1120 San Antonio Rd., Palo Alto, CA 94303, Tel: 415-969-7047, TWX: 910-373-2096; Empl.: 35

SYSTEMS RESCH. LABS., INC., 2800 Indian Ripple Rd., Dayton, OH 45440, Tel: 513-426-6000, TWX: 810-450-2621; FSC No.: 14590; Empl.: 1000

SYSTONICS, INC., Box 121, Winchester, MA 01890, Tel: 617-729-4439; Empl.: 11

SYSTRON-DONNER INERTIAL DIV., 2700 Systron Dr., Concord, CA 94518, Tel: 415-682-6161, TWX: 910-481-9478; Empl.: 416

SYSTRON-DONNER INSTR. DIV., 2727 Systron Dr., Concord, CA 94518, Tel: 415-676-5000, Telex: 171996, TWX: 910-481-9472; FSC No.: 52542; Empl.: 1400; *Sls. Mgr.:* Howard W. Mette

SYSTRON-DONNER MICROWAVE DIV., 14844 Oxnard St., Van Nuys, CA 91409, Tel: 818-786-1760, TWX: 910-495-1786; Empl.: 160; *Sls. Mgr.:* Tim A. Meehan

SYT, 1220 Barranca, El Paso, TX 79935, Tel: 915-593-1234; Empl.: 70; *Sls. Mgr.:* Larry Crum; *Dist. Mgr.:* John Sullivan

SYTEK, INC., 1225 Charleston Rd., Mountain View, CA 94043, Tel: 415-966-7300; *Sls. Mgr.:* Rhonda St. James

TAB BOOKS, Monterey & Pinola Aves., Blue Ridge Summit, PA 17214, Tel: 717-794-2191, Telex: 820562; Empl.: 175; *Sls. Mgr.:* Kevin Moran

TACHTRONIC INSTRUMENTS, INC., New Ulm, MN 56073, Tel: 507-354-3105

TADIRAN BATTERIES, See Plainview Elctrns.

TAFA, INC., Dow Rd, Box 1157, Bow, NH 03301-1157, Tel: 603-224-9585, Telex: 94-3424; Empl.: 50; *Sls. Mgr.:* Bob Unger; *Dist. Mgr.:* Leon Grant

TA INSTR. CASE CO., 4625 Alger St., Los Angeles, CA 90039, Tel: 818-242-8855, TWX: 910-497-4780; Empl.: 60; *Sls. Mgr.:* Jackie Garrison; *Dist. Mgr.:* Jackie Garrison ..... **C•1087**

Local Sales Offices & Reps

AL Huntsville, BJR Mfg. Reps. 205-881-3569
AZ Phoenix, Tri-Fab Sls. 602-265-3341
CA San Diego, L.L. Stoakes, Inc. 619-452-1600
CO Littleton, Omega Ltd. 303-798-7040
CT Hartford, Sturgeon Co. 203-249-7800

FL Orlando, Oem Mktg. Corp. 305-299-1000
FL Walton Beach, BJR Mfg. Reps. 904-863-3315
IL Chicago, Aktron Corp. 312-658-3538
IN Fort Wayne, Aktron 219-747-3650
IA Davenport, Ensco Rep., Inc. Iowa 319-386-6600
KS Overland Park, Ensco Rep. - Kansas .. 913-381-7557
KS Wichita, Ensco Rep. - Wichita 316-683-1070
KS Wichita, Ensco Wichita 316-683-1070
MD Rockville, Datek 301-294-0744
MA Needham, Sturgeon Co. 617-444-6603
MO Markland Hgts., Ensco Rep., Inc. 314-423-3935
NJ Ridgewood, Balloou, Inc. 201-444-6990
NM Albuquerque, C.T. Carlberg & Assocs. 505-888-3883
NY Great Neck, F. & F. Metro, Inc. 516-482-4080
NY New York, Ballou 212-964-4640
NY Rochester, Gislason Sls. 716-328-7400
OR Aloha, Caruso & Northcutt 503-646-4973
PA Blue Bell, Macron Dynamics 215-628-8000
TX Arlington, Bell Comps. 817-461-5303
TX El Paso, C.T. Carlberg & Assocs. 505-888-3883
WA Bellevue, Caruso & Northcutt 206-454-9699
Intl IS, Bnei Brak, Mono Elctrns. 011-44955-3606
Intl ST, Wick, Osprey Elctrns. 011-44955-3606
Can Ontario, Avotronics 416-475-2024
Can Quebec, Avotronics 514-697-2135

TAIYO YUDEN (USA) INC., 714 Algonquin Rd., Arlington Heights, IL 60005, Tel: 312-364-6104; Empl.: 35; *Sls. Mgr.:* Mikio Hasunuma

TAKEDA RIKEN CO., LTD., NS Bldg. 14th,4-1,Nishi-Shinjuku 2-Chome,Shinjuku-ku, Tokyo 160, Tokyo 176, Japan, Tel: 03-342-7500, Telex: 232-4914 Takeda J; Empl.: 1200; *Sls. Mgr.:* Hiroshi Yasui

TALLGRASS TECHNOLOGIES, 11100 W. 82nd St, Overland Park, KS 66214, Tel: 913-492-6002, TWX: 437121 Tallgrass LXKS; *Sls. Mgr.:* George Spiecker

T&B/ANSLEY CORP., Sub. Thomas & Betts, 920 Route 202, Raritan, NJ 08869, Tel: 201-685-1600; Empl.: 250; *Dist. Mgr.:* Roland Kolu

T & W SYSTEMS INC., 7372 Prince Dr. Ste 106, Huntington Beach, CA 92647, Tel: 714-847-9960; Empl.: 40; *Sls. Mgr.:* Robert Murphy; *Dist. Mgr.:* Greg La Porte/Al Brown

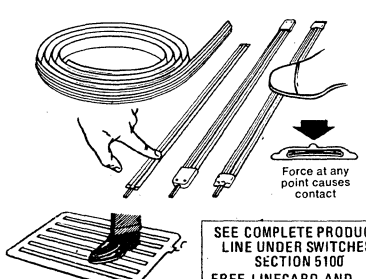
Tapeswitch Corporation of America

FULL LINE
AUTHORIZED DISTRIBUTOR

E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310

CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640

TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

TANO CORP., 4301 Poche Ct., New Orleans, LA 70129, Tel: 504-254-3500, TWX: 810-951-5229; Empl.: 390; *Sls. Mgr.:* T. M. Lowrey, Energy Control Sys.

TANSITOR ELCTRNS., West Rd., Bennington, VT 05201, Tel: 802-442-5473, TWX: 710-360-1782; FSC No.: 05079; Empl.: 200; *Sls. Mgr.:* Tom Moore; *Dist. Mgr.:* Tom Moore

TAPE CONCEPTS, INC., P. O. Box 815, 110 E. Vistula St., Bristol, IN 46507, Tel: 219-848-5234 ..... **D•1035**

TAPECON, INC., 10 Latta Rd., Rochester, NY 14612, Tel: 716-621-8400; Empl.: 80

TAPESWITCH CORP. OF AMERICA, 100 Schmitt Blvd., Farmingdale, NY 11735, Tel: 516-694-6312, Telex: 14-4611; Empl.: 100 ..... **B•1699**

TAPPAN WIRE & CABLE, 256 Oak Tree Rd., Tappan, NY 10983, Tel: 914-359-9300; FSC No.: 2G330; Empl.: 20; *Sls. Mgr.:* Mike Ressa

TARGA ELECTRONICS, Systems Inc., 3101 Hawthorne Rd., P. O. Box 8485, Ottawa, ON, Canada K1G 3H9, Tel: 613-731-9941, Telex: 053-3351; Empl.: 25; *Sls. Mgr.:* James E. Saarinen

TASKER SYSTEMS, 20131 Sunburst St., Chatsworth, CA 91311, Tel: 213-341-3010, TWX: 910-494-1214; FSC No.: 09017; Empl.: 250; *Sls. Mgr.:* Gary B. Etzler

TAUBER ELCTRNS. INC., 4901 Morena Blvd., Bldg. 314, San Diego, CA 92117, Tel: 619-274-7242; Empl.: 16; *Dist. Mgr.:* Doug Bennett ..... **D•1439**

Local Sales Offices & Reps
AL Huntsville, Macro-Marketing 205-883-9630
AZ Phoenix, MacDonald & Assocs. 602-998-1848
CA Fullerton, Myco Sls. 714-546-9113
CA Northridge, Myco Sls. 818-886-7101
CA San Jose, Tom Haskins 415-964-0329
CA Sunnyvale, Tom Haskins 415-964-0329
IL Wheeling, Ed Joyner & Co. 312-520-1200
NV Reno, Connie Dunning 702-849-0722
OK Tulsa, Cunningham Comps. Corp. 918-492-0390
OR Portland, Frank Jackson Assocs. 503-292-2638
TX Dallas, Cunningham Comps. Corp. 214-233-4303
TX Houston, Cunningham Comps. Corp. .. 713-451-4197
WA Redmond, Frank Jackson Assocs. 206-881-7277

TAURUS COMPUTER PRODUCTS, INC., 1755 Woodward Dr., Ottawa, ON, Canada K2COPQ, Tel: 613-226-5361, Telex: 053-3577; Empl.: 17; *Sls. Mgr.:* Bill Ormerod; *Dist. Mgr.:* Bill Ormerod

TAURUS CORP., Academy Hill, P.O. Box 278, Lambertville, NJ 08530, Tel: 609-397-2390 ..... **D•1074**

Local Sales Offices & Reps
CA Pasadena, Sci. Sls. 213-793-1244
FL Clearwater, Brennan Assocs. 813-446-5006

TAU-TRON, INC., A Unit of General Signal, 10 Lyberty Way, Westford, MA 01886, Tel: 617-692-5100, Telex: 750245; Empl.: 300; *Sls. Mgr.:* Tom Lillard

TAYLOR ELECTRONICS, INC., 401 West Orion, Tempe, AZ 85283, Tel: 602-838-4523; Empl.: 25; *Sls. Mgr.:* Sharon F. Hansen ..... **D•1848**

Local Sales Offices & Reps
CA Los Angeles, Power Partners., Inc. 213-215-0800
CA Sunnyvale, Qualtech Assocs. 408-732-4800
MA Westwood, Modtek 617-461-0620
MN Minneapolis, D. A. Case Assocs., Inc. .. 612-869-3700
PA King of Prussia, KSI 215-783-6400

T-bar® INCORPORATED

T-BAR INCORPORATED, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897-0730, Tel: 203-834-8227, Telex: 681-9129, TWX: 710-479-3216; Empl.: 560; *Sls. Mgr.:* Gerard F. Ryan; *Dist. Mgr.:* Bill Kruppenbacher

Advertisement

Unique T-Bar multi-contact switching devices switch more circuits in less space. They have proven reliability in data processing, data and voice communications, test equipment and instrumentation applications. Available as standard and latching relays, and toggle and pushbutton switches. Used for restoral, reconfiguring, and line access applications in commercial, military and aerospace applications. T-Bar will custom design and build a wired assembly to meet your switching needs.

Local Sales Offices & Reps
AL Huntsville, CSR Elctrns. 205-533-2444
CA Arcadia, Van Gott & Assocs. 818-445-9728
CA Palo Alto, Horne Electro Sls. 415-494-6777
CT Wilton, T-Bar, Inc. 203-834-8227
FL St. Petersburg, Tech-Rep Assocs. 813-577-2779
GA Atlanta, CSR Elctrns. 404-396-3720
MD Silver Spring, Carwithen Assocs. 301-589-9040
MA Westwood, Apex Assocs. 617-326-5042
NY Mount Vernon, Sonkin Assocs. 914-968-8282
NC Raleigh, CSR Elctrns. 919-878-9200
TX Richardson, McCoy Assocs. Co. 214-238-1017

Local Distributors
IL Chicago, Newark Elctrns. 312-638-4411
MA Hingham, Sager Elctrl. Supp. Co. 617-749-6700

TCL INCORPORATED, 41829 Albrae Street, Fremont, CA 94538, Tel: 415-657-3800; Empl.: 50

TDJ CO., INC., 1154 Morena Blvd., San Diego, CA 92110, Tel: 619-276-5920; Empl.: 6; *Sls. Mgr.:* R. Scherr ..... **C•1088-1089**

TDK CORPORATION OF AMERICA, 4711 Golf Rd., Skokie, IL 60076, Tel: 312-679-8200; *Sls. Mgr.:* A. Otsuka .. **A•1176-1178, 1278, 1640-1641; D•1046-1047, 1849**

Local Sales Offices & Reps
AL Birmingham, Robert Warnock Co. 205-879-0576
CA Cupertino, Thresum Assocs. 408-996-9889
CA Laguna Hills, English-Damco 714-837-3801
CA Torrance, TDK Corp. of Amer. 213-539-6631
FL St. Petersburg, Tech. Rep. Assocs. 813-577-2779
ID Meridian, Intermountain Techn. 208-888-5708
IL Palatine, Technology Sls. 312-991-6600
IN Indianapolis, TDK Corp. of Amer. 317-872-0370
MA Westwood, Comp. Rep. Assocs. 617-329-3454
MN Bloomington, Smiley-Scott Assocs. ... 612-888-5551
NJ Mount Laurel, Comtek, Inc. 609-235-8505
NY East Syracuse, Nycom, Inc. 315-437-8343
NY Port Washington, TDK Corp. of Amer. ..... 516-625-0100, Ext. 2300
NC Raleigh, Zucker Assoc. 919-782-8433
OH Cincinnati, Luebbe Sls. Co. 512-871-4211
TN Knoxville, Insul-Reps 615-691-7586
TX Richardson, Logic I Sls. 214-234-0765
WA Seattle, Harry Levinson Co. 206-285-5622

T.D.S. CIRCUITS, INC., 6290 Sunset Blvd., #1126, Los Angeles, CA 90028, Tel: 213-463-5170, TWX: 910-321-2903; *Sls. Mgr.:* Norman R. Sutherland

TEAC CORP. OF AMERICA, Indl. Prod. Div., 7733 Telegraph Rd., Montebello, CA 90640, Tel: 213-726-0303, Telex: 67-7014; Empl.: 200; *Sls. Mgr.:* Al Astor; *Dist. Mgr.:* Al Astor

TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703, Tel: 602-792-2230, TWX: 910-952-1377; Empl.: 600; *Sls. Mgr.:* Barry Hamilton; *Dist. Mgr.:* Barry Hamilton

TECA, THERMOELECTRIC COOLING AMERICA CORP., 448 N. Halsted St., Chicago, IL 60622, Tel: 312-666-1600; Empl.: 50 ..... **C•1675-1677**

Local Sales Offices & Reps
..... 312-367-5700,800-572-1180

TECCOR SEMICONDUCTORS

TECCOR ELCTRNS., 1801 Hurd Dr., Irving, TX 75062, Tel: 214-252-7651, Telex: 79-1600, TWX: 910-860-5068; Empl.: 700; *Sls. Mgr.:* Gerry Wiley ..... **A•2092-2093**

Local Sales Offices & Reps
AL Huntsville, Interep Assocs. 205-533-1730
AZ Tempe, System Sls. of Ariz. 602-829-9338
CA San Diego, O'Donnell Assocs. 619-578-1645
CA San Jose, O'Donnell Assocs. 408-263-6500
CA Torrance, O'Donnell Assocs. 213-539-9664
CO Castle Rock, Romulus 303-688-5127
CT Cheshire, Scientific Comps. 203-272-2963
FL Clearwater Beach, Perrott Assocs. 813-443-5214
FL Orlando, Perrott Assocs. 305-298-7748
FL Sunrise, Perrott Assocs. 305-482-6909
GA Norcross, Interep Assocs. 404-449-8680
IL Arlington Heights, MSI 312-956-1000
IN Fort Wayne, Robert O. Whitesell & Assocs. 219-432-5591
IN Indianapolis, Robert O. Whitesell & Assocs. 317-359-9283

IN Kokomo, Robert O. Whitesell & Assocs. 317-457-9127
IA Cedar Rapids, E. C. S. 612-933-2594
KS Olathe, SPS Assocs. 913-764-4460
KY Louisville, Robert O. Whitesell & Assocs. 502-426-7696
MD Baltimore, Burgin-Kren Assocs. 301-265-8500
MA Walpole, JEF Components 617-668-6695
MI Detroit, Rathsburg Assocs. 313-882-1717
MN Minneapolis, Electric Comp. Sls. 612-933-2594
MO St. Louis, SPS 913-764-4460
NM Albuquerque, Sys. Sls. of Arizona Inc. 505-881-8877
NY Canandaigua, Bensman/Upstate Assocs. 716-396-2498
NY Johnson City, Bensman/Upstate Assoc. 607-722-2242
NC Raleigh, J & B Sls. 919-772-3546
OH Cincinnati, Robert O. Whitesell Assocs. 513-521-2290
OH Cleveland, Robert O. Whitesell & Assocs. 216-447-9020
OH Columbus, Robert O. Whitesell & Assocs. 614-888-9396
OH Dayton, Robert O. Whitesell & Assocs. 513-298-9546
PA Flourtown, C. H. Newson & Assocs. ... 215-248-3377
PA Philadelphia, S-J Assocs. 215-629-1025
PA Pittsburgh, Robert O. Whitesell & Assoc. 412-963-6161
TX Houston, Bonser Philhower Sls. 713-495-3115
UT Salt Lake City, Electrodyne 801-486-3801
VA Lynchburg, Burgin-Kren Assocs. 804-239-2626
WA Redmond, Quadra Sls. 206-883-3550
WI Wauwatosa, Larsen Assocs. 414-258-0529

Local Distributors

AL Huntsville, RM Electronics 205-852-1550
AZ Phoenix, Tri-Tek 602-995-9352
AZ Tempe, Bell Inds. 602-966-7800
CA Chatsworth, Integrated Elctrns. 213-998-2200
CA Hayward, Electro Comp. Distrs. 415-783-5800
CA Irvine, Integrated Elctrns. 714-540-5600
CA San Jose, Rose Elctrns. Dist. 408-263-2934
CA Santee, Mouser Elctrns. 619-449-2220
CO Lakewood, Active Comp. Technlg. 303-233-4431
CO Wheatridge, Bell Inds. 303-424-1985
CT East Haven, JV Elctrns. 203-469-2321
CT Hamden, Almo Elctrns. 203-288-6556
FL Longwood, Intertec Distr. 305-834-7777
IL Elk Grove, RM Elctrns. 312-364-6622
IL Hoffman Estates, Inter Comp 312-843-2040
IL Rosemont, Advent Elctrns. 312-298-4210
IN Ft. Wayne, Graham Elctrns. 219-423-3422
IN Indianapolis, Advent Elctrns. 317-872-4910
IN Indianapolis, Graham Elctrns. 317-634-8202
IN Indianapolis, RM Elctrns. 317-247-9701
IA Cedar Rapids, Advent Elctrns. 319-363-0221
LA Baton Rouge, Indl. Elctrns. Supp. 504-926-0513
LA Shreveport, Indl. Elctrns. Supp. 318-222-9459
MD Rockville, Almo Elctrns. 301-251-1161
MD Savage, Pyttronic Inds. 301-792-0780
MA Burlington, Zeus Comps. 617-273-0750
MA Woburn, ACI Elctrns. 617-935-7230
MI Farmington Hills, Advent Elctrns. 313-477-1650
MI Wyoming, RM Elctrns. 616-531-9300
MN Minneapolis, Stark Elctrns. 612-332-1325
NE Lincoln, Scott Elctrns. 402-466-8221
NJ Camden, Gen. Radio Supp. 609-964-8560
NM Albuquerque, Bell Inds. 505-292-2700
NY Buffalo, Summit Distrs. 716-884-3450
NY Jamaica, Archer Indl. Distr. 212-291-3232
NY Port Chester, Zeus Comps. 914-937-7400
NY Rochester, Simcona Elctrns. 716-328-3230
NY Rochester, Summit Distrs. 716-334-7376
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Winston-Salem, Almo Elctrns. 919-760-0432
OH Cincinnati, Graham Elctrns. 513-772-1661
OH Columbus, Graham Elctrns. 614-895-1590
OH Dayton, Stotts Friedman 513-298-5555
OR Portland, Radar Elc. Co. 503-232-3404
PA Enola, Almo Elctrns. 717-732-3681
PA Mc Kean, Advacom 814-476-7774
PA Montgomeryville, Pyttronic Inds. 215-643-2850
PA Philadelphia, Almo Elctrns. 215-698-4000
PA Pittsburgh, Almo Elctrns. 412-931-5990
SC Greenville, Hammond Elctrns. 803-233-4121
TN Chatanooga, Techni-Tronics 615-875-5449
TN Nashville, Graham Elctrns. 615-242-2682
TX Austin, Active Comp. Technlg. 512-452-5254
TX Dallas, Active Comp. Technlg. 214-980-1888
TX Dallas, RM Elctrns. 214-235-3100
TX El Paso, ERA Elctrns. 915-592-4126
TX Houston, Active Comp. Technlg. 713-496-4000
UT Salt Lake City, Bell Inds. 801-972-6969
WA Bellevue, Integrated Elctrns. 206-455-2727
WA Seattle, Radar Elec. Co. 206-282-2511
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI New Berlin, RM Elctrns. 414-784-4420

TECHCON SYSTEMS INC., 1059 E. Bedmar St., Carson, CA 90746, Tel: 213-603-8888; Empl.: 25; *Sls. Mgr.:* S. L. Morse

TECH-ETCH, INC., 45 Aldrin Rd., Plymouth, MA 02360, Tel: 617-747-0300; Empl.: 280; *Sls. Mgr.:* P. A. Thomas

TECH LABS., INC., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, Tel: 201-944-2221; FSC No.: 83332; Empl.: 31 ..... **B•1700-1701**

Local Sales Offices & Reps

CT New Preston, NBS Assoc. 203-868-0501
GA Atlanta, Grady Duckett Sls. 404-451-3529
IL Glenview, Crimson Engrg. Co. 312-470-0024
KS DeSoto, Midtec Assocs. 913-441-6565
MI Jackson, N. Scroggs Co. 517-750-1170
MO Florissant, Midtec Assocs. 314-837-5200
NJ Haddonfield, Gray Assocs. 609-429-5300
NJ Upper Saddle River, Bob Cameron, Inc. 201-825-1304
NY Huntington Station, Haner Assocs. 516-242-7855
NY Pittsford, Net Sls. 716-467-4538
OH Cincinnati, Patco 513-931-3311
PA Pittsburgh, VerHill Assocs. 412-241-5202
TX Dallas, Southwest Elctrns. 214-690-9881
TX Houston, Southwest Elctrns. 713-729-1670
WA Seattle, SPS Elctrns. 206-323-4140

Local Distributors

CA Granada Hills, C & W Comps. Sls. 818-368-4032
CA Palo Alto, Mollard Mktg. 415-961-0456
NJ Garfield, Bob Cameron Assocs. 201-470-0700
NY Huntington Station, Haner Assocs., Inc. 516-242-7855

TECHLAND SYSTEMS, INC., 25 Waterside Plaza, New York, NY 10010, Tel: 212-684-7788, Telex: 961-134

TECHMAR

TECHMAR CORP., 2232 S. Cotner Ave., Los Angeles, CA 90064, Tel: 213-478-0046, 800-TECHMAR; Empl.: 12; *Sls. Mgr.:* Tom Cooper ..... **C•1090-1091**

TECHNAR INC., 205 N. 2nd Ave., Arcadia, CA 91006, Tel: 818-445-1143; *Sls. Mgr.:* James Rhodes

TECHNIC, INC., Box 965, Providence, RI 02901, Tel: 401-781-6100, Telex: 927514; Empl.: 125; *Sls. Mgr.:* A. A. Amtos

TECHNICAL AIDS TO INDEPENDENCE, INC., 12 Hyde Road, Bloomfield, NJ 07003, Tel: 201-338-8826; Empl.: 2

TECHNICAL COMMUNICATIONS CORPORATION, 100 Domino Drive, Concord, MA 01742, Tel: 617-862-6035, Telex: 923407

TECHNICAL DEVICES, 560 Alaska Ave., Torrance, CA 90503, Tel: 213-618-8437; FSC No.: 04772; Empl.: 21; *Sls. Mgr.:* D. Murrin; *Dist. Mgr.:* D. Murrin

TECHNICAL MARKING SYS., P.O. Box 10, Lynnfield, MA 01940, Tel: 617-334-6940; Empl.: 20

TECHNICAL MATERIALS, INC., Sub. of Brush Wellman, Inc., 5 Wellington Rd., Lincoln, RI 02865, Tel: 401-333-1700, TWX: 710-384-0600; Empl.: 250; *Sls. Mgr.:* John S. Seligman

Local Sales Offices & Reps

CA Los Angeles, E. J. Brookes Co. 213-722-8100
CA Santa Clara, E. J. Brookes Co. 408-988-1201
IL Elmhurst, Technical Materials 312-832-1263
IN Carmel, Larry Woodling Co. 317-844-7365
SC Greenville, B & B Sls. 803-297-1200

TECHNICAL PANELS, INC., 9162 La Rosa Dr., Temple City, CA 91780, Tel: 818-285-3105; Empl.: 13; *Sls. Mgr.:* Janlyn Prendiz

TECHNICAL RESEARCH & MFG., INC., R.F.D. #10, Manchester, NH 03103, Tel: 603-627-6000, TWX: 710-220-6765; Empl.: 25; *Sls. Mgr.:* A. Marin

TECHNIPOWER, A PENRIL CO., P.O. Box 222, Commerce Pk., Danbury, CT 06810, Tel: 203-748-7001, TWX: 710-456-9280; FSC No.: 13850; Empl.: 135; *Sls. Mgr.:* Ivan Bourgoin (Variac); *Dist. Mgr.:* James McCarty ..... **A•2306; D•1850**

Local Sales Offices & Reps

CA Thousand Oaks, Technipower 805-493-2244
FL Maitland, EIR, Inc. 305-660-9600
MA Sudbury, Technipower 617-443-7347
MN Burnsville, Electromec Sls., Inc. 612-894-8200
MO St. Louis, Rothkopf & Assocs. 314-961-4485
NY Pennsauken, Ar-Jay Tech. 609-663-4260
TX Richardson, Scientific Sls. Co. 214-231-6541
Can Guelph, Ont., Victrix, Ltd. 518-836-1480

Local Distributors

CA Hollywood, Yale Radio Elctrn. 213-465-3186, 800-421-4144
CA Los Angeles, Cal-State Elctrns. 213-933-8187
CA Oakland, N. A. D'Arcy 415-638-7773
CA Santa Ana, Action Elctrns. 714-547-5169
IL Chicago, Delta Tech. Prods. Co. 312-478-1134
MA Woburn, Abbott Elctrns. Co. 617-935-2040
MI Dearborn, Indl. Temperature & Control 313-278-2210
MN St. Paul, Gopher Elctrns. Co. 612-483-3322
MO St. Louis, Olive Elctrns., Inc. 314-426-4500
NY Albany, Adirondack Elctrns., Inc. 518-456-0203
NY Farmingdale, Midway Indl. Elctrns. 516-293-6800
NC Charlotte, Jenkins Elec. Co. 704-392-7371
OH Dayton, Esco Inc. 513-226-1133
OK Tulsa, Inotek 918-627-1500
PA Philadelphia, PEI/Genesis 215-568-7400
TX Dallas, Inotek 214-243-7000
TX Houston, Inotek 713-688-4494
Can Guelph, Ont., Victrix, Ltd. 519-836-1480

TECHNIQUES, INC., 235 Jackson St., Englewood, NJ 07631, Tel: 201-569-5900; Empl.: 60

TECHNISERV INC., 1560 Teaneck Rd., Teaneck, NJ 07666, Tel: 201-837-0032; *Sls. Mgr.:* L. G. Mansoor

TECHNI-TOOL, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462, Tel: 215-825-4990, Telex: 834-763; Empl.: 40

Technitrol, Inc.

TECHNITROL, 1952 E. Allegheny, Philadelphia, PA 19134, Tel: 215-426-9105, Telex: 834245; FSC No.: 90095; Empl.: 350; *Sls. Mgr.:* G. Shilling ...**A•1458, 1574-1579, 2307; B•1002, 1010**

Local Sales Offices & Reps

AL Huntsville, Murcota 205-539-8476
AZ Phoenix, Integrated Sys. & Dev. Sls. ... 602-971-6250
CA San Rafael, Wright Assocs. 415-457-9940
CA Torrance, Detomasi & Grupp, Inc. 213-327-1775
CO Castle Rock, Romulus Elctrns., Ltd. ... 303-688-5127
GA Norcross, Dixie Tech. Mktg. 404-447-6832
IL Wauconda, Cudahy Sls. 312-526-2484
IA Des Moines, The Beams Co. 515-255-1148
MD Baltimore, Callas Elctrns. 301-744-7711
MA Newton, Normell Assoc. 617-969-5478
NM Albuquerque, Syntech 505-266-7951
NY Fairport, TAC Assoc. 716-425-1070
NY Jericho, J. Square Mktg. 516-935-3200
NY Syracuse, Tac Sls. 315-637-9861
OH Galion, Retronics 419-468-4568
PA Easton, The Kendon Co. 215-253-3100
PA Pittsburgh, Robert Kneip 412-823-0169
TX Austin, Elctrns. Mktg. Assoc. 512-837-0893
TX Grapevine, Elctrns. Mktg. Assoc. 817-481-7502
TX Houston, Elctrns. Mktg. Assoc. 713-498-8120
WA Redmond, General Technlg., Inc. 206-881-6456

TECHNO-COMPONENTS CORP., 7803 Lemona, Van Nuys, CA 91405, Tel: 818-781-1642, TWX: 910-495-2015; FSC No.: 17826;Multiple; Empl.: 135; *Sls. Mgr.:* Vivian Meranda

TECHNOLOGY DYNAMICS, 91 E. Carver Ave., Westwood, NJ 07675, Tel: 201-664-7636 ..... **D•1851**

Local Sales Offices & Reps

CA Sunnyvale, Sourcetronics, Inc. 408-988-8801
CA West Lake Village, Powerdyne Assocs. 818-991-0632
CO Aurora, Butler Tech. Sls. 303-343-3787
FL Orlando, Gramar, Inc. 305-894-3351
MD Hagerston, Stinson Assocs., Inc. 301-790-1193
VA Reston, Stinson Assocs., Inc. 703-620-0088

TECHNOLOGY PRODS., INC., 8900 Eton Ave., Canoga Park, CA 91304, Tel: 213-998-8555; FSC No.: 8K984; *Sls. Mgr.:* N. Lerman

TECHNO VATION, INC., 14 Crandall Ave., Pompton Lakes, NJ 07442, Tel: 201-839-0740; Empl.: 10; *Sls. Mgr.:* Fredric S. Miller

TECH SPRAY, INC., Box 949, Amarillo, TX 79105, Tel: 806-372-8523, Telex: 738450; Empl.: 40; *Sls. Mgr.:* R. G. Russell; *Dist. Mgr.:* Jack Swanson

TCI

TECHTROL CYCLONETICS, INC., 815 Market St, New Cumberland, PA 17070, Tel: 717-774-2746, TWX: 510-650-7003; FSC No.: 58792; Empl.: 25; *Sls. Mgr.:* Robert Nemeth ..... **A•1446-1449**

Local Sales Offices & Reps

CA	Mountain View, Dimes Grp.	415-493-1885
CA	San Jose, MC Assocs.	408-446-4100
CA	Signal Hill, Thorson Co.	213-595-0361
MD	Ellicott City, Nelson Elctrns. Inc.	301-747-7887
NY	Brooklyn, Pensky Assocs.	212-763-4936
PA	Philadelphia, Eastern Instrmn.	215-245-6660
TX	Dallas, Airep Elctrns.	214-349-4360

TECKNIT®

TECKNIT (EASTERN FACILITY), 129 Dermody St, Cranford, NJ 07016, Tel: 201-272-5500, Telex: 6853079 TCKNT, TWX: 710-996-5961; FSC No.: 07700; Empl.: 300; *Sls. Mgr.:* Thomas McCreery ..... **C•1530-1535, 1730-1737**

Local Sales Offices & Reps

AZ	Tempe, Tempe Assocs.	602-829-1901
CA	Granada Hills, C & W Comp. Sls.	818-368-4032
CA	San Diego, Cerco	619-450-1754
CA	Santa Barbara, Tecknit (Western Facility)	809-963-5811
CA	Santa Clara, Nova-Tronix	408-727-9530
CO	Denver, Tecknit Mid-West	303-733-8645
FL	Altamonte Springs, Lawrence Assocs.	305-339-3855
FL	Boca Raton, Lawrence Assocs.	305-368-7373
FL	Clearwater, Lawrence Assocs.	813-584-8110
FL	Maitland, EIR, Inc.	305-660-9600
FL	N. Lauderdale, EIR, Inc.	305-975-8718
FL	West Melbourne, Lawrence Assocs.	305-724-8294
IL	Arlington Hgts., Diethert/Angel	312-593-7600
IL	Chicago, Industrial Reps.	312-647-7755
IA	Davenport, Ensco-Rep, Inc.	319-386-6600
KS	Overland Park, Ensco-Rep, Inc.	913-381-7557
KS	Wichita, Ensco-Rep, Inc.	316-683-1070
MD	Rockville, Mechtronics	301-340-2130
MA	Wallingford, Com-Sale	203-269-7964
MI	Lavonia, Lowell-Wendt Mktg. Co.	313-464-2722
MN	Eden Prairie, Elctrn. Innovators, Inc.	612-941-0830
MN	St. Paul, Repco	612-642-2828
MO	Maryland Heights, Ensco-Rep, Inc.	314-423-3935
NH	Hudson, EMC Sales	603-889-5751
NJ	N. Plainfield, Brady Co.	201-753-7988
NJ	Union, Meridian Entprs.	201-687-6220
OH	Columbus, McFadden Sls.	614-459-1280
OH	Dayton, Jay Engrg.	513-253-2151
OH	N. Royalton, Jay Engrg.	216-237-4235
TX	Austin, P. J. Scanlon & Co.	512-255-2664
TX	Dallas, P. J. Scanlon & Co.	214-231-4661
TX	Houston, P. J. Scanlon & Co.	713-663-7779
WA	Bellevue, Quest Mktg.	206-747-9424

TECMAR, INC., 6225 Cochran Rd., Solon, OH 44139, Tel: 216-349-0600; Empl.: 600; *Sls. Mgr.:* Tim Mahoney

TECNETICS, Box 910, Boulder, CO 80306, Tel: 303-442-3837, TWX: 910-940-3246; Empl.: 225; *Sls. Mgr.:* V.L. Garrison

TECO CORP., Bay Rd., P. O. Box A, Winnisquam, NH 03289, Tel: 603-524-1998; Empl.: 80-100; *Sls. Mgr.:* Sandra Murphy

TECOM INDS., 9324 Topanga Canyon Blvd., Chatsworth, CA 91311, Tel: 818-341-4010, Telex: 69 8476; FSC No.: 59850001; Empl.: 107; *Sls. Mgr.:* Philip R. Poutre'

Local Sales Offices & Reps

AZ	Phoenix, J. Smith & Assocs.	602-267-0981
CA	Mountain View, Disman - Bakner	415-969-3010
CO	Colorado Springs, J. Smith & Assocs.	303-597-5343
FL	Ft. Lauderdale, The Snow Co.	305-563-2448
FL	Melbourne, Barkman Assocs.	305-254-1863
IL	Northfield, Feller Assocs.	312-446-8065
IA	Cedar Rapids, Feller Assocs.	319-364-0566
MD	Rockville, CLC Assocs.	301-340-1175
MD	Severna Pk., Delmarva Engrg.	301-647-8007
MA	Topsfield, R. F. Assocs.	617-887-9762
NM	Albuquerque, J. Smith & Assocs.	505-265-3406
NY	Hartsdale, Spectrum Sls.	914-472-8600
NY	Skaneateles, Robtron, Inc.	315-685-5731
OH	Dayton, GVT Assocs.	513-253-1356
PA	Lafayette Hill, M. Lader Co.	215-825-3177
TX	Arlington, John Houston Assocs.	817-265-2931
TX	San Antonio, John Casey	512-492-8154
WA	Bellevue, Thorson Co. Northwest	206-455-9180
Can	Ottawa, Ont., Gigatron Assocs.	613-225-4090

TECRON INDUSTRIAL PRODS., Crown Intl., Inc., 1718 W. Mishawaka Rd., Elkhart, IN 46517, Tel: 219-294-8300, Telex: 810-294-2160; Empl.: 335; *Sls. Mgr.:* Howard King ..... **D•1018-1021, 1310-1311**

Local Sales Offices & Reps

CA	Milpitas, IFM Inc.	408-945-5920
CA	Thousand Oaks, HTEC	805-492-2889
CT	Woodbridge, Electronic Marketing Assoc.	203-397-1461
IL	Chicago, Berndt Assocs.	312-283-0713
IA	Cedar Rapids, MAI Assocs.	319-396-8030
MI	Livonia, Lowell-Wendt Mktg. Co.	313-464-2722
MN	St. Paul, Timewave Technlgy., Inc.	612-451-7575
NJ	Wayne, Ramapo, Inc.	201-839-6767
NY	Syracuse, Labtronics Inc.	315-455-7314
OH	Brecksville, Audio Mktg. Assoc.	216-526-2426
TX	Longview, Audex	214-758-9392
WA	Bellevue, Showalter Instrs., Inc.	206-746-7970

TECSTOR, INC., 16161 Gothard Street, Huntington Beach, CA 92647, Tel: 714-842-0077, TWX: 856305; Empl.: 100; *Sls. Mgr.:* Nancy Moren/Robert Whitegiver

TED CORP., 11415 Johnson Dr., Shawnee Mission, KS 66203, Tel: 913-631-6211; FSC No.: 05209; Empl.: 48

TEDEA USA

TEDEA USA, 7800 Deering Ave., Canoga Park, CA 91304, Tel: 818-884-8818, Telex: 67-3382, TWX: 910-494-1951; Empl.: 10; *Sls. Mgr.:* Tony Smalarz ..... **B•1827**

Local Sales Offices & Reps

AZ	Tempe, Trembly Assocs.	505-266-8616
CA	Carlsbad, Elotek Sys.	714-438-4856
CA	Palo Alto, Gado Instr. Sls.	415-961-2222
CO	Littleton, Rado Elctrns.	303-794-4279
GA	Atlanta, Physimetrics	404-955-0155
KS	Shawnee Mission, Tech. Sls. Assocs.	913-888-3330
MA	Lexington, Jodan Technology	617-862-2354
MI	Trenton, I & C Sls.	313-671-1320
MN	Minneapolis, CMI	612-566-6930
MO	St. Louis, Tech. Sls. Assocs.	314-725-5361
NV	Las Vegas, Trembly Assocs.	702-739-6816
NJ	Hillsdale, C B Assocs.	201-664-6230
NM	Albuquerque, Trembly Assocs.	505-266-8616
OH	Cincinnati, I & C Sls.	513-772-3101
OR	Boring, Westerberg & Assocs.	503-667-8048
PA	Bethayres, Control Instr. Sls.	215-676-1808
UT	Bountiful, Rado Elctrns.	801-292-3248
WA	Bellevue, Westerberg & Assocs.	206-453-8881
Can	Rexdale, ON, SRP Control Sys. Ltd.	416-746-0117

TEGAM, 7230 N. Ridge Rd., Madison, OH 44057, Tel: 216-428-7505; Empl.: 25

TEGAL SCIENTIFIC, INC., Box 5905, Concord, CA 94524, Tel: 415-827-1054; *Sls. Mgr.:* L. Rigali

TEKA PRODS., 45 Salem, Providence, RI 02907, Tel: 401-785-4110, TWX: 710-582-4946; Empl.: 89; *Sls. Mgr.:* John Robertson; *Dist. Mgr.:* John Robertson

TEK-COM CORPORATION, 1887 O'Toole Avenue, C103, San Jose, CA 95131, Tel: 408-263-7400, Telex: 171617; Empl.: 23; *Sls. Mgr.:* Becki Huntington; *Dist. Mgr.:* Ms. Kimberly Swensen

TEKNATIONAL INDS., INC., 430 S. Clinton Ave., Rochester, NY 14620, Tel: 716-232-1291; FSC No.: 24227; Empl.: 15; *Sls. Mgr.:* J. D. Hochheimer

TEKTITE CORP., 4756 Platt Rd., Ann Arbor, MI 48104, Tel: 313-971-9379; *Sls. Mgr.:* Jose Padilla

TEKTONE SOUND & SIGNAL, 1331 S. Killian Dr., Lake Park, FL 33403, Tel: 305-844-2383, Telex: 51-3438; FSC No.: 59-1500771; Empl.: 50; *Sls. Mgr.:* Carlos Mira; *Dist. Mgr.:* Carlos Mira

TEKTRONIX, INC., P. O. Box 500, Y3-314, Beaverton, OR 97077, Tel: 800-547-1512, Oregon only 800-452-1877, TWX: 910-467-8708; FSC No.: 80009; Empl.: 20000

TELAUTOGRAPH, 8700 Bellanca Ave., Los Angeles, CA 90045, Tel: 213-641-3690, TWX: 910-328-6117; Empl.: 300

TELCOM INC., 8027 Leesburg Pike, Vienna, VA 22180, Tel: 703-893-7700, Telex: 89-2321

TELCO PRODUCTS CO., 44 Sea Cliff, Glen Cove, NY 11542, Tel: 516-759-0300; Empl.: 34

TELEBYTE TECHNOLOGY, INC., Remark Datacom Div., 270 East Pulaski Road, Greenlawn, NY 11740, Tel: 516-423-3232, TWX: 510-226-0449; Empl.: 40; *Sls. Mgr.:* Curt DeForest

TELECOMMUNICATIONS DEVICES, 2320 Wisconsin Ave., Downers Grove, IL 60515, Tel: 312-971-3460, TWX: 910-695-3222; Empl.: 45; *Sls. Mgr.:* Joel Peterson; *Dist. Mgr.:* Theresa Kanaga

TELECOMMUNICATIONS TECHNIQUES CORP., 444 N. Frederick Ave., Gaithersburg, MD 20877, Tel: 301-258-5011, Telex: 908736; Empl.: 100; *Sls. Mgr.:* John Farrell

TELECTRO SYS., 96-18 43rd Ave., Corona, NY 11368, Tel: 212-651-8900; Empl.: 75; *Sls. Mgr.:* H. Sussman

TELEDYNE AEROSPACE SYS., 1007 E. 10th St., Fairmont, MN 56031, Tel: 507-235-3355, 507-235-9712, TWX: 910-565-2120; FSC No.: 24600; Empl.: 150; *Sls. Mgr.:* Robert L. Johnson

TELEDYNE ANSONIA, One Riverside Dr., Ansonia, CT 06401, Tel: 203-735-9311, Telex: 963408; *Sls. Mgr.:* Frank J. Stvebbe

TELEDYNE CAMERA SYS., 131 N. Fifth Ave., Arcadia, CA 91006, Tel: 818-359-6691, Telex: 675-423; FSC No.: 14440; Empl.: 96; *Sls. Mgr.:* Roy Larson

TELEDYNE-CRYSTALONICS, 147 Sherman St., Cambridge, MA 02140, Tel: 617-491-1670, TWX: 710-320-1196; FSC No.: 12498;Multiple; Empl.: 185; *Sls. Mgr.:* A. H. Pauk; *Dist. Mgr.:* W. J. Kilgarriff

TELEDYNE/GEOTECH, 3401 Shiloh Rd., Garland, TX 75041, Tel: 214-271-2561, Telex: 73-2394; FSC No.: 99019; Empl.: 440

TELEDYNE GURLEY, 514 Fulton St. P.O. Box 88, Troy, NY 12181, Tel: 518-272-6300, TWX: 710-443-8156; *Sls. Mgr.:* G. S. Gordon

Local Sales Offices & Reps

CA	Los Altos, Servo Data	415-964-1325
CA	Montebello, Tucul Engrg.	213-728-7397
CO	Longmont, Piper Sls.	303-443-5337
CT	Hamden, JBL Assocs.	203-281-3161
FL	Melbourne, R-Rep Co.	305-725-6993
IL	Berkeley, Cadre Tech. Reps.	312-449-3900
IN	Indianapolis, Ron Schafer & Assocs.	317-848-2702
MD	Columbia, Stein Instr.	301-596-3748
MA	Holbrook, McLellan Assocs.	617-767-4771
MI	Livonia, Lowell-Wendt Mktg.	313-464-2722
MN	St. Paul, Northstar Motion & Control	612-770-5311
NJ	Union, Friedman Assocs.	201-964-6200
NY	Buffalo, Good Comps.	716-634-4400
OH	Cleveland, Geotronix	216-526-2535
OH	Trotwood, Geotronix	513-854-5939
OK	Tulsa, Spectra Sls.	918-633-7188
OR	Portland, Tech. Comp.	503-292-1518
PA	Cheltenham, Stein Instr.	215-379-1990
TX	Houston, Spectra Sls.	713-747-2798
TX	Richardson, Spectra Sls.	214-234-3600
UT	Salt Lake City, Piper Sls.	801-466-9336
Can	Ottawa, Ont., Intrade	613-727-1272

TELEDYNE INET, 2750 W. Lomita Blvd., Torrance, CA 90509, Tel: 213-325-5040, Telex: 67-7228; Empl.: 600

TELEDYNE KINETICS, Div. of Teledyne, Inc., 410 S. Cedros Ave., Solana Beach, CA 92075, Tel: 619-755-1181, TWX: 910-322-1135; Empl.: 110; *Sls. Mgr.:* John Schuler

TELEDYNE MECCA, Box 36393, Houston, TX 77236, Tel: 713-772-2811, TWX: 913-881-7039; Empl.: 75; *Sls. Mgr.:* J. M. Barrow

TELEDYNE MICROELECTRONICS, 12964 Panama St, Los Angeles, CA 90066, Tel: 213-822-8229, 213-870-9831, TWX: 910-343-7436; FSC No.: 16170; Empl.: 1500; *Sls. Mgr.:* W. Kennedy

TELEDYNE MICRONETICS, 7155 Mission Gorge Rd., San Diego, CA 92120, Tel: 619-583-3525, TWX: 910-335-2085; Empl.: 120; *Sls. Mgr.:* S. Amarillas

TELEDYNE MICROWAVE, 1290 Terra Bella Ave., Mountain View, CA 94043, Tel: 415-968-2211, TWX: 910-379-6939; FSC No.: 24022; Empl.: 325

TELEDYNE PHILBRICK, Allied Dr. Rte 128, Dedham, MA 02026, Tel: 617-329-1600, TWX: 710-348-6726; Empl.: 250

TELEDYNE RELAYS, 12525 Daphne Ave., Hawthorne, CA 90250, Tel: 213-777-0077, TWX: 910-321-4610; *Sls. Mgr.:* Tom Garland

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
AZ	Scottsdale, Arcom Sls.	602-947-5745
CA	Saratoga, Teledyne Relays	408-996-9944
CO	Denver, Quorum 3	303-696-8480
CT	Stratford, G. Rosen Co.	203-375-5456
FL	Clearwater, Hutto, Hawkins & Peregoy	813-797-4447
FL	Maitland, Hutto, Hawkins & Peregoy	305-831-2474
FL	Pompano Beach, Hutto, Hawkins & Peregoy	305-971-5750
GA	Norcross, Montgomery Mktg.	404-447-6124
IL	Glen Ellyn, Teledyne Relays	312-858-1090
IN	Kokomo, Schillinger Asso.	317-452-4057
IA	Cedar Rapids, Stan Clothier Co.	319-395-0245
KS	Olathe, C-Tron	913-829-0073
MD	Towson, Arbotek Assocs.	301-825-0775
MA	Framingham, G. Rosen Co.	617-879-5505
MN	Minneapolis, S. Clothier Co.	612-944-3456
MO	St. Louis, Rothkoph & Assocs.	314-961-4485
NJ	Cranford, Teledyne Relays	201-272-0020
NM	Albuquerque, Reptronix	505-292-1718
NY	Mount Vernon, Friedman-Smith Elctrns.	914-664-4866
NY	Syracuse, I.A. Hotze Co.	315-479-6641
NC	Cary, Montgomery Mktg.	919-467-6319
OH	Dayton, J.C. Hofstetter Co.	513-296-1010
OH	Medina, J.C. Hofstetter Co.	216-241-4880
OR	Beaverton, B & P Sls.	503-641-3486
PA	Hickory, J. C. Hofstetter Co.	412-356-2305
PA	Pennsauken, Vantage Sls.	609-663-6660
TX	Austin, Kruvand Assocs.	512-441-6777
TX	Dallas, Kruvand Asso.	214-437-3355
TX	Houston, Kruvand Asso.	713-780-9710
UT	Sandy, Quorum 3	801-943-9227
WA	Bellevue, B & P Asso.	206-454-6571
Can	Calgary, Alb., Deskin Sls.	403-466-2106
Can	Edmonton, Alb., Deskin Sls.	403-466-2106
Can	Markham, Ont., Deskin Sls.	416-475-1412
Can	Ottawa, Ont., Deskin Sls.	613-729-1099
Can	Richmond, B.C., Deskin Sls.	604-273-4963
Can	St. Laurent, Que., Deskin Sls.	514-331-2860
Can	Transcona, Man., Deskin Sls.	403-466-2106

Local Distributors

AL	Huntsville, Pioneer Elctrns.	205-837-9300
AZ	Phoenix, Wyle	602-249-2232
AZ	Tempe, Time-Arizona	602-967-2000
CA	Anaheim, Time-Anaheim	714-937-0911
CA	Chatsworth, Time	818-998-7200
CA	El Segundo, Wyle Dist. Grp.	213-322-8100
CA	Irvine, Wyle Dist. Grp.	714-863-9953
CA	Rancho Cordova, Wyle	916-638-5282
CA	San Diego, Time	619-586-1331
CA	San Diego, Wyle Dist. Grp.	619-565-9171
CA	Santa Clara, Wyle Dist. Grp.	408-727-2500
CA	Sunnyvale, Time-N. Cal.	408-734-9888
CA	Torrance, Time-West	213-320-0880
CO	Englewood, Time-Colorado	303-850-7701
CO	Thornton, Wyle Dist. Grp.	303-457-9953
CT	Cheshire, Time	203-271-3200
CT	Orange, Milgray/Conn.	203-795-0711
FL	Altamonte Springs, Pioneer Elctrns.	305-834-9090
FL	Dania, Summit	305-920-6253
FL	Deerfield Beach, Pioneer	305-428-8877
FL	Ft. Lauderdale, Time-Florida	305-974-4800
FL	Winter Pk., Milgray/Fla.	305-647-5747
GA	Atlanta, Electro-Air-Georgia	404-351-3545
GA	Atlanta, Milgray	404-393-9666
GA	Norcross, Pioneer	404-448-1711
IL	Bensenville, Milgray	312-350-0490
IL	Elk Grove Village, Pioneer/Chicago	312-437-9680
IN	Indianapolis, Pioneer/Indianapolis	317-849-7300
KS	Overland Pk., Milgray/Kansas City	913-236-8800
MD	Columbia, Time-Maryland	301-964-3090
MD	Gaithersburg, Pioneer/Wash.	301-921-0660
MD	Rockville, Milgray/Wash.	301-468-6400
MA	Burlington, Milgray/New England	617-272-6800
MA	Woburn, Time-New England	617-935-8080
MI	Livonia, Pioneer/Mich.	313-525-1800
MN	Bloomington, Time	612-944-9192
MN	Minnetonka, Pioneer	612-935-5444
MO	St. Louis, Time-Mid West	314-391-6444
NJ	Marlton, Milgray/Delaware Valley	609-983-5010
NY	Buffalo, Summit Dist.	716-887-2800
NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	Hauppauge, Time-NY	516-273-0100
NY	Pittsford, Milgray	716-385-9330
NY	Rochester, Summit Dist.	716-334-8110
NC	Charlotte, Pioneer	704-527-8188
OH	Cleveland, Milgray/Cleveland	216-447-1520
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Dayton, Pioneer/Dayton	513-236-9900
OR	Hillsboro, Wyle Dist. Grp.	503-640-6000
PA	Horsham, Pioneer/Delaware Valley	215-674-4000
PA	King of Prussia, Time-Mid Atlantic	215-337-0900
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
TX	Austin, Pioneer	512-835-4000
TX	Austin, Wyle	512-834-9957
TX	Dallas, Electro-Air-Southwest	214-385-0566
TX	Dallas, Milgray	214-248-1603
TX	Dallas, Pioneer Std.	214-386-7300
TX	Houston, Pioneer Elctrns.	713-988-5555
TX	Houston, Wyle	713-879-9953
TX	Richardson, Wyle-Dallas	214-235-9953
UT	Salt Lake City, Wyle Dist. Grp.	801-974-9953
WA	Bellevue, Electro-Air-Northwest	206-641-3640
WA	Bellevue, Wyle Dist. Grp.	206-453-8300
Can	Calgary, Alb., Deskin Sls.	403-466-2106
Can	Edmonton, Alb., Deskin Sls.	403-466-2106
Can	Markham, Ont., Deskin Sls.	416-475-1412
Can	Ottawa, Ont., Deskin Sls.	613-729-1099
Can	Richmond, B.C., Deskin Sls.	604-273-4963
Can	St. Laurent, Que., Deskin Sls.	514-331-2860
Can	Transcona, Man., Deskin Sls.	403-466-2106

TELEDYNE ROTOLITE, 150 Mt. Bethel Rd., Warren, NJ 07060, Tel: 201-647-1040, TWX: 710-986-3017; *Sls. Mgr.:* J. F. Stickel

TELEDYNE SEMICONDUCTOR, 1300 Terra Bella Ave., PO Box 7267, Mountain View, CA 94039-7267, Tel: 415-968-9241, TWX: 910-379-6494; FSC No.: 15818; Empl.: 2000; *Sls. Mgr.:* Ralph Granchelli

TELEDYNE SOLID STATE PRODUCTS, 12525 Daphne Ave., Hawthorne, CA 90250, Tel: 213-777-0077, TWX: 910-321-4610; *Sls. Mgr.:* Tom Garland

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
AZ	Scottsdale, Arcom Sls.	602-947-5745
CA	Saratoga, Teledyne Relays	408-996-9944
CO	Denver, Quorum 3	303-696-8480
CT	Stratford, G. Rosen Co.	203-375-5456
FL	Clearwater, Hutto, Hawkins & Peregoy	813-797-4447
FL	Maitland, Hutto, Hawkins & Peregoy	305-831-2474
FL	Pompano Beach, Hutto, Hawkins & Peregoy	305-971-5750
GA	Norcross, Montogmery Mktg.	404-447-6124
IL	Glen Ellyn, Teledyne Relays	312-858-1090
IN	Kokomo, Schillinger Assocs.	317-452-4057
IA	Cedar Rapids, Stan Clothier Co.	319-395-0245
KS	Olathe, C-Tron	913-829-0073
MD	Towson, Arbotek Assocs.	301-825-0775
MA	Framingham, G. Rosen Co.	617-879-5505
MN	Minneapolis, S. Clothier Co.	612-944-3456
MO	St. Louis, RothKopf & Assocs.	314-961-4485
NJ	Cranford, Teledyne Relays	201-272-0020
NM	Albuquerque, Reptronix	505-292-1718
NY	Mount Vernon, Friedman-Smith Elctrns.	914-664-4866
NY	Syracuse, I. A. Hotze Co.	315-479-6641
NC	Cary, Montgomery Mktg.	919-467-6319
OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Medina, J. C. Hofstetter Co.	216-241-4880
OR	Beaverton, B & P Sls.	503-641-3486
PA	Hickory, J. C. Hofstetter Co.	412-356-2305
PA	Pennsauken, Vantage Sls.	609-663-6660
TX	Austin, Kruvand Assocs.	512-441-6777
TX	Dallas, Kruvand Assocs.	214-437-3355
TX	Houston, Kruvand Assocs.	713-780-9710
UT	Sandy, Quorum 3	801-943-9227
WA	Bellevue, B & P Assocs.	206-454-6571
Can	Calgary, Alb., Deskin Sls.	403-466-2106
Can	Edmonton, Alb., Deskin Sls.	403-466-2106
Can	Markham, Ont., Deskin Sls.	416-475-1412
Can	Ottawa, Ont., Deskin Sls.	613-729-1099
Can	Richmond, B.C., Deskin Sls.	604-273-4963
Can	St. Laurent, Que., Deskin Sls.	514-331-2860
Can	Transcona, Man., Deskin Sls.	403-466-2106

Local Distributors

AL	Huntsville, Pioneer Elctrns.	205-837-9300
AZ	Phoenix, Wyle	602-249-2232
AZ	Tempe, Time/Arizona	602-967-2000
CA	Anaheim, Time/Anaheim	714-937-0911
CA	Chatsworth, Time/Chatsworth	818-998-7200
CA	El Segundo, Wyle Dist. Grp.	213-322-8100
CA	Irvine, Wyle Dist. Co.	714-863-9953
CA	Rancho Cordova, Wyle	916-638-5282
CA	San Diego, Time/San Diego	619-586-1331
CA	San Diego, Wyle Dist. Grp.	619-565-9171
CA	Santa Clara, Wyle Dist. Grp.	408-727-2500
CA	Sunnyvale, Time/N. Cal.	408-734-9888
CA	Torrance, Time/West	213-320-0880
CO	Englewood, Time/Colorado	303-850-7701
CO	Thornton, Wyle Dist. Grp.	303-457-9953
CT	Cheshire, Time/Connecticut	203-271-3200
CT	Orange, Milgray/Conn.	203-795-0711
FL	Altamonte Springs, Pioneer Elctrns.	305-834-9090
FL	Dania, Summit	305-920-6253
FL	Deerfield Beach, Pioneer/Florida	305-428-8877
FL	Ft. Lauderdale, Time/Florida	305-974-4800
FL	Winter Pk., Milgray/Fla.	305-647-5747
GA	Atlanta, Electro-Air/Georgia	404-351-3545
GA	Atlanta, Milgray	404-393-9666
GA	Norcross, Pioneer	404-448-1711
IL	Bensenville, Milgray/Chicago	312-350-0490
IL	Elk Grove Village, Pioneer/Chicago	312-437-9680
IN	Indianapolis, Pioneer/Indianapolis	317-849-7300
KS	Overland Pk., Milgray/Kansas City	913-236-8800
MD	Columbia, Time/Maryland	301-964-3090
MD	Gaithersburg, Pioneer/Wash.	301-921-0660
MD	Rockville, Milgray/Wash.	301-468-6400
MA	Burlington, Milgray/New England	617-272-6800
MA	Woburn, Time/New England	617-935-8080
MI	Livonia, Pioneer/Mich.	313-525-1800
MN	Bloomington, Time/Minnesota	612-944-9192
MN	Minnetonka, Pioneer	612-935-5444
MO	St. Louis, Time/Mid-West	314-391-6444
NJ	Marlton, Milgray/Delaware Valley	609-983-5010
NY	Buffalo, Summit Dist.	716-887-2800
NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	Haupauge, Time/NY	516-273-0100
NY	Pittsford, Milgray	716-385-9330
NY	Rochester, Summit Dist.	716-334-8110
NC	Charlotte, Pioneer	704-527-8188
OH	Cleveland, Milgray/Cleveland	216-447-1520
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Dayton, Pioneer/Dayton	513-236-9900
OR	Hillsboro, Wyle Dist. Grp.	503-640-6000
PA	Horsham, Pioneer/Delaware Valley	215-674-4000
PA	King of Prussia, Time/Mid Atlantic	215-337-0900
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
TX	Austin, Pioneer	512-835-4000
TX	Austin, Wyle/Austin	512-834-9957
TX	Dallas, Electro-Air-Southwest	214-385-0566
TX	Dallas, Milgray/Dallas	214-248-1603
TX	Dallas, Pioneer Std.	214-386-7300
TX	Houston, Pioneer Elctrns.	713-988-5555
TX	Houston, Wyle/Houston	713-879-9953
TX	Richardson, Wyle/Dallas	214-235-9953
UT	Salt Lake City, Wyle Dist. Grp.	801-974-9953
WA	Bellevue, Electro-Air/Northwest	206-641-3640
WA	Bellevue, Wyle Dist. Grp.	206-453-8300
Can	Calgary, Alb., Deskin Sls.	403-466-2106
Can	Edmonton, Alb., Deskin Sls.	403-466-2106
Can	Markham, Ont., Deskin Sls.	416-475-1412
Can	Ottawa, Ont., Deskin Sls.	613-729-1099
Can	Richmond, B.C., Deskin Sls.	604-273-4963
Can	St.Laurent,Que., Deskin Sls.	514-331-2860
Can	Transcona, Man., Deskin Sls.	403-466-2106

TELEDYNE WESTERN WIRE & CABLE, 2425 E. 30th St., Los Angeles, CA 90051, Tel: 213-587-7103, Telex: 67-7110; Empl.: 250; *Sls. Mgr.:* W. Drolet, Jr.; *Dist. Mgr.:* M. Ibrahim

TELEFACE CORP., 111 Rivington St., New York, NY 10002, Tel: 212-477-6802, Telex: 125126; Empl.: 4; *Sls. Mgr.:* Richard W. Gans

TELEFUNKEN, See AEG Telefunken

TELEMECANIQUE, INC., Allied Control Products, 100 Relay Rd., Plantsville, CT 06479, Tel: 203-621-6771; FSC No.: 5945; Empl.: 1200; *Sls. Mgr.:* Mark Freyermuth **B•1450-1459**

Local Sales Offices & Reps

AZ	Tempe, Delta Elctrns. Sls. Corp.	602-244-1601
CA	Cerritos, El-Com, Inc.	213-404-2961

CA Milpitas, Maxim Elec. Sls. 408-946-6001
CO Denver, Electronic Sls., Inc. 303-771-6300
CT Clinton, Selmark Assocs., Inc. 203-573-9088
FL Melbourne, Raycom, Inc. 305-259-7988
FL Melbourne Beach, Raycom, Inc. 305-725-4558
FL Orlando, Raycom, Inc. 305-859-5504
FL Plantation, Raycom, Inc. 305-741-6690
FL Wellborn, Raycom, Inc. 904-963-5023
GA Atlanta, Electro-Rep Assocs. 404-320-1134
IL Chicago, Industrial Reps., Inc. 312-647-7755
IN Indianapolis, M & L Elctrn. Sls. 317-359-4742
MD Columbia, Delta III Assocs., Inc. 301-730-4700
MA Millis, Selmark Assocs., Inc. 617-376-2914
MI Livonia, Electronic Salesmasters, Inc. 313-421-2520
MN Minneapolis, Giefer Sls. 612-884-2395
NH Hopkinton, Selmark Assocs., Inc. 603-746-3299
NJ Medford, Component Consultants 609-654-5300
NJ Oakland, CRG Grp., Inc. 201-337-8149
NY Marcellus, Noeth-Honsinger Assocs. 315-673-1052
NY Pittsford, Noeth-Honsinger Assocs. 716-586-9002
NC Charlotte, Electro-Rep Assocs. 704-527-2530
OH Beachwood, Electronic Salesmasters, Inc. 216-831-9555
OR Aloha, Huntley Assocs. 503-649-5388
PA Champhill, Process Engrg. Co. 717-761-5083
PA Pittsburgh, Process Engrg. Co. 412-561-5050
TX Austin, Delta Comps., Inc. 512-458-4288
TX El Paso, Alexander Entprs. 915-591-3142
TX Seagoville, Delta Comps., Inc. 214-287-6333
VA Midlothian, Delta III Assocs., Inc. 804-379-1816
WA Everett, Huntley Assocs. 206-353-1833
WI Milwaukee, Industrial Reps., Inc. 414-259-0965
Can Don Mills, R. D. Assocs. 416-444-0959

Local Distributors

AL Birmingham, Newark Elctrns. 205-942-4044
AL Huntsville, Newark Elctrns. 205-837-9091
AZ Pheonix, Newark Elctrns. 602-957-0085
AZ Phoenix, Newark Elctrns. 602-957-0085
AZ Tempe, AnJon Elctrns. 602-894-1332
AZ Tempe, Newark Elctrns. 602-968-7441
AZ Tucson, Newark Elctrns. 602-628-7891
AR Little Rock, Newark Elctrns. 501-225-8130
CA Buena Park, Control Design 714-521-5040
CA Cerritos, El-Com, Inc. 213-404-2961
CA Chula Vista, Newark Elctrns. 619-585-1023
CA Corona, Inter-Conn Elctrns. 714-735-8200
CA Covina, Newark Elctrns. 213-339-9027
CA Foster City, Newark Elctrns. 415-572-8300
CA Hayward, KEA Elctrns. 415-887-2900
CA Hayward, Newark Elctrns. 415-632-7522
CA Inglewood, Newark Elctrns. 213-671-7066
CA Long Beach, Newark Elctrns. 213-427-7408
CA Los Angeles, Master Distrs. 213-452-1229
CA Monrovia, Erik-A Elctrns. 818-574-1020
CA Orange, Newark Elctrns. 714-634-8224
CA Reseda, Newark Elctrns. 213-344-2686
CA Riverside, Newark Elctrns. 714-784-1101
CA Sacramento, Newark Elctrns. 916-971-9555
CA San Carlos, Control Design 415-952-4808
CA San Diego, Newark Elctrns. 619-272-9480
CA San Jose, Newark Elctrns. 408-995-6255
CA San Jose, Newark Elctrns. 408-554-1616
CA San Mateo, Newark Elctrns. 415-571-5300
CA Sunnyvale, Newark Elctrns. 408-720-8755
CA Torrance, Newark Elctrns. 213-212-6161
CA Tustin, Newark Elctrns. 714-549-3004
CO Arvada, Newark Elctrns. 303-423-7941
CO Colorado Springs, Newark Elctrns. 303-576-2644
CO Denver, Newark Elctrns. 303-757-3351
CO Denver, Newark Elctrns. 303-373-4540
CO Englewood, Electronic Sls. 303-771-6300
CT Bloomfield, Newark Elctrns. 203-243-1731
CT East Hartford, R & S Elctrn. Distrs. 203-528-9901
CT East Haven, J V Elctrns. 203-469-2321
CA Orange, Newark Elctrns. 714-634-8224
CT Stamford, Bond Elctrns. 203-348-2663
FL Altamonte Springs, Control Design 305-788-3220
FL Clearwater, Newark Elctrns. 813-443-0661
FL Cocoa, Newark Elctrns. 305-631-2017
FL Ft. Lauderdale, Newark Elctrns. 305-587-2372
FL Ft. Lauderdale, Peerless Radio 305-973-4141
FL Ft. Walton Beach, Newark Elctrns. 904-862-2157
FL Jacksonville, Newark Elctrns. 904-399-5041
FL Orlando, Newark Elctrns. 305-896-8350
FL Tampa, Newark Elctrns. 813-872-5618
GA Fayetteville, Frankland, Inc. 404-461-4026
GA Forest Park, Newark Elctrns. 404-366-4050
GA Norcros, Newark Elctrns. 404-448-1300
GA Savannah, Newark Elctrns. 912-355-0457
HI Pearl City, Newark Elctrns. 808-456-5933
ID Boise, Newark Elctrns. 208-342-4311
ID Pocatello, Kimball Elctrns. 208-232-2201
ID Spirit Lake, A-I Elctrn. Supp. 208-623-3111
IL Chicago, Newark Elctrns. 312-784-5100
IL Downers Grove, Newark Elctrns. 312-969-9440
IL Genoa, Control Design 815-784-6515
IL Hickory Hills, Newark Elctrns. 312-430-4370
IL Hillside, Newark Elctrns. 312-544-8340
IL Mt. Prospect, Newark Elctrns. 312-259-9090
IL Northbrook, Newark Elctrns. 312-480-1300
IL Oak Park, Newark Elctrns. 312-524-1800
IL Rockford, Newark Elctrns. 815-229-0225
IL Schaumburg, Newark Elctrns. 312-843-0700
IL Springfield, Newark Elctrns. 217-787-9972
IN Ft. Wayne, Graham Elctrns. 219-423-3422
IN Ft. Wayne, Newark Elctrns. 219-484-0766
IN Indianapolis, Control Design 317-788-4559
IN Indianapolis, Graham Elctrns. 317-634-8202
IN Indianapolis, Newark Elctrns. 317-872-7070
IN Indianapolis, Newark Elctrns. 317-926-7050
IN Merrillville, Newark Elctrns. 312-768-5059
IA Bettendorf, Newark Elctrns. 319-359-3711
IA Cedar Rapids, Newark Elctrns. 319-362-1171
IA Des Moines, Newark Elctrns. 515-278-0670
KS Overland Park, Newark Elctrns. 913-341-1121
KS Wichita, Newark Elctrns. 316-267-8755
KS Wichita, RSC, Inc. 316-267-5213
KY Louisville, Newark Elctrns. 502-423-0280
LA Metarie, Newark Elctrns. 504-838-9771
LA New Orleans, Newark Elctrns. 504-364-1031
MD Beltsville, Newark Elctrns. 301-937-9540
MD Cheverly, Newark Elctrns. 301-773-1333
MD Columbia, Aztech Elctrns. 301-995-1760
MD Ellicott City, Newark Elctrns. 301-461-2300
MD Gaithersburg, Axis Elctrns. 301-840-9640
MA Methuen, Newark Elctrns. 617-688-1837
MA Newton, Greene-Shaw 617-969-8900
MA Sharon, Newark Elctrns. 617-784-4061
MA Springfield, Newark Elctrns. 413-785-5851
MA Waltham, Newark Elctrns. 617-894-8050
MA Wilmington, J V Elctrns. of Boston 617-657-6523
MA Woburn, Newark Elctrns. 617-935-8350
MA Worcester, Newark Elctrns. 617-757-4515
MI Grand Rapids, Newark Elctrns. 616-241-6681
MI Oak Park, Newark Elctrns. 313-968-2950
MI Oak Park, Newark Elctrns. 313-967-0600
MI Saginaw, Newark Elctrns. 517-799-0480
MN Burnsville, Newark Elctrns. 612-890-7362
MO Crestwood, Newark Elctrns. 314-821-7466
CT East Haven, J V Elctrns. 203-469-2321
MN Minneapolis, Control Design 612-721-1628
MN Minneapolis, Newark Elctrns. 612-331-6350
NH Nashua, Newark Elctrns. 603-883-9010
MO St. Louis, Newark Elctrns. 314-521-5066
NJ Bordentown, Newark Elctrns. 609-298-4450
NJ Edison, Newark Elctrns. 201-572-2103
MO Independence, Newark Elctrns. 816-478-0561
MN Minneapolis, Industrial Comps. 612-831-2666
MO St. Louis, Control Design 314-426-3150
MO St. Louis, Interstate Industrial 314-423-4322
MN Crystal, Newark Elctrns. 612-561-7541
NE Omaha, Newark Elctrns. 402-392-1221
MO Blue Springs, Newark Elctrns. 816-228-3170
NJ Fairfield, Newark Elctrns. 201-882-0300
MS Jackson, Newark Elctrns. 601-956-3834
NJ Kenilworth, Federated Purchaser 201-272-0505
NJ Medford, Component Consultants 609-654-5300
NJ Pennsauken, Newark Elctrns. 609-663-9490
NJ Springfield, Newark Elctrns. 201-376-9500
MN St. Paul, Newark Elctrns. 612-631-2683
NM Albuquerque, International Elctrns. 505-345-8127
NM Albuquerque, Newark Elctrns. 505-883-6181
NY Amherst, Standard Elctrns. 716-691-3801
NY Buffalo, Newark Elctrns. 716-892-4321
NY Buffalo, Summit Distrbg. 716-884-3450
NY Farmingdale, Pride Elctrns. 516-293-4020
NY Hauppauge, Sherburn Elctrns. 516-231-4300
NY Latham, Newark Elctrns. 518-783-0983
NY Newburgh, Newark Elctrns. 914-564-2700
NY Rochester, Newark Elctrns. 716-427-8220
NY Rochester, Summit Distrbg. 716-334-8110
NY Rome, Rome Elctrns. 315-337-5400
NY Syracuse, Newark Elctrns. 315-437-6611
NY Valley Stream, Newark Elctrns. 516-825-6200
NC Charlotte, Control Design 704-588-4410
NC Charlotte, Newark Elctrns. 704-535-5650
NC Greensboro, Newark Elctrns. 919-292-7240
NC Raleigh, Newark Elctrns. 919-781-7677
NC Winston Salem, Kirkman Elctrns. 919-722-9131
OH Akron, Akron Elctrns. 216-762-8818
OH Akron, Newark Elctrns. 216-374-9987
OH Bedford Heights, Newark Elctrns. 216-439-4383
OH Cincinnati, Graham Elctrns. 513-772-1661
OH Cincinnati, Newark Elctrns. 513-771-9700
OH Cleveland, Newark Elctrns. 216-391-9330
OH Columbus, Newark Elctrns. 614-481-8141
OH Columbus, Newark Elctrns. 614-451-0002
OH Dayton, Newark Elctrns. 513-294-8980
OH Dayton, Stotts Friedman 513-298-5555
OH North Canton, Newark Elctrns. 216-497-7713
OH Solon, Target Elctrns. 216-248-7930
OH Toledo, Newark Elctrns. 419-866-0404
OH Warrensville Heights, Newark Elctrns. 216-587-1700
OH Wickliffe, Gateway Megatech 216-944-5801
OH Youngstown, Newark Elctrns. 216-793-6134
OK Oklahoma City, Electro Entprs. 405-427-6591
OK Oklahoma City, Newark Elctrns. 405-495-5000
OK Tulsa, Newark Elctrns. 918-832-7004
OR Portland, Carlyle Tech. Sls. 503-244-1375
OR Portland, Newark Elctrns. 503-257-0741
PA Allentown, Federated Purchaser 215-437-4481
PA Allentown, Newark Elctrns. 215-434-7171
PA Cornwells Heights, Newark Elctrns. 215-245-7300
PA Erie, Newark Elctrns. 814-453-5726
PA Erie, Wettekin Elctrns. 814-838-9184
PA Johnstown, Bird Elec. & Supp. 814-535-3574
PA King of Prussia, Newark Elctrns. 215-265-0933
PA Malvern, Control Design 215-296-0150
PA Malvern, Newark Elctrns. 215-296-5522
PA McKees Rocks, Newark Elctrns. 412-331-2400
PA McKeesport, Barno Radio 412-751-5966
PA North Versailles, Newark Elctrns. 412-824-8504
PA Philadelphia, Philadelphia Elctrns. 215-568-7400
PA Philadelphia, Shap Elctrns. 215-969-3300
PA Pittsburgh, Newark Elctrns. 412-367-2790
RI Warwick, Newark Elctrns. 401-738-4010
SC Greenville, Newark Elctrns. 803-288-9610
TN Knoxville, Newark Elctrns. 615-588-6493
TN Memphis, Newark Elctrns. 901-365-8060
TN Nashville, Electra Distrbg. Co. 615-329-3971
TN Nashville, Newark Elctrns. 615-883-2482
TX Dallas, Control Design 214-358-1441
TX Dallas, Newark Elctrns. 214-340-3585
TX Dallas, Sterling Elctrns. 214-243-1600
TX Dallas, Trevino Sls. 214-357-5446
TX El Paso, International Elctrns. 915-598-3406
TX El Paso, Midland Specialty 915-533-9555
TX El Paso, Newark Elctrns. 915-778-5322
TX Ft. Worth, Newark Elctrns. 817-589-1295
TX Garland, Newark Elctrns. 214-494-5911
TX Houston, Geophysical Supp. 713-666-4100
TX Houston, Newark Elctrns. 713-782-4800
TX Houston, Newark Elctrns. 713-688-6846
TX Houston, Sterling Elctrns. 713-623-6600
TX Pasadena, Newark Elctrns. 713-477-0286
TX San Antonio, Newark Elctrns. 512-349-2641
UT Salt Lake City, Kimball Elctrns. 801-328-2075
UT Salt Lake City, Newark Elctrns. 801-484-8611
VA Arlington, Newark Elctrns. 703-522-0880
VA Richmond, Newark Elctrns. 804-282-5671
VA Virginia Beach, Newark Elctrns. 804-499-0719
WA Bellevue, Newark Elctrns. 206-641-9809
WA Bellevue, Newark Elctrns. 206-641-4676
WA Bellevue, Newark Elctrns. 206-641-9900
WA Seattle, Carlyle Tech. Sls. 206-575-6750
WA Spokane, Newark Elctrns. 509-922-5007
WV Charleston, Newark Elctrns. 304-345-6505
WI Green Bay, Newark Elctrns. 414-494-1400
WI Madison, Newark Elctrns. 608-221-4738
WI Milwaukee, Newark Elctrns. 414-463-1000
WI Milwaukee, Newark Elctrns. 414-351-6031
WI New Berlin, Control Design 414-784-1015
Can Downsview, Ont., Future Elctrns. 416-638-4771
Can Ottawa, Ont., Future Elctrns. 613-820-9471
Can Pointe Claire, Que., Future Elctrns. 514-694-7710
Can Vancouver, B.C., Future Elctrns. 604-438-5545

TELEMET, 185 Dixon Ave., Amityville, NY 11701, Tel: 516-842-2300, TWX: 510-227-9850; Empl.: 60

TELEPACIFIC ELECTRONICS CO., INC., 772 N. Twin Oaks Valley Road, San Marcos, CA 92069, Tel: 619-744-4415; Empl.: 25; *Sls. Mgr.:* Vernon P. Cooke

TELEPHONICS, 770 Park Ave., Huntington, NY 11743, Tel: 516-549-6000, Telex: 96-7815, TWX: 510-226-6983; Empl.: 800; *Sls. Mgr.:* R. H. Collopy

TELERAM COMMUNICATIONS, 2 Corporate Park Dr., White Plains, NY 10604, Tel: 914-694-9270, Telex: 64-6658; Empl.: 50; *Sls. Mgr.:* R. R. Ansell

TELESENSORY SPEECH SYS., Telesensory Sys., Inc., 3408 Hillview Ave., Palo Alto, CA 94304, Tel: 415-856-8255, Telex: 348352; *Sls. Mgr.:* David Giblon

TELESIS LABORATORY, Box 1972, Chillocothe, OH 45601, Tel: 614-642-5000, Telex: 24-5451; Empl.: 22; *Sls. Mgr.:* John Robertson

TELETERMINAL CORP., Greenland, NH 03840, Tel: 603-431-1200; Empl.: 13

TELETYPE, 5555 Touhy Ave., Skokie, IL 60076, Tel: 312-982-2000, Telex: 25-4051, TWX: 910-223-3611; FSC No.: 5815; Empl.: 6,000; *Sls. Mgr.:* D. M. Printz

TELEVIDEO SYS., INC., 1170 Morse Ave., Sunnyvale, CA 94086, Tel: 408-745-7760, TWX: 910-338-7633; *Sls. Mgr.:* Steve Tatum (VDT Div.)

TELEVISION EQUIP. ASSOCS., Box 393, So. Salem, NY 10590-0393, Tel: 914-763-8893, TWX: 710-575-2600; Empl.: 10

TELEVISION MICROTIME, INC., 1280 Blue Hills Ave., Bloomfield, CT 06002, Tel: 203-242-4242, TWX: 710-425-2390; Empl.: 80

TEL LABS, INC., 154 Harvey Rd., PO Box 375, Londonderry, NH 03053, Tel: 603-625-8994, TWX: 710-220-1844; FSC No.: 94322;Multiple; Empl.: 180 ..... **A•1952-1953**

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrn. Sls.	205-881-5031
AZ	Tempe, Gassner & Clark	602-968-9037
CA	La Mirada, Select Elec.	714-739-8891
CA	Mountain View, Serra Assocs.	415-964-4300
CO	Aurora, Sage Sls.	303-750-3501
FL	Clearwater, Beacon Elec. Sls.	813-796-2378
FL	Ft. Lauderdale, Beacon Elec. Sls.	305-491-1054
FL	Maitland, Beacon Elec. Sls.	305-647-3498
FL	Melbourne, Beacon Elec. Sls.	305-724-8010
GA	Atlanta, Beacon Elec. Sls.	404-256-9640
IL	Downers Grove, Richmar Elec. Corp.	312-968-0118
IN	West Lafayette, Richmar Elec. Corp.	317-846-6383
MD	Randallstown, Precision Mktg.	301-521-5353
MA	Topsfield, RFC Assocs.	617-887-8545
NJ	Clifton, Ossmann	201-778-8888
NY	Rochester, Ossmann Comps.	716-424-4460
NY	Syracuse, Ossmann Comps.	315-455-6611
NC	Greensboro, Beacon Elec. Sls.	919-275-9997
NC	Raleigh, Beacon Elec. Sls.	919-787-0330
OH	Akron, Augnat Assocs.	216-535-4396
OH	Dayton, Augnat Assocs.	513-298-1507
OK	Tulsa, ION Assocs.	918-664-0186
OR	Aloha, Caruso & Northcutt	503-624-1606
PA	Ardmore, Precision Mktg.	215-649-6301
PA	Pittsburgh, Augnat Assocs.	412-281-8283
TN	Johnson City, Beacon Elec. Sls.	615-282-2421
TX	Austin, ION Assocs.	512-458-2108
TX	Grand Prairie, ION Assocs.	214-647-8225
TX	Houston, ION Assocs.	713-681-6266
UT	Salt Lake City, Sage Sls.	801-467-5451
WA	Bellevue, Caruso & Northcutt	206-454-9699
WI	Butler, Richmar Elec. Corp.	414-781-1730

TELONIC/BERKELEY, 2825 Laguna Canyon Rd., Laguna Beach, CA 92652, Tel: 714-494-9401, Telex: 182720; FSC No.: 04423; Empl.: 75; *Sls. Mgr.:* H. Elmes

TELPAR, INC., 4137 Billy Mitchell Rd., P.O. Box 796, Addison, TX 75001, Tel: 214-233-6631, Telex: 73-2561; Empl.: 28; *Sls. Mgr.:* Wm. Konrad ..... **D•1075**

TELTONE, 10801-120 Ave. NE, Kirkland, WA 98033, Tel: 206-827-9626, TWX: 910-449-2862; Empl.: 450; *Sls. Mgr.:* D. E. Johnson; *Dist. Mgr.:* Mike Arndt

TEMESCAL, 2850 Seventh St., Berkeley, CA 94710, Tel: 415-841-5720, TWX: 910-366-7366; Empl.: 300

TEMPIL DIV., Big Three Inds., Hamilton Blvd., S. Plainfield, NJ 07080, Tel: 201-757-8300, Telex: 138-662; Empl.: 38; *Sls. Mgr.:* A. P. Jeanguenin

TEMPO INSTRUMENT, INC., 87 Modular Ave., Commack, NY 11725, Tel: 516-864-3700, TWX: 510-226-3787; FSC No.: 07031; Empl.: 205

TEMPOSONICS, MTS Sys. Corp., 111 East Ames Ct., Plainview, NY 11803, Tel: 516-349-1950, TWX: 510-226-3787; *Sls. Mgr.:* W. Brenner

TEMPTRONIC, 55 Chapel St., Newton, MA 02158, Tel: 617-969-2501, Telex: 200-119 TEMP UR; Empl.: 100+; *Sls. Mgr.:* Frank Healy

TENCOR INSTR., 2400 Charleston Road, Mountain View, CA 94043, Tel: 415-969-6767; *Sls. Mgr.:* Barry Hart

TENNELEC, 601 Turnpike, Oak Ridge, TN 37830, Tel: 615-483-8405, TWX: 810-572-1018; Empl.: 80

TENNEY ENGRG., 109 Springfield Rd., Union, NJ 07083, Tel: 201-686-7870, TWX: 710-985-4725; Empl.: 204; *Sls. Mgr.:* Jerome Perlstein ..... **D•1173**

Local Sales Offices & Reps

AL	Huntsville, Equipment Sales Co., Inc.	205-536-5399
AZ	Phoenix, Jayson Co.	602-867-1964
CA	Sunnyvale, Tenney Engrg., Inc.	408-745-6232
CA	Van Nuys, Environment Assocs.	818-997-3791
CO	Englewood, Tenney Engrg.	303-798-0955
CT	Hamden, Equip. Sls.	203-281-4578
FL	Altamonte Springs, Equip. Sls.	305-339-2972
FL	Delray Beach, Equip. Sls.	305-243-0709
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-293-5437
MD	Wheaton, Brimberg Sls.	301-946-2670
MA	Lowell, Equip. Sls. Co.	617-459-7000
MI	Warren, Dietrich & Assoc.	313-751-4990
MO	Blue Springs, Tenney Engrg., Inc.	816-229-7667
NJ	Mt. Laurel, Tan-Mar, Inc.	609-235-4345
NJ	Union, Tenney Engrg., Inc.	201-686-7870
NY	Fayetteville, M. P. Andrews	315-637-3144
NC	Raleigh, Equip. Sls.	919-872-8376
OH	Cleveland, Dietrich & Assocs.	216-781-1855
OH	Dayton, Dietrich & Assoc.	513-223-6042
PA	Pittsburgh, Dietrich & Assoc.	412-892-2992
TX	Austin, Carey, McMahill & Zerbe Co.	512-255-1663
TX	Garland, Carey, McMahill & Zerbe Co.	214-681-1414
TX	Houston, Carey, McMahill & Zerbe Co.	713-771-1500
WI	New Berlin, Marsland Assocs., Inc.	414-786-6611

TENOR, 17020 W. Rogers Dr., New Berlin, WI 53151, Tel: 414-782-3800, Telex: 26-706; Empl.: 30; *Sls. Mgr.:* P. Yoblin; *Dist. Mgr.:* P. Yoblin

TENSOLITE, Old Post Rd., Rte. 9A, Buchanan, NY 10511, Tel: 914-737-5600, TWX: 710-573-2341; Empl.: 300; *Sls. Mgr.:* David Yellin

TENSOR, Box 14843, Austin, TX 78761, Tel: 512-251-4131, Telex: ITT 4940124; Empl.: 15

TEN-TEC, INC., Industrial Park, Sevierville, TN 37862, Tel: 615-453-7172, Telex: 261337 ACTAUR; Empl.: 110; *Sls. Mgr.:* Joe Redwine

TEPRO OF FLORIDA, 2608 Enterprise Rd., Clearwater, FL 33575, Tel: 813-796-1044; FSC No.: 15915; Empl.: 97; *Sls. Mgr.:* Roger C. Mayo; *Dist. Mgr.:* Beverly Mayer

Local Sales Offices & Reps

CA	Burbank, MODCO	818-848-2215
CA	San Mateo, Melvin Sls.	415-349-7445
FL	Clearwater, Tepro of Florida	813-796-1044
IL	Glencoe, Howard Benjamin	312-835-0150
MA	Hopkinton, Berkshire Elctrns.	617-435-9356
NY	Great Neck, Pacent Engrg.	516-482-4678
OH	Cleveland, Components, Inc.	216-243-9200
TX	Dallas, Elctrn. Prods. Reps.	214-341-2666

TERADO, 1068 Raymond Ave., St. Paul, MN 55108, Tel: 612-646-2868; Empl.: 17; *Sls. Mgr.:* Don Munson; *Dist. Mgr.:* Fred Munson

TERADYNE, INC., 183 Essex St., Boston, MA 02111, Tel: 617-482-2700, TWX: 710-321-1055; Empl.: 3200; *Sls. Mgr.:* D. O'Connell

TERADYNE CONNECTION SYS., 44 Simon St., Nashua, NH 03060, Tel: 603-889-5156, TWX: 710-228-1431; FSC No.: 31413; Empl.: 1,400; *Sls. Mgr.:* D. Murphy

TERMINAL DATA CORP., 15733 Crabbs Branch Way, Rockville, MD 20855, Tel: 301-921-8282; Empl.: 12

TERMINAL SYS., See A & B Technical Services

TERRA TECHNLG. CORP., 3860 148th Ave. N.E., Redmond, WA 98052, Tel: 206-883-7300, Telex: 15-2070; *Sls. Mgr.:* Irl Davis

TEST & MEASUREMENT SYSTEMS, INC., 349 Cobalt Way, Ste. 301, Sunnyvale, CA 94086, Tel: 408-720-8877, Telex: 297584 TEAM UR; *Sls. Mgr.:* Bill Nicklin

TESTLINE, See Fairchild Test Sys. Grp., Testline Instrs.

TESTOTERM, P.O. Box 111509, Nashville, TN 37211, Tel: 615-834-5082, Telex: 55-5112

TEST PROBES, INC., Box 2113, La Jolla, CA 92038, Tel: 619-459-4197, Telex: 697192; *Sls. Mgr.:* Hal Wardein; *Dist. Mgr.:* Hal Wardein

TESTRONICS, 1810-102 N. Glenville Dr., Richardson, TX 75081, Tel: 214-238-8378, Telex: 469602; Empl.: 21

TETRAGENICS, Box 1338, Butte, MT 59701, Tel: 406-782-8606; Empl.: 40; *Sls. Mgr.:* Jack Dunn

TETTEX INSTRUMENTS, INC., P.O. Box 281, Fairview Village, PA 19409-0281, Tel: 215-539-6050, Telex: 753-899 TETTEX; Empl.: 100; *Sls. Mgr.:* Charles Prievys ..... **D•1312**

TEXAS INSTRS., INC., Box 225012-MS-84, Dallas, TX 75265, Tel: 214-995-6611, TWX: 910-867-4702; Empl.: 85,000

TEXAS INSTRS., Data Sys. Group, P. O. Box 809063, Dallas, TX 75380-9063, Tel: 1-800-527-3500, Telex: 73324 TEXINS DAL, TWX: 910-867-4702; Empl.: 80,696

TEXAS INSTRS., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703, Tel: 617-699-3800, Telex: 92-7708, TWX: 710-346-0566

TEXAS INSTRUMENTS

TEXAS INSTRUMENTS OPTOELECTRONICS, P.O. Box 225012 MS12, Dallas, TX 75265, Tel: 214-995-3821, Telex: 910-867-4702; Empl.: 89,000 world wide; *Sls. Mgr.:* Glenn Snyder; *Dist. Mgr.:* Rudy Profaizer ..... **B•1216-1219**

Local Sales Offices & Reps

AL	Huntsville	205-837-7530
AZ	Phoenix	602-995-1007
CA	Irvine	714-660-1200
CA	Sacramento	916-929-1521
CA	San Diego	619-278-9601
CA	Santa Clara	408-980-9000
CA	Torrance	213-217-7010
CA	Woodland Hills	213-704-7759
CO	Aurora	303-368-8000
CT	Wallingford	203-269-0074
FL	Ft. Lauderdale	305-973-8502
FL	Maitland	305-660-4600
FL	Tampa	813-870-6420
GA	Norcross	404-662-7900
IL	Arlington Heights	312-640-2925
IN	Ft. Wayne	219-424-5174
IN	Indianapolis	317-248-8555
IA	Cedar Rapids	319-395-9550
MD	Baltimore	301-944-8600
MA	Waithman	617-895-9100
MI	Farmington Hills	313-553-1500
MN	Eden Prairie	612-828-9300
MO	Kansas City	816-523-2500
MO	St. Louis	314-569-7600
NJ	Iselin	201-750-1050
NM	Albuquerque	505-345-2555
NY	East Syracuse	315-483-9291
NY	Endicott	607-754-3900
NY	Melville	516-454-6600
NY	Pittsford	716-385-6770
NY	Poughkeepsie	914-473-2900
NC	Charlotte	704-527-0930
NC	Raleigh	919-876-2725
OH	Beachwood	216-464-6100
OH	Dayton	513-258-3877
OK	Tulsa	918-250-0633
OR	Beaverton	503-643-6758
PA	Coraopolis	412-771-8550
PA	Ft. Washington	215-643-6450
TX	Austin	512-250-7655
TX	Houston	713-778-6592
TX	Richardson	214-680-5082
TX	San Antonio	512-496-1779
UT	Murray	801-266-8972
VA	Fairfax	703-849-1400
WA	Redmond	206-881-3080
WI	Brookfield	414-785-7140
PR	Hato Ray	809-753-8700
Can	Neapean, Ont.	613-726-1970
Can	Richmond Hill, Ont.	416-884-9181
Can	St. Laurent, Que.	514-334-3635

Local Distributors

AL Huntsville, Arrow Elctrns. 205-837-6955
AL Huntsville, Kierulff Elctrns. 205-883-6070
AL Huntsville, Marshall Elctrns. 205-881-9235
AZ Phoenix, Kierulff Elctrns. 602-437-0750
AZ Phoenix, Wyle Elctrns. 602-249-2232
AZ Tempe, Arrow Elctrns. 602-968-4800
AZ Tempe, Marshall Elctrns. 602-968-6181
CA Anaheim, R.V. Weatherford Elctrns. 714-634-9600
CA Canoga Park, Marshall Elctrns. 213-999-5001
CA Chatsworth, Arrow Elctrns. 818-701-7500
CA Commerce, Kierulff Elctrns. 213-725-0325
CA Cypruss, Kierulff Elctrns. 714-220-6300
CA El Segundo, Wyle Elctrns. 213-322-8100
CA Elmonte, Marshall Elctrns. 818-442-7204
CA Glendale, R.V. Weatherford Elctrns. 213-849-3451
CA Hayward, Arrow Elctrns. 415-487-4600
CA Irvine, Marshall Elctrns. 714-660-0951
CA Irvine, Wyle Elctrns. 714-863-9953
CA Sacramento, Arrow Elctrns. 916-925-7456
CA Sacramento, Wyle Elctrns. 916-638-5282
CA San Diego, Arrow Elctrns. 619-565-4800
CA San Diego, Kierulff Elctrns. 619-278-2112
CA San Diego, Marshall Elctrns. 619-578-9600
CA San Diego, Wyle Elctrns. 619-565-9171
CA San Jose, Kierulff Elctrns. 408-971-2600
CA Santa Barbara, R.V. Weatherford Elctrns. 805-965-8551
CA Sunnyvale, Arrow Elctrns. 408-745-6600
CA Sunnyvale, Marshall Elctrns. 408-732-1100
CA Tustin, Arrow Elctrns. 714-838-5422
CA Tustin, Kierulff Elctrns. 714-731-5711
CO Denver, Arrow Elctrns. 303-696-1111
CO Englewood, Kierulff Elctrns. 303-790-4444
CO Thornton, Wyle Elctrns. 303-457-9953
CT Danbury, Diplomat Elctrns. 203-797-9674
CT Orange, Milgray Elctrns. 203-795-0714
CT Wallingford, Arrow Elctrns. 203-265-7741
CT Wallingford, Kierulff Elctrns. 203-265-1115
CT Wallingford, Marshall Elctrns. 203-265-3822
FL Ft. Lauderdale, Arrow Elctrns. 305-429-8200
FL Ft. Lauderdale, Diplomat Elctrns. 305-974-8700
FL Ft. Lauderdale, Kierulff Elctrns. 305-486-4004
FL Orlando, Arrow Elctrns. 305-725-1480
FL Orlando, Milgray Elctrns. 305-647-5747
FL Tampa, Arrow Elctrns. 813-576-8995
FL Tampa, Diplomat Elctrns. 813-443-4514
FL Tampa, Kierulff Elctrns. 813-576-1966
GA Atlanta, Kierulff Elctrns. 404-447-5252
GA Norcross, Arrow Elctrns. 404-449-8252
GA Norcross, Marshall Elctrns. 404-923-5750
IL Bensenville, Diplomat Elctrns. 312-595-1000
IL Chicago, Arrow Elctrns. 312-397-3440
IL Chicago, Newark Elctrns. 312-784-5100
IL Itasca, Kierulff Elctrns. 312-250-0500
IL Schaumburg, Marshall Elctrns. 312-490-0155
IN Ft. Wayne, Graham Elctrns. 219-423-3422
IN Indianapolis, Arrow Elctrns. 317-243-9353
IN Indianapolis, Graham Elctrns. 317-634-8202
IA Cedar Rapids, Arrow Elctrns. 319-395-7230
KS Lenexa, Marshall Elctrns. 913-492-3121
KS Wichita, LComp 316-265-9507
MD Columbia, Arrow Elctrns. 301-995-0003
MD Columbia, Diplomat Elctrns. 301-995-1226
MD Linthicum, Kierulff Elctrns. 301-636-5800
MD Rockville, Milgram Elctrns. 301-793-3993
MA Billerica, Kierulff Elctrns. 617-667-8331
MA Burlington, Marshall Elctrns. 617-272-8200
MA Woburn, Arrow Elctrns. 617-933-8130
MA Woburn, Diplomat Elctrns. 617-935-6611
MA Woburn, Time Elctrns. 617-935-8080
MI Detroit, Arrow Elctrns. 313-971-8220
MI Detroit, Marshall Elctrns. 313-525-5850
MI Detroit, Newark Elctrns. 313-967-0600
MI Grand Rapids, Arrow Elctrns. 616-243-0912
MN Edina, Kierulff Elctrns. 612-941-7500
MN Minneapolis, Arrow Elctrns. 612-830-1800
MN Minneapolis, Marshall Elctrns. 612-559-2211
MO Kansas City, LComp 816-221-2400
MO St. Louis, Arrow Elctrns. 314-567-6888
MO St. Louis, Kierulff Elctrns. 314-739-0855
NH Manchester, Arrow Elctrns. 603-668-6968
NM Albuquerque, Milgram Elctrns. 609-983-5010
NJ Camden, General Radio 215-922-7037
NJ Camden, General Radio 609-964-8560
NJ Fairfield, Arrow Elctrns. 201-575-5300
NJ Fairfield, Kierulff Elctrns. 201-575-6750
NJ Fairfield, Marshall Elctrns. 201-882-0320
NJ Marlton, Arrow Elctrns. 215-928-1800
NJ Marlton, Arrow Elctrns. 609-596-8000
NJ Mt. Laurel, Kierulff Elctrns. 609-235-1444
NJ Mt. Laurel, Marshall Elctrns. 609-234-9100
NJ Totawa, Diplomat Elctrns. 201-785-1830
NM Albuquerque, Arrow Elctrns. 505-243-4566
NM Albuquerque, International Elctrns. 505-345-8127
NY Farmingdale, Milgray Elctrns. 516-420-9800
NY Hauppauge, Arrow Elctrns. 516-231-1000
NY Hauppauge, Jaco 516-273-5500
NY Hauppauge, Marshall Elctrns. 516-272-2053
NY Melville, Diplomat Elctrns. 516-454-6400
NY Rochester, Arrow Elctrns. 716-275-0300
NY Rochester, Marshall Elctrns. 716-235-7620
NY Rochester, Rochester Radio Supp. 716-454-7800
NY Syracuse, Arrow Elctrns. 315-652-1000
NY Syracuse, Diplomat Elctrns. 315-652-5000
NY Syracuse, Marshall Elctrns. 607-754-1570
NC Raleigh, Arrow Elctrns. 919-876-3132
NC Raleigh, Kieroff Elctrns. 919-872-8410
NC Winston-Salem, Arrow Elctrns. 919-725-8711
OH Cincinnati, Graham Elctrns. 513-772-1661
OH Cleveland, Arrow Elctrns. 216-248-3990
OH Cleveland, Kierulff Elctrns. 216-587-6558
OH Cleveland, Marshall Elctrns. 216-248-1788
OH Columbus, Graham Elctrns. 614-895-1590
OH Dayton, Arrow Elctrns. 513-435-5563
OH Dayton, Esco 513-226-1133
OH Dayton, Kierulff Elctrns. 513-439-0045
OH Dayton, Marshall Elctrns. 513-236-8088
OK Tulsa, Arrow Elctrns. 918-665-7700
OK Tulsa, Kierulff Elctrns. 918-252-7537
OR Beaverton, Marshall Elctrns. 503-644-5050
OR Hillsboro, Wyle Elctrns. 503-640-6000
OR Portland, Arrow Elctrns. 503-684-1690
PA Monroeville, Arrow Elctrns. 412-856-7000
TX Austin, Arrow Elctrns. 512-835-4180
TX Austin, Kierulff Elctrns. 512-835-2090
TX Austin, Marshall Elctrns. 512-458-5654
TX Austin, Wyle Elctrns. 512-834-9957
TX Dallas, Arrow Elctrns. 214-380-6464
TX Dallas, International Elctrns. 214-233-9323
TX Dallas, Kierulff Elctrns. 214-343-2400
TX Dallas, Marshall Elctrns. 214-233-5200
TX Dallas, Wyle Elctrns. 214-235-9953
TX El Paso, International Elctrns. 915-598-3406
TX Houston, Arrow Elctrns. 713-530-4700
TX Houston, Harrison Equip. 713-879-2600
TX Houston, Kierulff Elctrns. 713-530-7030
TX Houston, Marshall Elctrns. 713-789-6600
TX Houston, Wyle Elctrns. 713-879-9953
UT Salt Lake City, Diplomat Elctrns. 801-486-4134
UT Salt Lake City, Kierulff Elctrns. 801-973-6913
UT Salt Lake City, Wyle Elctrns. 801-974-9953
VA Richmond, Arrow Elctrns. 804-282-0413
WA Bellevue, Arrow Elctrns. 206-643-4800
WA Bellevue, Marshall Elctrns. 206-747-9100
WA Bellevue, Wyle Elctrns. 206-453-8300
WA Kent, Kierulff Elctrns. 206-575-4420
WI Oak Creek, Arrow Elctrns. 414-764-6600
WI Wakesha, Kierulff Elctrns. 414-784-8160
Can Calgary, Alb., Future Elctrns. 403-259-6408
Can Calgary, Alb., Varah Elctrns. 403-230-1235
Can Edmonton, Alb, Future Elctrns. 403-438-2858
Can Montreal, Que., CESCO 613-226-6903
Can Montreal, Que., Future Elctrns. 514-694-7710
Can Montreal, Que., ITT Comps. 514-735-1177
Can Ottawa, Ont., CESCO 613-226-6903
Can Ottawa, Ont., Future Elctrns. 613-820-8313
Can Ottawa, Ont., ITT Comps. 613-226-7406
Can Ottawa, Ont., Varah Elctrns. 613-726-8884
Can Quebec City, Que., CESCO 418-687-4231
Can Toronto, Ont., CESCO 416-661-0220
Can Toronto, Ont., Future Elctrns. 416-638-4771
Can Toronto, Ont., ITT Comps. 416-630-7971
Can Toronto, Ont., Varah Elctrns. 416-516-9311
Can Vancouver, B.C., Future Elctrns. 604-438-5545
Can Vancouver, B.C., ITT Comps. 604-270-7805
Can Vancouver, B.C., Varah Elctrns. 604-873-3211
Can Winnepeg, Man., Varah Elctrns. 204-633-6190

Regional Technology Centers

CA Irvine 714-660-8140
CA Santa Clara 408-748-2220
GA Norcross 404-662-7945
IL Arlington Heights 312-640-2909
MA Waltham 617-890-6671
TX Richardson 214-680-5066

Technical Support Center

Can 214-995-2171

TEXAS TRANSFORMER CORP., P.O. Box 220, Plano, TX 75074, Tel: 214-424-1581; FSC No.: 1181; Empl.: 75; *Sls. Mgr.:* Felix Smith

TEXASWITCH, INC., 2512 Program Dr., # 108, Dallas, TX 75220, Tel: 214-357-1768

TEXET SEMICONDUCTORS, 301 Texet Dr., Allen, TX 75002, Tel: 214-727-1111, TWX: 203943 TEXET UR; *Sls. Mgr.:* Kent Paris; *Dist. Mgr.:* Bill Bamsch

TEXMATE INC

TEXMATE, INC., 348 S. Cedros Ave., P.O. Box 2000, Solana Beach, CA 92075, Tel: 619-481-7177, TWX: 910-322-1738; Empl.: 36 ..... **D•1378-1379**

Texmate employs no sales reps or local salesmen in the USA. Instead we offer factory direct contact, fast delivery, and lower prices.

Local Distributors

Intl Australia, Melbourne ..... (03) 329-8873
Intl Australia, Sydney ..... (02) 797-9222
Intl France, Paris ..... (1) 575-53-53
Intl Germany, Darmstadd 0 61 51/2 64 46
Intl Germany, Dusseldorf 02 11/66 61 45
Intl Germany, Hanover 05 11/88 6086
Intl Germany, Munich 089-47 3023
Intl Germany, Quickborn 041 06/612-1
Intl Germany, Stuttgart 07 11/73 63 57
Intl India, Bangalore 812-58227
Intl Spain, Barcelona ..... (93) 692-35-19
Intl Sweden, Stockholm 08-710 06 20
Intl Taiwan, Taipei 595-3509,591-9651
Intl United Kingdom, Walsall ..... (0922)640003
Can Edmonton 403-432-7746
Can Montreal 514-337-0425
Can Ottawa 613-238-7077
Can Toronto 416-661-3193

TEXSCAN INSTRUMENTS, 3169 N. Shadeland, Indianapolis, IN 46226, Tel: 317-545-4196, Telex: 810-341-3184, TWX: 27-2110; FSC No.: 23042; Empl.: 765; *Sls. Mgr.:* Alan Whitlock; *Dist. Mgr.:* Rob Shenlot

TEX-TECHS, INC., 10021 Cayuga, Dallas, TX 75228, Tel: 214-328-6200, Telex: 73-0796 TEX TECH DAL; Empl.: 50; *Sls. Mgr.:* Jackie Miller

TEXTOOL PRODUCTS, Electronic Products Division/3M, 1410 W. Pioneer Dr., Irving, TX 75061, Tel: 214-259-2676; *Sls. Mgr.:* Dick Evans

TEXTRO INCORPORATED

TEXTRO, P.O. Box 381, Greer, SC 29652, Tel: 803-879-0752; Empl.: 15; *Sls. Mgr.:* Ed Ross; *Dist. Mgr.:* Pat Ross ..... **C•1906-1908**

Local Sales Offices & Reps

CA Santa Ana, Wayne Champa Assocs. 714-662-2228
CA Santa Clara, Con-Cab Sls. 408-727-4771
CO Englewood, Cablex 303-792-5760
CT Tolland, TMR Corp. 203-872-3624
DC Ellicott City, Marketing Tech., Inc. 301-465-8944
FL Longwood, CBC Elctrns. 305-831-5380
MD Ellicott City, Marketing Tech. Inc. 301-465-5944
MA Tewksbury, Sequel Assocs., Inc. 617-851-4010
NY Commack, MTR Tech. 516-543-1200
SC Mauldin, Carl Hart 803-288-2323

T-F ELCTRNS., 9415 Neils Thompson Dr., Austin, TX 78759, Tel: 512-836-7323, Telex: 77-6427; FSC No.: 50307; Empl.: 55

TGM DETECTORS, INC., 166 Bear Hill Rd., Watham, MA 02154, Tel: 617-890-2090

THALER CORP., 10940 N. Stallard Pl., Tucson, AZ 85704, Tel: 602-742-5572; Empl.: 5

THERMAL AMER. FUSED QUARTZ, Change Bridge Rd., Montville, NJ 07045, Tel: 201-334-7770, Telex: 136477; Empl.: 65; *Sls. Mgr.:* G.A. Miller

Thermalloy Inc.

The Innovator in semiconductor accessories.

THERMALLOY, INC., 2021 W. Valley View, P. O. Box 810839, Dallas, TX 75381-0839, Tel: 214-243-4321, Telex: 203965, TWX: 910-860-5542; Empl.: 248; *Sls. Mgr.:* Larry Marshall ..... **C•1679**

Local Sales Offices & Reps

AL Huntsville, Montgomery Mktg., Inc. 205-830-0498
AZ Phoenix, Integrated Sys. & Dvc. Sls. 602-971-6250
CA Mountain View, Straube Assocs. 415-969-6060
CA San Diego, Interstate Mktg. Assocs. 818-883-7606
CA Woodland Hills, Interstate Mktg. Assocs. 818-883-7607
CO Denver, Lindberg Co. 303-758-9033
FL Altamonte Springs, V. G. Sls., Inc. 305-831-8688

FL Largo, V. G. Sls., Inc. 813-584-2246
FL Pompano Beach, V. G. Sls., Inc. 315-971-0900
GA Norcross, Montgomery Mktg., Inc. 404-447-6124
ID Boise, N. R. Schultz Co. 208-377-8686
IL Elk Grove Village, The John G. Twist Co. 312-593-0200
IN Ft. Wayne, R.O. Whitesell & Assocs. .. 219-432-5591
IN Indianapolis, R.O. Whitesell & Assocs. 317-359-9283
IN Kokomo, R.O. Whitesell & Assocs. 317-457-9127
IA Cedar Rapids, PMR Corp. 319-362-9177
KS Overland Park, PMR Corp. 913-381-0004
KY Louisville, R.O. Whitesell & Assocs. ... 502-426-7696
MI Grand Rapids, R.O. Whitesell & Assocs. 616-942-5420
MI Southfield, R.O. Whitesell & Assocs. .. 313-559-5454
MI St. Josephs, R.O. Whitesell & Assocs. 616-983-7337
MN Bloomington, The John G. Twist Co. .. 612-835-2120
MO Maryland Hgts., PMR Corp. 313-569-1220
NH Salem, Sales Engrg. Co., Inc. 603-893-5521
NJ Cherry Hill, Trinkle Sls., Inc. 609-795-4200
NM Albuquerque, Lindberg Co. 505-881-1006
NY Ithaca; Bob Dean, Inc. 607-257-1111
NY Melville, Comtronic Assocs. 516-249-0505
NY Wappinger Falls, Bob Dean, Inc. 914-297-6406
NC Cary, Montgomery Mktg., Inc. 919-467-6319
OH Cincinnati, R.O. Whitesell & Assocs. ... 513-521-2290
OH Cleveland, R.O. Whitesell & Assocs. .. 216-447-9020
OH Columbus, R.O. Whitesell & Assocs. .. 614-888-9396
OH Dayton, R.O. Whitesell & Assocs. 513-298-9546
OK Tulsa, Ion Assocs. 918-664-0186
OR Beaverton, N. R. Schultz Co. 503-643-1644
PA Pittsburgh, R.O. Whitesell & Assocs. .. 412-963-6161
TX Austin, Ion Assocs. 512-331-7251
TX Grand Prairie, Ion Assocs. 214-647-8225
TX Houston, Ion Assocs. 713-977-4354
UT Salt Lake City, Lindberg Co. 801-467-1794
WA Bellevue, N. R. Schultz Co. 206-454-0300
WI Brookfield, The John G. Twist Co. 414-782-2670
WI Can., Markham, Ont, Deskin Sls. Corp. 416-495-1412
WI Can., Vancouver, B.C., Deskin Sls. Corp. 604-324-6331
WI Can, Montreal, Que., Deskin Sls. Corp. 514-331-2860
PR San Juan, Electronic Tech. Sls., Inc. ... 809-790-1300
Can Edmonton/Transconia/Calgary, Deskin Sls. 403-466-2106
Can Markham, Ont., Deskin Sls. 416-475-1412
Can Montreal, Que., Deskin Sls. 514-331-2860
Can Ottawa, Ont., Deskin Sls. 613-729-1099
Can Richmond, B.C., Deskin Sls. 604-273-4963

THERMAX WIRE CORP., 32-02 Linden Pl, Flushing, NY 11354-2897, Tel: 718-939-8300, Telex: 645587, TWX: 710-582-2551; FSC No.: 12814; Empl.: 220; *Sls. Mgr.:* R. Prusak

Therm-O-Disc®

THERM-O-DISC, INC., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907, Tel: 419-756-5911, Telex: 987455; *Sls. Mgr.:* J. A. Kight ..... **B•1775**

THERMODYNE INTERNATIONAL LTD., 20850 S. Alameda, Long Beach, CA 90810, Tel: 213-603-1976; FSC No.: 29724; Empl.: 100-120; *Sls. Mgr.:* Walter Wolf

THERMO ELECTRIC, 109 Fifth St., Saddle Brook, NJ 07662, Tel: 201-843-5800, TWX: 710-990-5108; Empl.: 375; *Sls. Mgr.:* H. Korman

THERMOELECTRICS, See TECA

THERMOGRAPHICS MEASUREMENTS LTD., 3733 W. 139th St., Hawthorne, CA 90250, Tel: 213-675-9182, Telex: 674432; *Sls. Mgr.:* Andrew Hilbert

THERMOLAB, 13345 Saticoy St., N. Hollywood, CA 91605, Tel: 213-875-0105, Telex: 662494, TWX: 910-499-2156; FSC No.: 09152

THERMOMETRICS, INC., 808 U.S. Hwy. #1, Edison, NJ 08817-4695, Tel: 201-287-2870, Telex: 844-387; FSC No.: FSCM 58090; Empl.: 130; *Sls. Mgr.:* Harold Broitman

THERMONICS, 3350 Scott Blvd., Bldg. 32, Santa Clara, CA 95054, Tel: 408-496-6838, Telex: 172-353; *Sls. Mgr.:* James D. Martin; *Dist. Mgr.:* James D. Martin

THERMOPLASTIC PROCESSES, INC., 1268 Valley Rd., Stirling, NJ 07980, Tel: 201-647-1000, TWX: 710-997-9583; FSC No.: 08230; *Sls. Mgr.:* Robert B. Scheffler; *Dist. Mgr.:* William Kaufman

THERMOSEN, P.O. Box 1254, Stamford, CT 06904, Tel: 203-324-6125, Telex: 965846; FSC No.: 00428; Empl.: 33

Local Sales Offices & Reps
CA San Carlos, Elctrn. Engrg. Assoc. 415-593-2189
CA Santa Monica, REP Assoc. 213-393-9666
CO Denver, Lindberg Co. 303-758-9033
FL Melbourne, Electro Mechanical Standards 305-724-1027
MA Newton, Normell Assocs. 617-969-5478
MN Minneapolis, Intl. Sls. Co. 612-831-8423
NM Albuquerque, Lindberg Co. 505-881-1006
OH Cincinnati, John O. Olsen Co. 513-574-7711
OH Cleveland, John O. Olsen Co. 216-662-3454
OR Portland, Syscom 503-644-2505
PA Glenside, Elcom, Inc. 215-885-1715
PA Pittsburgh, John O. Olsen Co. 412-279-2550
TX Austin, John B. Guenther, Inc. 512-472-3825
TX Dallas, John B. Guenther, Inc. 214-691-8500
TX Houston, John B. Guenther, Inc. 713-974-0383
UT Salt Lake City, Lindberg Co. 801-467-1794
VT Bennington, Magyar Assocs. 802-442-5858
WA Kirkland, Syscom Sls. 206-821-4575

THERMOTECH, See ITT Thermotech.

THETA INSTR. CORP., See Allen-Bradley Co: Industrial Control Div.

THICKFILM INT'L., Rt. 1-Box 85-0, Indian Head, MD 20640, Tel: 301-375-8666, TWX: 710-829-0590; Empl.: 14; *Sls. Mgr.:* P. Gundotra

THIELEX PLASTICS CORP., 201 11th St., Piscataway, NJ 08854, Tel: 201-968-5300, TWX: 710-997-9662; *Sls. Mgr.:* M. A. DeMatteo

THINCO DIV., HULL CORP., Davisville Rd., Hatboro, PA 19040, Tel: 215-672-7800, TWX: 510-665-6822; Empl.: 8; *Sls. Mgr.:* John L. Hull

THIRD DOMAIN, P.O. Box 35400, Tucson, AZ 85740-5400, Tel: 602-293-6310; Empl.: 26; *Sls. Mgr.:* Julia Gerdes

THOMAS & BETTS, Electronics Group Hdqtrs., 920 Route 202, Raritan, NJ 08869, Tel: 201-469-4000, Telex: 844372; FSC No.: 59730; Empl.: 2000

Local Sales Offices & Reps
CA Burbank, T & B Elctrns. Grp. 213-841-9670
CA San Jose, T & B Elctrns. Grp. 408-248-9111
IL Naperville, T & B Elctrns. Grp. 312-357-0404
NJ Flemington, T & B Elctrns. Grp. 201-788-5900

THOMAS & SKINNER, Box 150 B, Indianapolis, IN 46206, Tel: 317-923-2501, Telex: 02-7335; Empl.: 250; *Sls. Mgr.:* Sherman Smith

THOMAS ELCTRNS., 100 Riverview Dr., Wayne, NJ 07470, Tel: 201-696-5200, TWX: 710-988-5836; FSC No.: ;01852; Empl.: 380; *Sls. Mgr.:* Bruce Piaget

THOMSON-CSF COMPS CORP., Dumont Div., 550 Mt. Pleasant Ave., Dover, NJ 07801, Tel: 201-328-1400

THOMSON-CSF COMPS. CORP., DuMont Div., 750 Bloomfield Ave., Clifton, NJ 07015, Tel: 201-773-2000; FSC No.: 18778;Multiple; Empl.: 250; *Sls. Mgr.:* George Petro

THOMSON-CSF COMPS. CORP., Electron Tube Div., 301 Route 17 N., Rutherford, NJ 07070, Tel: 201-438-2300, TWX: 710-989-7286; *Sls. Mgr.:* Stephen Barthelmes

THOMSON-CSF COMPS. CORP., Metals & Chemicals Div., 6660 Variel Ave., Canoga Pk., CA 91303, Tel: 213-887-1010, Telex: 69-8481, TWX: 910-494-1954; Empl.: 3; *Sls. Mgr.:* Wm. E. Wheeler

THOMSON-CSF COMPS. CORP., Passive Comp. Div., 5850 Canoga Ave., Suite 300, Woodland Hills, CA 91367, Tel: 818-887-1010, Telex: 3719759, TWX: 310-371-9759; Empl.: 150; *Sls. Mgr.:* Chris Whitehead; *Dist. Mgr.:* Carolyn Peters

Local Sales Offices & Reps
AL Huntsville, E.S.I. 205-533-1735
AZ Phoenix, Sanford Sls. Assocs. 602-957-3570
CA Chatsworth, WCV-Raltech 818-700-0933
CA Los Gatos, Pro Assocs. 408-358-3861
CO Westminster, D. Barth & Assocs. 303-427-8679
FL Maitland, E I R, Inc. 305-660-9600
IL Elk Grove Village, John G. Twist Co. .. 312-593-0200
IN Indianapolis, Luebbe Sls. Co. 317-845-7389
KS Merriam, Midwest Techn. Sls. 913-236-8557
MA Framingham, Stone Comp. Sls. 617-875-3266
MI Bloomfield Hills, Enco Mktg. 313-642-0203
MN Bloomington, John G. Twist Co. 612-835-2120
NY Buffalo, Quality Comps. 716-837-5430
NY Great Neck, MOS Assocs. 516-487-3966
NY Manlius, Quality Comps. 315-682-8885
NC Cary, Electronic Sls., Inc. 919-467-8486
OH Cleveland, Luebbe Sls. Co. 216-333-0426
OH Columbus, Luebbe Sls. Co. 614-431-0474
OR Tigard, Elctrn. Comp. Sls. 206-232-9301
PA Wynnewood, Metz-Benhan Assocs., Inc. 215-896-7300
TX Dallas, Norcom 214-386-4888
WA Mercer Island, Elctrn. Comp Sls. 206-232-9301

THOMSON-CSF COMPS. CORP., Semiconductor Div., 6660 Variel Ave., Canoga Pk., CA 91304, Tel: 213-887-1010, Telex: 69-8481, TWX: 910-494-1954; *Sls. Mgr.:* Les Kilpatrick; *Dist. Mgr.:* David Johnson

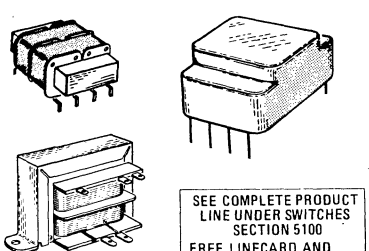
THOMSON-CSF COMPS. CORP., Socapex Div., 6660 Variel Ave., Canoga Pk, CA 91303, Tel: 213-887-0750, Telex: 69-8481, TWX: 910-494-1954

THOMSON-CSF COMPS. CORP., Special Prods. Div., 301 Rte. 17 North, Rutherford, NJ 07070, Tel: 201-438-2300, TWX: 710-989-7286; *Sls. Mgr.:* Hans H. Sandager

THORDARSON

THORDARSON MEISSNER, Components Corp. of Amer., Electronic Center, Mt. Carmel, IL 62863, Tel: 618-262-5121, TWX: 510-525-2254; FSC No.: 96256; Empl.: 600; *Sls. Mgr.:* Wm. Converse ..... **A•2308-2313**

THOR ELCTRNS., 321 Pennsylvania Ave., Linden, NJ 07036, Tel: 201-486-3300, Telex: 138 968; Empl.: 50; *Sls. Mgr.:* Jack Rose

THORDARSON MEISSNER
INCORPORATED
FULL LINE
AUTHORIZED DISTRIBUTOR
E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971
INDUSTRIAL, COMMERCIAL and MIL SPEC (QPL)

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

THORN EMI GENCOM INC., 23 Madison Rd., Fairfield, NJ 07006, Tel: 201-575-5586, Telex: RCA 221236 TEGI; Empl.: 35; *Sls. Mgr.:* L. A. Evangelist ..... **A•2342-2343**

Local Sales Offices & Reps

AZ	Phoenix, Odessey-1	505-883-4019
CA	N. Hollywood, O'Halloran Assocs.	213-877-0173
CA	Palo Alto, O'Halloran Assocs.	415-326-1493
CO	Denver, Odessey-1	505-883-4019
FL	Orange Park, Pulcir	904-264-7615
NM	Albuquerque, Odessey-1	505-883-4019
PA	Elkins Park, Snow Assocs.	215-379-4700
TN	Oak Ridge, Pulcir	615-483-6358
TX	Dallas, SW Eng. & Equip.	214-340-1741
TX	Houston, SW Eng. & Equip.	713-820-2500
VA	Front Royal, Eltron Sls., Ltd.	703-635-7201
WA	Seattle, Underwood Assocs.	206-451-8223

THORN EMI TECHNOLOGY INC., 8601 Dunwoody Pl., Atlanta, GA 30338, Tel: 404-587-0017, 800-243-2572, TWX: 810-766-2267 ..... **D•1313**

Local Sales Offices & Reps

CA	Irvine	714-261-0141
CA	Sunnyvale	408-732-9027
MA	Framingham	617-875-5858
NM	Albuquerque	505-884-0541
VA	Manassas	703-631-1766

THORSON ENGRG. CO., 6225 76th St. S.E., Snohomish, WA 98290, Tel: 206-334-4214

3D OPTICS, Box 224, 4 Strathmore Cir., Braintree, MA 02184, Tel: 617-848-8002; Empl.: 2

3M CO., see listing under letter "M"

THUNDER SCI. CORP., 623 Wyoming S.E., Albuquerque, NM 87123, Tel: 505-265-8701; Empl.: 26; *Sls. Mgr.:* J. L. Bennewitz

TIDEWATER TECHNOLOGICAL, INC., 611 Industrial Pk. Dr., Newport News, VA 23602, Tel: 804-874-2800; Empl.: 25

TIF INSTRS., INC., 9101 N.W. 7th Ave., Miami, FL 33150, Tel: 305-757-8811; *Sls. Mgr.:* Tom Wolff

TII ELECTRONICS, INC., Div. TII Industries, 226 Terminal Rd., E. Setauket, NY 11733, Tel: 516-789-5004, Telex: 144631; *Sls. Mgr.:* Jim Roach ..... **D•1852-1853**

Local Sales Offices & Reps

CA	Irvine, Quality Peripherals	714-549-8866
CA	San Jose, Quality Peripherals	408-559-3882
CT	Goshen, Northern Computer Sls. (OEM)	203-491-3585
MA	Westwood, Northern Computer Sls. (OEM)	617-326-3454
MN	St. Paul, ACT Comms.	612-738-7794
TX	Bonham, ACT Comms.	214-583-9541

TIMBER-TOP, Hopkins Rd., Box 517E, Watertown, CT 06795, Tel: 203-274-6706; FSC No.: 06773; Empl.: 5; *Sls. Mgr.:* W. E. Fischer

Advertisement

TTI's SYNCLAMPS are the ONLY quick-releasing, self-locking and INSTANT NULLING SYNCHROCLAMPS! Their INTEGRAL STOPS permit component mounting and nulling (techniques that can save 70% OR MORE of the mounting and nulling time!). SYNCLAMPS meet the MAXIMUM MIL SHOCK AND VIBRATION: 2000 ft-lbs/2000 cps! They also have the LOWEST INSTALLED COST of any type of clamp! A size and style for ANY size component and ANY application!!

TIMECO, INC., 1035 - 26th St., P.O. Box 8036, Huntington, WV 25705, Tel: 304-523-5149; *Sls. Mgr.:* Wm. F. Ransbottom

TIME LOCK, INC., 87 Water Mill Lane, Great Neck, NY 11021, Tel: 516-487-0690, TWX: 510-223-0886; Empl.: 6; *Sls. Mgr.:* Ernie Odierna

TIMEPLEX, INC., 400 Chestnut Ridge Rd., Woodcliff Lake, NJ 07675, Tel: 201-930-4600, Telex: 178200, TWX: 710-990-7270; FSC No.: 7035-0001; Empl.: 1000+; *Sls. Mgr.:* Rick MacPherson

TIMES FIBER COMMUNICATIONS, INC., 358 Hall Ave., P.O. Box 384, Wallingford, CT 06492-0384, Tel: 203-265-8500, TWX: 710-476-0763; Empl.: 1,100; *Sls. Mgr.:* Jack J. Barbera; *Dist. Mgr.:* Al Criscuolo

Local Sales Offices & Reps

AL	Huntsville, 20th Century Mktg.	205-533-9281
AZ	Phoenix, Mercury Engrg. Corp.	602-244-0123
CA	Anaheim, Westrep	714-527-2822
CA	Santa Clara, Westrep	408-988-8833
CA	SanDiego, Westrep	619-566-6580
CO	Denver, Lindberg Co.	303-758-9033
CT	Clinton, Selmark Assocs.	203-573-9088
CT	Hamden, MacArthur & Co.	203-281-5847
FL	Coral Springs, CBC Elctrns.	305-755-1111
FL	Longwood, CBS Elctrns.	305-831-5380
GA	Norcross, 20th Century Mktg.	404-466-1999
IL	Berkeley, Cadre Tech. Reps.	312-449-3900
IN	Indianapolis, Schank Elctrns. Mktg.	317-842-6204
IA	Cedar Rapids, PMR, Inc.	319-362-9177
KS	Overland Park, PMR, Inc.	913-381-0004
KS	Wichita, PMR, Inc.	316-684-4141
MD	Rockville, Mechtronics Sls.	301-340-2130
MA	Millis, Selmark Assoc.	617-376-2914
MI	Livonia, Lowell-Wendt Mktg. Co.	313-464-2722
MN	Bloomington, E.S.A.	612-884-8291
MO	Maryland Hgts., PMR, Inc.	314-569-1220
NH	Hopkinton, Selmark Assocs.	603-746-4507
NM	Albuquerque, Lindberg Co.	505-881-1006
NY	Massapequa, MacArthur & Co.	516-481-0400
NY	Rochester, Electra Sls. Corp.	716-427-7860
NY	Syracuse, Electra Sls. Corp.	315-463-1248
NC	Winston Salem, DGW, Inc.	919-768-7166
OH	Columbus, Baehr, Greenleaf & Assocs.	614-486-4046
OH	Dayton, Baehr, Greenleaf & Assocs.	513-439-0724
OH	Lakewood, Baerh, Greenleaf & Assocs.	216-221-9030
OK	Oklahoma City, Ammon & Rizos	405-942-2552
OR	Tigard, Electronic Sources	503-684-0040
PA	Evans City, Baehr, Greenleaf & Assocs.	412-776-2151
PA	Springhouse, PWC	215-643-2550
SC	Greenville, DGW, Inc.	803-288-0019
TN	Knoxville, 20th Century Mktg.	615-966-3608
TN	Memphis, 20th Century Mktg.	901-756-4681
TX	Austin, Ammon & Rizos Co.	512-454-5131
TX	Houston, Ammon & Rizos	713-781-6240
TX	Richardson, Ammon & Rizos	214-644-5591
UT	Salt Lake City, Lindberg Co.	801-467-1794
WA	Bellevue, Electronic Sources	206-451-3500

Local Distributors

CA	Hawthorne, Radio Hardware	213-679-3381
CA	Irvine, Republic Elctrn. Sls.	714-855-2222
CA	San Jose, RFI Elctrns.	408-298-5400
CT	E. Hartford, E.J. Stephens	203-568-1927
FL	Ft. Lauderdale, KSM Elctrns.	305-971-5900
FL	Orlando, Cablematic	305-293-5729
MD	Gaithersburg, Pioneer/Wash.	301-921-0660
MD	Hanover, Vertex Elctrns.	301-796-5000
MA	Burlington, QPL Elctrns.	617-229-2424
NJ	Passaic, Seacoast Elc. Supp.	201-779-5151
NY	Farmingdale, Vertex Elctrns.	516-293-9880
NY	Freeport, Mil-Spec Wire & Cable	516-546-5454
NY	Port Washington, Restart Elctrns.	516-883-3500
NY	Rochester, Simcona Elctrns.	716-328-3230
PA	Folcroft, Delphi Elctrns.	215-534-3900
PA	Montgomeryville, Pyttronics Inds.	215-643-2850
TX	Garland, Vonn Wire & Cable	214-494-0355

TIME ZERO CORP., 103 Cental Ave., Clifton, NJ 07011, Tel: 201-340-0400

TITAN TECHNOLOGIES, INC., 310 W. Ann, Ann Arbor, MI 48104, Tel: 313-662-8542, Telex: 757689; *Sls. Mgr.:* Don Carone

TITAN TRANSFORMER CO., 134 Coolidge Ave., Watertown, MA 02172, Tel: 617-923-1200

TITCHENER, E. H., & CO., 1 Titchener Pl., Binghamton, NY 13902, Tel: 607-772-1161, TWX: 510-252-1985; Empl.: 235

TL INDUSTRIES, INC., 2541 Tracy Road, Toledo, OH 43619, Tel: 1-419-666-8144, Telex: 286-431; *Sls. Mgr.:* Mark Lorenz

TMC SYSTEMS (ARIZ.) INC., See Dale Electronics, Inc.

TNR TECHNICAL, INC., Saft & Gates Batteries, 45 Jefryn Blvd. West, Deer Park, NY 11735, Tel: 516-242-4800; Empl.: 35; *Sls. Mgr.:* Wayne Thaw

TOBE DEUTSCHMANN LABS., INC., 550 Turnpike St., Canton, MA 02021, Tel: 617-828-3366, Telex: 92-4427; FSC No.: 21966; Empl.: 40; *Sls. Mgr.:* T. Deutschumann, Jr.

TOCOS AMERICA, INC., Tokyo Cosmos Electric Co., Ltd., Ste. 565 Arlington Center, Golf Rd., Arlington Heights, IL 60005, Tel: 312-310-8641, TWX: 910-997-0078; Empl.: 2,000; *Sls. Mgr.:* Masaji Matsunami

TODD PRODS. CORP., 50 Emjay Blvd., Brentwood, NY 11717, Tel: 516-231-3366, TWX: 510-227-4905; Empl.: 250; *Sls. Mgr.:* R. Schlote ..... **D•1854-1855**

Local Sales Offices & Reps

AL	Huntsville, R. W. Mitscher Co.	205-882-6050
AZ	Scottsdale, Thorson Desert States	602-998-2444
CA	Los Alamito, Santana Sls.	213-431-3533, 714-827-9100
CA	Sunnyvale, Todd Prods. Corp.	408-732-0512
CO	Wheat Ridge, Waugaman Assocs., Inc.	303-423-1020
CT	Weston, Northeast Reps.	203-866-6030
FL	Alamonte Springs, R.W. Mitscher Co.	305-788-6844
FL	Boca Raton, R.W. Mitscher Co.	305-368-3841
GA	Lawrenceville, R. W. Mitscher Co.	404-923-3239
IL	Arlington Heights, Coombs Assocs.	312-439-9810
IN	Indianapolis, E. T. Kaul Assocs.	317-888-6187
IA	Cedar Rapids, Coombs Assocs.	319-362-4116
MA	Hingham, Northeast Reps.	617-749-8700
MI	Livonia, Electro Sls. Assocs.	313-474-7320
MN	Minneapolis, R. K. Sales Assocs.	612-786-5713
MO	St. Louis, AME Sls.	314-965-1779
NH	Nashau, Todd Prods. Corp.	603-881-3175
NH	Nashua, Northeast Reps.	603-880-8199
NJ	Pennsauken, Scientific Reps.	609-662-5222
NJ	Ridgefield, Rical Assocs.	201-945-5250
NM	Albuquerque, Thorsen Desert States, Inc.	505-293-8555
NY	Charlotte, R. W. Mitscher Co.	704-598-8644
NY	E. Syracuse, Nycom	315-437-8343
NC	Raleigh, R. W. Mitscher Co.	919-848-0941
OH	Dayton, Thompson & Assocs., Inc.	513-435-7733
PA	Mars, Thompson & Assocs., Inc.	412-776-6495
TN	Johnson City, R. W. Mitscher Co.	615-929-7258
TX	Austin, J. Clay Co.	512-346-7340
TX	Dallas, J. Clay Co.	214-350-1281
UT	Salt Lake City, Waugaman Assocs., Inc.	801-261-0802
VA	Fairfax, Scientific Assocs., Inc.	703-385-0600
WA	Bellevue, Venture Elctrns.	206-454-4594
WI	Milwaukee, Coombs Assocs.	414-351-6123

TODD SYSTEMS, INC., 50 Ash St., Yonkers, NY 10701, Tel: 914-963-3400; Empl.: 45; *Sls. Mgr.:* S. Edwards ..... **A•2314-2317**

Local Distributors

AL	Mobile, Athenian, Inc.	205-432-2985
CA	San Francisco, Aris Corp.	415-550-8605
CA	San Francisco, Delray Distr.	415-777-4405
CT	Norwalk, Park Distr.	203-853-2010
FL	Miami, Gay Mar, Inc.	305-371-0765
GA	Macon, Giga Corp.	912-745-2897
IL	Chicago, Irv Wolfson Co.	312-267-7828
LA	New Orleans, Trestman Supp.	504-561-8590
MD	Bethesda, Albee Sls.	301-897-8088
NJ	Newark, Cotrapex, Inc.	201-589-1416
NJ	Newark, Pinto Trading	201-344-7748
NY	Long Island City, H. L. Dalis, Inc.	212-361-1100
NY	New York, Gelb Sls.	212-475-7940
NY	New York, Rosetta Elec.	212-233-9088
OH	Dayton, K. Elctrns.	513-426-1877
PA	Philadelphia, H & Z Sls.	215-912-2500
TX	Houston, Cross & Co.	713-673-3100
TX	Houston, Western Sls.	713-869-6671
VA	Fall Church, Arya Corp.	703-845-0800
WA	Seattle, ForeigN Elctrns.	206-682-2761
EXP	NY, New York, Able Intl., Ltd.	212-696-5300

TOHOKU METAL INDS., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, Japan, Tel: Tokyo 03-402-6161, Telex: 242 2695 TOKIN J; Empl.: 2000; *Sls. Mgr.:* H. Ishihara; *Dist. Mgr.:* T. Ikeda

TOKO AMERICA, INC., 1250 Feehanville Dr., Mt. Prospect,, IL 60056, Tel: 312-297-0070, Telex: 230-724372; *Sls. Mgr.:* Mark Saito .....**A•1279, 1581, 1643; D•1856, 1989**

Local Sales Offices & Reps

AL	Madison, Kathy Leverock	205-837-9350
CA	Cupertino, Toko America, Inc.	408-996-7575
IL	Chicago, Esco Assocs.	312-763-0800
IL	Skokie, Toko America, Inc.	312-674-3640
IL	Skokie, Ultech Assocs.	312-674-3820
NY	White Plains, Toko America, Inc.	914-694-5618

TOKYO ELEC. CO., LTD., 1-1 Nishiki-Cho, Kanda, Chiyoda-Ku, Tokyo, 101, Japan, Tel: (03) 292-1011, Telex: 0222-3575, TWX: S

TOLEDO SCALE, Reliance Electric, P. O. Box 99502, Cleveland, OH 44199, Tel: 800-245-4501, in OH 800-245-4497

TOPAZ ELECTRONICS, 9192 Topaz Way, San Diego, CA 92123-1164, Tel: 619-279-0831, TWX: 910-335-1526; FSC No.: 06049; Empl.: 450; *Sls. Mgr.:* Ruxton Tucker; *Dist. Mgr.:* Chuck Roberts

TOPFLIGHT, 160 East 9th Ave., York, PA 17404, Tel: 800-233-9386, TWX: 510-657-4849; Empl.: 250; *Sls. Mgr.:* James Danser

TORAD COIL CO., INC., 283 Linden Rd., Wayne, NJ 07470, Tel: 201-835-6195; *Sls. Mgr.:* Dan Gupta

TORELCO, INC., 14 Paine Ave., P.O. Box 108, Irvington, NJ 07111, Tel: 201-374-8641; Empl.: 20; *Sls. Mgr.:* Stewart H. Cook

TOROID CORP. OF MARYLAND, 6000 Laurel-Bowie Rd., Bowie, MD 20715-4037, Tel: 301-464-2100, TWX: 710-826-0414; *Sls. Mgr.:* Marshall Sorenson ..... **A•2318-2319**

Local Sales Offices & Reps

CA	Seal Beach, Texel	213-596-9411
IL	Wheeling, Ed Joyner & Co.	312-520-1200
PA	Hatboro, Electro Rep Engrg.	215-674-4421

TOROTEL PRODS. INC., 13402 S. 71 Hwy., Grandview, MO 64030, Tel: 816-761-6314, TWX: 910-777-7037; Empl.: 275; *Sls. Mgr.:* H. Foland ..... **A•1280-1295, 2320-2325**

Local Sales Offices & Reps

AL	Huntsville, L & D, Inc.	205-837-1469
AL	Westlake, OH, JN Bailey & Assocs.	216-892-1513
AZ	Tempe, Gassner & Clark Co.	602-968-9037
CA	Aurora, Hi Tech. Assocs.	303-696-7403
CA	Redwood City, Hickey Ind. Sls.	415-368-3849
CA	San Diego, California Elctrn. Mktg.	619-692-3551
CA	Santa Ana, California Elctrn. Mktg.	714-835-2702
FL	Orlando, Perrott Assocs.	305-298-7748
GA	Atlanta, L & D, Inc.	404-395-7079
IL	Schaumburg, Gassner & Clark Co.	312-882-8608
IA	Hiawatha, Gassner & Clark Co.	319-393-5763
MD	Towson, Dickison Sls. Co.	301-823-0923
MA	Weston, John Goode Assocs.	617-235-3900
NY	Manhasset, Win-Cor Elctrns.	516-627-9474
NY	Syracuse, Rep, Tech, Inc.	315-437-2845
NC	Greensboro, L & D, Inc.	919-292-3201
NC	Raleigh, L & D, Inc.	919-876-5301
OH	New Lebanon, J. N. Bailey & Assocs.	513-687-1325
OH	Westlake, J. N. Bailey & Assocs.	216-892-1513
PA	Birchrunville, Jadelectronic Assocs.	215-296-3800
PA	Philadelphia, Jadelectronic Assocs.	215-455-0664
TN	Seymour, L & D, Inc.	615-577-1549
TX	Austin, Oeler & Menelaides	512-453-0275
TX	Dallas, Oeler & Menelaides	214-361-8876
TX	Houston, Oeler & Menelaides	713-772-0730

TOROTRON CORP., 519 South Fifth Ave., Mt. Vernon, NY 10550, Tel: 914-664-2050; Empl.: 14; *Sls. Mgr.:* Lee Abramson ..... **D•1315**

TORQ CORP., 32 W. Monroe St., Bedford, OH 44146, Tel: 216-232-4100; Empl.: 135

TORRINGTON CO., 59 Field St., Torrington, CT 06790, Tel: 203-482-9511

TORWICO ELCTRNS. INC., 410 Oberlin Ave. South, Lakewood, NJ 08701, Tel: 201-364-1800, TWX: 710-723-8343; Empl.: 240 ..... **A•2328-2329**

Local Sales Offices & Reps

CA	El Cajon, KCE Corp.	619-588-1198
CA	Menlo Park, Long and Assocs.	415-327-1300
FL	Orlando, Gra-Mar	305-894-3351
IN	Noblesville, Patco & Assocs.	317-877-5986
IA	Davenport, Ensco Rep	319-386-6600
KS	Overland Park, Ensco Rep	913-381-7557
KS	Wichita, Ensco Rep	316-683-1070
MD	Riderwood, W. S. Warrington & Assoc.	301-823-8759
MA	Hingham, N.E. Reps.	617-749-8700
MO	Maryland Heights, Ensco Rep	314-423-3935
NJ	Marlton, BGR Assocs.	609-983-1020
NY	Albany, Lynn Assocs.	518-459-1239
NY	Buffalo, Lynn Assocs.	716-631-0054
NY	Great Neck, Trionic	516-466-2300
OH	Copley, Eljay Assoc.	216-666-3774
OR	Portland, Abacus Sls.	503-777-8111
PA	Pittsburgh, Lynn Assocs.	412-341-5155
TX	Irving, Kite Elctrns. Sls. Co.	214-438-9336

TOSHIBA CORPORATION, See General Products Corp.

TOUCH TECHNOLOGY, INC., 107 Gibralter Street, Annapolis, MD 21401, Tel: 301-269-6181; Empl.: 19

TOWNSEND INDUSTRIES, 51 Carl Rd., Orange, CT 06477, Tel: 203-795-0241, TWX: 710-465-1898; *Sls. Mgr.:* Charles Dorsa

TOYO COMM. EQUIP. CO., LTD., No. 8 Mori Bldg., 20-4, Nichi-Shimbashi, 3-Chome Minato-Ku, Tokyo, Japan 105, Tel: 03-459-7320/03-459-7310, Telex: 02423115 Toyocoj.; Empl.: 1800; *Sls. Mgr.:* T. Nagai/S. Nakagome

TRACEWELL ENCLOSURES, 7032 Worthington Galena Rd., Columbus, OH 43085, Tel: 614-846-6175, 800-848-4525; Empl.: 30 ..... **C•1092-1093**

TRA-CON, INC., 55 North St., Medford, MA 02155, Tel: 617-391-5550; Empl.: 55

TRACOR INSTRUMENTS, 6500 Tracor La., Bldg. 27, Austin, TX 78725, Tel: 512-929-2051, TWX: 910-874-1366; Empl.: 9100; *Sls. Mgr.:* William R. Murphy; *Dist. Mgr.:* Will Hoover

TRACOR PAKTRONICS, 2441 Northeast Pkwy., Ft. Worth, TX 76106, Tel: 817-625-2311, Telex: 758-273; Empl.: 10; *Sls. Mgr.:* Harold Whittenton

TRAK MICROWAVE CORP., 4726 Eisenhower Blvd., Dept. E5, Tampa, FL 33614, Tel: 813-884-1411, Telex: 52-827, TWX: 810-876-9140; FSC No.: 12855; *Sls. Mgr.:* Toby Gant ..... **A•1782-1783**

Local Sales Offices & Reps

AL	Huntsville, Magaro & Assocs.	205-882-0827
AZ	Phoenix, J. Smith Assocs.	602-267-0981
CA	Malibu, RL Comps.	213-456-9021
CA	Mountain View, Disman Bakner	415-969-3010
CO	Colorado Springs, J. Smith Assocs.	303-597-5343
CO	Greely, W. H. Howard Assocs.	303-426-3499
FL	Melbourne, Jerry Williams, Inc.	305-259-7700
GA	Atlanta, Magaro & Assocs.	404-451-8862
IL	Franklin Park, Dekotech	312-455-5100
IN	Ft. Wayne, TX Sls. Indiana	219-489-4447
IA	Cedar Rapids, J.R. Sls. Engrg.	319-393-2232
MD	Columbia, M. Lader Co.	301-730-1550
MD	Conowingo, M. Lader Co.	301-378-3449
MA	Andover, Bee Assoc.	617-475-2124
MN	Minneapolis, Deerland Distrs.	612-331-6433
NJ	Belford, Ascor Elctrns.	201-787-6011
NM	Albuquerque, J. Smith Assocs.	505-265-3406
NY	Liverpool, R&D Assocs.	315-457-0100
NY	New Rochelle, Ascor Elctrns.	914-235-8838
NC	Raleigh, M. Lader Co.	919-848-3231
PA	Lafayette Hill, M. Lader Co.	215-825-3177
TX	Dallas, Cain & Co.	214-247-3901
UT	Salt Lake City, Effective Sls.	801-266-9617
WA	Seattle, Datacom Assocs.	206-285-2525

TRAK MICROWAVE, Western Division, 735 Palomar Ave, Dept. E-5, Sunnyvale, CA 94086, Tel: 408-735-9660, TWX: 910-339-9309; FSC No.: 29111; *Sls. Mgr.:* Thomas L. Roberts ..... **A•1782-1783**

Local Sales Offices & Reps

AL	Huntsville, Magaro & Assocs.	205-882-0827
AZ	Scottsdale, Territorial Mktg.	602-994-8665
CA	Malibu, RL Comps.	213-456-9021
CA	Mountain View, Disman-Bakner	415-969-3010
CO	Colorado Springs, J. Smith Assocs.	303-597-5343
FL	Melbourne, Jerry Williams, Inc.	305-259-7700
GA	Altanta, Magaro & Assocs.	404-451-8862
IL	Franklin Park, Dekotech, Inc.	312-455-5100
IN	Ft. Wayne, TX Sls. Indiana	219-489-4447
IA	Cedar Rapids, J. R. Sls. Engrg.	319-393-2232
MD	Conowingo, M. Lader Co.	301-378-3449
MA	Andover, Bee Assocs.	617-475-2124
MN	Minneapolis, Deerland Dists., Inc.	612-331-6433
NM	Albuquerque, J. Smith Assocs.	505-265-3406
NY	Hartsdale, Spectrum Sls.	914-472-8600
NY	Liverpool, R&D Assocs.	315-457-0100
NC	Raleigh, M. Lader Co.	919-848-3231
PA	Lafayette Hill, M. Lader Co.	215-825-3177
TX	Dallas, Cain & Co.	214-247-3901
UT	Salt Lake City, Effective Sls.	801-266-9617
WA	Seattle, Datacom Assocs.	206-285-2525

TOSHIBA/HOUSTON
INTERNATIONAL CORPORATION
FULL LINE
AUTHORIZED DISTRIBUTOR
E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039
213-660-1310
CALL TOLL FREE
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971

SEE COMPLETE PRODUCT LINE UNDER SWITCHES SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST
PROGRAMMABLE CONTROLLER

TRAK SYSTEMS, Div. TRAK Microwave Corp., 4722 Eisenhower Blvd., Dept. E-5, Tampa, FL 33614, Tel: 813-884-1411, Telex: 52-827, TWX: 810-876-9140; FSC No.: 11165; *Sls. Mgr.:* Thomas L. Roberts ..... **D•1076-1081**

Local Sales Offices & Reps

AL	Huntsville, Magaro & Assocs.	205-882-0827
AZ	Phoenix, J. Smith Assocs.	602-267-0981
CA	Mountain View, Disman-Bakner	415-969-3010
CA	San Diego, L. L. Stoakes, Inc.	619-452-1600
CO	Greely, W. H. Howard Assocs.	303-426-3499
FL	Sarasota, Bass Assocs.	813-922-9538
GA	Atlanta, Magaro & Assocs.	404-451-8862
IN	Ft. Wayne, TX Sales	219-489-4447
MD	Annapolis, Blackwood Assocs.	301-261-1904
MA	Cochituate, High-Tech Sls., Inc.	617-653-3838
NM	Albuquerque, J. Smith Assocs.	505-265-3406
NC	Greensboro, Magaro & Assocs.	919-294-4783
PA	Huntingdon Valley, Rabal Assocs.	215-947-4825
TX	Arlington, J. T. Houston Assocs.	817-265-2931
WA	Bellevue, Tasco, Inc.	206-453-1414

TRANSAMERICA DELAVAL, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990, Tel: 203-677-1311, Telex: 99-306; Empl.: 203; *Sls. Mgr.:* M. W. Brown; *Dist. Mgr.:* M. W. Brown

TRANS AMERICAN TRANSFORMER, 142 Peconic Ave., Medford, NY 11763, Tel: 516-654-1880; Empl.: 23

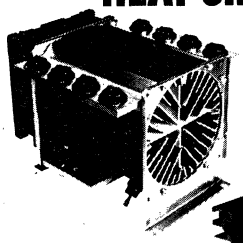
TRANSCO PRODUCTS, INC., 4241 Glencoe Ave., Marina del Rey, CA 90295, Tel: 213-822-0800, Telex: 65-2448, TWX: 910-343-6469; FSC No.: 82152; Empl.: 400; *Sls. Mgr.:* T. G. Katter

Local Sales Offices & Reps

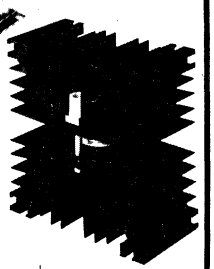
CA	Marina del Rey, Michael Robinson	213-822-0800
CA	San Jose, Jon Walker	408-244-6150
CA	San Juan Capistrano, Bruce Toffelmier	714-643-0506

tran-tec

IMPROVED-DESIGN HEAT SINKS



COMPLETE LINE OF FORCED AIR



PRESS PACK HEAT SINKS

COMPLETE LINE OF NATURAL AIR

We fabricate heat sinks to your specifications. Write for NEW CATALOG.

tran-tec CORPORATION

P.O. Box 1044 — Columbus, NE 68601
Phone (402) 564-2748

MD	Ellicott City, VPI, Inc.	301-461-2525
MO	Ellisville, Hi Grant Wilson	314-227-0737
NY	Bayside, R. L. Diamond Inc.	212-423-7330
TX	Richardson, Ronald B. Patton	214-669-1951
WA	Bellevue, Poggi Assocs., Inc.	206-454-2026

TRANSDUCERS & SYSTEMS

TRANSDUCERS AND SYSTEMS INC., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, Tel: 203-481-5721, TWX: 710-452-3092; Empl.: 60; *Sls. Mgr.:* J. L. Jamieson ..... **B•1828**

Local Sales Offices & Reps

CA	Huntington Beach, Transducer Sys.	714-840-5357
CA	Palo Alto, Gado Instr. Sls.	415-961-2222
CT	Washington, Tri-Com Assocs.	203-563-2241
FL	Indian Rocks Beach, PAR Assocs.	813-596-8841
GA	Atlanta, PAR Assocs.	404-391-9117
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs., Inc.	317-293-5437
IA	Cedar Rapids, Marsland Assocs.	319-396-8030
MA	Burlington, Tri-Com Assocs.	617-272-8163
MI	Mt. Clemens, O'Hara Assocs.	313-791-7140
MN	Minneapolis, Marsland Assocs.	612-545-4481
MO	St. Louis, Marsland Assocs.	314-991-1399
NJ	Cherrry Hill, Markey Instrmn.	609-667-3809
NJ	Hillsdale, CB Assocs., Inc.	201-644-6230
NY	Rochester, TAE-REP	716-586-8710
NY	Whitney Point, TAE-REP, Inc.	607-692-3705
OH	Dayton, RIXAN Assocs.	513-278-4216
OH	Stow, Rixan Assocs., Inc.	216-686-2909
TX	Lewisville, Electric Control Assocs.	214-221-3143
WI	New Berlin, Marsland Assocs., Inc.	414-786-6611

TRANSDUCER SYSTEMS, INC., 1510 Delp Dr., Kulpsville, PA 19443, Tel: 215-256-4611, Telex: 846078; Empl.: 310

Local Sales Offices & Reps

CA	Santa Clara, Nelson Elctrn. Sls.	408-980-1950
IN	Indianapolis, Electro Dev. Engrg.	317-547-5274
MI	Madison Heights, L. C. Nyman & Co.	313-543-6520
MN	Mendota, GII Sls.	612-454-3086

TRANSDUKTOR, INC., See Ulveco, Inc.

TRANSENE, Rte. 1, Rowley, MA 01969, Tel: 617-948-2501; Empl.: 21; *Sls. Mgr.:* J. Doucette

TRANSFORMATION ELCTRNS. CORP., 170 Wilbur Pl., Bohemia, NY 11716, Tel: 516-563-1117, TWX: 510-222-0972; *Sls. Mgr.:* David Baum ..... **D•1857**

Local Sales Offices & Reps

CA	Pasadena, EMI	818-795-7193
CA	Sunnyvale, Schwerin & Merrill	408-735-7900
CO	Englewood, Elctrn. Comp. Sys.	303-781-5904
FL	Longwood, Boetto Corp.	305-331-1771
GA	Norcross, New South Mktg. Ltd.	404-887-7254
KS	Kansas City, BC Elctrns.	913-342-1211
MD	Pikesville, Imagitron Sls. Co.	800-638-3592
MA	Wakefield, Kentronics	617-246-0245
NY	New York, Livera-Polk	516-759-9300
TX	Arlington, Hite Elctrn. Sls. Co.	817-861-8627
WA	Bellevue, Elctrn. Mktg. Grp.	206-882-0962

TRANSFORMER & COIL PRODUCTS, TRW Electronic Assemblies Division, 150 Varick St., New York, NY 10013, Tel: 212-255-3500, TWX: 710-581-2722; Empl.: 325; *Sls. Mgr.:* A. Profeta

TRANSFORMER DESIGN, INC., 78th & Clinton, Milwaukee, WI 53223, Tel: 414-358-5300

TRANSICOIL, INC., Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, Tel: 215-277-1300, TWX: 510-660-0132; FSC No.: 82686; Empl.: 220; *Sls. Mgr.:* P. Schoenacker

TRANSISTOR DEVICES, 274 S. Salem St., Randolph, NJ 07869, Tel: 201-361-6622; Empl.: 350; *Sls. Mgr.:* J. A. Gilson ..... **D•1316-1317**

Local Sales Offices & Reps

CA	Costa Mesa, FLW Inc.	714-751-7512
CA	Los Altos, Cain-White Co.	415-948-6533
GA	Atlanta, Magaro & Assocs.	404-252-6609
IL	Elmhurst, Scott Assocs.	312-279-5681
MD	Ellicott City, Dyna-Rep Co.	301-992-4350
MA	Lexington, E. F. Delfino, Inc.	617-862-1118
NJ	Ridgewood, Hansen Assocs.	201-652-7055
NY	North Syracuse, Advance Components	315-699-2671
OH	Medina, McShane Inc.	216-725-4568
OR	Hillsboro, Controlek Sls.	503-640-8444
PA	Fort Washington, GCM Inc.	215-646-7535
TX	Lewisville, J. Hughes Co.	817-430-1683
VA	Alexandria, Dyna-Rep Co.	703-354-1222
EXP	NY, New York, Singer Prods.	212-432-1400

TRANSKINETIC SYS., 110 Shawmut Rd., Canton, MA 02021, Tel: 617-828-3000; Empl.: 7

TRANSMAGNETICS, 210 Adams Blvd., Farmingdale, NY 11735, Tel: 516-293-3100, TWX: 510-224-6420; FSC No.: 17755; Empl.: 40; *Sls. Mgr.:* Fred Haber ..**D•1162-1163**

Local Sales Offices & Reps

TX	Bellaire, Seaton Corp.	713-731-2649
TX	Carrollton, Seaton Corp.	214-380-0414

TRANSMET CORP., 4290 Perimeter Dr., Columbus, OH 43228, Tel: 614-276-5522, 800-245-5253, TWX: 810-482-1016; *Sls. Mgr.:* Ronald A. Crossman; *Dist. Mgr.:* Robert M. Simon

TRANS-MET ENGRG., 601 S. Palm St., La Habra, CA 90631, Tel: 213-691-2266; Empl.: 25; *Sls. Mgr.:* Robert J. Powers

TRAN-SPECTRA, INC., Rte. 1-Box 27A, Greenfield, TN 38230, Tel: 901-235-2218; Empl.: 25; *Sls. Mgr.:* D. Cole

TRANS-TECH, 12 Meem Ave., Gaithersburg, MD 20760, Tel: 301-948-3800, Telex: 898-303, TWX: 710-828-0549; FSC No.: 14591; Empl.: 74; *Sls. Mgr.:* Blair W. Stiles; *Dist. Mgr.:* Blair W. Stiles

TRANS-TECH, INC., Alpha Inds., Inc., 20 Sylvan Rd., Woburn, MA 01801, Tel: 617-935-5150, Telex: 949436, TWX: 710-396-1236; FSC No.: 17540; *Sls. Mgr.:* Blair Stiles

TRANS-TEK, P.O. Box 338, Rte. 83, Ellington, CT 06029, Tel: 203-872-8351, Telex: 99207; FSC No.: 27109; Empl.: 40; *Sls. Mgr.:* William R. Padin

TRAN-TEC, Box 1044, Columbus, NE 68601, Tel: 402-564-2748; Empl.: 46; *Sls. Mgr.:* Cliff Schroeder

Local Sales Offices & Reps

CA	Redwood City, Woodworth Co.	415-365-0252
CA	Tustin, Sierra-Pacific Engrg. Co.	714-731-3411
CO	Golden, Pierce-Robbins Assocs.	303-399-6618
FL	Winter Park, Russell Assocs.	813-526-1134
GA	Atlanta, Russell Assocs.	404-225-8422
IN	Indianapolis, Scott Elctrns, Inc.	317-897-9976
IA	Cedar Rapids, Ard Sls. Co.	319-366-8733
MD	Bel Air, Russell Assocs.	301-879-9180
MA	Wakefield, H.C. Jappe Co.	617-245-9359
NJ	Fair Haven, Russell Assocs.	201-747-0600
NY	Bay Shore, Russell Assocs.	516-666-6500
NY	Cazenovia, Naylor Elec. Co.	315-655-8174
OH	Cleveland, D. Steffen & Assocs.	216-461-8333
TX	Dallas, Russell Assocs.	214-699-0383
WA	Bellevue, Russell Assocs.	206-455-3694

TRAN-TROL CO., 2525 N. Alvernon Way, C-6, Tucson, AZ 85712, Tel: 602-795-8008

TRENDATA/STANDARD MEMORIES, 3400 W. Segerstrom, Santa Ana, CA 92704, Tel: 714-540-3605, TWX: 910-595-1596; Empl.: 200; *Sls. Mgr.:* M.S. Efron

TRENT, INC., 201 Leverington Ave., Philadelphia, PA 19127, Tel: 215-482-5000; Empl.: 55

TRIAC ELECTRONIC SYSTEMS, INC., 87-27 Myrtle Ave., Glendale, NY 11385, Tel: 718-441-4759, TWX: 221500 ASAS ATT TRIAC; Empl.: 35; *Sls. Mgr.:* Victor Botnick ..... **D•1132-1133**

TRIAD POWER SYSTEMS, 10362 Miller Road, Dallas, TX 75238, Tel: 214-341-8700; FSC No.: 214-341-1804; *Sls. Mgr.:* Jack Conn

TRIAD-UTRAD
Standard Products

TRIAD-UTRAD, 1124 E. Franklin St., Huntington, IN 46750, Tel: 219-356-6500, TWX: 810-333-1532; Empl.: 750; *Dist. Mgr.:* Dave N. Miller ..... **A•2330-2337; D•1970-1971**

Local Sales Offices & Reps

AK	Anchorage, H.J. Lang & Assocs.	907-279-5741
AZ	Phoenix, Steve Fisher Assocs.	602-247-7865

AR	Little Rock, J. Y. Schoonmaker Co.	501-375-2168
CA	Chino, Tracy Elec. Sls.	714-591-4736
CA	Santa Clara, Logan Sls.	408-496-0660
CO	Denver, West Inc.	303-692-0131
FL	Maitland, Hutto-Hawkins-Peregoy	305-831-2474
GA	Atlanta, Effective Mktg. Force	404-948-6023
HI	Honolulu, Hawaii Elctrn. Svc.	808-845-8207
IL	Wilmette, J. Wasserman Assocs.	312-256-3566
KS	Overland Park, T.L. Dowell, Inc.	913-648-7373
LA	Little Rock, J. Y. Schoonmaker	501-375-2168
MA	Framingham, Bay Colony	617-620-0607
MN	Minneapolis, Elec. Comp. Sls.	612-933-2594
MO	St. Louis, T.L. Dowell, Inc.	314-849-4234
NJ	Medford, Champion Elctrn. Sls.	609-654-0475
NY	Rochester, Marchese, Marsey, Barden	716-544-4300
NY	Rockville Centre, Schmitt Indl. Mktg.	516-486-3510
OH	Cincinnati, F.E. Kahsar Sls.	513-922-3133
OH	Hudson, F.E. Kahsar Sls.	216-650-1089
OR	Portland, J. J. Backer Co.	503-297-3777
OR	Salem, J. J. Backer Co.	503-362-0717
TX	Dallas, J. Y. Schoonmaker Co.	214-349-1650
WA	Seattle, J. J. Backer Co.	206-285-1300
EXP	Westbury, N.Y., Minthorne Int'l.	516-546-4700

Local Distributors

AL	Birmingham, Forbes Distrbg.	205-251-4104
AZ	Phoenix, Dalis Elctrn. Supp.	602-275-2885
AR	Little Rock, Carlton Bates Co.	501-562-9100
CA	Glendale, R. V. Weatherford	213-849-3451
CA	Mountain View, Abacus Elctrns.	415-961-1500
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Riverside, Electronic Supp.	714-683-7300
CO	Denver, Integrated Elctrns.	303-534-6121
FL	Ft. Lauderdale, Peerless Radio Corp. of Fla.	305-973-4141
GA	Atlanta, Ack Radio Supp.	404-351-6340
IL	Chicago, Bell Inds.	312-982-9210
IL	Chicago, Newark Elctrns.	312-638-4411
IN	Lafayette, CWY Elctrns.	317-448-1611
IA	Cedar Rapids, Deeco, Inc.	319-365-7551
KY	Louisville, P. I. Burks Co.	502-589-3960
LA	New Orleans, William B. Allen Co.	504-525-8222
MD	Rockville, Capitol Radio Whls.	301-881-2270
MA	Burlington, Marshall Wilshire Elctrns.	617-272-8200
MA	Wilmington, Cronin Elctrns.	617-449-0500
MI	Grand Rapids, S-F Elctrns.	616-459-0216
MI	Livonia, R. S. Elctrns.	313-525-1155
MN	St. Paul, Gopher Elctrns.	612-483-4450
MO	St. Louis, Olive Indl. Elctrn.	314-426-4500
NE	Lincoln, Scott Elctrn. Supp. Corp.	402-466-8221
NH	Hudson, C & H Elctrns.	603-882-1133
NJ	Camden, General Radio Supp.	215-922-7037
NJ	Springfield, Route Elctrns.	201-379-7710
NM	Albuquerque, Electronic Parts Co.	505-293-6161
NY	Hauppauge, Broadline Elctrn. Distr.	516-231-4100
NY	Rochester, Simcona	716-328-3230
NY	Rockville Centre, Midway Indl. Elctrns.	516-764-2400
NY	Rome, Rome Elctrns.	315-337-5400
NC	Greensboro, Hammond Elctrns.	919-275-6391
OH	Cleveland, Pioneer Std. Elctrns.	216-587-3600
OH	Dayton, Pioneer/Dayton	513-236-9900
OK	Tulsa, Combined Tech.	918-582-8242
OR	Portland, United Radio Supp.	503-233-5346
PA	Philadelphia, Almo Elctrns.	215-698-4000
RI	Warwick, W. H. Edwards Elctrns.	401-781-8000
SC	Greenville, Hammond Elctrns.	803-233-4121
TN	Memphis, Bluff City Elctrns.	901-345-9500
TX	Dallas, Sterling Elctrns.	214-243-1600
TX	Houston, Altair Co.	713-462-3029
UT	Provo, Omega Elctrns.	801-375-4664
WA	Seattle, Almac	206-643-9992
WI	New Berlin, RM/Wisconsin	414-784-4420

TRI-COM, INC., 7304 Grove Rd., Frederick, MD 21701, Tel: 301-694-6666, Telex: 64828 TRICOM; Empl.: 35; *Sls. Mgr.:* Marc Vivori

TRIDAK, 1120 Federal Rd., Brookfield, CT 06804, Tel: 203-775-1287, TWX: 710-456-1372; Empl.: 20; *Sls. Mgr.:* F. C. Herot

TRI-DATA CORP., 505 E Middlefield Rd., Mountain View, CA 94043, Tel: 415-969-3700, Telex: 910-379-6978; Empl.: 173

TRILOBYTE COMPUTER CORPORATION, 801 W. Grand Ave., Oakland, CA 94607, Tel: 415-839-1100, TWX: 910-350-0171; Empl.: 15; *Sls. Mgr.:* Barbara Ulfeldt

TRILOG, 17391 Murphy Ave., Irvine, CA 92714, Tel: 714-549-4079, TWX: 910-595-2798; Empl.: 35; *Sls. Mgr.:* Jack Rice

TRIMM, INC., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048, Tel: 312-362-3700; Empl.: 90; *Dist. Mgr.:* H. Lewis

TRIM-TRONICS, INC., 67 Albany St., Cazenovia, NY 13035, Tel: 315-655-9528, TWX: 710-541-1530; Empl.: 20; *Sls. Mgr.:* James E. Dowd

TRINETICS

TRINETICS INC., 55807 Currant Rd., Mishawaka, IN 46545-4899, Tel: 219-259-8535; Empl.: 100; *Sls. Mgr.:* T. J. Dawson

Local Sales Offices & Reps

AZ	Phoenix, Bill Earl & Assocs.	602-994-3813
CA	Pasadena, Western Comp.	818-791-9794
CA	San Rafael, Wright Assocs.	415-457-9940
CT	Clinton, Berkshire Elctrns.	203-669-0752
IL	Chicago, Jerry Golten Co.	312-792-1991
IN	Ft. Wayne, Walter W. Bieberich	219-432-2537
IN	New Albany, Walter W. Bieberich	812-945-3187
AR	Hot Springs, Automation Supp.	501-767-5444
MA	Hopkinton, Berkshire Elctrns.	617-435-9356
MI	Sturgis, Kesler Assocs.	616-651-7619
MO	St. Louis, Hill & Co.	314-432-1136
NH	Gonic, Berkshire Elctrns.	603-335-1897
NJ	Burlington, V.D.E. Elctrn. Sls.	609-387-9331
NY	Rochester, V.D.E. Elctrn. Sls.	716-473-5015
OH	Cincinnati, Stegman Blaine Mktg.	513-729-1969
OH	Cleveland, Stegman Blaine Mktg.	216-871-0520
OH	Vandalia, Stegman Blaine Mktg.	513-890-7975
PA	Philadelphia, V.D.E. Elctrn. Sls.	215-524-0591

TRIO LABS., 80 Dupont St., Plainview, NY 11803, Tel: 516-349-0400, TWX: 510-221-1861; FSC No.: 00638; Empl.: 60; *Sls. Mgr.:* John Crawford

TRIO-TECH INTL., 2040 N. Lincoln St., Burbank, CA 91504, Tel: 818-846-9200, Telex: 194811; Empl.: 266; *Sls. Mgr.:* Ted Mezo

TRIPLE I, See PHI Technologies, Inc.

TRIPLETT
A *Penril* COMPANY

TRIPLETT CORP.-A PENRIL CO., One Triplett Dr., Bluffton, OH 45817-9987, Tel: 419-358-5015, TWX: 810-490-2400; *Sls. Mgr.:* Richard Anderson
D•1318-1321, 1380-1381

Local Sales Offices & Reps

AZ	Phoenix, Shefler-Kahn	602-257-9015
CA	Burlingame, Polach & Bensinger	415-697-2525
CA	Costa Mesa, Berman-Gravley, Inc.	714-549-2122
CO	Aurora, R & R Instrmn.	303-364-8325
CO	Denver, IW Strong & Assocs.	303-292-6900
FL	Lighthouse Pt., Jack Krutek & Assocs.	305-941-6544
FL	Maitland, Jack Krutek & Assocs.	305-628-4837
GA	Atlanta, Millar Elctrns.	404-261-6160
IL	Berkeley, G. Petitt Co.	312-449-8000
IN	Ft. Wayne, W. Bieberich	219-432-2537
IN	New Albany, W. Bieberich	812-945-3187
KS	Olathe, SPS Assocs., Ltd.	913-764-4460
MD	Baltimore, Sunshine Sci. Inst.	301-661-5900
MI	Grosse Point Woods, A & D Elctrn. Sls.	313-884-1956
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
NJ	Englewood Cliffs, Masin Esco	201-569-8868
NY	Hauppauge, Masin Esco	516-273-3500
NY	Rochester, Marchese, Marsey & Barden	716-544-4300
NC	Charlotte, Brownell-Electro, Inc.	704-597-1270
NC	Raleigh, Millar Elctrns.	919-787-9564
OH	Centerville, Dolfuss-Root	513-433-6776
OH	Strongsville, Dolfuss-Root	216-238-0300
OR	Portland, J.J. Backer	503-297-8744
PA	Bridgeville, Dolfuss-Root	412-221-4420
PA	Trevose, PSA	215-245-0513
RI	Lincoln, Adams-McGregor	401-726-1300
RI	West Warwick, Adams McGregor, Inc.	401-821-1320
TX	Dallas, Elcom Mktg. Inc.	214-241-2166
WA	Seattle, J.J. Backer	206-285-1300

Local Distributors

AL	Birmingham, Brownell-Electro	205-323-4761
AL	Mobile, Brownell-Electro	205-479-8581
AZ	Phoenix, Metermaster Div.	602-437-1425

TRIPLETT
PANEL METERS, VOM's & DIGITAL TEST EQUIPMENT

AUTHORIZED DISTRIBUTORS

METERMASTER
FOR

Panel Meters • Test Equipment • Components
Sales, Modifications, Repair and Calibration

METERMASTER LOCATIONS:

ARIZONA	
Phoenix	(602) 243-4111
Tucson	(602) 792-3411
CALIFORNIA	
Los Angeles	(213) 685-4340
Palo Alto	(415) 960-8500
San Diego	(619) 560-4841
GEORGIA	
Atlanta	(404) 446-0166
ILLINOIS	
Chicago	(312) 250-0606
MASSACHUSETTS	
Boston	(617) 523-2580
MINNESOTA	
Minneapolis	(612) 332-6117
MISSOURI	
St. Louis	(314) 454-0241
NEW MEXICO	
Albuquerque	(505) 292-3330
OHIO	
Cleveland	(216) 651-4100
OKLAHOMA	
Tulsa	(918) 582-1444
PENNSYLVANIA	
Pittsburgh	(412) 261-4548
TEXAS	
Austin	(512) 473-8876
Dallas	(214) 271-5671
Houston	(713) 733-9814
WISCONSIN	
Milwaukee	(414) 643-0554
ALL OTHER STATES	**(800) 962-8128**

TRIPLETT
A *Penril* COMPANY

AUTHORIZED DISTRIBUTOR

SUNSHINE
THE SOURCE FOR METERS & TEST EQUIPMENT

Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT
(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area
(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

CA Glendale, Western Elctrn. Supp. 213-245-1226
CA Irvine, Meter Craft/Larson 714-261-7135
CA Los Angeles, E.I.L. Instrs. 213-685-7020
CA Los Angeles, Metermaster Div. 213-685-4340
CA Palo Alto, Metermaster Div. 415-968-0313
CA San Diego, Metermaster Div. 619-560-4841
CA Santa Clara, Dynametron 408-727-6531
CA Santa Clara, Fisher/Brownell 408-988-6041
CO Denver, Meter-master 303-722-5766
CT Middletown, E. I. L. Instr. 203-346-6646
FL Hialeah, Kimball Elctrn. Lab. 305-822-5792
FL Miami, Brownell-Electro 305-884-3072
FL Orlando, Brownell-Electro 305-843-6770
GA Atlanta, Brownell-Electro 404-762-5181
GA Atlanta, Process Meas. Control 404-696-7481
HI Honolulu, Kems, Inc. 808-845-6402
IL Bridge View, E.I.L. Instrs. 312-430-2292
IL Countryside, Pacific Indicator 312-352-3500
IL Elk Grove Village, Meter-Makers 312-439-5050
IL Elk Grove Village, Metermaster 312-593-8650
IN Evansville, Electro-Lab Svcs. 812-423-5211
IN Indianapolis, E.I.L. Instrs. 317-545-1373
KS Overland Park, Brooks Elec. 913-648-3131
KY Louisville, E. I. L. Instr. 502-454-3432
LA New Orleans, Indl. Instr. Works 504-733-8355
MD Gaithersburg, Pioneer/Instrmn. 301-921-0660
MD Savage, Pyttronic 301-792-0780
MD Sparks, E.I.L. 301-771-4800
MA Burlington, E. I. L. Instr. 617-272-9450
MA Waltham, Calibron 617-894-6440
MI Ferndale, Ram Meter 313-697-6911
MN Minneapolis, Instr. Control 612-871-2514
MO St. Louis, ISL Corp. 314-535-5760
NJ Belleville, Marshall Inst. 201-751-1190
NJ New Foundland, Hosica Labs 201-697-6111
NY Clarence, Trott Elctrns. 716-634-8500
NY L.I.C., Metermod Instr. 212-726-4850
NC Charlotte, Brownell-Electro 704-597-1270
NC Raleigh, Brownell-Electro, Inc. 919-876-6524
NC Raleigh, Meter-Meterics, Div. of I.T.R. .. 919-872-5456
NC Raleigh, Speed Instr. Div. Owen-Barbot 919-876-4919
OH Cleveland, Pioneer/Instrmn. 216-587-3600
OH Cleveland, Weschler Elec. 216-238-2550
OH Dayton, Pioneer/Dayton 513-236-9900
OK Tulsa, Tri-State Instr. 918-836-0286
PA Philadelphia, Sunshine Sci. 215-673-5600
PA Pittsburgh, CAM/RPC 412-963-1885
PA Pittsburgh, E.I.L. 412-731-5230
TN Knoxville, Brownell-Electro 615-966-3441
TN Memphis, Brownell-Electro 901-795-8487
TN Memphis, Instrument Repair Svc. 901-278-0762
TN Nashville, Brownell-Electro 615-889-8230
TX Beaumont, Straughn Elec. 409-838-4563
TX Dallas, Ultra Instr. 214-357-0297
TX Garland, Metermaster 214-271-5671
TX Houston, Meters & Instrs. 713-644-1631
TX Houston, Quality Instr. 713-524-0528
TX Odessa, Whitlock Instr. 915-337-3412
VA Richmond, Meter Metrics (I.T.R.) 804-275-1431
WA Seattle, E. I. L. Instrs., Inc. 206-762-0880
WA Seattle, Eicher-Richards 206-523-7888
WI Milwaukee, E-M Instrs. 414-272-7799

TRIPP-LITE, 500 No. Orleans, Chicago, IL 60610, Tel: 312-329-1777; Empl.: 80; *Sls. Mgr.:* Priscilla Galgan; *Dist. Mgr.:* Priscilla Galgan

TRI-STAR ELCTRNS., INC., 362 Main Street # 2, Venice, CA 90291, Tel: 213-823-5779, Telex: 182058 Tristarel Vnce, TWX: 910-343-7448; FSC No.: 5935, 5999, 5120, 5280; *Sls. Mgr.:* Tom Magdalik

TRITON MFG. CO., P.O. Box 361, East Haddam, CT 06423, Tel: 203-838-4666, Telex: 955439; FSC No.: 54195; *Sls. Mgr.:* Jack Spangler

TRI-TRONICS CO. INC., 13420 Wright Cir., Tampa, FL 33624, Tel: 813-855-4453; Empl.: 27; *Sls. Mgr.:* Robert A. Warner

TRIVEX, 3180 Redhill Ave., Costa Mesa, CA 92626, Tel: 714-546-7781, TWX: 910-595-2589; Empl.: 180; *Sls. Mgr.:* R. Martin

TRO DYNE CORP., 900 Corporate Dr., Mahwah, NJ 07430, Tel: 201-529-1800, TWX: 710-988-2138; FSC No.: 17346; Empl.: 55; *Sls. Mgr.:* T. Mazzaccaro

TROMPETER ELECTRONICS, INC., 8936 Comanche, Chatsworth, CA 91311, Tel: 818-882-1020, TWX: 910-494-1210; FSC No.: 14949; Empl.: 110; *Sls. Mgr.:* Paul Cox; *Dist. Mgr.:* Hap Gladish

Local Sales Offices & Reps

AL Huntsville, Currie, Peak and Frazier ... 205-536-1506
AZ Phoenix, Aztec Entprs. 602-944-9185
CA Los Angeles, Knight Co. 213-670-2833
CA San Diego, Knight Co. 619-571-7903
CA Santa Clara, DC Elctrns. 408-980-1199
CO Denver, Aztec Entprs. 303-779-5285
CT Wethersfield, Underwood Sls. 203-563-3046
FL Orlando, Currie, Peak & Frazier 305-855-0843
GA Norcross, Currie, Peak & Frazier 404-449-7662
IL Schaumburg, Engineering Prods. 312-882-7640
IN Indianapolis, Engrg. Prods. Assoc. 317-894-7156
IA Iowa City, Engineering Prods. Assoc. .. 319-354-5344
MD Silver Spring, Sel-Tronics 301-589-3391
MA Lowell, Underwood Sls. 617-256-8191
MN Edina, Engineering Prods. Assoc. 612-835-9022
NJ Elmwood Park, L & M Assoc. Eng. Rep. 201-797-0441
NM Albuquerque, Aztec Entprs. 505-262-1688
NY New York, L & M Assocs. Eng. Rep. .. 212-243-6155
NY Rochester, T A E Reps. 716-586-8710
NY Whitney Point, T.A.E. Reps. 607-692-3705
NC Greensboro, Currie, Peak & Frazier ... 919-373-0380
NC Raleigh, Currie, Peak & Frazier 919-787-0808
OH Cleveland, Geotronix 216-526-2535
OH Trotwood, Geotronix 513-252-6700
PA Andalusia, L & M Assocs. 215-245-6658
PA Reading, L & M Assocs. 215-775-9559
TX Lewisville, Milestek 214-436-1597
UT Ogden, Aztec Entprs. 801-621-1655
WA Lynnwood, Blum & Assocs. 206-775-6656

TRUE DATA, 17092 Pullman St. # B, Irvine, CA 92714, Tel: 714-979-4842, TWX: 910-595-1917; Empl.: 37

TRULINE CORP., P.O. Box 1469, Visalia, CA 93279, Tel: 209-625-3237; *Sls. Mgr.:* Charlie Torres

TRW CAPACITOR DIV., 301 West "O" St., Ogallala, NE 69153, Tel: 308-284-3611, TWX: 910-620-0321; *Sls. Mgr.:* Dennis Lienemann ..... **A•1179-1185**

Local Sales Offices & Reps

AL Huntsville, TRW/ECG 205-533-7600
AZ Scottsdale, TRW/ECG 602-994-0441
CA Los Angeles, ISDS 213-478-0183
CA Mountain View, Straube Assocs. 415-969-6060
CA Orange County, Hamilton 714-641-4100
CA Sacramento, Hamilton Avnet 916-925-2216
CA San Diego, Hamilton Avnet 619-571-7510
CA San Diego, ISDS 619-571-1544
CA San Francisco, Hamilton Avnet 408-743-3355
CA San Gabriel, Hamilton Avnet 714-989-4602
CA Santa Ana, ISDS 714-973-2162
CA Woodland Hills, ISDS 213-883-7130
CO Westminster, Straube Assocs. 303-426-0890
CT Rowayton, TRW/ECG 203-853-4466
FL Ft. Lauderdale, TRW/ECG 305-772-3000
FL Melbourne, Hamilton Avnet 305-725-2700
FL Orlando, TRW/ECG 305-857-3650
GA Norcross, TRW/ECG 404-447-6154
IL Chicago, TRW/ECG 312-693-7730
IN Ft. Wayne, R. O. Whitesell & Assocs. .. 219-432-5591
IN Indianapolis, R. O. Whitesell & Assocs. 317-359-9283
IN Kokomo, R. O. Whitesell & Assocs. ... 317-457-9127
IA Cedar Rapids, C. H. Horn & Assocs. .. 319-393-8703
KS De Soto, Midtec Assocs. 913-441-6565
KS Wichita, Hamilton Avnet 800-532-6720
KY Lexington, Hamilton Avnet 800-543-4783
KY Louisville, R. O. Whitesell & Assocs. .. 502-426-7696
MD Baltimore, Hamilton Avnet 301-995-3500
MD Columbia, TRW/ECG 301-964-9110
MA Boston, Hamilton Avnet 617-273-7500
MA Westborough, TRW/ECG 617-870-0745
MI Grand Rapids, R. O. Whitesell & Assocs. 616-942-5420
MI Southfield, R. O. Whitesell & Assocs. .. 313-559-5454
MI St. Joseph, R. O. Whitesell & Assocs. 616-983-7337
MN Minneapolis, TRW/ECG 612-854-6616
MO St. Louis, John G. Macke Co. 314-432-2830
NE Panama, Norris Stricker 402-788-2700
NY Fairport, TRW/ECG 716-425-3775
NC Greensboro, TRW/ECG 919-852-4676
OH Cincinnati, R. O. Whitesell & Assocs. .. 513-521-2290
OH Cleveland, R. O. Whitesell & Assocs. .. 216-447-9020
OH Columbus, R. O. Whitesell & Assocs. .. 614-888-9396
OH Dayton, Hamilton Avnet 513-433-0610
OH Dayton, R. O. Whitesell & Assocs. 513-298-9546
OR Tigard, TRW/ECG 503-620-5032
PA Bala Cynwyd, TRW/ECG 215-667-3400
PA Pittsburgh, Hamilton Avnet 800-321-6890
PA Pittsburgh, R. O. Whitesell & Assocs. .. 412-963-6161
TN Greeneville, R. O. Whitesell & Assocs. 615-639-6154
TX Austin, Hamilton Avnet 512-837-8911
TX Austin, Technlg. Sls. Co. 512-346-9940
TX Dallas, TRW/ECG 214-248-8000
TX El Paso, TRW/ECG 915-594-8259
TX Houston, TRW/ECG 713-772-5541
UT Salt Lake City, Straube Assocs. 801-263-2640
VA Richmond, TRW/ECG 804-288-8334
WA Bellevue, TRW/ECG 206-641-9996
WV Huntington, Hamilton Avnet 800-543-4783
WI Brookfield, TRW/ECG 414-784-7773
EXP NY, New York, Hamilton Avnet 516-997-6868
Can Calgary,Alb., Hamilton Avnet 403-230-3586
Can Montreal, Que., Hamilton Avnet 514-335-1000
Can Ottawa, Ont., Hamilton Avnet 613-226-1700
Can Vancouver, B.C., Hamilton Avnet 604-272-4242

Local Distributors

AL Huntsville, Hall-Mark Elctrns. 205-837-8700
AL Huntsville, Hamilton Avnet 205-837-7210
AZ Phoenix, Hall-Mark Elctrns. 602-437-1200
AZ Phoenix, Hamilton Avnet 602-231-5100
AZ Phoenix, R. V. Weatherford Co. 602-272-7144
AZ Tempe, Arrow Elctrns. 602-968-4800
CA Chatsworth, Arrow Elctrns. 818-701-7500
CA Garden Grove, Bell Inds. 714-220-0681
CA Gardena, Bell Inds. 213-515-1800
CA Glendale, R. V. Weatherford Co. 213-849-3451
CA Los Angeles, Avnet 213-558-2345
CA Los Angeles, Hamilton 213-558-2121
CA Orange County, Avnet 714-754-6111
CA San Fernando Valley, Avnet 818-700-2600
CA San Fernando Valley, Hamilton 818-700-6500
CA San Jose, Hall-Mark Elctrns. 408-946-0900
CA Sunnyvale, Arrow Elctrns. 408-745-6600
CA Sunnyvale, Bell Inds. 408-734-8570
CA Thousand Oaks, Bell Inds. 805-499-6821
CO Aurora, Arrow Elctrns. 303-696-1111
CO Denver, Hamilton Avnet 303-779-9998
CO Denver, R. V. Weatherford Co. 303-428-6900
CT Danbury, Hamilton Avnet 203-797-2800
CT Wallingford, Arrow Elctrns. 203-265-7741
FL Clearwater, Hall-Mark Elctrns. 813-530-4543
FL Ft. Lauderdale, Arrow Elctrns. 305-776-7790
FL Miami, Hamilton Avnet 305-971-2900
FL Orlando, Hall-Mark Elctrns. 305-855-4020
FL Orlando, Hamilton Avnet 305-628-3888
FL Palm Bay, Arrow Elctrns. 305-725-1480
FL Pompano Beach, Hall-Mark Elctrns. ... 305-971-9280
FL St. Petersburgh, Hamilton Avnet 813-576-3930
GA Atlanta, Hamilton Avnet 404-447-7507
GA Norcross, Arrow Elctrns. 404-449-8252
GA Norcross, Hall-Mark Elctrns. 404-447-8000
IL Bensenville, Hall-Mark Elctrns. 312-860-2678
IL Champaign, Hamilton Avnet 800-625-8654
IL Chicago, Hamilton Avnet 312-860-7700
IL Schaumburg, Arrow Elctrns. 312-397-3440
IN Indianapolis, Arrow Elctrns. 317-243-9353
IN Indianapolis, Hamilton Avnet 317-844-9333
IA Cedar Rapids, Hamilton Avnet 319-362-4757
KS Kansas City, Hamilton Avnet 913-888-8900
KS Lenexa, Hall-Mark Elctrns. 913-888-4747
KY Louisville, Hamilton Avnet 800-428-6012
MD Columbia, Arrow Elctrns. 301-995-0003
MD Columbia, Hall-Mark Elctrns. 301-988-9800
MA Billerica, Hall-Mark Elctrns. 617-935-9777
MA Norwood, Gerber Radio Supp. Co. 617-769-6000
MA Woburn, Arrow Elctrns. 617-933-8130
MI Ann Arbor, Arrow Elctrns. 313-971-8220
MI Detroit, Hamilton Avnet 313-522-4700
MI Grand Rapids, Hamilton Avnet 616-243-8805
MN Bloomington, Hall-Mark Elctrns. 612-854-3223
MN Edina, Arrow Elctrns. 612-830-1800
MN Minneapolis, Hamilton Avnet 612-932-0600
MO Maryland Hgts., Hall-Mark Elctrns. 314-291-5350
MO St. Louis, Arrow Elctrns. 314-567-6888
MO St. Louis, Hamilton Avnet 314-344-1200
NE Lincoln/Omaha, Hamilton Avnet 800-255-6702
NH Manchester, Arrow Elctrns. 603-668-6968
NJ Cherry Hill, Hall-Mark Elctrns. 609-424-7300
NJ Cherry Hill, Hamilton Avnet 609-424-0100
NJ Fairfield, Arrow Elctrns. 201-575-5300
NJ Fairfield, Hall-Mark Elctrns. 201-575-4415
NJ Fairfield, Hamilton Avnet 201-575-3390
NJ Marlton, Arrow Elctrns. 609-596-8000
NM Albuquerque, Arrow Elctrns. 505-243-4566
NM Albuquerque, Hamilton Avnet 505-765-1500
NY Hauppauge, Arrow Elctrns. 516-231-1000
NY Liverpool, Arrow Elctrns. 315-652-1000
NY Long Island, Hamilton Avnet 516-231-9800
NY Lynbrook, Peerless Radio 516-593-2121
NY Rochester, Arrow Elctrns. 716-427-0300
NY Rochester, Hamilton Avnet 716-475-9130
NY Syracuse, Hamilton Avnet 315-437-2641
NC Charlotte, Elctrns. Mktg. Corp. 704-394-6195
NC Raleigh, Arrow Elctrns. 919-876-3132
NC Raleigh, Hall-Mark Elctrns. 919-872-0712
NC Raleigh, Hamilton Avnet 919-878-0810
NC Winston-Salem, Arrow Elctrns. 919-725-8711
OH Centerville, Arrow Elctrns. 513-435-5563
OH Cleveland, Hamilton Avnet 216-831-3500
OH Columbus, Elctrn. Mktg. 614-299-4161
OH Columbus, Hamilton Avnet 614-882-7004
OH Solon, Arrow Elctrns. 216-248-3990
OH Solon, Hall-Mark Elctrns. 216-349-4632
OH Westerville, Hall-Mark Elctrns. 614-891-4555

OR Portland, Arrow Elctrns. 503-684-1690
OR Portland, Hamilton Avnet 503-635-8831
PA Monroeville, Arrow Elctrns. 412-856-7000
PA Philadelphia, Hamilton Avnet 215-831-1300
PA Philadelphia, Phila. Elctrn. 215-568-7400
SC Columbia, Hamilton Avnet 800-334-1579
TX Austin, Arrow Elctrns. 512-835-4180
TX Austin, Hall-Mark Elctrns. 512-258-8848
TX Carrollton, Arrow Elctrns. 214-380-6464
TX Dallas, Hall-Mark Elctrns. 214-341-1147
TX Dallas, Hamilton Avnet 214-659-4111
TX Houston, Arrow Elctrns. 713-530-4700
TX Houston, Hall-Mark Elctrns. 713-781-6100
TX Houston, Hamilton Avnet 713-780-1771
UT Salt Lake City, Arrow Elctrns. 801-539-1135
UT Salt Lake City, Hamilton Avnet 801-972-2800
WA Seattle, Hamilton Avnet 206-453-5844
WA Seattle, R. V. Weatherford Co. 206-575-1340
WV Charleston, Hamilton Avnet 800-543-4783
WI Milwaukee, Hamilton Avnet 414-784-4510
WI New Berlin, Hall-Mark Elctrns. 414-797-7844
WI Oak Creek, Arrow Elctrns. 414-764-6600
EXP Los Angeles, Hamilton Avnet 213-558-2441
Can Toronto, Hamilton Avnet 416-677-7432

TRW/CINCH-GRAPHIK, 200 S. Turnbull Canyon Rd., City of Industry, CA 91744, Tel: 213-333-1201, TWX: 910-584-1861; *Sls. Mgr.:* James Kirby

TRW CONNECTOR DIV., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007, Tel: 312-981-6000, TWX: 910-222-1796; *Sls. Mgr.:* B. Walthall; *Dist. Mgr.:* Jim Hartranft Jr.
..... **B•1126-1127; C•1536-1565**

Local Sales Offices & Reps

AL Huntsville, TRW/ECG 205-533-7600
AZ Scottsdale, TRW/ECG 602-994-0441
CA Mountain View, Straube Assocs. 415-969-6060
CO Westminster, Straube Assocs. 303-426-0890
CT Rowayton, TRW/ECG 203-853-4466
FL Ft. Lauderdale, TRW/ECG 305-772-3000
FL Orlando, TRW/ECG 305-857-3650
GA Norcross, TRW/ECG 404-447-6154
IL Chicago, TRW/ECG 312-693-7730
IN Fort Wayne, R. O. Whitesell & Assocs. 219-432-5591
IN Indianapolis, R. O. Whitesell & Assocs. 317-359-9283
IN Kokomo, R. O. Whitesell & Assocs. ... 317-457-9127
IA Cedar Rapids, C. H. Horn & Assocs. .. 319-393-8703
KS De Soto, Midtec Assocs. 913-441-6565
KY Louisville, R. O. Whitesell & Assocs. .. 502-426-7696
MA Framingham, TRW/ECG 617-620-0625
MI Grand Rapids, R. O. Whitesell & Assocs. 616-942-5420
MI Southfield, R. O. Whitesell & Assocs. .. 313-559-5454
MI St. Joseph, R. O. Whitesell & Assocs. 616-983-7337
MN Minneapolis, TRW/ECG 612-854-6616
MO St. Louis, J. G. Macke Co. 314-432-2830
NM El Paso, Straube Assocs. 915-594-8259
NY Fairport, TRW/ECG 716-425-3775
NC Greensboro, TRW/ECG 919-852-4676
OH Cincinnati, R. O. Whitesell & Assocs. .. 513-521-2290
OH Cleveland, R. O. Whitesell & Assocs. .. 216-447-9020
OH Columbus, R. O. Whitesell & Assocs. .. 614-888-9396
OH Dayton, R. O. Whitesell & Assocs. 513-298-9546
OR Tigard, TRW/ECG 503-620-5032
PA Bala Cynwyd, TRW/ECG 215-667-3400
PA Pittsburgh, R. O. Whitesell & Assocs. .. 412-963-6161
TN Greeneville, R. O. Whitesell & Assocs. 615-639-6154
TX Austin, TRW/ECG 512-345-2331
TX Dallas, TRW/ECG 214-248-8000
TX El Paso, TRW/ECG 915-594-8259
TX Houston, TRW/ECG 713-772-5541
UT Salt Lake City, Straube Assocs. 801-263-2640
WA Bellevue, TRW/ECG 206-641-9996
WI Brookfield, TRW/ECG 414-784-7773

Local Distributors

AL Huntsville, Hall-Mark Elctrns. 205-837-8700
AL Huntsville, Hamilton/Avnet Elctrns. ... 205-837-7210
AZ Phoenix, Hall-Mark Elctrns. 602-243-6601
AZ Phoenix, Kierulff Elctrns. 602-243-4101
AZ Phoenix, R. V. Weatherford Co. 602-272-7144
AZ Tempe, Arrow Elctrns. 602-968-4800
AZ Tempe, Fisher-Brownell 602-967-1464
AZ Tempe, Hamilton/Avnet Elctrns. 602-231-5100
AR Ft. Smith, Carlton Bates Co. 501-646-8201
AR Little Rock, Carlton Bates Co. 501-562-9100
CA Alhambra, Fisher-Brownell 213-289-0255
CA Anaheim, R. V. Weatherford Co. 714-634-9600
CA Costa Mesa, Avnet Elctrns. 714-754-6088
CA Costa Mesa, Hamilton Electro Sls. 714-641-4100
CA Culver City, Hamilton Electro Sls. 213-558-2121
CA El Segundo, Hallmark Elctrns. 213-643-9101
CA Glendale, R. V. Weatherford Co. 213-849-3451
CA Los Angeles, Kierulff Elctrns. 213-725-0325
CA Los Angeles, Newark Elctrns. 213-671-7066
CA Newport Beach, Arrow Elctrns. 714-851-8961
CA Palo Alto, Kierulff Elctrns. 415-968-6292
CA Pomona, R. V. Weatherford Co. 714-623-1261
CA Riverside, Elctrn. Supp. 714-787-9220
CA Sacramento, Hamilton/Avnet Elctrns. 916-920-3150
CA San Diego, Arrow Elctrns. 619-565-4800
CA San Diego, Fisher-Brownell 619-560-8545
CA San Diego, Hall-Mark Elctrns. 619-268-1201
CA San Diego, Hamilton/Avnet Elctrns. ... 619-571-7510
CA San Diego, Kierulff Elctrns. 619-278-2112
CA San Diego, R. V. Weatherford Co. 619-695-1700
CA San Francisco, Zack Radio Supp. 415-626-1444
CA San Jose, Hall-Mark Elctrns. 408-946-0900
CA Santa Clara, Fisher-Brownell 408-988-6041
CA Santa Clara, Wyle Dist. Grp. 408-727-2500
CA Sunnyvale, Arrow Elctrns. 408-745-6600
CA Sunnyvale, Bell Inds. 408-734-8570
CA Sunnyvale, Hamilton/Avnet Elctrns. ... 408-743-3355
CA Tustin, Kierulff Elctrns. 714-731-5711
CO Denver, Arrow Elctrns. 303-758-2100
CO Denver, Kierulff Elctrns. 303-371-6500
CO Denver, Newark Elctrns. 303-757-3351
CO Englewood, Hall-Mark Elctrns. 303-790-1662
CO Englewood, Hamilton/Avnet Elctrns. .. 303-779-9998
CO Englewood, R. V. Weatherford Co. 303-770-9762
CO Thornton, Wyle Dist. Grp. 303-457-WYLE
CT Danbury, Hamilton/Avnet Elctrns. 203-797-2800
CT Wallingford, Arrow Elctrns. 203-265-7741
FL Ft. Lauderdale, Arrow Elctrns. 305-776-7790
FL Ft. Lauderdale, Hall-Mark Elctrns. 305-971-9280
FL Ft. Lauderdale, Hamilton/Avnet Elctrns. 305-971-2900
FL Ft. Lauderdale, Kierulff Elctrns. 305-463-4940
FL Largo, Lodan Elctrns. 813-586-2851
FL Orlando, Hall-Mark Elctrns. 305-855-4020
FL Palm Bay, Arrow Elctrns. 305-725-1480
FL St. Petersburg, Hamilton/Avnet Elctrns. 813-576-3930
FL St. Petersburg, Kierulff 813-576-1966
GA Norcross, Arrow Elctrns. 404-449-8252
GA Norcross, Hall-Mark Elctrns. 404-447-8000
GA Norcross, Hamilton/Avnet Elctrns. 404-447-7507
GA Norcross, Kierulff Elctrns. 404-447-5252
HI Honolulu, Precision Radio Ltd. 808-537-5291
IL Bensenville, Hall-Mark Elctrns. 312-860-3800
IL Bensenville, Hamilton/Avnet Elctrns. .. 312-860-7780
IL Champaign, Klaus Radio 217-356-1896
IL Chicago, Bell Elctrns. 312-982-9210
IL Chicago, Electronic Connector 312-767-2200
IL Chicago, Newark Elctrns. 312-638-4411
IL Elk Grove Village, Pioneer/Chicago ... 312-437-9680
IL Itasca, Kierulff Elctrns. 312-250-0500
IL La Salle, Klaus Radio 815-223-7400
IL Palatine, Ohm Elctrns. 312-359-5500
IL Peoria, Klaus Radio 309-691-4840
IL Quincy, Klaus Radio 217-223-7560
IL Schaumburg, Arrow Elctrns. 312-397-3440
IN Ft. Wayne, Graham Elctrn. 219-423-3422
IN Indianapolis, Arrow Elctrns. 317-243-9353
IN Indianapolis, Graham Elctrns. 317-634-8202
IN Indianapolis, Hamilton/Avnet Elctrns. 317-844-9333
IN Indianapolis, Pioneer/Ind. 317-849-7300
IA Cedar Rapids, Arrow Elctrns. 319-395-7230
IA Cedar Rapids, DEECO, Inc. 319-365-7551
IA Eldridge, Klaus Radio 319-285-8484
KS Lenexa, Hall-Mark Elect. 913-888-4747
KS Overland Park, Hamilton/Avnet Elctrns. 913-888-8900
LA Baton Rouge, Indl. Elctrn. Supp. 504-926-0513
LA Lafayette, Ralph's of Lafayette 318-234-4507
LA Shreveport, Indl. Elctrn. Supp. 318-222-9459
MD Baltimore, Arrow Elctrns. 301-247-5200
MD Baltimore, Hall-Mark Elctrns. 301-796-9300
MD Columbia, Hamilton/Avnet Elctrns. 301-995-3500
MD Columbia, Powell Elctrn. 301-621-4070
MD Gaithersburg, Pioneer/Washington ... 301-948-0710
MD Rockville, Capitol Radio Whlsrs. 301-881-2270
MD Timonium, Zebra Elctrns. 301-252-6576
MA Billerica, Kierulff Elctrns. 617-935-5134
MA Hingham, Sager Elec. Supp. 617-749-6700
MA Norwood, Gerber Radio Supp. 617-329-2400
MA Woburn, Arrow Elctrns. 617-933-8130
MA Woburn, Hall-Mark Elctrns. 617-935-9777
MA Woburn, Hamilton/Avnet Elctrns. 617-935-9700
MI Ann Arbor, Arrow Elctrns. 313-971-8220
MI Ann Arbor, Wedemeyer Elec. Supp. ... 313-665-8611
MI Grand Rapids, Hamilton/Avnet Elctrns. 616-243-8805
MI Livonia, Hamilton/Avnet Elctrns. 313-522-4700
MI Livonia, Pioneer/Michigan 313-525-1800
MI Livonia, R.S. Elect. Corp. 313-525-1155
MI Oak Park, Newark Elctrns. 313-967-0600
MN Bloomington, Hall-Mark Elect. 612-854-3223
MN Edina, Arrow Elctrns. 612-830-1800
MN Edina, Kierulff Elctrns. 612-941-7500
MN Minneapolis, Newark Elctrns. 612-331-6350
MN Minnetonka, Hamilton/Avnet Elctrns. .. 612-932-0600
MN St. Paul, Gopher Elctrns. 612-483-3322
MO Earth City, Hamilton/Avnet Elctrns. ... 314-344-1200
MO Maryland Hgts., Hall-Mark Elect. 314-291-5350
MO Maryland Hgts., Kierulff Elctrns. 314-739-0855
MO St. Louis, Arrow Elctrns. 314-567-6888
MO St. Louis, Olive Indl. Elctrns. 314-426-4500
NE Lincoln, Scott Elctrn. Supp. 402-466-8221
NE Omaha, Scott Elctrn. Supp. 402-734-6750
NH Manchester, Arrow Elect. 603-668-6968
NJ Cherry Hill, Hall-Mark Elctrns. 609-424-0880
NJ Cherry Hill, Hamilton/Avnet Elctrns. ... 609-424-0100
NJ Fairfield, Arrow Elctrns. 201-575-5300
NJ Fairfield, Hall-Mark Elctrns. 201-575-4415
NJ Fairfield, Hamilton/Avnet Elctrns. 201-575-3390
NJ Fairfield, Kierulff Elctrns. 201-575-6750
NJ Hanover, State Elec. Parts Corp. 201-887-2550
NJ Marlton, Arrow Elctrns. 609-596-8000
NM Albuquerque, Arrow Elctrns. 505-243-4566
NM Albuquerque, Hamilton/Avnet Elctrns. 505-765-1500
NM Albuquerque, Intl. Elctrns. 505-345-8127
NY Binghamton, Pioneer Elctrns. 607-748-8211
NY East Syracuse, Hamilton/Avnet Elctrns. 315-437-2641
NY Hauppauge, Arrow Elctrns. 516-231-1000
NY Liverpool, Arrow Elctrns. 315-652-1000
NY Lynbrook, Peerless Radio 516-593-2121
NY Melville, Hamilton/Avnet Elctrns. 516-454-6060
NY Rochester, Arrow Elctrns. 716-275-0300
NY Rochester, Hamilton/Avnet Elctrns. ... 716-475-9130
NY Rochester, Rochester Radio Supp. 716-454-7800
NY Rochester, Simcona Elctrns. Corp. 716-328-3230
NY Ronkonkoma, Conco Elctrns. Corp. ... 516-467-8200
NY Ronkonkoma, Hall-Mark Elctrns. 516-737-0600
NC Cary, Powell Elctrns. 919-467-1212
NC Greensboro, Kierulff Elctrns. 919-852-9440
NC Raleigh, Arrow Elctrns. 919-876-3132
NC Raleigh, Hall-Mark Elect. 919-872-0712
NC Raleigh, Hamilton/Avnet Elctrns. 919-829-8030
NC Winston-Salem, Arrow Elect. 919-725-8711
OH Centerville, Arrow Elctrns. 513-435-5563
OH Cincinnati, Hughes Peters, Inc. 513-351-2000
OH Cleveland, Hamilton/Avnet Elctrns. ... 216-831-3500
OH Cleveland, Newark Elctrns. 216-447-8860
OH Cleveland, Pioneer/Cleveland 216-587-3600
OH Columbus, Elctrns. Mktg. Corp. 614-299-4161
OH Columbus, Hughes Peters, Inc. 614-294-5351
OH Dayton, Hamilton/Avnet Elctrns. 513-433-6010
OH Dayton, Pioneer/Dayton 513-236-9900
OH Dayton, Stotts-Friedman 513-298-5555
OH Highland Hgts., Hall-Mark Elctrns. 216-473-2907
OH Solon, Arrow Elctrns. 216-248-3990
OH Solon, Hall-Mark Elctrns. 216-349-4632
OH Westerville, Hall-Mark Elctrns. 614-891-4555
OK Oklahoma City, Trice Wholesale Elctrns. 405-524-4411
OK Tulsa, Hall-Mark Elctrns. 918-665-3200
OR Lake Oswego, Hamilton/Avnet Elctrns. 503-635-8157
OR Portland, Kierulff Elctrns. 503-641-9150
OR Tigard, Arrow Elctrns. 503-684-1690
PA Monroeville, Arrow Elctrns. 412-856-7000
PA Philadelphia, Almo Elctrns. Corp. 215-698-4000
PA Philadelphia, Powell Elctrns. 215-365-1900
PA Pittsburgh, CAM/RPC 412-782-3770
PA Pittsburgh, Pioneer/Pittsburgh 412-782-2300
PA Wayne, Peak Elect. 215-293-9000
TX Austin, Arrow Elctrns. 512-835-4180
TX Austin, Hall-Mark Elect. 512-258-8848
TX Austin, Hamilton/Avnet Elctrns. 512-837-8911
TX Dallas, Arrow Elctrns. 214-386-7500
TX Dallas, Hall-Mark Elctrns. 214-341-1147
TX Dallas, Intl. Elctrns. 214-233-9323
TX Dallas, Kierulff Elctrns. 214-343-2400
TX Dallas, R. V. Weatherford Co. 214-980-1110
TX El Paso, Intl. Elctrns. 915-778-9761
TX Garland, Newark Elctrns. 214-494-5911
TX Houston, Hall-Mark Elctrns. 713-781-6100
TX Houston, Hamilton/Avnet Elctrns. 713-780-1771
TX Houston, R. V. Weatherford Co. 713-688-7406
TX Irving, Hamilton/Avnet Elctrns. 214-659-4111
TX Richardson, Fisher Brownell 214-235-3177
TX Stafford, Arrow Elctrns. 713-491-4100
TX Stafford, Harrison Equip. 713-879-2729
UT Salt Lake City, Arrow Elctrns. 801-539-1135
UT Salt Lake City, Hamilton/Avnet Elctrns. 801-972-4300
UT Salt Lake City, Kierulff Elctrns. 801-973-6913
UT Salt Lake City, Standard Supp. Co. 801-486-3371
WA Bellevue, Arrow Elctrns. 206-643-4800
WA Bellevue, Hamilton/Avnet Elctrns. 206-643-3950
WA Bellevue, Wyle Dist. Grp. 206-453-8300
WA Seattle, R. V. Weatherford Co. 206-243-6340
WA Tukwila, Kierulff Elctrns. 206-575-4420
WI Milwaukee, Elctrn. Expeditors 414-228-8100

WI Milwaukee, Marsh Elctrns. 414-475-6000
WI New Berlin, Hamilton/Avnet Elctrns. .. 414-784-4510
WI Oak Creek, Arrow Elctrn. 414-764-6600
WI Oak Creek, Hall-Mark Elctrns. 414-761-3000

TRW CYLINDRICAL CONNECTOR DIV., TRW Electronic Components Grp., 8821 Science Center Dr., Minneapolis, MN 55428, Tel: 612-537-1010, TWX: 910-576-2748; *Sls. Mgr.:* Gene Schmidt; *Dist. Mgr.:* Gene Schmidt ..... **C•1566**

Local Sales Offices & Reps

AL Huntsville, TRW/ECG 205-533-7600
AZ Scottsdale, TRW/ECG 602-994-0441
CA Los Angeles, ISDS 213-478-0183
CA Mountain View, Straube Assocs. 415-969-6060
CO Westminster, Straube Assocs. 303-426-0890
CT Rowayton, TRW/ECG 203-853-4466
FL Ft. Lauderdale, TRW/ECG 305-772-3000
FL Orlando, TRW/ECG 305-857-3650
GA Norcross, TRW/ECG 404-447-6154
IL Chicago, TRW/ECG 312-693-7730
IN Ft. Wayne, R. O. Whitesell & Assocs. .. 219-432-5591
IN Indianapolis, R. O. Whitesell & Assocs. 317-359-9283
IN Kokomo, R. O. Whitesell & Assocs. ... 317-457-9127
IA Cedar Rapids, C. H. Horn & Assocs. .. 319-393-8703
KS De Soto, Midtec Assocs. 913-441-6565
KY Louisville, R. O. Whitesell & Assocs. .. 502-426-7696
MA Framingham, TRW/ECG 617-620-0625
MI Grand Rapids, R. O. Whitesell & Assocs. 616-942-5420
MI Southfield, R. O. Whitesell & Assocs. .. 313-559-5454
MI St. Joseph, R. O. Whitesell & Assocs. 616-983-7337
MN Minneapolis, TRW/ECG 612-854-6616
MO St. Louis, J. G. Macke Co. 314-432-2830
NY Rochester, TRW/ECG 716-424-2830
NC Greensboro, TRW/ECG 919-852-4676
OH Cincinnati, R. O. Whitesell & Assocs. .. 513-521-2290
OH Cleveland, R. O. Whitesell & Assocs. .. 216-447-9020
OH Columbus, R. O. Whitesell & Assocs. .. 614-888-9396
OH Dayton, R. O. Whitesell & Assocs. 513-298-9546
PA Bala Cynwyd, TRW/ECG 215-667-3400
PA Pittsburgh, R. O. Whitesell & Assocs. .. 412-963-6161
TN Greeneville, R. O. Whitesell & Assocs. 615-639-6154
TX Austin, TRW/ECG 512-345-2331
TX Dallas, TRW/ECG 214-248-8000
TX El Paso, Straube Assocs. 915-594-8259
TX El Paso, TRW/ECG 915-594-8259
TX Houston, TRW/ECG 713-772-5541
UT Salt Lake City, Straube Assocs. 801-263-2640
VA Richmond, TRW/ECG 804-288-8334
WA Bellevue, TRW/ECG 206-641-9996
WI Brookfield, TRW/ECG 414-784-7773

Local Distributors

CA Brea, Aeroflite 714-773-4251
CA Chatsworth, Arrow Elctrns. 213-701-7500
CA Newport Beach, Arrow Elctrns. 714-851-8961
CA San Diego, Arrow Elctrns. 619-565-4800
CA Sunnyvale, Arrow Elctrns. 408-745-6600
CO Denver, Arrow Elctrns. 303-758-2100
CT Wallingford, Arrow Elctrns. 203-265-7741
FL Ft. Lauderdale, Arrow Elctrns. 305-776-7790
FL Palm Bay, Arrow Elctrns. 305-725-1480
GA Norcross, Arrow Elctrns. 404-449-8252
IL Chicago, Electronic Connector 312-767-2200
IL Schaumburg, Arrow Elctrns. 312-397-3440
IN Indianapolis, Arrow Elctrns. 317-243-9353
IA Cedar Rapids, Arrow Elctrns. 319-395-7230
MD Baltimore, Arrow Elctrns. 301-247-5200
MA Woburn, Arrow Elctrns. 617-933-8130
MI Ann Arbor, Arrow Elctrns. 313-971-8220
MN Edina, Arrow Elctrns. 612-830-1800
MO St. Louis, Arrow Elctrns. 314-567-6888
NH Manchester, Arrow Elctrns. 603-668-6968
NJ Fairfield, Arrow Elctrns. 201-575-5300
NJ Moorestown, Arrow Elctrns. 609-235-1900
NM Albuquerque, Arrow Elctrns. 505-243-4566
NY Hauppauge, Arrow Elctrns. 516-231-1000
NY Liverpool, Arrow Elctrns. 315-652-1000
NY Rochester, Arrow Elctrns. 716-275-0300
NY Ronkonkoma, Conco 516-467-8200
NC Raleigh, Arrow Elctrns. 919-876-3132
NC Winston-Salem, Arrow Elctrns. 919-725-8711
OH Centerville, Arrow Elctrns. 513-435-5563
OH Dayton, Pioneer/Dayton 513-236-9900
OH Solon, Arrow Elctrns. 216-248-3990
PA Monroeville, Arrow Elctrns. 412-856-7000
TX Austin, Arrow Elctrns. 512-835-4180
TX Dallas, Arrow Elctrns. 214-386-7500
TX Dallas, Hall-Mark 214-341-1147
TX Houston, Hall-Mark 713-781-6100
TX Stafford, Arrow Elctrns. 713-491-4100
UT Salt Lake City, Arrow Elctrns. 801-539-1135
WA Bellevue, Arrow Elctrns. 206-643-4800
WI Madison, Arrow Elctrns. 608-273-4977
WI Oak Creek, Arrow Elctrns. 414-764-6600

TRW, Dynalco Controls Div., 5200 NW 37th, P.O. Box 8187, Ft. Lauderdale, FL 33310, Tel: 305-739-4300, Telex: 514833; Empl.: 125; *Sls. Mgr.:* Kurlin Wilson; *Dist. Mgr.:* Joe Stephens

TRW ELECTRONIC COMPONENTS GRP., 2525 E. El Segundo Blvd., El Segundo, CA 90245, Tel: 213-536-0600

TRW FIBER OPTIC PRODS., CONNECTOR DIV., TRW Elctrn. Comps. Grp., 401 N. Broad St., Philadelphia, PA 19108, Tel: 215-922-8900, TWX: 710-670-2286; *Sls. Mgr.:* Harry Saleker

TRW LSI PRODUCTS, PO Box 2472, La Jolla, CA 92038, Tel: 619-457-1000, Telex: 697957, TWX: 910-335-1571; Empl.: 400; *Sls. Mgr.:* Doug Turnage; *Dist. Mgr.:* Ron Courtois

TRW MICROWAVE, 825 Stewart Dr., Sunnyvale, CA 94086, Tel: 408-732-0880, TWX: 910-339-9207; FSC No.: 21847; Empl.: 600; *Sls. Mgr.:* R. J. Roy

TRW MOTOR DIVISION, Industrial/Commerical Products, Napierfield Road, Postal Route 6, Box M-30A, Dothan, AL 36303, Tel: 205-983-3542, Telex: 810-744-1000; *Sls. Mgr.:* Dave Hall ..... **B•1194**

TRW MOTOR DIV. (MILITARY), 2275 Stanley Ave., Dayton, OH 45404, Tel: 513-228-3171, Telex: 288-224, TWX: 810-459-1642; Empl.: 580; *Sls. Mgr.:* Bill Pelfrey; *Dist. Mgr.:* Tom Coyle ..... **B•1195**

Local Sales Offices & Reps

AL Huntsville, TRW/ECG 205-533-7600
AZ Scottsdale, TRW/ECG 602-994-0441
CA Los Angeles, Integrated Sls. 213-478-0183
CA Mountain View, Straube Assocs. 415-969-6060
CA San Diego, Integrated Sls. 619-571-1544
CA Santa Ana, Integrated Sls. 714-973-2162
CA Woodland Hills, Integrated Sls. 213-883-7130
CO Westminster, Straube Assocs. 303-426-0890
CT Rowayton, TRW 203-853-4466
FL Ft. Lauderdale, TRW/ECG 305-772-3000
FL Orlando, TRW/ECG 305-857-3650
GA Norcross, TRW/ECG 404-447-6154
IL Chicago, TRW/ECG 312-693-7730
IN Ft. Wayne, R. O. Whitesell & Assocs. .. 219-432-5591
IN Indianapolis, R. O. Whitesell & Assocs. 317-359-9283
IN Kokomo, R. O. Whitesell & Assocs. ... 317-457-9127
IA Cedar Rapids, C. H. Horn & Assocs. .. 319-393-8703
KS De Soto, Midtec Assocs. 913-441-6565
KY Louisville, R. O. Whitesell & Assocs. .. 502-426-7696
MD Baltimore, TRW/ECG 301 964-9110
MA Framingham, TRW/ECG 617-620-0625
MI Grand Rapids, R. O. Whitesell & Assocs. 616-942-5420
MI Southfield, R. O. Whitesell & Assocs. .. 313-559-5454
MI St. Joseph, R. O. Whitesell & Assocs. 616-983-7337
MN Minneapolis, TRW/ECG 612-854-6616
MO St. Louis, John G. Macke Co. 314-432-2830
NY Fairport, TRW/ECG 716-425-3775
NC Greensboro, TRW 919-852-4676
OH Cincinnati, R.O. Whitesell 513-521-2290
OH Cleveland, R.O. Whitesell 216-447-9020
OH Columbus, R.O. Whitesell 614-888-9396
OH Dayton, R.O. Whitesell 513-298-9546
OR Tigard, N. R. Schultz Co. 503-620-5032
PA Bala Cynwyd, TRW/ECG 215-667-3400
PA Pittsburgh, R. O. Whitesell & Assocs. .. 412-963-6161
TN Greeneville, R. O. Whitesell & Assocs. 615-639-6154
TX Austin, Technlg. Sls. 512-346-9940
TX Dallas, TRW/ECG 214-248-8000
TX El Paso, TRW/ECG 915-594-8259
TX Houston, TRW/ECG 713-772-5541
UT Salt Lake City, Straube Assocs. 801-263-2640
VA Richmond, TRW/ECG 804-288-8334
WA Bellevue, TRW/ECG 206-641-9996
WI Brookfield, TRW/ECG 414-784-7773

Local Distributors

AL Huntsville, Arrow Elctrns. 205-882-2730
AL Huntsville, Hallmark Elctrns. 205-837-8700
AL Huntsville, Hamilton/Avnet Elctrns. ... 205-837-7210
AZ Phoenix, Hallmark Elctrns. 602-243-6601
AZ Tempe, Arrow Elctrns. 602-968-4800
AZ Tempe, Fisher Brownell 602-967-1464
AZ Tempe, Hamilton/Avnet Elctrns. 602-231-5100
CA Alhambra, Fisher Brownell 213-289-0255
CA Chatsworth, Arrow Elctrns. 213-701-7500
CA Chatsworth, Avnet Elctrns. 213-700-2600
CA Costa Mesa, Avnet Elctrns. 714-754-6111
CA Culver City, Hamilton/Avnet Elctrns. .. 213-558-2252
CA El Segundo, Hallmark Elctrns. 213-643-9101
CA Sacramento, Hamilton/Avnet Elctrns. 916-925-2216
CA San Diego, Arrow Elctrns. 619-565-4800
CA San Diego, Fisher Brownell 619-560-8545
CA San Diego, Hallmark Elctrns. 619-268-1201
CA San Diego, Hamilton/Avnet Elctrns. ... 619-571-7510
CA San Jose, Hallmark Elctrns. 408-946-2575
CA Santa Clara, Fisher Brownell 408-988-6041
CA Sunnyvale, Arrow Elctrns. 408-745-6600
CA Sunnyvale, Hallmark Elctrns. 408-773-9990
CA Sunnyvale, Hamilton/Avnet Elctrns. ... 408-743-3355
CA Tustin, Arrow Elctrns. 714-838-5422
CO Aurora, Arrow Elctrns. 303-696-1111
CO Englewood, Hallmark Elctrns. 303-790-1662
CO Englewood, Hamilton/Avnet Elctrns. .. 303-740-1000
CT Danbury, Hamilton/Avnet Elctrns. 203-797-2800
CT Wallingford, Arrow Elctrns. 203-265-7741
FL Clearwater, Hallmark Elctrns. 813-530-4543
FL Ft. Lauderdale, Arrow Elctrns. 305-776-7790
FL Ft. Lauderdale, Hallmark Elctrns. 305-971-9280
FL Ft. Lauderdale, Hamilton/Avnet Elctrns. 305-971-2900
FL Orlando, Hallmark Elctrns. 305-855-4020
FL Palm Bay, Arrow Elctrns. 305-725-1480
FL St. Petersburg, Hamilton/Avnet Elctrns. 813-576-3930
FL Winter Park, Hamilton/Avnet Elctrns. .. 305-628-3888
GA Norcross, Arrow Elctrns. 404-449-8252
GA Norcross, Hallmark Elctrns. 404-447-8000
GA Norcross, Hamilton/Avnet Elctrns. 404-447-7507
IL Bensenville, Hallmark Elctrns. 312-860-3800
IL Bensenville, Hamilton/Avnet Elctrns. .. 312-860-7700
IL Elk Grove Village, Pioneer/Chicago ... 312-437-9680
IL Schaumburg, Arrow Elctrns. 312-397-3440
IN Carmel, Hamilton/Avnet Elctrns. 317-844-9333
IN Indianapolis, Arrow Elctrns. 317-243-9353
IN Indianapolis, Pioneer/Indiana 317-849-7300
KS Lenexa, Hallmark Elctrns. 913-888-4747
KS Overland Park, Hamilton/Avnet Elctrns. 913-888-8900
MD Baltimore, Arrow Elctrns. 301-247-5200
MD Bethesda, Arrow Elctrns. 301-564-3000
MD Columbia, Hallmark Elctrns. 301 988-9800
MD Columbia, Hamilton/Avnet Elctrns. 301-995-3500
MA Woburn, Arrow Elctrns. 617-933-8130
MA Woburn, Hallmark Elctrns. 617-935-9777
MA Woburn, Hamilton/Avnet Elctrns. 617-273-7500
MI Ann Arbor, Arrow Elctrns. 313-971-8220
MI Grand Rapids, Hamilton/Avnet Elctrns. 616-243-8805
MI Livonia, Hamilton/Avnet Elctrns. 313-522-4700
MI Livonia, Pioneer/Michigan 313-525-1800
MN Bloomington, Hallmark Elctrns. 612-854-3223
MN Edina, Arrow Elctrns. 612-830-1800
MN Minnetonka, Hamilton/Avnet Elctrns. .. 612-932-0600
MN Minnetonka, Pioneer/Twin Cities 612-935-5444
MO Earth City, Hamilton/Avnet Elctrns. ... 314-344-1200
MO Maryland Heights, Hallmark Elctrns. ... 314-291-5350
MO St. Louis, Arrow Elctrns. 314-567-6888
NH Manchester, Arrow Elctrns. 603-688-6968
NJ Cherry Hill, Hallmark Elctrns. 609-424-7300
NJ Cherry Hill, Hamilton/Avnet Elctrns. ... 609-424-0100
NJ Fairfield, Arrow Elctrns. 201-575-5300
NJ Fairfield, Hallmark Elctrns. 201-575-4415
NJ Fairfield, Hamilton/Avnet Elctrns. 201-575-3390
NJ Marlton, Arrow Elctrns. 609-596-8000
NM Albuquerque, Arrow Elctrns. 505-243-4566
NM Albuquerque, Hamilton/Avnet Elctrns. 505-765-1500
NY E. Syracuse, Hamilton/Avnet Elctrns. 315-437-2641
NY Hauppauge, Arrow Elctrns. 516-231-1000
NY Hauppauge, Hamilton/Avnet Elctrns. .. 516-434-7421
NY Hauppauge, Jaco Elctrns. 516-273-5500
NY Liverpool, Arrow Elctrns. 315-652-1000
NY Rochester, Arrow Elctrns. 716-427-0300
NY Rochester, Hamilton/Avnet Elctrns. ... 716-475-9130
NY Ronkonkoma, Hallmark Elctrns. 516-737-0600
NC Raleigh, Arrow Elctrns. 919-876-3132
NC Raleigh, Hallmark Elctrns. 919-872-0712
NC Raleigh, Hamilton/Avnet Elctrns. 919-878-0819
NC Winston-Salem, Arrow Elctrns. 919-725-8711
OH Centerville, Arrow Elctrns. 513-435-5563
OH Cincinnati, Hallmark Elctrns. 513-563-2980
OH Cleveland, Hamilton/Avnet Elctrns. ... 216-831-3500
OH Cleveland, Pioneer/Cleveland 216-587-3600
OH Dayton, Hamilton/Avnet Elctrns. 513-433-0610
OH Dayton, Pioneer/Dayton 513-236-9900
OH Solon, Arrow Elctrns. 216-248-3990
OH Solon, Hallmark Elctrns. 216-349-4632
OH Westerville, Hallmark Elctrns. 614-891-4555
OK Tulsa, Hallmark Elctrns. 918-665-3200
OR Lake Oswego, Hamilton/Avnet Elctrns. 503-635-8157
OR Tigard, Arrow Elctrns. 503-684-1690
PA Monroeville, Arrow Elctrns. 412-856-7000
PA Pittsburgh, Pioneer/Pittsburgh 412-782-2300

TX Austin, Arrow Elctrns. 512-835-4180
TX Austin, Hallmark Elctrns. 512-258-8848
TX Dallas, Arrow Elctrns. 214-386-7500
TX Dallas, Hall-Mark Elctrns. 214-343-5000
TX Houston, Arrow Elctrns. 713-530-4700
TX Houston, Hallmark Elctrns. 713-781-6100
TX Houston, Hamilton/Avnet Elctrns. 713-780-1771
TX Irving, Hamilton/Avnet Elctrns. 214-659-4111
TX Richardson, Fisher Brownell 214-235-3177
UT Salt Lake City, Hamilton/Avnet Elctrns. 801-972-2800
WA Bellevue, Arrow Elctrns. 206-643-4800
WA Bellevue, Hamilton/Avnet Elctrns. 206-643-3950
WI New Berlin, Hamilton/Avnet Elctrns. 414-784-4510
WI Oak Creek, Arrow Elctrns. 414-764-6600
WI Oak Creek, Hallmark Elctrns. 414-761-3000

TRW OPTOELECTRONICS DIV., 1207 Tappan Circle, Carrollton, TX 75006, Tel: 214-323-2200, TWX: 910-860-5958; Empl.: 2200; *Sls. Mgr.:* Ron Komatz; *Dist. Mgr.:* Robert Linker ..... **A•2094; B•1221-1223**

Local Sales Offices & Reps

AL Huntsville, TRW/ECG 205-533-7600
AK Dallas, TRW/ECG 214-248-8000
AZ Scottsdale, TRW/ECG 602-994-0441
AZ Scottsdale, TRW/Phoenix 602-994-0441
CA Los Angeles, Integrated Sys. & Device Sls. 213-478-0183
CA Mountain View, Straube Assocs. 415-969-6060
CA San Diego, Integrated Sys. & Device Sls. 619-571-1544
CA Santa Ana, Integrated Sys. & Device Sls. 714-973-2162
CA Woodland Hills, Integrated Sys. & Device Sls. 818-883-7130
CO Westminster, Straube Assocs. 303-426-0890
CT Rowayton, TRW/ECG 203-853-4466
DE Richmond, TRW/ECG 804-288-8334
DC Richmond, TRW/ECG 804-288-8334
FL Ft. Lauderdale, TRW/ECG 305-772-3000
FL Orlando, TRW/ECG 305-857-3650
GA Norcross, TRW/ECG 404-447-6154
ID Boise, N.R. Schultz/Idaho 801-263-2640
IL Cedar Rapids, C. H. Horn & Assocs. 319-393-8703
IL Chicago, TRW/ECG 312-693-7730
IL St. Louis, John G. Macke Co. 314-432-2830
IN Ft. Wayne, Robert O. Whitesell 219-432-5591
IN Indianapolis, Robert O. Whitesell 317-359-9238
IN Kokomo, Robert O. Whitesell 317-457-9127
IA Cedar Rapids, C. H. Horne & Assocs. 319-393-8703
KS DeSoto, MIDTEC Assocs. 913-441-6565
KY Louisville, Robert O. Whitesell 502-426-7696
LA Dallas, TRW/ECG 214-248-8000
ME Framingham, TRW/ECG 617-620-0625
MD Columbia, TRW/ECG 301-964-9110
MA Framingham, TRW/ECG 617-870-0745
MA Maynard, Byrne Assoc. 617-897-3131
MI Farmington Hills, TRW/ECG 313-478-7210
MI Grand Rapids, Robert O. Whitesell 616-942-5420
MI Southfield, Robert O. Whitesell 313-559-5454
MI St. Joseph, Robert O. Whitesell 616-983-7337
MN Minneapolis, TRW/ECG 612-854-6616
MS Norcross, TRW/ECG 404-447-6154
MO DeSoto, MIDTEC Assoc. 913-441-6565
MO St. Louis, John G. Macke Co. 314-432-2830
MT Salt Lake City, Straube Assoc. 801-263-2640
NE DeSoto, MIDTEC Assoc. 913-441-6565
NV Scottsdale, TRW/ECG 602-994-0441
NH Framingham, TRW/ECG 617-870-0745
NJ Bala Cynwyd, TRW/ECG 215-667-3400
NJ Rowayton, TRW/ECG 203-853-4466
NM Albuquerque, S.W. Sales 505-883-1388
NY Fairport, TRW/ECG 716-425-3775
NY Rowayton, TRW/ECG 203-853-4466
NC Greensboro, TRW/ECG 919-852-4676
OH Cincinnati, TRW/ECG 513-521-2290
OH Cleveland, Robert O. Whitesell 216-447-9020
OH Columbus, Robert O. Whitesell 614-888-9396
OH Dayton, Robert O. Whitesell 513-298-9546
PA Bala Cynwyd, TRW/ECG 215-667-3400
PA Pittsburg, Robert O. Whitesell 412-963-6161
RI Westborough, TRW/ECG 617-870-0745
SC Greensboro, TRW/ECG 919-852-4676
SD Minneapolis, TRW/ECG 612-854-6616
TN Knoxville, Robert O. Whitesell 615-694-9476
TX Austin, Technology Sls. Co. 512-346-9940
TX Dallas, TRW/ECG 214-248-8000
TX El Paso, S.W. Sls. 915-594-8259
TX Houston, TRW/ECG 713-772-5541
UT Salt Lake City, Straube Assocs. 801-263-2640
VT Westborough, TRW/ECG 617-870-0745
VA Richmond, TRW/ECG 804-288-8334
WA Bellevue, TRW/ECG 206-641-9996
WV Dayton, Robert O. Whitesell 513-298-9546
WI Brookfield, TRW/ECG 414-784-7773
WY Salt Lake City, Straube Assocs. 801-263-2640
WY Westminster, Straube Assocs. 303-426-0890
Intl Rio Piedras, Electronics Sls. Assocs. 809-769-2911
Can Carleton Place, ONT, Renmark Elctrns. Ltd. 613-257-1490
Can Toronto, ONT, Renmark Elctrns. Ltd. 416-494-5445

Local Distributors

AL Huntsville, Arrow Elctrns. 205-882-2730
AL Huntsville, Hall-Mark Elctrns. 205-837-8700
AL Huntsville, Hamilton-Avnet 205-837-7210
AL Huntsville, Pioneer Elctrns. 205-837-9300
AZ Phoenix, Hall-Mark Elctrns. 602-437-1200
AZ Tempe, Arrow Elctrns. 602-968-4800
AZ Tempe, Fisher/Brownell 602-967-1464
AZ Tempe, Hamilton-Avnet 602-231-5100
CA Alhambra, Fisher/Brownell 818-289-0255
CA Anaheim, Pacesetter Elctrns. 714-777-4711
CA Chatsworth, Arrow Elctrns. 818-701-7500
CA Chatsworth, Avnet Elctrns. 818-700-2600
CA Costa Mesa, Avnet Elctrns. 714-754-6111
CA Costa Mesa, Hamilton Electro Sls. 714-641-4100
CA Culver City, Hamilton Electro Sls. 818-558-2121
CA El Segundo, Hall-Mark Elctrns. 213-643-9101
CA Garden Grove, Bell Inds. 714-220-0681
CA Gardena, Bell Inds. 213-515-1800
CA Manhattan Beach, Prime Electro 213-379-3642
CA Sacramento, Hamilton-Avnet 916-925-2216
CA San Diego, Arrow Elctrns. 619-565-4800
CA San Diego, Fisher/Brownell 619-560-8545
CA San Diego, Hall-Mark Elctrns. 619-268-1201
CA San Diego, Hamilton-Avnet 619-571-7510
CA San Jose, Hall-Mark Elctrns. 408-946-0900
CA Santa Clara, Fisher/Brownell 408-988-6041
CA Sunnyvale, Arrow Elctrns. 408-745-6600
CA Sunnyvale, Bell Inds. 408-734-8570
CA Sunnyvale, Hamilton-Avnet 408-743-3355
CA Sunnyvale, Pacesetter Elctrns. 408-734-5470
CA Tustin, Arrow Elctrns. 714-838-5422
CO Aurora, Arrow Elctrns. 303-696-1111
CO Englewood, Hall-Mark Elctrns. 303-790-1662
CO Englewood, Hamilton-Avnet 303-740-1000
CO Wheatridge, Bell Inds. 303-424-1985
CT Danbury, Hamilton-Avnet 203-797-2800
CT Wallingford, Arrow Elctrns. 203-265-7741
FL Altamonte Spring, Pioneer Elctrns. 305-834-9090
FL Clearwater, Hall-Mark Elctrns. 813-530-4543
FL Deerfield Beach, Pioneer Elctrns. 305-428-8877
FL Orlando, Chip Supp. Co. 305-298-7100
FL Orlando, Hall-Mark Elctrns. 305-855-4020
FL Palm Bay, Arrow Elctrns. 305-725-1480
FL Winter Park, Hamilton-Avnet 305-628-3888
GA Norcross, Arrow Elctrns. 404-449-8252
GA Norcross, Hall-Mark Elctrns. 404-447-8000
GA Norcross, Hamilton-Avnet 404-447-7507
GA Norcross, Pioneer Elctrns. 404-448-1711
IL Bensenville, Hall-Mark Elctrns. 312-806-3800
IL Bensenville, Hamilton-Avnet 312-860-7700
IL Elk Grove Vlg., Pioneer Elctrns. 312-437-9680
IL Elk Grove Vlg., R M Elctrns. 312-364-6122
IL Schaumburg, Arrow Elctrns. 312-397-3440
IN Carmel, Hamilton-Avnet 317-844-9333
IN Indianapolis, Pioneer Elctrns. 317-849-7300
IN Indianapolis, R M Elctrns. 317-291-7110
IA Cedar Rapids, Arrow Elctrns. 319-395-7230
KS Lenexa, Hall-Mark Elctrns. 913-888-4747
KS Overland Park, Hamilton-Avnet 913-888-8900
MD Columbia, Arrow Elctrns. 301-995-0003
MD Columbia, Hall-Mark Elctrns. 301-988-9800
MD Columbia, Hamilton-Avnet 301-995-3500
MD Gaithersburg, Pioneer Elctrns. 301-921-0660
MA Billerica, Hall-Mark Elctrns. 617-667-0902
MA Newton, Greene-Shaw Elctrns. 617-969-8900
MA Norwood, Gerber Elctrns. 617-769-6000
MA Woburn, Arrow Elctrns. 617-933-8130
MA Woburn, Hamilton-Avnet 617-935-9700
MI Ann Arbor, Arrow Elctrns. 313-971-8220
MI Grand Rapids, Hamilton-Avnet 616-243-8805
MI Livonia, Hamilton-Avnet 313-522-4700
MI Livonia, Pioneer Elctrns. 313-525-1800
MI Wyoming, R M Elctrns. 616-531-9300
MN Bloomington, Hall-Mark Elctrns. 612-854-3223
MN Edina, Arrow Elctrns. 612-830-1800
MN Minnetonka, Hamilton-Avnet 612-932-0600
MN Minnetonka, Pioneer Elctrns. 612-935-5444
MO Earth City, Hamilton-Avnet 314-344-1200
MO Maryland Hts., Hall-Mark Elctrns. 314-291-5350
MO St. Louis, Arrow Elctrns. 314-567-6888
NH Manchester, Arrow Elctrns. 603-668-6968
NJ Cherry Hill, Hall-Mark Elctrns. 609-424-7300
NJ Cherry Hill, Hamilton-Avnet 609-424-0100
NJ Fairfield, Arrow Elctrns. 201-575-5300
NJ Fairfield, Hall-Mark Elctrns. 201-575-4415
NJ Fairfield, Hamilton-Avnet 201-575-3390
NJ Marlton, Arrow Elctrns. 609-596-8000
NM Albuquerque, Arrow Elctrns. 505-243-4566
NM Albuquerque, Bell Inds. 505-292-2700
NM Albuquerque, Hamilton-Avnet 505-765-1500
NM Albuquerque, Intl. Elctrns. 505-345-8127
NY Hauppauge, Arrow Elctrns. 516-231-1000
NY Hauppauge, Hamilton-Avnet 516-231-9800
NY Liverpool, Arrow Elctrns. 315-652-1000
NY Melville, Arrow Elctrns. 516-694-6800
NY Port Chester, Zeus Comps. 914-937-7400
NY Rochester, Arrow Elctrns. 716-275-0300
NY Rochester, Hamilton-Avnet 716-475-9130
NY Rochester, Rochester Radio Supp. 716-454-7800
NC Charlotte, Pioneer Elctrns. 704-527-8188
NC Raleigh, Arrow Elctrns. 919-876-3132
NC Raleigh, Hall-Mark Elctrns. 919-872-0712
NC Raleigh, Hamilton-Avnet 919-878-0819
NC Winston-Salem, Arrow Elctrns. 919-725-8711
OH Centerville, Arrow Elctrns. 513-435-5563
OH Cincinnati, Hall-Mark Elctrns. 513-563-5980
OH Cleveland, Hamilton-Avnet 216-831-3500
OH Cleveland, Pioneer Elctrns. 216-587-3600
OH Dayton, Hamilton-Avnet 513-439-6700
OH Dayton, Pioneer Elctrns. 513-237-9900
OH Solon, Arrow Elctrns. 216-248-3990
OH Westerville, Hall-Mark Elctrns. 614-891-4555
OK Tulsa, Hall-Mark Elctrns. 918-665-3200
OK Tulsa, Quality Comps. 918-664-8812
OR Lake Oswego, Bell Inds. 503-241-4115
OR Lake Oswego, Hamilton-Avnet 503-635-8157
OR Tigard, Arrow Elctrns. 503-684-1690
PA Horsham, Pioneer Elctrns. 215-674-4000
PA Monroeville, Arrow Elctrns. 412-856-7000
PA Pittsburgh, Pioneer Elctrns. 412-782-2300
TX Addison, Quality Comps. 214-733-4300
TX Austin, Arrow Elctrns. 512-835-4180
TX Austin, Hamilton-Avnet 512-837-8911
TX Austin, Pioneer Elctrns. 512-835-4000
TX Austin, Quality Comps. 512-835-0220
TX Dallas, Hall-Mark Elctrns. 214-553-4300
TX Dallas, Intl. Elctrns. 214-233-9323
TX Dallas, Pioneer Elctrns. 214-386-7300
TX El Paso, Intl. Elctrns. 915-598-3406
TX Houston, Arrow Elctrns. 713-530-4700
TX Houston, Hall-Mark Elctrns. 713-781-6100
TX Houston, Hamilton-Avnet 713-780-1771
TX Houston, Pioneer Elctrns. 713-988-5555
TX Irving, Hamilton-Avnet 214-659-4111
TX Richardson, Fisher/Brown 214-235-3177
TX Sugarland, Quality Comps. 713-240-2255
UT Salt Lake City, Arrow Elctrns. 801-539-1135
UT Salt Lake City, Bell Inds. 801-972-6969
UT Salt Lake City, Hamilton-Avnet 801-972-2800
VA Richmond, Arrow Elctrns. 804-282-0413
WA Bellevue, Arrow Elctrns. 206-653-4800
WA Bellevue, Bell Inds. 206-747-1515
WA Bellevue, Hamilton-Avnet 206-643-3950
WI New Berlin, Classic Comps. 414-786-5300
WI New Berlin, Hall-Mark Elctrns. 414-797-7844
WI New Berlin, Hamilton-Avnet 414-784-4510
WI Oak Creek, Arrow Elctrns. 414-764-6600
Can Calgary, Future Elctrns. 403-259-6408
Can Calgary, Alberta, Hamilton-Avnet 403-230-3586
Can Edmonton, Future Elctrns. 403-486-0974
Can Mississauga, Ontario, Hamilton-Avnet 416-677-7432
Can Nepean, Ontario, Hamilton-Avnet 613-226-1700
Can Ottawa, Future Elctrns. 613-820-8313
Can Pointe Clair, Quebec, Future Elctrns. 514-694-7710
Can St. Laurent, Quebec, Hamilton-Avnet 514-331-6443
Can Toronto, Future Elctrns. 416-663-5563
Can Vancouver, Future Elctrns. 604-438-5545
Can Willowdale, Ontario, Electrosonic 416-494-1555

TRW RESISTIVE PRODUCTS DIV., TRW Electronic Components Grp., 401 N. Broad St., Philadelphia, PA 19108, Tel: 215-923-8230, TWX: 710-670-3370; Empl.: 600; *Dist. Mgr.:* Hugh Bolen ..... **A•1954-1957**

Local Sales Offices & Reps

AL Huntsville, TRW/ECG 205-533-7600
AZ Scottsdale, TRW/ECG 602-994-0441
CA Los Angeles, TRW/ECG 213-535-6175
CA Mountain View, Straube Assocs. 415-969-6060
CA San Diego, TRW/ECG 619-279-3990

CA Santa Ana, TRW/ECG 714-550-1101
CA Woodland Hills, TRW/ECG 818-703-1771
CO Westminster, Straube Assocs. 303-426-0890
CT Rowayton, TRW/ECG 203-853-4466
FL Ft. Lauderdale, TRW/ECG 305-772-3000
FL Orlando, TRW/ECG 305-857-3650
GA Norcross, TRW/ECG 404-447-6154
IL Chicago, TRW/ECG 312-693-7730
IN Ft. Wayne, R. O. Whitesell & Assocs. .. 219-432-5591
IN Indianapolis, R. O. Whitesell & Assocs. 317-359-9283
IN Kokomo, R. O. Whitesell & Assocs. ... 317-457-9127
KS De Soto, Midtec Assocs. 913-441-6565
KY Louisville, R. O. Whitesell & Assocs. .. 502-426-7696
MD Columbia, TRW/ECG 301-964-9110
MA Westborough, TRW/ECG 617-870-0745
MI Grand Rapids, R. O. Whitesell & Assocs. 616-942-5420
MI Southfield, R. O. Whitesell & Assocs. .. 313-559-5454
MI St. Joseph, R. O. Whitesell & Assocs. 616-983-7337
MN Minneapolis, TRW/ECG 612-854-6616
MO St. Louis, Jack Macke Co. 314-432-2830
NY Fairport, TRW/ECG 716-425-3775
NC Greensboro, TRW/ECG 919-852-4676
OH Cincinnati, R. O. Whitesell & Assocs. .. 513-521-2290
OH Cleveland, R. O. Whitesell & Assocs. .. 216-447-9020
OH Columbus, R. O. Whitesell & Assocs. .. 614-888-9396
OH Dayton, R. O. Whitesell & Assocs. 513-298-9546
OR Portland, TRW/ECG 503-620-5032
PA Bala Cynwyd, TRW/ECG 215-667-3400
PA Pittsburgh, R. O. Whitesell & Assocs. .. 412-963-6161
TN Greeneville, R. O. Whitesell & Assocs. 615-639-6154
TX Austin, Technlg. Sls. Co. 512-345-2331
TX Dallas, TRW/ECG 214-248-8000
TX El Paso, S. W. Sales 915-594-8259
TX Houston, TRW/ECG 713-772-5541
UT Salt Lake City, Straube Assocs. 801-263-2640
VA Richmond, TRW/ECG 804-288-8334
WA Bellevue, TRW/ECG 206-641-1996
WI Brookfield, TRW/ECG 414-784-7773

Local Distributors

AL Huntsville, Arrow Elctrns. 205-882-2730
AL Huntsville, Hamilton/Avnet 205-837-7210
AZ Tempe, Arrow Electronics 602-968-4800
AZ Tempe, Bell Inds. 602-966-7800
AZ Tempe, Fisher Brownell 602-967-1464
AZ Tempe, Hamilton/Avnet 602-231-5100
CA Alhambra, Fisher Brownell 818-289-0255
CA Chatsworth, Arrow Elctrns. 213-701-7500
CA Chatsworth, Avnet Elctrns. 818-700-2600
CA Chatsworth, Hamilton Electro Sls. 818-700-6500
CA Costa Mesa, Avnet Elctrns. 714-754-6111
CA Costa Mesa, Hamilton Electro Sls. 712-641-4100
CA Culver City, Hamilton Electro Sls. 213-558-2121
CA Gardena, Bell Inds. 213-515-1800
CA Glendale, R. V. Weatherford 213-849-3451
CA Hayward, Arrow Elctrns. 415-487-4600
CA Ontario, Hamilton/Avnet 714-989-4602
CA Sacramento, Arrow Electronics 916-925-7456
CA Sacramento, Hamilton/Avnet 916-925-2216
CA San Diego, Arrow Elctrns. 619-565-4800
CA San Diego, Fisher Brownell 619-560-8545
CA San Diego, Hamilton/Avnet 619-571-7510
CA Santa Clara, Fisher Brownell 408-988-6041
CA Sunnyvale, Arrow Elctrns. 408-745-6600
CA Sunnyvale, Bell Inds. 408-734-8570
CA Sunnyvale, Hamilton/Avnet 408-743-3355
CA Tustin, Arrow Electronics 714-838-5422
CO Aurora, Arrow Elctrns. 303-696-1111
CO Englewood, Hamilton/Avnet 303-779-9998
CT Danbury, Hamilton/Avnet 203-797-2800
CT Wallingford, Arrow Elctrns. 203-265-7741
CT Wallingford, Midan Elctrns. 203-265-2077
FL Clearwater, Arrow Elctrns. 813-576-8995
FL Deerfield Beach, Arrow Elctrns. 305-429-8200
FL Ft. Lauderdale, Hamilton/Avnet 305-971-2900
FL Palm Bay, Arrow Elctrns. 305-725-1480
FL St. Petersburg, Hamilton/Avnet 813-576-3930
FL Tampa, Impala Elctrns. 813-885-4747
FL Winter Park, Hamilton/Avnet 305-628-3888
GA Norcross, Arrow Elctrns. 404-449-8252
GA Norcross, Hamilton/Avnet 404-447-7507
IL Bensenville, Hamilton/Avnet 312-860-7700
IL Chicago, Newark Elctrns. 312-638-4411
IL Elk Grove Village, Bell Inds. 312-640-1910
IL Schaumburg, Arrow Elctrns. 312-397-3440
IN Carmel, Hamilton/Avnet 317-844-9333
IN Indianapolis, Arrow Elctrns. 317-243-9353
IN Indianapolis, Graham Elctrns. 317-634-8202
IA Cedar Rapids, Arrow Elctrns. 319-395-7203
IA Cedar Rapids, Deeco 319-365-7551
IA Cedar Rapids, Hamilton/Avnet 319-362-4757
KS Overland Park, Arrow Electrns. 913-642-0592
KS Overland Park, Hamilton/Avnet 913-888-8900
MD Columbia, Arrow Elctrns. 301-995-0003
MD Columbia, Hamilton/Avnet 301-995-3500
MD Timonium, Zebra Elctrns. 301-252-6576
MA Norwood, Gerber Elctrns. 617-769-6000
MA Wilmington, R.C. Components 617-273-1860
MA Woburn, Arrow Elctrns. 617-933-8130
MA Woburn, Hamilton/Avnet 617-273-7500
MI Ann Arbor, Arrow Elctrns. 313-971-8220
MI Grand Rapids, Arrow Elctrns. 616-243-0912
MI Grand Rapids, Hamilton/Avnet 616-243-8805
MI Livonia, Hamilton/Avnet 313-522-4700
MI Livonia, R.S. Elctrns. 313-525-1155
MN Edina, Arrow Elctrns. 612-830-1800
MN Minnetonka, Hamilton/Avnet 612-932-0600
MO Earth City, Hamilton/Avnet 314-344-1200
MO St. Louis, Arrow Elctrns. 314-567-6888
NH Manchester, Arrow Elctrns. 603-668-6968
NH Manchester, Hamilton/Avnet 603-624-9400
NJ Cherry Hill, Hamilton/Avnet 609-424-0100
NJ Fairfield, Arrow Elctrns. 201-575-5300
NJ Fairfield, Hamilton/Avnet 201-575-3390
NJ Hanover, State Elctrns. 201-887-2550
NJ Marlton, Arrow Elctrns. 609-596-8000
NJ Mountainside, Enox Resistors 201-654-7600
NM Albuquerque, Arrow Elctrns. 505-243-4566
NM Albuquerque, Hamilton/Avnet 505-765-1500
NM Albuquerque, Intl. Elctrns. 915-778-9761
NY Hauppauge, Arrow Elctrns. 516-231-1000
NY Hauppauge, Hamilton/Avnet 516-231-9800
NY Hauppauge, Jaco Elctrns. 516-273-5500
NY Liverpool, Arrow Elctrns. 315-652-1000
NY Rochester, Arrow Elctrns. 716-275-0300
NY Rochester, Hamilton/Avnet 716-475-9130
NY Rochester, Rochester Radio 716-454-7800
NC Charlotte, Elctrn. Mktg. Corp. 704-394-6195
NC Raleigh, Arrow Elctrns. 919-876-3132
NC Raleigh, Hamilton/Avnet 919-878-0819
NC Raleigh, Resco/Raleigh 919-781-5700
NC Winston-Salem, Arrow Elctrns. 919-725-8711
OH Cleveland, Hamilton/Avnet 216-831-3500
OH Columbus, Arrow Elctrns. 614-885-8362
OH Columbus, Electronic Mktg. 614-299-4161
OH Dayton, Arrow Elctrns. 513-435-5563
OH Dayton, Bell Inds. 513-434-8231
OH Dayton, Elctrn. Mktg. Corp. 513-439-4711
OH Dayton, Hamilton/Avnet 513-439-6700
OH Highland Hgts, Elctrn. Mktg. Corp. 216-442-3441
OH Solon, Arrow Elctrns. 216-248-3990
OH Westerville, Hamilton/Avnet 614-882-7004
OK Tulsa, Arrow Elctrns. 918-665-7700
OR Lake Oswego, Hamilton/Avnet 503-635-8157
OR Tigard, Arrow Elctrns. 503-684-1690
PA Monroeville, Arrow Elctrns. 412-856-7000
PA Philadelphia, Philadelphia Elctrns. 215-568-7400
PA Pittsburgh, Hamilton/Avnet 412-281-4150
PA Wayne, Peak Elctrns. 215-293-9000
TX Austin, Arrow Elctrns 512-835-4180
TX Austin, Hamilton/Avnet 512-837-8911
TX Carrollton, Arrow Elctrns. 214-380-6464
TX Dallas, Intl. Elctrns. 214-233-9323
TX El Paso, Intl. Elctrns. 915-778-9761
TX Houston, Arrow Elctrns. 713-530-4700
TX Houston, Hamilton/Avnet 713-780-1771
TX Irving, Hamilton/Avnet 214-659-4100
TX Richardson, Fisher Brownell 214-235-3177
TX Richardson, Jaco Elctrns. 214-235-9575
UT Salt Lake City, Arrow Elctrns. 801-972-0404
UT Salt Lake City, Hamilton/Avnet 801-972-2800
VA Richmond, Arrow Elctrns. 804-282-0413
WA Bellevue, Arrow Elctrns. 206-643-4800
WA Bellevue, Hamilton/Avnet 206-643-3950
WA Bellevue, Priebe Elctrns. 206-821-4695
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI New Berlin, Hamilton/Avnet 414-784-4510
WI Oak Creek, Arrow Elctrns. 414-764-6600

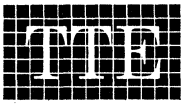
TRW, RF Devices Div., 14520 Aviation Blvd., Lawndale, CA 90260, Tel: 213-536-0888, TWX: 910-325-6206; Empl.: 1000; *Dist. Mgr.:* G. Vegvari

TRW UTC TRANSFORMERS, See TRW Inductive Products Div.

TS PRODUCTS, INC., 12455 Branford St., Bldg. 22, Arleta, CA 91331, Tel: 818-896-6676; Empl.: 20; *Sls. Mgr.:* Jon Thomasson; *Dist. Mgr.:* Jon Thomasson ..... **D•1990**

Local Sales Offices & Reps

CA Los Angeles, TS Products, Inc. 818-896-6676
CA San Marino, Motion Control, Inc. 818-796-0189



TTE, INC., 11650 W. Olympic Blvd., Los Angeles, CA 90064, Tel: 213-478-8224; FSC No.: 07766; *Sls. Mgr.:* S. J. Sodaro ..... **A•1644-1655**

Local Sales Offices & Reps

CA Culver City, Sodaro 213-478-7733

TTS-TELECOM TERMINAL SYSTEMS, 621 Hindry Ave, Inglewood, CA 90301, Tel: 213-641-8111, Telex: 182405, TWX: 3715831; Empl.: 18; *Sls. Mgr.:* L. Winters

TUCKER ELCTRNS., Box 461966, Garland, TX 75046, Tel: 214-348-8800, 800-527-4642, Telex: 79-1726; Empl.: 51; *Sls. Mgr.:* Clay Aclin

Advertisement

Call us first! We sell, rent, or lease all kinds of test instruments. Instruments are reconditioned and calibrated to original specifications. Trained Sales Engineers assist you with selections. We offer fast delivery, 90-day warranty, and an exclusive 10-day money-back guarantee if for any reason you are not satisfied with your purchase.

TUNGSTONE BATTERIES, INC., 18 Billings St., Sharon, MA 02067, Tel: 617-784-2000, Telex: 951908; Empl.: 8; *Sls. Mgr.:* J. McMahon

TURNER DESIGNS, 2247 Old Middlefield Way, Mountain View, CA 94043-2489, Tel: 415-965-9800; Empl.: 16; *Sls. Mgr.:* John Griffin

Local Sales Offices & Reps

CA Garden Grove, Advanced Digital Grp. 714-897-0319
CA Santa Clara, MANCO 408-496-6611
CO Wheat Ridge, Active Component Tech. 303-422-9229
MD Baltimore, Rep-Tron, Inc. 301-799-7490
MA North Reading, Martindale Assocs. 617-942-0514
NY Fayetteville, Martin P. Andrews 315-637-5291
TX Addison, Active Component Tech. 214-980-1888
TX Austin, Active Component Tech. 512-452-5254

TUSONIX

TUSONIX, INC., 7741 N. Business Park Drive, P. O. Box 37144, Tucson, AZ 85740-7144, Tel: 602-744-0400, Telex: 102-299640, TWX: 310-299640; FSC No.: 59660; Empl.: 800; *Sls. Mgr.:* Robert H. Jones; *Dist. Mgr.:* John H. Ohlrich ..... **A•1187-1193, 1656-1657**

Local Sales Offices & Reps

AZ Tucson, Tusonix, Inc. 602-744-0400
CA N. Hollywood, Tusonix, Inc. 213-509-0449
CA Redwood City, James S. Heaton Co. .. 415-367-9000
FL Winter Park, Tusonix 305-647-2936
IA Cedar Rapids, J.R. Sls. Engrg. 319-393-2232
MA Andover, Richard Purinton, Inc. 617-475-7055
NY Webster, Tusonix, Inc. 716-671-4073
NC Greensboro, Tusonix, Inc. 919-292-4286
OR Portland, Tusonix, Inc. 503-297-1555
TX Ft. Worth, P.T.I. 817-831-0441

Local Distributors

FL Ft. Lauderdale, Newark Elctrns. 350-587-2372
IL Chicago, Newark Elctrns. 312-638-4411
MD Beltsville, Resco 301-937-9100
MD White Marsh, Resco 301-529-0500
MN Minneapolis, Newark Elctrns. 612-331-6350
NY Hauppauge, Fairmont Elctrn. Sls. 516-231-3313
NY Melville, Arrow Elctrns. 516-694-6800
NC Raleigh, Resco 919-781-5700

TUSTIN ELCTRNS. CO., 1431 E. Saint Andrews Pl., Santa Ana, CA 92705, Tel: 714-549-0391; FSC No.: 7025-0010; *Sls. Mgr.:* Saul Tunkelrott

TWP, INC., 2133 4th St., Berkeley, CA 94710, Tel: 415-548-4434, Telex: 171-267; Empl.: 10; *Sls. Mgr.:* R. Moreno

TYCO INSTR. DIV., See Data Instrs.

TYTON CORP., Box 23055, 7930 N. Faulkner Rd., Milwaukee, WI 53223, Tel: 414-355-1130, TWX: 910-262-3094; *Sls. Mgr.:* Tom Bednar

UBER GRAFIC INSTRS., Box 4, Palo Alto, CA 94302, Tel: 415-327-4732; Empl.: 2

UCCEL CORPORATION, UCCEL Tower Exchange Park, Dallas, TX 75235, Tel: 214-353-7100, TWX: 910-861-4990; Empl.: 1381 (U.S.) 644 (Foreign)

UCE, INC., 24 Fitch St., Norwalk, CT 06855, Tel: 203-838-7509; Empl.: 20; *Sls. Mgr.:* Richard Eicher

Local Sales Offices & Reps

CA	Fullerton, Electronic Comp. Mkt.	714-879-9460
CA	Mountain View, Leddy Assocs.	415-969-6313
CO	Denver, Butler Tech. Sls.	303-343-3787
IA	Cedar Rapids, Coombs Assocs.	319-362-4116
TX	Richardson, Eagle Mktg.	214-238-5383

UID SWITCHES INC., Sub. of ITW, 6615 W. Irving Park Rd., Chicago, IL 60634, Tel: 312-282-4040, Telex: 4330130, TWX: 910-221-0275; Empl.: 250; *Sls. Mgr.:* A. Steiner; *Dist. Mgr.:* A. Steiner

ULTRA CARBON, Box X-924, Bay City, MI 48707, Tel: 517-894-2911, TWX: 810-265-1222; Empl.: 200; *Sls. Mgr.:* R. J. Anthony

ULTRAPAR, 90 Liberty Corner Road, Warren, NJ 07060-6709, Tel: 201-647-6650; Empl.: 1; *Sls. Mgr.:* Chris Parkinson

Local Sales Offices & Reps

CT	Northford, Indeco	203-484-0093
GA	Norcross, Alup America	404-446-3614
PA	Wallingford, Eled	215-566-7595
RI	Smithfield, Alcom	401-232-0119

ULTRONIX, INC., P.O. Box 1090, Grand Junction, CO 81502, Tel: 303-242-0810, TWX: 910-929-6965; FSC No.: 05347; Empl.: 260; *Sls. Mgr.:* Gerald Krebill; *Dist. Mgr.:* Gerald Krebill **A•1958-1965**

Local Sales Offices & Reps

AZ	Phoenix, Howe & Howe Sls.	602-264-7971
CA	Anaheim, Westrep	714-527-2822
CA	San Diego, Westrep	619-566-6580
CA	Santa Clara, Westrep	408-988-8833
CO	Denver, West Inc.	303-773-8180
IL	Elk Grove Village, Parcom	312-228-6360
IA	Cedar Rapids, Stan Clothier Co.	319-395-0245
KS	Parker, S. W. Wollard Co.	913-898-6552
MA	Newton Upper Falls, Anchor Engrg.	617-964-6205
MN	Minneapolis, S. Clothier Co.	612-944-3456
MO	St. Louis, Abrams & Assoc.	314-569-0447
NJ	Cherry Hill, Danco Corp.	609-424-5590
NM	Albuquerque, West, Inc.	505-822-8901
NY	Jericho, J-Square Mktg.	516-935-3200
NY	Rochester, Apex Assocs.	716-254-6050
TX	Austin, O. M. Sls.	512-452-1838
TX	Houston, O. M. Sls.	713-789-4426
TX	Richardson, O. M. Sls.	214-690-6746
EXP	CT, Stamford, Dage Corp.	203-324-3123

Local Distributors

CA	North Hollywood, T.T.I., Inc.	213-982-0201
CA	San Fernando, Petell Electronics	213-365-3984
FL	Orlando, Hammond Elctrns.	305-849-6060
FL	Orlando, T.T.I-2	305-859-1000
FL	Tampa, Impala Elctrns.	813-885-4747
MD	Columbia, Azteck Elctrns.	301-995-1760
MA	Burlington, TLC Elctrns.	617-273-0140
MA	Woburn, T.T.I., Inc.	617-938-8800
NY	Farmingdale, SAI, Inc.	516-293-2710
OH	Dayton, Electro-Line	513-461-5683
TX	Fort Worth, Allied Elctrns.	817-336-5401
TX	Fort Worth, T.T.I., Inc.	800-433-7092
WA	Kent, Shannon Ltd.	206-763-0545

ULVAC NORTH AMERICA, P.O. Box 799, 105 York Street, Kennebunk, ME 04043, Tel: 207-985-2973, Telex: 94-4344, TWX: 510-299-0007; Empl.: 35; *Sls. Mgr.:* Susan Zilaro; *Dist. Mgr.:* Harold Baum

ULVECO, INC., 323 Vintage Park Drive, Foster City, CA 94404, Tel: 415-574-1100, TWX: 856446 ULVECO **A•2338-2339**

Local Sales Offices & Reps

CA	Foster City, Ulveco, Inc.	415-574-1100
CT	Avon, Ulveco, Inc.	203-678-7711
MI	Detroit, CMP	313-477-7700
NJ	Cherry Hill, Power2	609-424-6737
NY	Rochester, KLM Garner	716-381-8350
NY	Rochester, Ulveco, Inc.	716-381-4673
NY	Syracuse, KLM Garner	315-458-6214
OH	Cleveland, CMP	216-779-5100
OH	Dayton, CMP	513-836-0951
PA	Pittsburgh, CMP	412-372-4415
Can	Toronto, Ont., Stetron Intl.	416-475-6202

UNARCO-ROHN, See UNR-Rohn

UNDERWRITERS SAFETY DEVICE, Allied Amphenol Prods., 7300 W. Wilson Ave., Chicago, IL 60656, Tel: 312-867-4600, TWX: 910-221-3474; Empl.: 200; *Sls. Mgr.:* J. A. VanCura; *Dist. Mgr.:* R. S. Heyne

UNGAR, Div. Eldon Inds., Inc., 100 W. Manville St., Compton, CA 90224-6005, Tel: 213-774-5950, Telex: 4720750 Eldon; FSC No.: 78976; Empl.: 140; *Sls. Mgr.:* George Mellevold

UNHOLTZ-DICKIE CORP., 6 Brookside Dr., Wallingford, CT 06492, Tel: 203-265-3929, Telex: 643802; Empl.: 49

UNIBOX, Div. of Amerex, P.O. Box 2815, Riverside, CA 92516, Tel: 714-686-1400; *Sls. Mgr.:* Roger Orton

UNICO, 3725 Nicholson Rd., Franksville, WI 53126-0505, Tel: 414-886-5678, TWX: 910-271-2385; Empl.: 175; *Sls. Mgr.:* Eric Hogse

UNICORN ENGRG. CO., Membrane Keyboard Div., 6201 Harwood Ave., Oakland, CA 94618, Tel: 415-428-1626; *Sls. Mgr.:* Steve Gensler

UNICORP, 291 Cleveland St., Orange, NJ 07050, Tel: 201-674-1700; FSC No.: 04729; Empl.: 82; *Sls. Mgr.:* B. Levine **C•1696**

Local Sales Offices & Reps

AL	Tuscumbia, MSC Corp.	205-383-6850
CA	South Gate, James E. Fitch	213-563-2336
IL	Palatine, Claeson Assocs.	312-359-7230
MA	Shrewsbury, Nordstrom Assocs.	617-842-8646
MI	Farmington, Amtech Rep.	313-474-8300
MN	Bloomington, Termatech	612-854-2001
OH	Centerville, EMA, Inc.	513-433-2800
PA	Media, The Balwin Co.	215-565-6044

UNIDOT, INC., 602 Park Point Dr., Golden, CO 80401, Tel: 303-526-9263, Telex: RCA-296621

UNILATOR TECHNICAL CERAMICS INC., 6290 Sunset Blvd., Ste. 1126, Los Angeles, CA 90028-8770, Tel: 213-463-5618, TWX: 910 321-2903; *Sls. Mgr.:* Norman R. Sutherland

UNIMAX SWITCH CORP., Ives Rd., Wallingford, CT 06492, Tel: 203-269-8701, Telex: 96-3485, TWX: 710-476-1397; FSC No.: 80207; Empl.: 300; *Dist. Mgr.:* Neil Gould **B•1702**

Local Sales Offices & Reps

AZ	Phoenix, Mercury Engrg. Sls., Inc.	602-244-0123
CA	Brea, MASCO	714-529-0866
CA	Los Altos, Ewing-Foley	415-941-4525
CA	Los Angeles, MASCO	213-295-7781
CO	Englewood, CompuTech Mktg.	303-773-2981
CT	Ansonia, Zaslow Sls.	203-735-9581
CT	Bloomfield, Zaslow Sls.	203-242-7781
FL	Tampa, J. R. Controls	813-961-9478
IL	Lisle, Wasson-Gallagher	312-963-5954
IN	Ft. Wayne, O. H. Bromberg & Assocs.	219-744-1636
KY	Louisville, O. H. Bromberg & Assocs.	502-245-8916
MD	Silver Spring, L. G. White & Co.	301-434-1555
MD	Silver Spring, NKA, Inc.	301-585-6141
MA	Norton, Zaslow Sls.	617-285-3992
MA	Westboro, Zaslow Sls.	617-393-8150
MI	Grosse Pointe Park, Greiner Assocs.	313-499-0188
MN	Minneapolis, Jos-Co. Sls. Engrg.	612-861-3343
MO	St. Louis, Hill & Co.	314-432-1136
NH	Londonderry, Zaslow Sls.	603-432-8907
NJ	West Caldwell, Grimm, Siegel Assocs.	201-575-9300
NY	E. Syracuse, Nycom	315-437-8343
NY	Williamsville, Nycom	
NC	Winston-Salem, L. G. White & Co.	919-725-3612
OH	Cincinnati, O. H. Bromberg & Assocs.	513-771-9333
OH	Dayton, O. H. Bromberg & Assocs.	513-434-8788
OH	Medina, J. C. Hofstetter Co.	216-241-4880
PA	Edgemont, White-Whiddett	215-353-6343
PA	Hickory, J. C. Hofstetter Co.	412-356-2305
SC	Greenville, L. G. White & Co.	803-271-0630
SC	Greenville, Sunbelt Sls.	803-877-0771
TN	Taft, Sunbelt Sls.	615-425-6164
TX	Bedford, W. Pat Fralia Co.	817-267-3577
VA	Richmond, L. G. White & Co.	804-740-7093
WA	Mercer Island, J. H. Andersen	206-232-0484

Local Distributors

AL	Decatur, Forbes Distr. Co.	205-353-4762
AL	Montgomery, Southern Controls	205-277-5030
AK	Anchorage, Alaska Elctrns.	907-563-3774
AZ	Phoenix, Continental Light & Supp.	602-263-6000
AZ	Phoenix, Electro Comps.	602-258-2665
AZ	Tempe, Electronic Supp.	602-258-4769
AR	Fort Smith, Southern Elec.	501-646-5500
CA	Belmont, Arndt Elctrns.	415-592-6718
CA	Belmont, Lo Dan Elctrns.	415-592-4600
CA	Covina, Selecta Switch	213-915-3409, 213-967-4123
CA	Fountain Valley, Components Ctr.	213-582-0667
CA	Gardena, California Switch & Signal	213-538-9830
CA	Inglewood, Newark Elctrns.	213-671-7066
CA	Los Angeles, Master Distrs.	213-829-4656
CA	Riverside, Electronic Supp.	714-683-7300
CA	Sacramento, Dunlap Elctrns.	916-442-5801
CA	San Diego, Electronic Supp.	619-693-8222
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Santa Monica, Master Distrs.	213-452-1229, 213-829-4656
CA	Torrance, Cypress Elctrns.	213-533-6005
CA	Van Nuys, Pacific Switch	213-873-4802
CO	Denver, Fistell's Elec. Supp.	303-629-1312
CO	Denver, Newark Elctrns.	303-757-3351
CO	Wheat Ridge, Cypress	303-431-2622
CT	East Haven, J.V. Elctrns.	203-469-2321
CT	Hartford, Atlantic Switch Controls	203-525-6907
CT	Taftville, Atlantic Switch	203-887-1639
CT	Wallingford, Sager Elect.	203-265-4600
FL	Hialeah, Atlas Elec. Supp.	305-885-8941
FL	Lakeland, Switch Controls	813-644-7564
FL	Largo, Lodan Elctrns.	813-586-2851
FL	Miami, Electronic Equip.	305-871-3500
GA	Macon, Quality Bearing Co.	912-746-5655
IL	Arlington Hgts., Lo Dan Elctrns.	312-398-5311
IL	Carol Stream, Connectrix	312-653-1460, 800-323-9431
IL	Carol Stream, Lectro Comps.	312-690-0520
IL	Chicago, Newark Elctrns.	312-638-4411
IA	West Des Moines, Ramco	515-225-6933
KS	Emporia, Emporia Elec., Inc.	316-342-2965
KY	Louisville, Main Elect. Equip.	502-587-6511
LA	Harvey, AFG Elctrns.	504-368-9696
LA	New Orleans, William B. Allen Supp.	504-525-8222
ME	Portland, Rockingham Elect. Supp.	207-772-4614
MA	Hingham, Sager Elec. Supp.	617-749-6700
MI	Battlecreek, Great Lakes Elctrns.	616-731-4156
MI	Oak Park, Newark Elctrns.	313-967-0600
MI	St. Claire Shores, Specialties Mfg. Co.	313-771-2700
MN	Hopkins, Joel Co.	612-935-6202
MN	Minneapolis, Newark Elctrns.	612-331-6350
MO	Maryland Hgts., Western Extralite	314-432-4560
NH	Nashua, Atlantic Switch	603-732-8500
NH	Salem, Sager Elec.	603-898-1348
NJ	Audubon, Universal Elctrn. Supp.	215-627-4646, 609-547-3430
NJ	Fair Lawn, Relay Specialities	201-797-3313
NJ	Mt. Laurel, Jerseyswitch	609-778-8190
NJ	Paterson, Feldman Bros. Elec. Supp.	201-742-7330
NY	Bohemia, Key Comps.	516-567-7500
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Geneva, Gersh	315-789-4505
NY	Hempstead, Elctrn. Equip.	516-538-5510
NY	Rochester, Summit Elctrns.	716-334-8110
NY	Sodus, AED Distrs.	315-483-6561
NY	Woodside, Switches Unltd.	212-478-5000
NC	Charlotte, Dixie Elctrns.	704-377-4348
NC	Winston-Salem, Kirkman Elect.	919-722-9131
OH	Cincinnati, Cartessa Corp.	513-385-7700
OH	Cincinnati, Institutional Svc. Parts	513-242-3139
OH	Cincinnati, Rilco	513-474-5400
OH	Columbus, Ohio Switch	614-885-0319
OH	Valley View, Trexon Elctrns.	216-447-1050
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Portland, Johnstone	503-231-4833
PA	Allentown, Lehigh Elctrns.	215-433-3045
PA	Drexel Hill, Kass Elctrn. Dist.	215-789-7700
PA	Philadelphia, Herbach & Rademan	215-426-1700
PA	Pittsburgh, Alder-tronics	412-821-5565
SC	Columbia, Dixie Elctrns.	803-779-5332
TX	Dallas, Cypress Elctrns.	214-869-1435
TX	Dallas, Texaswitch	214-357-1768
TX	Dallas, Watson Elec. Supp. Co.	214-742-8441
TX	Dallas, Wilkinson Bros.	214-941-9963
TX	El Paso, Ideal Indl. Elctrn. Supp.	915-779-6647
TX	Garland, Newark Elctrns.	214-494-5911
TX	Houston, Newark Elctrns.	713-782-4800
TX	San Antonia, Purvis Bearing	512-299-1010
TX	Waco, Hargis Co.	817-754-5667
TX	Waco, Purvis Bearing	817-753-6477
VA	Alexandria, Techn. Distrs.	703-971-8979
VA	Roanoke, Peoples Elctrn. Supp.	703-342-8933
WI	Mequon, Taylor Elec.	414-241-4321
Can	Burlington, Ont., Motion Controls	416-637-9369
Can	Vancouver, B.C., Canadian Dynamics	604-872-8106

EVEREADY. ENERGIZER®

UNION CARBIDE CORPORATION

UNION CARBIDE CORPORATION, Battery Prods. Div., 39 Old Ridgebury Road, Danbury, CT 06817-0001, Tel: 203-794-7548 ..... **D•1440-1441**

Local Sales Offices & Reps

CA San Francisco 415-875-2800
CT Danbury, Military & Govt. App. Only ... 203-794-7547
GA Norcross 404-446-2400
IL Itasca 312-773-3444
NJ Saddle Brook 201-845-5400
OH Middleburg Hgts. 216-826-4444
TX Dallas 214-241-9100

UNION CARBIDE CORP., ELCTRNS. DIV., Component Dept., Box 5928, Greenville, SC 29606, Tel: 803-963-6348, Telex: 57-0496, TWX: 810-287-2536; FSC No.: 31433; *Sls. Mgr.:* Robert Taylor; *Dist. Mgr.:* Dan Manly ..... **A•1106-1107**

Refer to Kemet, Union Carbide Corp., Elctrns. Div. for sales office information and for distributor listings.

UNION CARBIDE CORPORATION, Elctrns. Div., Crystal Prods. Dept., 9320 Chesapeake Dr., Ste. 104, San Diego, CA 92123, Tel: 619-279-4500, Telex: 695-465; Empl.: 125; *Sls. Mgr.:* J. J. Beeman

UNION ETCHANTS INTL., INC., 8-10 Green St., Bldg. G, Woburn, MA 01801, Tel: 617-935-8878

UNIQ DIGITAL TECHNOLOGIES, 28 S. Water Street, Batavia, IL 60510, Tel: 312-879-1008, Telex: 721467; Empl.: 50

UNIQUE OPTICAL CO., Diversified Optical Corp., P.O. Box 585, Farmingdale, NY 11735, Tel: 516-420-0288, TWX: 510-224-6598; Empl.: 20

UNITED CHEMI-CON

UNITED CHEMI-CON

UNITED CHEMI-CON INC., 9801 W. Higgins Rd., Rosemont, IL 60018, Tel: 312-696-2000, Telex: 28-3557, TWX: 910-253-2964; Empl.: 50; *Sls. Mgr.:* Dick Keats; *Dist. Mgr.:* Peter Ishu ..... **A•1194-1197**

Local Sales Offices & Reps

NJ Medford, Jack McCoy, Inc. 609-953-0770
AL Huntsville, R. D. Whitesell 205-883-5110
CA Culver City, DeAngelo, Rothman Co. .. 213-827-2202
CA Mountain View, Straube Assocs. 415-969-6060
CO Westminster, Straube Assocs. Mountain States, Inc. 303-426-0890
CT Connecticut, John E. Boeing 203-723-2355
FL Altamonte Springs, Semtronic Assocs., Inc. 305-831-8233
FL Clearwater, Semtronic Assocs., Inc. ... 813-461-4675
FL Ft. Lauderdale, Semtronic Assocs., Inc. 305-731-2484
GA Norcross, Twentieth Century 404-446-1999
ID Boise, Cascade Comps., Inc. 208-343-9886
IL Chicago, M. Gottlieb Assocs. 312-775-1151
IL Elk Grove Village, John G. Twist Co. .. 312-593-0200
IN Fort Wayne, R. O. Whitesell 219-432-5591
IN Indianapolis, M. Gottlieb Assocs. 314-846-5788
IN Indianapolis, R. O. Whitesell 317-359-9283
IN Kokomo, M. Gottlieb Assocs. 317-455-0444
IN Kokomo, R. O. Whitesell 317-457-9127
KS Shawnee Mission, Lowell Kangas & Assocs., Inc. 913-631-3515
KY Louisville, R. D. Whitesell 502-426-7696
MD Baltimore, Pro-Rep, Inc. 301-653-3600
MA Lexington, John E. Boeing Co., Inc. 617-862-2500
MI Grand Rapids, R. O. Whitesell 616-942-5420
MI Southfield, M. Gottlieb Assocs. 313-569-5501
MI Southfield, R. O. Whitesell 313-559-5454
MI St. Joseph, R. O. Whitesell 616-983-7337
MN Bloomington, Twist Co. 612-835-2120
NM Albuquerque, Straube Assocs. Mountain States, Inc. 303-426-0890
NY Jamaica, S-J Assocs., Inc. 212-291-3232
NY New York, Caravan Sls., Corp. 212-734-5800
NY Pittsford, Franklin Sls. Corp. 716-248-8251
NC Greensboro, Caravan Sls. 919-294-1500
NC Raleigh, Tingen Tech Sls., Inc. 919-878-4440
OH Cincinnati, Makin Assoc. 513-871-2424
OH Columbus, Makin Assoc. 513-871-2424
OK Tulsa, ION Assocs., Inc. 918-664-0186
OR Portland, Earl & Brown 503-245-2283
PA Dowington, Jack McCoy Inc. 215-363-0350
PA Pittsburgh, R. O. Whitesell 412-963-6161
TN Knoxville, M. Gottlieb Assocs. 615-966-1314
TN Knoxville, R. O. Whitesell 615-694-9476
TX Austin, ION Assocs., Inc. 512-331-7251
TX Grand Prairie, ION Assocs., Inc. 214-647-8225
TX Houston, ION Assocs., Inc. 713-977-4354
UT Salt Lake City, Straube Assocs. Mountain States, Inc. 801-263-2640
WA Seattle, Earl & Brown 206-284-1121
WI Brookfield, Twist Co. 414-782-2670
Can Oakville, Ont., Haltronics, Ltd. 416-844-2121

Local Distributors

AL Huntsville, Contact Elctrn. Inc. 205-881-9321
AZ Tempe, Bell Inds. 602-966-7800
CA Chatsworth, QC Comps. 818-700-2622
CA Garden Grove, National Capacitor Corp. 714-892-7749
CA San Diego, Bell Inds. 619-268-1277
CA Santa Ana, Nesco 714-541-6181
CA Santa Ana, Projections Unltd., Inc. 714-621-2323
CA Van Nuys, Nesco 818-781-0505
CO Wheatridge, Bell Inds. 303-424-1985
CT Pawcatuck, Glynn Elctrns. 203-599-5373
FL Fort Lauderdale, Hammond Elctrns., Inc. 305-973-7103
FL Tampa, Reptron Elctrns. 813-855-4656, 813-441-2893
GA Norcross, Hammond Elctrns., Inc. 404-869-2080
IL Chicago, NEP Elctrns. 312-625-8400
IL Elk Grove, RM Elctrns. 312-449-1996
IL Northbrook, Classic Comps. Supp., Inc. 312-272-9650
IN Indianapolis, Classic Comps. 317-872-4777
IN Indianapolis, RM Electronics 317-291-7110
IA Arlington Hgts., Reptron Elctrns. 312-593-7070
MA Burlington, TLC Elctrns. 617-273-0140/0141
MA Hopkinton, Interface Elctrns. Corp. 617-435-6858
MA Middleboro, Glynn Elctrns. 617-947-4262
MA Westford, Electronic's Specialties 617-486-8495
MI Grand Rapids, RM Elctrns. 616-531-9300
MI Lavonia, Reptron 313-525-2700
MN Hopkins, Joel Co. 612-935-6202
NH Salem, Glynn Elctrns. 603-893-8313
NJ Clifton, J-Mar Elctrns., Inc. 201-772-6400
NM Albuquerque, Bell Ind. 505-292-2700
NY Glen Cove, Jacques Ebert Assocs. ... 516-671-6123
NY Rochester, Masline Elctrns. 716-546-5373
NY Ronkonkoma, Prime Comps. 516-737-1730
NC Greensboro, Hammond Elctrns., Inc. .. 919-275-6391
OH Worthington, Reptron 614-436-6675
OR Lake Oswego, Bell Inds. 503-241-4115
OR Lake Oswego, Moore Elctrns. 503-684-3100
PA Exton, VSH 215-363-2250
PA Philadelphia, Philadelphia Elctrns. 215-568-7400
PA York, E.C.I. 717-846-5334
SC Greenville, Hammond Elctrns., Inc. 803-233-4121
TX Austin, Captronics, Inc. 512-459-4328
TX Austin, Kent Elctrns. 512-834-1900
TX Dallas, Captronics, Inc. 214-340-3592
TX Fort Worth, Patco Supp. Co. 817-429-8596
TX Houston, Kent Elctrns. 713-780-7770
TX Richardson, Jaco Elctrns. 214-235-9575
TX Richardson, Kent Elctrns. 214-669-2600
WA Bellevue, Bell Inds. 206-747-1515
WI New Berlin, Classic Comps. Supp., Inc. 414-786-5300
WI New Berlin, NEP Elctrns. 414-785-9100
WI New Berlin, RM Elctrns. 414-784-4420
Can Pointe Claire, Future Elctrns. 514-694-7710
Can Willowdale, Electro Sonic, Inc. 416-494-1616

UNITED DETECTOR TECH., 12525 Chadron Ave., Hawthorne, CA 90250, Tel: 213-978-0516, Telex: 18-2458; FSC No.: 50486; Empl.: 200; *Sls. Mgr.:* Michael Feeney

UNITED ELEC. CONTROLS, 85 School St., Watertown, MA 02172, Tel: 617-WA6-1000, Telex: 92 2445; Empl.: 420; *Dist. Mgr.:* Jim Dever

UNITED FOAM PLASTICS, 172 E. Main St., Georgetown, MA 01833, Tel: 617-352-2200, TWX: 710-347-0315; FSC No.: 55900; Empl.: 163

..... **A•1988**

UNITED SOLDER WRAP INC., 2608 Electronic La., Ste 509, Dallas, TX 75220, Tel: 214-350-4978, Telex: 79-1535; Empl.: 80; *Sls. Mgr.:* Perry L. Gross

UNITED STATES CRYSTAL CORP., 3605 McCart St., Fort Worth, TX 76110, Tel: 817-921-3014, TWX: 910-893-4084; FSC No.: 52847; Empl.: 75; *Sls. Mgr.:* Jan Henderson

UNITED STATES SOFTWARE CORP., 5470 N.W. Innisbrook Place, Portland, OR 97229, Tel: 503-645-5043, TWX: 4993875 U S SOFTWARE; *Sls. Mgr.:* Donald L. Dunstan

UNITED STATES TESTING CO., INC., 1415 Park Ave., Hoboken, NJ 07030, Tel: 800-631-3096, 201-792-2400, Telex: 126493, TWX: 219504; FSC No.: 93282; *Sls. Mgr.:* R. Donohue

UNITED TECHNOLOGIES AUTOMOTIVE, 1230 Sabine St., Huntington, IN 46750, Tel: 219-356-2700, Telex: 23-2461, TWX: 810-332-1519; Empl.: 465; *Sls. Mgr.:* R. Michael Gibson

UNITED WIRE & CABLE, 425 Shrewsbury St., Worcester, MA 01604, Tel: 617-757-3872, TWX: 710-340-0635; FSC No.: 51348; Empl.: 10; *Sls. Mgr.:* T. P. Andrews

UNIT INDS., 1140 E. Valencia Dr., Fullerton, CA 92631, Tel: 714-871-4161; Empl.: 40

UNITRACK DIV., Calabro Inds., Inc., Goshen Corp. Pk., P.O. Box 1927, 1372 Enterprise Dr., West Chester, PA 19380, Tel: 215-692-0800, TWX: 510-663-0000; Empl.: 25 ..... **C•1094**

Local Sales Offices & Reps

AZ Phoenix, Finn-Pat Co. 602-954-0301
CA Agoura, Robert A. Borden 818-991-1940
CA San Jose, Ruby Sls. 408-224-0881
CO Aurora, Delltron Co. 303-373-0300
FL Coral Springs, H.A., Inc. 305-752-7520
GA Atlanta, Magaro & Assocs. 404-451-8862
IL Des Plaines, Lincoln, Hodges & Assocs. 312-297-3810
IN Ft. Wayne, Aktron Corp. 219-747-3650
MA Northboro, Henik Assocs. 617-393-3127
MI Kentwood, C.A. Geer Co. 616-534-9449
MN St. Paul, Countrymen Assocs. 612-645-9151
MO Blue Springs, Chesco 816-229-1404
NJ Clinton, Churchill Assocs. 201-735-8971
NY Larchmont, Hingston Walsh Assocs., Inc. 914-834-5781
NY Syracuse, Lenard Co. 315-479-9191
OH Akron, Augnat Assocs. 216-273-1211
PA Norristown, Rivco January 215-631-1414
TX Wylie, Air Quip/Robleyco 214-442-3573
MD Timmonium, Eastern Comps. 301-561-5811
Can Guelph, Ont., Hammond Mfg. Co., Ltd. 519-822-2960

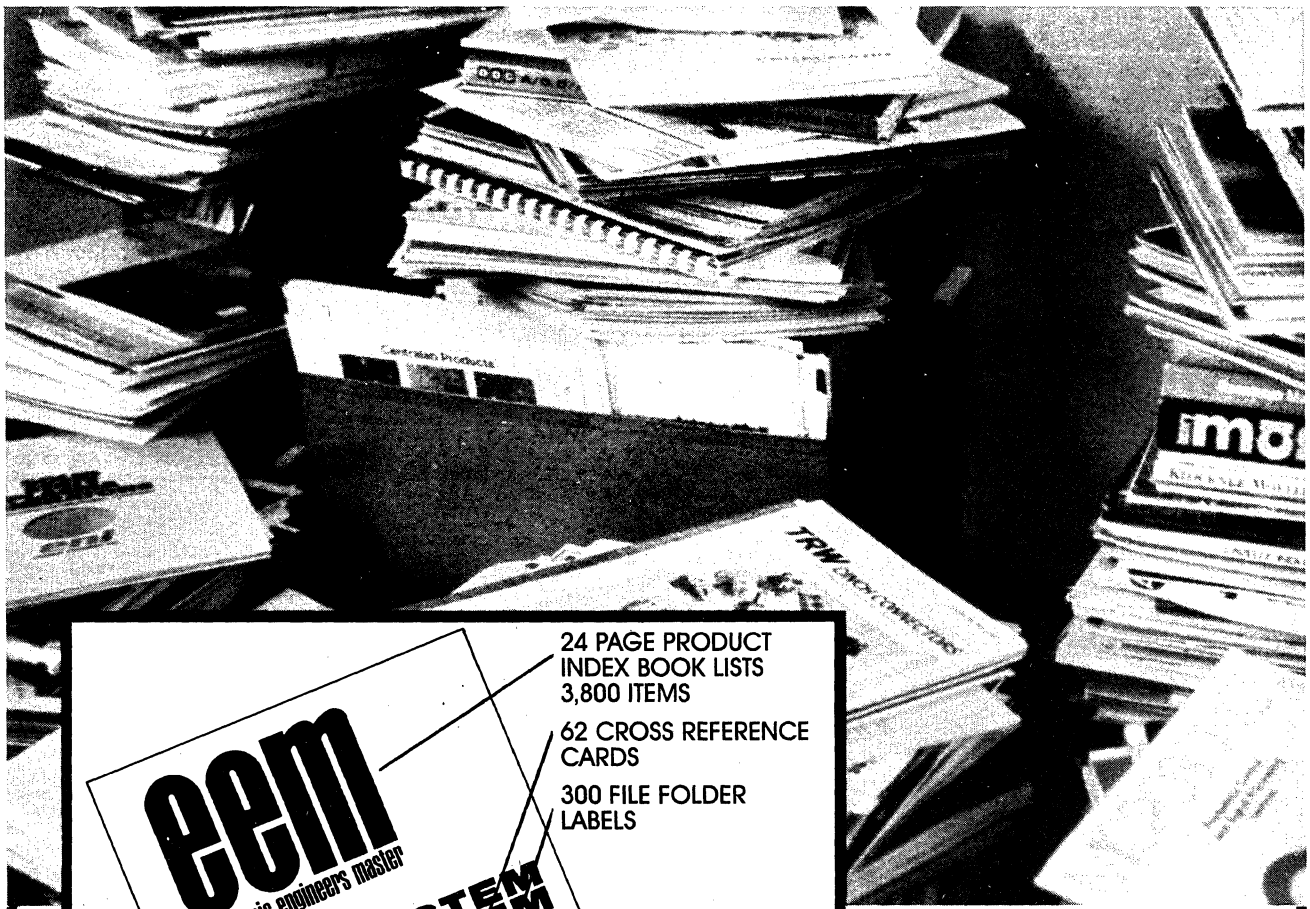
Local Distributors

CA Cerritos, El-Com 213-404-2961
CO Denver, Integrated Elctrns. 303-534-6121
GA Atlanta, Trans Southern 404-451-4425
MA Northboro, Papi Supp. 617-393-3127
MA Winchester, Rush Inds. 617-729-5800
MI Grand Rapids, S-F Elctrn. Supp. Co. .. 616-459-0216
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
OH Dayton, Televox, Inc. 513-294-4499
OH Warren, Rem Elctrns. Supp. Co., Inc. .. 216-373-1300
PA Erie, Rem Elctrns. Supp. Co., Inc. 814-453-5625
TX Wylie, Air Quip/Robleyco 214-442-3573
Can Guelph, Ont., Hammonds Mfg. Co., Ltd. 519-822-2960

UNITRODE CORP., 5 Forbes Rd., Lexington, MA 02173, Tel: 617-861-6540, Telex: 95-1064, TWX: 710-326-6509; Empl.: 2,000; *Sls. Mgr.:* Frederick Myers; *Dist. Mgr.:* John Flannery ..... **A•1697-1699**

Local Sales Offices & Reps

AL Huntsville, Advanced Comp. Mktg. 205-881-5495
AZ Phoenix, Compass Mktg. & Sls., Inc. ... 609-996-0635
AZ Tucson, Compass Mktg. & Sls., Inc. ... 602-293-1220
CA Irvine, Centaur Corp. 714-261-2123
CA San Diego, Centaur Corp. 619-571-7871
CA San Jose, Unitrode Corp. 408-294-4210
CA Santa Ana, Unitrode Corp. 714-261-1546
CA Santa Clara, I2, Inc. 408-988-3400
CA Tarzana, Unitrode Corp. 818-705-8085
CA Woodland Hills, Centaur Corp. 818-704-1655
CO Denver, Component Sls. Co. 303-779-8060
CO Littleton, Unitrode Corp. 303-972-2693
CT Yalesville, Kanan Assocs. 203-265-2404
FL Clearwater, Delmac Sls., Inc. 813-447-5192
FL Orlando, Delmac Sls., Inc. 305-898-4688
FL Palm Bay, Delmac Sls., Inc. 305-724-8377
FL Talmarac, Delmac Sls., Inc. 305-726-1330
FL Tampa, Unitrode Corp. 813-932-5807
IL Arlington Heights, Unitrode Corp. 312-394-5240
IL Elk Grove Village, Oasis Sls. Corp. 312-640-1850
IN Carmel, Shamrock Assocs. 317-848-5265
IA Davenport, Rush & West Assocs. 319-326-3091
KS Olathe, Rush & West Assocs. 913-764-2700
MD Columbia, Unitrode Corp. 301-995-0994
MD Severna Park, New Era Sls., Inc. 301-544-4100
MA Maynard, Byrne Assocs. 617-897-3131



24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS

62 CROSS REFERENCE CARDS

300 FILE FOLDER LABELS

eem
electronic engineers master
FILE SYSTEM

HARDWARE (ELECTRICAL/ELECTRONIC)
CROSS REFERENCE
eem 2800
PRODUCTS | SEE ALPHA FILE — COMPANY NAME | PAGE NO.

ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

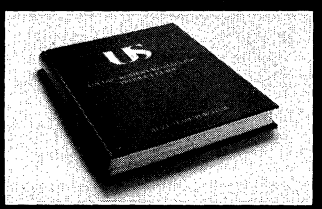
The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,

645 stewart ave., garden city, ny 11530

We don't just rent test equipment. Or lease it. We sell it. And right now everything in the U.S. Instrument Rentals inventory is on sale. So you can save money. Save on the widest selection of the best and latest equipment. Brand new or rental returns. Fully warranteed. Tested and calibrated. Delivered on time. It also means the most flexible terms in the business. We're U.S. Instrument Rentals. But we sell, too.



We wrote the book on test equipment. The 1985 U.S. Instrument Rentals Product Guide. Test, Telcom, MDS, CAE... FREE. Phone for local office. **(800) 227-6884.**

UNITED STATES FOR SALE.

(800) 227-6884

United States Instrument Rentals, Inc.

A U.S. Leasing Company
2988 Campus Dr, San Mateo, CA 94403
(415) 572-6600

MA Needham, Kanan Assocs. 617-449-7400
MA Wakefield, Unitrode Corp. 617-245-3010
MI Ballwin, Rush & West Assocs. 314-394-7271
MI Grand Rapids, Miltimore Sls., Inc. 619-942-9721
MI Novi, Miltimore Sls., Inc. 313-349-0260
MN Eden Prairie, Aldridge Assocs. 612-944-8433
NJ Cedar Knolls, T.A.M., Inc. 201-575-4390
NM Albuquerque, Compass Mktg. & Sls., Inc. 505-888-0800
NY Albany, Reagan/Compar Albany, Inc. 518-489-7408
NY E. Northport, Unitrode Corp. 516-368-0956
NY Endwell, Reagan/Compar Albany, Inc. 607-754-8946,607-723-8743
NY Fairport, Reagan/Compar Albany, Inc. 716-271-2230
NY New Hartford, Reagan/Compar Albany, Inc. 315-732-3775
NY South Hauppauge, T.A.M., Inc. 516-348-0800
NC Raleigh, J & B Sls. 919-878-8600
OH Cleveland, Baehr, Greenleaf & Assocs., Inc. 216-221-9030
OH Columbus, Baehr, Greenleaf & Assocs., Inc. 614-486-4046
OH Dayton, Baehr, Greenleaf & Assocs., Inc. 513-439-0724
OR Portland, Jas J. Backer Co. 503-297-874
OR Salem, Jas J. Backer Co. 503-362-0717
PA Erdenheim, Omni Sls. 215-233-4600
PA Evans City, Baehr, Greenleaf & Assocs., Inc. 412-776-2151
TX Austin, Sundance Sls., Inc. 512-339-6611
TX Dallas, Sundance Sls., Inc. 214-867-0592
TX Dallas, Unitrode Corp. 214-231-8700
TX Houston, Sundance Sls., Inc. 713-772-4988
UT Salt Lake City, Component Sls., Inc. ... 801-268-8440
WA Seattle, Jas J. Backer Co. 206-285-1300
WI Brookfield, Oasis Sls. Corp. 414-782-6660
Can Concord, Ont., Kaytronics, Ltd. 416-669-2262
Can Kanata, Ont., Kaytronics, Ltd. 613-592-6606
Can Quebec, Kaytronics, Ltd. 514-367-0101
Can Surrey, Kaytronics, Ltd. 604-581-7611

UNITRODE CORP., Capacitor Div., 11494 Sorrento Valley Road, San Diego, CA 92121, Tel: 619-453-8020

Unitron INCORPORATED

UNITRON INC., 10925 Miller Rd., Dept. EE, Dallas, TX 75238, Tel: 214-340-8600, Telex: 882511; FSC No.: 6130; Empl.: 113; *Sls. Mgr.:* R. L. Beutel ..... **D•1895-1897**

Local Sales Offices & Reps
CA Sunland, Unitron (Jim Crevier) 818-352-7348
GA Byron, Unitron (Joe Joiner) 912-956-2866

UNITRONIX CORP., 197 Meister Ave., Somerville, NJ 08876, Tel: 201-231-9400, Telex: 833184; Empl.: 35; *Sls. Mgr.:* Frank Zimmer; *Dist. Mgr.:* Joseph Murawski

UNIVERSAL AD-YU ELCTRNS., INC., 2517 E. Norwich St., Milwaukee, WI 53207, Tel: 414-482-4100; FSC No.: 90101; Empl.: 10

UNIVERSAL CAPACITORS, See TRW/Capacitor Div.

UNIVERSAL DATA SYSTEMS, INC., Motorola Information Systems Group, 5000 Bradford Dr., Huntsville, AL 35805-1953, Tel: 205-837-8100, Telex: 752602 UDS HTV; Empl.: 1; *Sls. Mgr.:* John Jurenko; *Dist. Mgr.:* Tom Scott

UNIVERSAL ELECTRONICS INC., 3475 A. Victor St., Santa Clara, CA 95050, Tel: 408-970-0455, Telex: 3719249 UNIVESAL; FSC No.: 94-2845455; *Sls. Mgr.:* Paul Shieh

UNIVERSAL INSTRS., P.O. Box 825, Binghamton, NY 13902, Tel: 607-775-1102, TWX: 510-252-1990; FSC No.: 607-775-5272; Empl.: 2200

UNIVERSAL INSTRS. CORP., MECHANIZED ELCTRN. ASSEMBLY (MEA) DIV., See Mechanized Elctrn. Assembly Div., Universa

UNIVERSAL MFG. CO., INC., 1168 Grove St., Irvington, NJ 07111, Tel: 201-374-9800, TWX: 710-995-4647; Empl.: 70; *Sls. Mgr.:* M. Mayer

UNIVERSAL SHIELDING CORP., 20 W. Jefryn Blvd., Deer Park, NY 11729, Tel: 516-667-7900, Telex: 221213 TTC UR

UNIVERSAL VOLTRONICS, 27 Radio Circle Dr., Mt. Kisco, NY 10549, Tel: 914-241-1300, TWX: 710-571-2142; Empl.: 135; *Sls. Mgr.:* Bill Herndon ..... **D•1858**

Local Sales Offices & Reps
CA Santa Clara, Sourcetronics 408-998-8801
MA Woburn, Jenks Assocs. 617-938-0488
MN Minneapolis, R.J. Sls. 612-866-3661
NM Albuquerque, Fry Gates Co. 505-262-1525
PA Audubon, Holmes Assocs. 215-666-0636

UNIVERSITY SOUND, P.O. Box 26105, Oklahoma City, OK 73126, Tel: 405-354-5311, Telex: 748-510; *Sls. Mgr.:* David Jetzke

UNIVERSITY SOUND, Altec Corp., 1250 N. Red Gum St., Anaheim, CA 92806, Tel: 714-632-7117, Telex: 655415; Empl.: 200; *Sls. Mgr.:* G. H. Rilling

UPSystems INC.

UPSYSTEMS, INC., 7801 E. Compton Blvd., Paramount, CA 90723, Tel: 213-634-0621, TWX: 910-346-7814; FSC No.: 3698; *Sls. Mgr.:* Dick Williams ..... **D•1973**

URBAN ELCTRNS., P. O. Box 456, Dover, MA 02030, Tel: 617-329-4068, TWX: 710-325-1579; Empl.: 50; *Sls. Mgr.:* G. Urban

U S CAPACITOR CORP., See U S Microtek Components

U.S. COMPONENTS, INC., Unitech PLC., 35 Carlough Rd., Bohemia, NY 11716, Tel: 516-589-8080; *Sls. Mgr.:* H. Nalbantian; *Dist. Mgr.:* H. Nalbantian

DIGITAL

U.S. DIGITAL, 12371 Kensington Rd., Los Alamitos, CA 90720, Tel: 213-594-0094 ..... **B•1829**

Local Distributors
Intl UK, Bedford, Control Transducers, Ltd.

USECO DIV., Litton Inds, 13536 Saticoy St, Van Nuys, CA 91409, Tel: 818-786-9388, TWX: 910-495-1700; Empl.: 250

U.S. INSTR. RENTALS, 2988 Campus Dr., San Mateo, CA 94403, Tel: 415-572-6600, Telex: 34 301 USIR SMT; Empl.: 300; *Dist. Mgr.:* Randy Steyer ..... **D•1322-1323**

Local Sales Offices & Reps
AZ Phoenix, U.S. Instr Rentals 602-257-1345
CA Burbank, U.S. Instr. Rentals 213-849-5861
CA San Diego, U.S. Instr. Rentals 619-231-3990
CA San Mateo, U.S. Instr. Rentals 415-579-0911
CA Santa Ana, U.S. Instr. Rentals 714-641-9101
CO Denver, U.S. Instr. Rentals 303-790-0523
CT Watertown, U.S. Instr Rentals 1-800-526-7563
FL Orlando, U.S. Instr. Rentals 305-352-0923
GA Atlanta, U.S. Instr Rentals 404-955-4473
IL Arlington Hgts., U.S. Instr. Rentals 312-991-9770
KS Kansas City, U.S. Instr Rentals 913-677-0011
MD Rockville, U.S. Instr. Rentals 301-258-9888
MA Brookline, U.S. Instr. Rentals 617-739-2255
MI Detroit, U.S. Instr Rentals 313-493-1919
MN Minneapolis, U.S. Instr. Rentals 612-881-3743
MO St. Louis, U.S. Instr. Rentals 314-454-0210
NJ Edison, U.S. Instr. Rentals 201-494-1500
NY Rochester, U.S. Inst Rentals 800-631-5321
OH Cincinnati, U.S. Instr. Rentals 513-863-4446
OH Cleveland, U.S. Instr. Rentals 216-779-5155
OH Dayton, U.S. Instr Rentals 513-253-3824
OK Oklahoma City, U.S. Instr. Rentals 405-525-2659
OK Tulsa, U.S. Instr Rentals 918-492-7333
OR Portland, U.S. Instr. Rentals 800-227-5075
PA Philadelphia, U.S. Instr Rentals 215-752-3936
PA Pittsburg, U.S. Instr. Rentals 412-922-1331
TX Austin, U.S. Instr. Rentals 512-441-7014
TX Houston, U.S. Instr Rentals 713-923-2222
TX Richardson, U.S. Instr. Rentals 214-234-3392
UT Salt Lake City, U.S. Instr. Rentals 801-582-0116
WA Redmond, U.S. Instr. Rentals 800-227-5075

U S MICROTEK COMPONENTS CORPORATION, 11144 Penrose St., Sun Valley, CA 91352, Tel: 818-767-6770, TWX: 910-498-4998; FSC No.: 59942; Empl.: 210; *Sls. Mgr.:* Donald F. Hosmer

U.S. SCIENTIFIC INSTRS., 61 North Beacon St., Boston, MA 02134, Tel: 617-787-2411; Empl.: 50; *Sls. Mgr.:* S. Eric Kondi

U.S. TERMINALS, 7502 Camargo Rd., Cincinnati, OH 45243, Tel: 513-561-8145, TWX: 810-461-2290; FSC No.: 12615; *Sls. Mgr.:* G.L. Stepp

U. S. TOYO FAN CORPORATION

U.S. TOYO FAN CORP., 4915 Walnut Grove Ave., San Gabriel, CA 91776, Tel: 818-287-5297, TWX: 910-589-1540; Empl.: 20; *Sls. Mgr.:* Bruce Rockwell; *Dist. Mgr.:* Bruce Rockwell ..... **C•1680-1681**

Local Sales Offices & Reps
AL Huntsville, Par Mktg. 205-837-6534
AZ Tempe, Delta Elctrn. Sls. 602-224-1601
CA San Diego, Noo Rep Tech Sls. 619-483-4861
CA San Gabriel, U.S. Toyo Fan Corp. 213-287-5297
CA Santa Clara, U.S. Toyo Fan Corp. 408-984-2618
CO Denver, Troy Sls./Wintronics 303-934-2406
FL Clearwater, WMM Assocs. 813-442-3913
GA Marietta, Par Mktg. 404-953-4168
IL Elk Grove, Martec Assocs. 312-956-8090
KS DeSoto, Midtec Assocs. 913-441-6565
MA Westboro, Tech. Mktg. Svcs. Co. 617-366-6655
MN Osseo, Gaffney Sls. Co. 612-425-5484
MO Florissant, Midtec Assocs. 314-837-5200
NH Windham, Tech. Mktg. Svcs. Co. 603-434-2716
NJ Madison, Livera-Polk Assocs. 201-377-3220
NY Cooperstown, Fitzelle Assocs. 607-547-9333
NY Glen Head, Livera-Polk Assocs. 516-759-9300

U.S. TOYO FAN CORP

fans

AUTHORIZED & STOCKING DISTRIBUTOR

ALPHA DISTRIBUTOR CORP

550 E. ROYALTON ROAD
CLEVELAND, OHIO 44147
PHONE 216/526-3716

OH Cleveland, Geotronix 216-526-2535
OH Trotwood, Geotronix 513-854-5939
OR Troutdale, Comtec 503-227-2111
PA Horsham, Dalbrook Corp. 215-441-8380
TX Richardson, Zonk Assocs. 214-238-7651
WA Bellevue, Comtec 206-453-1188

Local Distributors
AZ Phoenix, Aero-Space Southwest 602-861-1785
CA Anaheim, Pacesetter Elec. 714-777-4711
CA Fremont, Terminal Sls. Corp. 415-656-7722
CA San Jose, Cypress Elctrns. 408-945-8400
CA Santa Ana, Pacesetter Elctrns. 714-557-7131
CA Torrance, Cypress Elctrns. 213-530-1900
CA Tustin, Added Value Elctrns. Distr. 714-730-5848
CO Denver, Wintronics 303-934-2406
FL Longwood, Intertec Comps. 305-834-7777
IL Elk Grove, Martec Assocs. 312-956-8090
MA Westboro, TMSC Elctrns. Supp. 617-366-8462
NV Las Vegas, Kiesub Corp. 702-733-3888
NJ Collingswood, Index 609-429-4055
NY Elmsford, Multimeterics 914-347-3666
NY Glen Head, Livera-Polk Assocs. 516-759-9300
OH Cleveland, Alpha Distr. Corp. 216-526-3716
OR Beaverton, Hansen Elctrns. 503-642-4455
TX Dallas, Cypress Elctrns. 214-869-1435
TX Richardson, Zec Sls. 214-238-7651
WA Kent, Shannon, Ltd. 206-763-0545

USUS, INC., UCSD Pascal Sys. User's Society, P.O. Box 1148, La Jolla, CA 92038

UTE MICROWAVE, 3500 Sunset Ave., Asbury Park, NJ 07712, Tel: 201-922-1009, Telex: 13-2461; FSC No.: 23261; Empl.: 20

Local Sales Offices & Reps
AZ Mesa, PTL, Inc. 602-892-9329
CA Goleta, Thorson Co. 805-964-8751
FL Melbourne, EMS Assocs. 305-724-1027
MA Wakefield, Nerem 617-245-4426
NY Commack, Richman Sls. 516-543-5532
OH Dayton, Fred Ohmer Assocs. 513-434-1454
TX Dallas, Airep Elctrns. 214-349-4360
VA Annandale, Q.T. Elctrn. 703-941-4242
EXP FL, Boca Raton, Microwave Intl. Corp. 305-391-7475

UTICA TOOL CO., INC., Cameron Rd., P.O. Box 1807, Orangeburg, SC 29115, Tel: 803-534-7010

UTI INSTRUMENTS CO., 325 N. Mathilda Ave., Sunnyvale, CA 94086, Tel: 408-738-3301, TWX: 910-339-9546; Empl.: 80; *Sls. Mgr.:* Jim Nicholson

UVP, INC., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778, Tel: 818-285-3123, Telex: 688-461; Empl.: 100; *Sls. Mgr.:* Phil Cashen

VACO PRODS., 1510 Skokie Blvd., Northbrook, IL 60062, Tel: 312-564-3300, TWX: 910-686-0658; Empl.: 250; *Sls. Mgr.:* Fred Grede

VACTRONIC LAB. EQUIP., 65 Brightside Ave., E. Northport, NY 11731, Tel: 516-AN1-2660; Empl.: 25

VALHALLA SCIENTIFIC, 9955 Mesa Rim Rd., San Diego, CA 92126, Tel: 619-457-5576, Telex: 181750 VALHALLA SDG; Empl.: 75; *Sls. Mgr.:* Kerry Clark

VALIDYNE ENGRG. CORP., 8626 Wilbur Ave., Northridge, CA 91324, Tel: 818-886-2057, Telex: 65-1303; Empl.: 200; *Sls. Mgr.:* Gene Goodrich ..... **D•1164**

VALLEY ELECTROMAGNETICS CORP., P.O. Box 557, Crystal Lake, IL 60014, Tel: 815-459-3080, Telex: 72-2417

VALLEY ELECTROMAGNETICS, P.O. Box 131, Spring Valley, IL 61362, Tel: 815-664-2348; Empl.: 70; *Sls. Mgr.:* T. Heldt

VALOR ELECTRONICS, INC., 2950 Airway Ave., Bldg. C-5, Costa Mesa, CA 92626, Tel: 714-540-9261, TWX: 910-595-2480; FSC No.: 15003; *Sls. Mgr.:* T. N. Kasabali

VALPEY-FISHER, 75 South St, Hopkinton, MA 01748, Tel: 617-435-6831, Telex: 94-8332; Empl.: 160; *Sls. Mgr.:* Donald Elliott

VALTEC, Sub. of U.S. Philips, See ITT Electro-Optical Products

VAMISTOR CORP., 115 Industrial Pk., Sevierville, TN 37862, Tel: 615-453-0001, Telex: 810-570-4931; Empl.: 49; *Sls. Mgr.:* George Hebner; *Dist. Mgr.:* George Hebner ..... **A•1967**

Local Distributors
CA San Fernando, Petell Elctrns., Inc. 818-365-9841
MD Timonium, Zebra Elctrns., Inc.
MA Needham, Cronin Elctrns., Inc. 617-449-5000
NY Bohemia, Justin Elctrns. 516-589-4000
NY Hauppauge, Fairmont Elctrns. 516-231-3313
NY Hauppauge, Jaco Elctrns. 800-645-5112
NY Valley Stream, L & S Elctrns., Inc. 516-561-2474

VANGUARD ELCTRNS. CO., 1480 W. 178th St., Gardena, CA 90248, Tel: 213-323-4100, TWX: 910-346-7067; FSC No.: 03550; Empl.: 250; *Sls. Mgr.:* T. A. Crawford; *Dist. Mgr.:* T. A. Crawford

VANGUARD RELAY CORP., 225 Cortland St., Lindenhurst, NY 11757, Tel: 516-226-5000; *Sls. Mgr.:* B. S. Gilman

VANN INSTRUMENTS, 1200 Schofield La., Farmington, NM 87401, Tel: 505-326-7557; *Sls. Mgr.:* Michael E. Vann

VARIAN ASSOCS., Indl. Equip. Grp., 611 Hansen Way, Palo Alto, CA 94303, Tel: 415-493-4000, TWX: 910-373-1731; Empl.: 1500

VARIAN ASSOCS., Instr. Grp., 611 Hansen Way, Palo Alto, CA 94303, Tel: 415-493-4000, TWX: 910-373-1731

varian

VARIAN ASSOCIATES, INC., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303, Tel: 415-493-4000, Telex: 910-373-1731; Empl.: 16,000; *Sls. Mgr.:* Dominic Ruggieri

Local Sales Offices & Reps
CA Covina, Varian Electron Dvc. Grp. 213-967-3834
AL Huntsville, Varian Electron Dvc. Grp. 205-837-9225
CA Palo Alto, Varian Assocs. Image Tube Div. 415-493-1800
CA Palo Alto, Varian Assocs. Microwave Tube Div. 415-493-4000
CA Palo Alto, Varian Electron Dvc. Grp. 415-424-6400
CA San Carlos, Varian Assocs., Electron Dvc. Grp. 415-592-1221
CA Santa Clara, Varian Assoc, Solid State Microwave Div. 408-988-1331
CA Santa Clara, Varian Electron Dvc. Grp. 408-496-6273
FL Clearwater, Varian Electron Dvc. Grp. 813-446-8513
GA Warner Robins, Varian Electron Dvc. Grp. 912-922-2202
IL Park Ridge, Varian Electron Dvc. Grp. 312-825-6686
IN Bloomington, Varian Electron Dvc. Grp. 812-334-9900
MD Linthicum, Varian Electron Dvc. Grp. 301-850-5010
MA Beverly, Varian Assocs., Beverly Div. 617-922-6000
MA Burlington, Varian Electron Dvc. Grp. 617-272-8532
NJ Cranford, Varian Electron Dvc. Grp. 201-276-9050
NJ Moorestown, Varian Electron Dvc. Grp. 609-235-6800
OH Dayton, Varian Electron Dvc. Grp. 513-258-3930
TX Dallas, Varian Electron Dvc. Grp. 214-235-2385
UT Salt Lake City, Varian EIMAC Salt Lake City 801-972-5000
VA Arlington, Varian Electron Dvc. Grp. 703-522-8002

varian

VARIAN CANADA, INC., Microwave Div., 45 River Drive, Georgetown, ON, Canada L7G2J4, Tel: 416-877-0161, Telex: 069-7502, TWX: 610-492-2641; *Sls. Mgr.:* George C. Plhak ..... **D•1859-1862**

Local Distributors
AL Huntsville, Varian Assocs. 205-837-9225
CA Los Angeles, Varian Assocs. 818-967-3834
CA Sacramento, Varian Assocs. 916-331-5552
CA San Francisco, Varian Assocs. 415-424-6400
FL Clearwater, Varian Assocs. 813-446-8513
GA Warner Robins, Varian Assocs. 912-922-2202
IL Chicago, Varian Assocs. 312-825-6686
IN Bloomington, Varian Assocs. 812-334-9900
MD Limthicum, Varian Assocs. 301-850-5010
MA Boston, Varian Assocs. 617-272-8532
NJ Cranford, Vairan Assocs. 201-276-9050
NY Syracuse, Varian Assocs. 315-455-2810
OH Dayton, Varian Assocs. 513-258-3930
PA Philadelphia, Varian Assocs. 609-235-6800
TX Dallas, Varian Assocs. 214-235-2385
Can Ottawa, Varian Assocs. 613-725-9285

VARIAN DATA MACHINES, See Sperry Univac, Mini-Comp. Opers.

VARITRONIX, See VL Electronics

VARO, INC., Electron Devices Div., 2203 W. Walnut St., Garland, TX 75040, Tel: 214-272-3561, TWX: 910-860-5093; FSC No.: 27777;Multiple; Empl.: 250; *Sls. Mgr.:* Lon Hodge

VARO SEMICONDUCTOR, INC., 2800 W. Kingsley Dr., Garland, TX 75046, Tel: 214-271-8511, TWX: 910-860-5178; Empl.: 550; *Sls. Mgr.:* Charlie Merz; *Dist. Mgr.:* Mike Hawkins ..... **A•2095**

Local Sales Offices & Reps
AL Huntsville, Rep, Inc. 205-881-9270
AZ Scottsdale, SMS & Assocs. 602-998-0831
CA Los Angeles, Corcoran Assocs. 213-823-4589
CA Sunnyvale, W. W. Posey Co. 408-746-0771
CO Parker, Technology Mktg. Assocs. 303-841-3435
CT North Haven, Comp Rep Assocs. 203-269-1145
FL Orlando, OEM Mktg. Corp. 305-299-1000
GA Tucker, Rep, Inc. 404-938-4358
IL Northbrook, D. Dolin Sales Co. 312-498-6770
IN Frankfort, C-S Electronic Sls. 317-659-1874
IA Cedar Rapids, D. Dolin Sls. Co. 319-395-9094
KS Overland Park, Electri-Rep 913-649-2168
MD Towson, DG Representatives 301-583-1360
MA Westwood, Comp Rep Assocs. 617-329-3454
MI Farmington, Amtech Reps. 313-474-8300
MN Minneapolis, Electric Comp. Sls. 612-933-2594
MO St. Louis, Electri-Rep 314-878-8209
NY Franklin Square, Cooper-Simon & Co. 516-489-0404
NY Ithaca, Bob Dean, Inc. 607-257-1111
NC Charlotte, Rep, Inc. 704-563-5554
NC Raleigh, Rep, Inc. 919-851-3007
OH Dayton, J. C. Hofstetter Co. 513-296-1010
OH Medina, J. C. Hofstetter Co. 216-241-4880
OK Tulsa, Ammon & Rizos Co. 918-663-8788
OR Hillsboro, Western Tech. Sls. 503-640-4621
PA Feasterville, Knowles Assocs. 215-322-7100
PA Hickory, J. C. Hofstetter Co. 412-356-2305
TN Jefferson City, Rep, Inc. 615-475-4105
TX Austin, Ammon & Rizos Co. 512-454-5131
TX Dallas, Ammon & Rizos Co. 214-644-5591
TX Houston, Ammon & Rizos Co. 713-781-6240
UT Salt Lake City, Technology Mktg. Assocs. 801-483-1009
WA Bellevue, Western Tech. Sls. 206-641-3900
WA Spokane, Western Tech. Sls. 509-922-7600
WI Milwaukee, D. Dolin Sales Co. 414-482-1111

Local Distributors
AL Huntsville, Resistacap 205-883-4270
AZ Tempe, Anthem Elctrns. 602-966-6600
AZ Tempe, Bell Inds. 602-966-7800
CA Chatsworth, Anthem Elctrns. 818-700-1000
CA Garden Grove, Bell Inds. 714-220-0681
CA Gardena, Bell Inds. 213-515-1800
CA Hayward, Allied Elctrns. 415-487-5250
CA San Diego, Anthem Elctrns. 619-453-9005
CA San Diego, Bell Inds. 619-268-1277
CA San Jose, Anthem Elctrns. 408-946-8000
CA Sunnyvale, Bell Inds. 408-734-8570
CA Thousand Oaks, Bell Inds. 805-499-6821
CA Tustin, Anthem Elctrns. 714-730-8000
CO Denver, Integrated 303-292-6121
CO Wheat Ridge, Bell Inds. 303-424-1985
CT Cheshire, Time Elctrns. 203-271-3200
CT Orange, Milgray Elctrns. 203-795-0711
FL Winterpark, Milgray Elctrns. 305-647-5747
GA Atlanta, Milgray Elctrns. 404-393-9666
IL Bensonville, Milgray Elctrns. 312-350-0490
IL Chicago, Bell Inds. 312-982-9210
IL Elgin, Allied Elctrns. 312-697-8200
IL Elk Grove Village, Pioneer Std. 312-437-9680
IL Palatine, OHM Elctrns. 312-359-5500
IL Peoria, Klaus Radio 309-691-4840
IN Fort Wayne, Graham Elctrns. 219-423-3422
IN Indianapolis, Graham Elctrns. 317-634-8202
IN Indianapolis, Pioneer 317-849-7300
IA Cedar Rapids, Deeco 319-365-7551
KS Overland Park, Milgray Elctrns. 913-236-8800
MD Rockville, Milgray Elctrns. 301-468-6400
MA Burlington, Milgray Elctrns. 617-272-6800
MA Woburn, Time Elctrns. 617-935-8080
MI Livonia, Pioneer 313-525-1800
MN Minnetonka, Pioneer Std. 612-935-5444
MO St. Louis, Time Elctrns. 314-391-6444
NJ Marlton, Milgray Elctrns. 609-983-5010
NM Albuquerque, Bell Inds. 505-292-2700

NY Buffalo, Summit Distrs. 716-887-2800
NY Farmingdale, Milgray Elctrns. 516-391-3000
NY Pittsford, Milgray Elctrns. 716-385-9330
NY Rochester, Summit Distrs. 716-334-8110
NC Greensboro, Hammond Elctrns. 919-275-6391
OH Cincinnati, Graham Elctrns. 513-772-1661
OH Cleveland, Milgray Elctrns. 216-447-1520
OH Cleveland, Pioneer Std. 216-587-3600
OH Dayton, Pioneer Std. 513-236-9900
OH Dayton, Stotts Friedman 513-298-5555
OK Tulsa, Altair 918-252-5781
OR Lake Oswego, Bell Inds. 503-241-4115
PA Pittsburgh, Pioneer Std. 412-782-2300
SC Greenville, Hammond Elctrns. 803-233-4121
TN Memphis, Bluff City Elctrns. 901-345-9500
TX Dallas, Pioneer Std. 214-386-7300
TX Fort Worth, Allied Elctrns. 817-336-5401
TX Houston, Altair Co. 713-462-3029
TX Richardson, Altair Co. 214-231-5166
TX San Antonio, Sherman Elctrns. 512-224-1004
UT Salt Lake City, Bell Inds. 801-972-6969
UT Salt Lake City, Standard Supp. 801-486-3371
WA Bellevue, Bell Inds. 206-747-1515
WA Seattle, Priebe Elctrns. 206-821-4695
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI Waukesha, Bell Inds. 414-547-8879

VARTA BATTERIES, INC., 300 Executive Blvd., Elmsford, NY 10523, Tel: 914-592-2500, Telex: 996-548; *Sls. Mgr.:* Dominick Isola ..... **D•1442**

Local Sales Offices & Reps
AL Huntsville, 20th Century Mktg. 404-446-1999
CA Norwalk, Ed Rivers Assocs. 213-868-1471
CO Denver, Moss Mktg. 303-455-7205
FL Fern Park, EIR, Inc. 305-660-9600
KS Shawnee Mission, Microtronics 913-262-1444
MI Brighton, Elctronic Sources 313-227-3598
NY Glen Head, Livera-Polk 201-377-3239
PA Broomall, TCA Assocs. 215-353-2022
WA Bellevue, Gene Stout Assocs. 503-649-9074
Can Mississauga, Ont., Nikon Power Battery Corp.

Local Distributors
CA La Mirada, Energy Devices 213-921-8775
CA San Diego, Tauber Elctrns. 619-274-7242
CA Van Nuys, Nesco, Inc. 818-781-0505
GA Atlanta, Falcon Batteries 404-953-3500
IL Downers Grove, Telecommunications Dvcs. 312-971-3460
IL Morton Grove, Power Pak 312-966-6000
MA Sharon, Adcour 617-784-8123
NJ Clifton, Engineered Assemblies 201-772-6400
NY Commack, Brentronics 516-499-5155
TX Stafford, Southwest Elctrns. 713-491-4900

VECTOR CABLE CO., 555 Industrial Rd., Sugarland, TX 77478, Tel: 713-240-9196

VECTOR ELECTRONIC CO., INC., 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, CA 91342, Tel: 818-365-9661, TWX: 910-496-1539; FSC No.: 82893; Empl.: 140; *Sls. Mgr.:* F. L. Hill ..... **C•1095, 1098, 1102-1103; D•1103-1104**

Local Distributors
AL Huntsville, Mock Elctrns. 205-539-2401
AZ Phoenix, Dalis Elctrns. 602-275-2626
CA Buena Park, RPS, Inc. 714-521-5230
CA Canoga Pk., Sandy's Elec. Supp. 818-346-8353
CA Chatsworth, Priority I Elctrns. 818-709-5464
CA Inglewood, Newark Elctrns. Co. 213-671-7066
CA Mountain View, Abacus Elctrns. Co. 415-961-1500
CA Oakland, Brill Elctrns. 415-834-5888
CA Palo Alto, Zack Elctrns. 415-326-5432
CA Pasadena, Dow Radio 213-793-1195
CA Pasadena, Empire Elctrns. Distr. 213-681-2711
CA Riverside, Elctrn. Supp. 714-787-9220
CA San Diego, RPS Elctrns. 619-292-5611
CA San Diego, Shanks & Wright 619-239-0176
CA San Francisco, Zack Elctrns. 415-626-1444
CA San Jose, Quement Elctrns. 408-998-5900
CO Denver, Electronic Parts-Ragon 303-744-3601
CO Denver, Newark-Denver Elctrn. Supp. 303-757-3351
CT Wallingford, Sager Elec. 203-265-4600
FL Ft. Lauderdale, Powell-Florida Elctrns. 305-972-4300
FL Miami, Elctrn. Equip. 305-871-3500
GA Atlanta, Jack Spears Elctrns. 404-237-4531
IL Chicago, Newark Elctrns. Corp. 312-638-4411
IL Elgin, Allied Elctrn. Corp. 312-697-8200
IL Niles, Joseph Elctrns. 312-297-4200
IL Palatine, Ohm/Elctrns. 312-359-5500
IL Peoria, Klaus Radio 309-691-4840
IN Indianapolis, Graham Elctrn. Supp. 317-634-8202
MD Baltimore, A S I Elctrns. 301-265-5100
MD Rockville, Capitol Radio Whlsrs. 301-881-2270
MA Hingham, Sager Elec. Supp. 617-749-6700
MA Lynn, Land Elctrn. Supp. 617-592-2220
MA Needham, Cronin Elctrns. 617-449-0500
MA Norwood, Gerber Elctrns. 617-329-2400
MI Ann Arbor, Wedemeyer Elctrn. Supp. 313-665-8611
MI Livonia, RS Elctrns. 313-525-1155
MI Oak Park, Newark - Detroit Elctrns. 313-967-0600
MN St. Paul, Gopher Elctrns. Co. 612-483-3322
MO St. Louis, Olive Indl. Elctrns. 314-426-4500
NE Lincoln, Scott Elctrn. Supp. Corp. 402-466-8221
NJ Camden, General Radio Supp. 609-964-8560
NJ E. Hanover, State Elctrn. Parts Corp. 201-887-2550
NJ Kenilworth, Federated Purchaser 201-272-0505
NM Albuquerque, Elctrn. Parts Co. 505-293-6161
NY Buffalo, Summit Distrs. 716-884-3450
NY Hauppauge, Broadline Elctrn. Dist. 516-231-4100
NY Hempstead, Davis Elctrns. 516-483-9200
NY Lynbrook, Peerless Radio Dist. 516-593-2121
NY Rochester, Rochester Radio Supp. Co. 716-454-7800
NY Rochester, Simcona Elctrns. 716-328-3230
NC Raleigh, Southeastern Elctrns. 919-828-2311
OH Akron, Akron Elctrns. Supp. 216-762-8818
OH Cleveland, Pioneer/Cleveland 216-587-3600
OH Columbus, Hughes Peters Co. 614-294-5351
OH Dayton, Stotts Friedman Co. 513-298-5555
OK Tulsa, Radio, Inc. 918-587-9123
OR Beaverton, Almac Elctrns. 503-629-8090
PA Drexel Hill, Kass Elctrn. Distr. 215-449-2300
PA Philadelphia, Powell Elctrns. 215-365-1900
PA Pittsburgh, CAM/RPC 412-782-3770
TN Memphis, Bluff City Distrb. Co. 901-345-9500
TX Dallas, Harrison Equip. 214-239-2750
TX Dallas, Whls. Elctrn. Supp. 214-824-3001
TX Fort Worth, Allied Elctrns. 817-336-5401
TX Fort Worth, Whls. Elctrn. Supp. 817-336-0461
TX Garland, Newark-Dallas Elctrns. Corp. 214-494-5911
WA Seattle, Almac Elctrns. 206-643-9992
WA Seattle, Radar Electric Co. 206-282-2511
WI Milwaukee, Marsh Elctrns. 414-475-6000
EXP CA, Los Angeles, Trans-World Trade 213-476-8406

VECTROL, Division of Westinghouse Elec. Corp., 110 Douglas Rd, Oldsmar, FL 33557, Tel: 813-855-4621, Telex: 803784; Empl.: 120; *Sls. Mgr.:* G. Lierman

VECTRONICS MICROWAVE CORP., 276 Lincoln Blvd., Middlesex, NJ 08846, Tel: 201-356-2377, Telex: 833560; FSC No.: 32846; *Sls. Mgr.:* John G. Vogler

VECTRON LABS., 166 Glover Ave., Norwalk, CT 06850, Tel: 203-853-4433, TWX: 710-468-3796; FSC No.: 27802; Empl.: 325; *Sls. Mgr.:* Larry Jawitz ..... **A•1450-1454**

Local Sales Offices & Reps
AL Huntsville, Saber Assocs. 800-327-0853
AZ Glendale, Fetty/Schoenduve 602-241-9009
CA El Segundo, Fetty/Schoenduve 213-322-4991
CA Mountain View, Fetty/Schoenduve 415-962-8330
CA San Diego, Fetty/Schoenduve 619-292-5136
CO Parker, Techn. Mktg. Assocs. 303-841-3435
CT Cheshire, Meco 800-225-3409
FL Melbourne, Saber Assocs. 800-432-6288
FL Pensacola, Saber Assocs. 800-327-0853
GA Norcross, Saber Assocs. 800-327-0853
IL Bannockburn, Heth, Inc. 312-295-8440
IN Indianapolis, Ihrig Assocs. 317-783-7630
KS OLATHE, C-Tron, Inc. 913-829-0073
AR Hot Springs, Automation Supp. 501-767-5444
MA Reading, Meco 617-944-6660
MI Detroit, R. P. Urban Assocs. 313-535-2355
MI Grand Rapids, R. P. Urban Assocs. 616-245-0511
MN Burnsville, Allied Comp. Reps. 612-435-7876
KS Olathe, C-Tron 913-829-0073
NJ Woodcliff Lake, J. Freid & Assocs. 201-391-6792
NM Albuquerque, J. Smith & Assocs. 505-265-3406
NY Great Neck, F & F Metro 516-482-4080
NY Syracuse, Rep Tech 315-437-2845
NC Clayton, Saber Assocs. 800-327-0853
OH Englewood, A. Nace Co. 513-836-0931
OH Richfield, A. Nace Co. 216-659-7178
PA Allison Park, A. Nace Co. 412-487-1217
PA Newtown Sq., SWR Assocs. 215-356-8550
TX Dallas, Texas Avionics 214-363-6324
UT Salt Lake City, Techn. Mktg. Assocs. 801-483-1009
VA Springfield, Tech-Reps 703-569-6868
WA Seattle, Datacom 206-285-2525
Can Montreal, Ont., Soquelec, Ltd. 514-482-6427
Can Nepean, Que., Soquelec, Ltd. 613-226-1696

VEECO INSTRS. INC., 370 San Aleso Ave., Sunnyvale, CA 94086, Tel: 408-733-3700, TWX: 910-339-9263; Empl.: 95; *Sls. Mgr.:* T. McKee

VEECO INSTRUMENTS INC., Terminal Dr., Plainview, NY 11803, Tel: 516-349-8300; *Sls. Mgr.:* Tony Carrozzo

VEEDER-ROOT, 70 Sargeant St., Hartford, CT 06102, Tel: 203-527-7201, Telex: 9-9219; Empl.: 1200; *Sls. Mgr.:* J. R. Garrison; *Dist. Mgr.:* K. Boyle

VEETRONIX, INC., Sub. Reach Electronics, Box 480, Lexington, NE 68850, Tel: 308-324-4600; Empl.: 25; *Sls. Mgr.:* Robert M. Wallace ..... **B•1703**

Local Sales Offices & Reps
CA Arcadia, Van Gott & Assocs., Inc. 213-445-9728
CA San Jose, Ruby Sls. 408-224-0881

VEGA PRECISION LABS., 800 Follin La., Vienna, VA 22180, Tel: 703-938-6300, Telex: 89-2521; Empl.: 350; *Sls. Mgr.:* W. E. Kinsley

VELONEX, 560 Robert Ave., Santa Clara, CA 95050, Tel: 408-727-7370, Telex: 756562; Empl.: 60; *Sls. Mgr.:* Customer Service ..... **D•1324-1325, 1383**

VELONEX, 560 Robert Ave., Santa Clara, CA 95050, Tel: 408-727-7370, Telex: 756562; Empl.: 45

VEMALINE PRODS. DIV., P.O. Box 6267, Providence, RI 02940, Tel: 401-739-7600, Telex: 927573; FSC No.: 08730; Empl.: 35; *Sls. Mgr.:* Paul Vamvaketis; *Dist. Mgr.:* Paul Vamvaketis

VENABLE INDUSTRIES, INC., 3555 Lomita Blvd., Torrance, CA 90505, Tel: 213-539-2522, Telex: 752421; Empl.: 20; *Sls. Mgr.:* Wayne H. Tuttle; *Dist. Mgr.:* Shelley Scott

VENT-RAK DIV., P.O. Box 39100, Indianapolis, IN 46239-9632, Tel: 317-897-7000, Telex: 27-2169; Empl.: 61; *Sls. Mgr.:* Glenn Feest ..... **C•1064-1065**

Local Sales Offices & Reps
AZ Phoenix, Synder Eng. 602-279-2010
CA Fullerton, Groh Assocs. 714-738-7105
CA Mountain View, G. C. Woempner Co. 415-964-5454
CO Boulder, R. F. Mayo Assocs. 303-499-2155
CT North Haven, Coakley, Boyd & Abbett 203-481-2828
FL Maitland, J. Krutek & Assocs. 305-628-4837
FL North Miami, J. Krutek & Assocs. 305-941-6544
IL Glencoe, Howard Benjamin Assocs. 312-835-0150
IN Noblesville, Century Elctrns. 317-849-2026
KS Shawnee Mission, Lowell-Kangas & Assocs. 913-631-3515
MA Needham, Coakley, Boyd & Abbett 617-444-5470
MO St. Louis, Lowell-Kangas & Assocs. 314-821-4050
NH Plaistow, Coakley, Boyd & Abbett 617-444-5470
NJ Mountainside, H. G. Richter 201-233-4615
NY Fayetteville, H. G. Richter 315-637-6713
OH Cleveland, Electronic Comp., Inc. 216-261-4103
OH Miamisburg, Electronic Comp., Inc. 513-866-3340
OK Tulsa, Advance Tech. Sls. 918-664-0482
PA Doylestown, Monteiro & Assocs. 215-345-5855
TX Austin, Advance Tech. Sls. 512-440-7677
TX Dallas, Advance Tech. Sls. 214-340-1300
TX Houston, Advance Tech. Sls. 713-440-3888
WA Olympia, Bergford & Assocs. 206-866-2001
EXP IN, Indianapolis, General Devices Co. 317-897-7000

VENUS SCIENTIFIC, INC., 399 Smith St., Farmingdale, NY 11735, Tel: 516-293-4100, TWX: 510-224-6492; Empl.: 450; *Sls. Mgr.:* Mike Maletta ..... **D•1863**

Local Sales Offices & Reps
AZ Scottsdale, Venus Scientific Inc. 602-991-9684
MA Norwood, MPS Electronics Inc. 617-769-8700

VERBATIM CORP., 323 Soquel Way, Sunnyvale, CA 94086, Tel: 408-245-4400, Telex: 940-692, TWX: 910-339-9381; Empl.: 1800; *Sls. Mgr.:* S.P. Cochran; *Dist. Mgr.:* Earl Liebich

VERMONT AUTOMATION CO., INC., 18 Morse Dr., Essex Junction, VT 05452, Tel: 802-879-7571; Empl.: 7; *Sls. Mgr.:* J. Littlefield

VERMONT PRECISION RESISTOR, Codeco Corp. of Vermont, Box 1170, Stowe, VT 05672, Tel: 802-253-8567; Empl.: 8

VERMONT RESCH. CORP., Precision Pk., N. Springfield, VT 05150, Tel: 802-886-2256, TWX: 710-363-6533; Empl.: 175; *Sls. Mgr.:* Richard Simmons

VERNAY LABORATORIES, INC., S. College St., Yellow Springs, OH 45387, Tel: 513-767-7261; Empl.: 600; *Sls. Mgr.:* Alex Le Pera

VERNITECH DIVISION

VERNITECH, 300 Marcus Blvd., Deer Pk., NY 11729, Tel: 516-586-5100, TWX: 510-227-6079; FSC No.: 30223; Empl.: 300; *Sls. Mgr.:* S. Wexler ..... **A•2048-2049; B•1011, 1196-1197, 1830-1831; D•1991**

Local Sales Offices & Reps

AL	Huntsville, Remco	205-883-9260
AZ	Fountain Hills, Halbar Assocs.	602-837-2464
CA	Glendale, Halbar Assocs.	213-246-8263
CA	San Mateo, Halbar Assocs.	415-349-4700
CO	Parker, Techn. Mktg. Assocs.	303-841-3435
CT	Cheshire, Selmark Assocs.	203-272-8764
FL	Orlando, E.P.M. Corp.	305-425-6149
GA	Atlanta, Remco	404-447-6937
IL	Glencoe, Howard Benjamin Assocs.	312-835-0150
IA	Cedar Rapids, Dytronix	319-377-8275
MD	Baltimore, R.P. Luce & Co.	301-752-8200
MA	Millis, Selmark Assocs.	617-376-2914
MA	Norwell, Bordewieck Eng. Sls.	617-659-4915
MN	St. Paul, Wikeland Sls.	612-645-4747
MO	Bridgeton, Dytronix	314-731-5799
MO	Independence, Dytronix	816-373-6600
NH	Concord, Selmark Assocs.	603-623-5774
NM	Albuquerque, Technology Mktg.	505-265-5661
NY	Endicott, Tech-Mark	607-748-7473
NY	Melville, Comtronic Engrg. Sls.	516-249-0505
NY	Pittsford, Net Sls. Co.	716-467-4538
NC	Raleigh, Remco	919-847-5079
OH	Dayton, George Lessis	513-294-1551
OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Dayton, Rixan Assocs.	513-278-4216
OH	Medina, J. C. Hofstetter Co.	216-241-4880
OR	Beaverton, Halbar Assocs.	503-226-0451
PA	Philadelphia, R.P. Luce & Co.	215-884-8365
TX	Bellaire, Seaton Corp.	713-731-2649
TX	Dallas, Seaton Corp.	214-380-0414
UT	Sandy, TMA, Inc.	801-254-6410
VA	Powhatan, R.P. Luce & Co.	804-598-4804
WA	Redmond, Halbar Assocs.	206-882-0990
WA	Seattle, G.M. Gillette & Assocs.	206-284-3344
WA	Vancouver, Halbar Assocs.	206-696-0170

VERNITRON CORP., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073, Tel: 619-428-5581, TWX: 910-322-1862; FSC No.: 10112; *Sls. Mgr.:* S. J. Rado ..... **B•1199-1202**

Local Sales Offices & Reps

AZ	Fountain Hills, Halbar Assocs.	602-837-2464
CA	Glendale, Halbar Assocs.	818-246-8263
CA	Santa Clara, Comtronics	408-773-9800
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Orlando, Mackay Smith & Assocs.	305-423-4353
IL	Glencoe, Howard Benjamin Assocs.	312-835-0150
MA	Burlington, Kitchen & Kutchin	617-229-2660
MN	Minneapolis, SMC	612-545-3618
NJ	Cherry Hill, Lanson Assocs.	609-424-4670
NJ	Harrington Park, Metro Tech. Sls.	201-768-8495
NY	Fairport, NET Sls.	716-467-4538
NY	Jericho, Metro Tech. Sls.	516-935-3330
OH	Dayton, Rixan Assocs.	513-222-0011
TX	Dallas, Norcom, Inc.	214-386-4888
TX	Houston, Norcom, Inc.	713-778-0392
VA	Fredericksburg, Vernitron	703-752-4499

VERNITRON ELEC. COMPS., See Beau Prods. Div.

VERNITRON PIEZOELECTRIC DIV., 232 Forbes Rd., Bedford, OH 44146-5478, Tel: 216-232-8600, TWX: 810-427-2274; Empl.: 120; *Sls. Mgr.:* William K. Dorn ..... **A•1455**

Local Sales Offices & Reps

CA	Fullerton, GRU Assocs.	714-738-0903

VERSALOGIC, 87070 Dukhobar Rd., Eugene, OR 97402, Tel: 503-485-8575

VERTEX INDS., INC., Vertel Div., P.O. Box 1123, 23 Carol St., Clifton, NJ 07014, Tel: 201-472-1331, TWX: 710-989-7021; Empl.: 85; *Sls. Mgr.:* Ron Byer

Local Sales Offices & Reps

AL	Huntsville, Electrn. Mfgrs. Agts.	205-830-4030
CA	Santa Ana, California Elctrn. Mktg.	714-835-2702
FL	Melbourne, Reynolds & Assocs.	305-259-7000
IL	Elk GRove Village, Quad Data, Inc.	312-228-1722
KS	Shawnee Mission, Panatek	913-362-3349
NJ	Haddonfield, G.L. Williams Assocs.	609-428-6060
NY	New York, Daner Hayes, Inc.	201-889-4515
TX	Dallas, IBL Engrg. & Sls.	214-363-2921
WA	Seattle, SJI Corp.	206-763-8981
Can	Lachine, Quebec, Electrodesign Ltd.	514-636-4838

VERTOX CO., 9252 Garden Grove Blvd. #22, Garden Grove, CA 92644, Tel: 714-530-4541, Telex: 678401 TAB IRIN; FSC No.: 53688; Empl.: 12; *Sls. Mgr.:* Steve Hacker; *Dist. Mgr.:* Steve Hacker

VESTA TECHNOLOGY, INC., 7100 W. 44th Ave. Ste. 101, Wheat Ridge, CO 80033, Tel: 303-759-4988; Empl.: 10

VIABLE SYSTEMS INC., Box 438, Needham, MA 02192, Tel: 617-449-4570; Empl.: 15

VIA WEST INC., 534 N. Stone Ave., Tucson, AZ 85705, Tel: 602-623-5716, Telex: 165025; Empl.: 25; *Sls. Mgr.:* David C. Troupe

VIBRAC, 1 Columbia Dr., Amherst, NH 03031, Tel: 603-882-6777, Telex: 312698 VIBRAC; Empl.: 50; *Sls. Mgr.:* R. Searle

VIBRA-METRICS, 1014 Sherman Ave., Hamden, CT 06514, Tel: 203-288-6158, 1-800-352-2001, TWX: 710-465-0169; Empl.: 25 ..... **B•1832**

Local Sales Offices & Reps

CA	Long Beach, Saber Enterprises	213-595-5646
CA	Mountain View, Saber Enterprises	415-968-0427
CA	San Diego, Saber Enterprises	619-271-1523
CT	North Haven, International Sls.	203-288-1638
FL	Ft. Lauderdale, Elctrn. Devices & Controls	305-974-2500
IL	Chicago, Comtel-Midwest	312-539-4838
IN	Indianapolis, Comtel Corp.	317-253-1681
IA	Cedar Rapids, Comtel Corp.	319-377-9434
KS	Shawnee Mission, Comtel Corp.	913-722-1030
MI	Southfield, Comtel Instrs.	313-358-2505
MN	Wayzata, Comtel Corp.	612-476-1551
MO	St. Louis, Comtel Corp.	314-428-5508
NH	Chester, Compline	603-887-3515
NJ	Basking Ridge, Blejwas Assocs.	201-221-1440
NY	Baldwinsville, Oshex Assocs., Inc.	315-635-6027
NC	Raleigh, Lee-Carolinas	919-848-8818
OH	Cleveland, Comtel Instrs.	216-442-8080
OH	Dayton, Comtel Instrs.	513-298-7573
OH	Hilliard, Comtel Instrs.	614-876-8305
PA	Pittsburgh, Comtel Instrs.	412-922-5720
TN	Knoxville, Mace Instr. Co.	615-938-3773
TX	Houston, Techsas, Inc.	713-578-3750
UT	West American Fork, Highland Tech. Mktg.	801-756-3744
WI	New Berlin, Comtel Corp.	414-544-6042
Can	Montreal, Que., Predictive Mtce.	514-374-8720
Can	N. Vancouver, B.C., Interworld Elctrns.	604-984-4171

VIBRATION INSTRS. CO., 1614 Orangethorpe Way, Anaheim, CA 92801, Tel: 714-879-6085, Telex: 692433; FSC No.: 32102; Empl.: 21; *Sls. Mgr.:* L. Rothberg

VIBRO-METER CORP., 1 Progress Rd., Billerica, MA 01822-5058, Tel: 617-663-7600, Telex: 948145, TWX: 710-320-1872; FSC No.: 617-667-1944; Empl.: 50; *Sls. Mgr.:* Carl Nicolino

VICKERS INST., INC., Vickers Instruments, P.O. Box 99, Malden, MA 02148, Tel: 617-324-0350, Telex: 949913; Empl.: 20; *Sls. Mgr.:* Phill Truckle

VICLAN, 7373A Engineers Rd., San Diego, CA 92138, Tel: 619-292-1411, TWX: 910-335-1264; FSC No.: 51959; Empl.: 250; *Sls. Mgr.:* Bob Goodman

VICOM SYSTEMS, INC., 2520 Junction Avenue, San Jose, CA 95134, Tel: 408-946-5660, Telex: 171-603; Empl.: 85; *Sls. Mgr.:* R. P. LaJeunesse

VICON INDUSTRIES, INC., 525 Broad Hollow Rd., Melville, NY 11747, Tel: 516-293-2200, Telex: 144581; Empl.: 500; *Sls. Mgr.:* Ronald Klein

VICTOREEN, INC., Component Div., 10101 Woodland Ave., Cleveland, OH 44104, Tel: 216-795-8200, TWX: 810-421-8287 ..... **A•1968-1971**

Local Sales Offices & Reps

CA	Santa Cruz, Brenda Costa	408-438-2110
MD	Gaithersburg, Axis Elctrns.	800-368-2815
MA	Boston, Com Serve, Inc.	617-862-3080
OH	Cleveland, Pruitt Energy Sources	216-566-1545
WA	Edmonds, EDCO Sls.	206-776-8922
WA	Edmonton, Edco Sls.	206-776-8922

Local Distributors

MD	Gaithersburg, Axis Elctrns.	800-368-2815
MA	Boston, Com Serve, Inc.	617-969-4905
OH	Cleveland, Pruitt Energy Sources	216-566-1545
WA	Edmonton, Edco Sls. Inc.	206-776-8922

VICTOR ELEC. WIRE & CABLE, 618 Main St., W. Warwick, RI 02893, Tel: 401-821-1700, SALES 401-821-7800, Telex: 952122, TWX: 710-382-1534; Empl.: 900; *Sls. Mgr.:* E. M. Colasanto

VICTOR WIRE & CABLE CORP., 3601 Holdrege Ave., Los Angeles, CA 90016, Tel: 213-870-9933; Empl.: 30

VICTORY ENGRG. CORP., Victory Rd., Springfield, NJ 07081, Tel: 201-379-5900, TWX: 710-983-4430; Empl.: 300; *Sls. Mgr.:* J. Bacek

VIDAIRE ELECTRONICS MFG. CORP., P. O. Box 788, Freeport, NY 11520, Tel: 516-623-6696; Empl.: 20

VIDCO, 8323 S.W. Cirrus Drive, Beaverton, OR 97005, Tel: 503-641-1804; Empl.: 8; *Sls. Mgr.:* Bradley Cohen

VIDEO AUTOMATION SYSTEMS, Upper Shad Rd., Pound Ridge, NY 10576, Tel: 914-764-4613; Empl.: 5

VIDEO LOGIC CORP., 597 No. Mathilda Ave., Sunnyvale, CA 94086, Tel: 408-245-8622, Telex: 35-7400

VIDEO MONITORS, INC., 3833 N. White Ave., Eau Claire, WI 54703, Tel: 715-834-7785; *Sls. Mgr.:* J. Carpentier

VIDEX INC., 1105 NW Circle Blvd., Corvallis, OR 97330, Tel: 503-758-0521, Telex: 469570

VIKING CASES, 10480 Oak St. N.E., St. Petersburg, FL 33702, Tel: 813-577-1216; *Sls. Mgr.:* Robert D. Stemler

VIKING CONNECTORS, 21001 Nordhoff St., P.O. Box 2379, Chatsworth, CA 91311, Tel: 818-341-4330, TWX: 910-494-2094; FSC No.: 05574; Empl.: 500; *Sls. Mgr.:* Bob Ploudre

VIKING ELECTRONICS, Industrial St., Hudson, WI 54016, Tel: 715-386-8861; Empl.: 24; *Sls. Mgr.:* Bill Wiese

Viking Labs/Honeywell

VIKING LABS/HONEYWELL, Operation of Test Instruments Div. of Honeywell, Inc., 440 Bernardo Ave., Mountain View, CA 94043, Tel: 415-969-5500, TWX: 910-379-6555; Empl.: 140; *Sls. Mgr.:* Jack Eagan, Prod. Reliability; *Dist. Mgr.:* M. J. Marchman, Comp. Test ..... **B•1013; D•1327**

Local Sales Offices & Reps

CA	Irvine, Centaur Corp.	714-556-5420
FL	Orlando, Donato & Assocs.	
FL	Palm harbor, Donato & Assocs.	
FL	Tampa, Donato & Assocs.	
MD	Baltimore, Stemler Assocs.	301-944-8262

VILLARREAL ELECTRONICS, Box 43A, RD 2, South Rd., Millbrook, NY 12545, Tel: 914-677-3447

V.I.P. INDS., INC., 246 Knickerbocker Ave., Paterson, NJ 07503, Tel: 201-345-5800; Empl.: 30; *Sls. Mgr.:* John M. Sonatore

VIRGINIA PANEL, 1400 New Hope Rd., Waynesboro, VA 22980, Tel: 703-949-8376, TWX: 710-839-0406; Empl.: 225; *Sls. Mgr.:* Jeff Stowers

VIRGINIA PLASTICS CO., P.O. Box 4577, Roanoke, VA 24015-0577, Tel: 703-985-3811, TWX: 710-870-0440; FSC No.: 59608; Empl.: 120; *Sls. Mgr.:* Charles Bogese; *Dist. Mgr.:* Carl Bump ..... **C•1567-1569, 1909-1911**

Local Sales Offices & Reps

AZ	Tempe, General Comps. Grp.	602-829-8124
CA	Granada Hills, C&W Comps.	213-368-4032
CA	San Jose, Pitts Sls. Assocs.	408-252-6177
CO	Parker, Mikro Sls. Co.	303-841-4131
CT	Middletown, Gerber Sls.	204-346-3000
FL	Altamonte Springs, APM Assocs.	305-869-6831
FL	Ft. Lauderdale, APM Assocs.	305-565-0056
FL	Merritt Island, APM Assocs.	305-453-4322
FL	Tampa, APM Assocs.	813-886-2457
GA	Stone Mountain, H & H Mktg.	404-296-9830
IL	Palatine, Claeson Assocs.	312-359-7230
MD	Silver Spring, Carwithen Assocs.	301-589-9040
MA	Monson, Gerber Sls.	413-267-5051
MA	Waltham, Gerber Sls.	617-890-3334
MN	Minneapolis, Northstar Comps.	612-553-1888
NJ	Haworth, Kay Sls.	201-384-3261
NY	Syracuse, Canavan-Scanlon Assocs.	315-437-1271
OH	Worthington, Roc Assocs., Inc.	614-885-1057
PA	Southampton, Campbell Assocs.	215-322-6630
TX	Dallas, MGR Elctrns., Inc.	214-238-5246
TX	El Paso, El Paso Elctrn. Comps.	919-593-8481
TX	Houston, AID Elctrns.	713-955-6204

Local Distributors

MN	Minneapolis, K & H Elctrn. Distrbg.	800-328-8515

VIRTIS CO., Rte. 208, Gardiner, NY 12525, Tel: 914-255-5000, Telex: 926474; Empl.: 92; *Sls. Mgr.:* J. D. Schmidt

VISHAY

...to be precise ®

VISHAY RESISTIVE SYS. GRP., 63 Lincoln Hwy., Malvern, PA 19355, Tel: 215-644-1300, TWX: 510-668-8944; Empl.: 500; *Dist. Mgr.:* Iris Demeritt ..... **A•1972-1985, 2051-2053**

Local Sales Offices & Reps

AL	Huntsville, REMCO	205-533-3763
AZ	Phoenix, Howe & Howe	602-264-7971
CA	Cupertino, Vishay Resistive Sys. Grp.	408-730-1292
CA	Fullerton, Vishay Resistive Sys. Grp.	714-738-1581
CO	Englewood, Comps. Sls. Inc.	303-779-8060
CT	Wallingford, Comp Rep Assocs.	203-269-1145
FL	Altamonte Springs, Semtronic Assocs.	305-831-8233
FL	Clearwater, Semtronic Assocs.	813-461-4675
FL	Ft. Lauderdale, Semtronic Assocs.	305-731-2484
GA	Atlanta, REMCO	404-447-6937
ID	Boise, N. R. Schultz Co.	208-377-8686
IL	Rolling Meadows, Eagle Tech. Sls.	312-991-0700
IN	Carmel, Shamrock Elctrn. Sls.	317-848-5265
KS	Shawnee Misson, Technical Sls. Assocs.	913-888-3330
MD	Lutherville, J. A. Dougherty Sls. Co.	301-321-7890
MA	Westwood, Comp Rep Assocs.	617-329-3454
MI	Bloomfield Hills, Enco Mktg.	313-642-0203
MN	St. Paul, Proud Inds.	612-646-9428
MO	Ferguson, Technical Sls. Assocs.	314-725-5361
NJ	Flanders, K & R Engrg. Sls. Co.	201-584-5235
NM	Albuquerque, Compass Mktg. & Sls.	505-888-0800
NY	E. Syracuse, L-Mar Assocs.	315-437-7779
NY	Rochester, L-Mar Assocs.	716-323-1000
NC	Raleigh, REMCO	919-847-5079
OH	Aurora, EMA, Inc.	216-562-6104
OH	Centerville, EMA, Inc.	513-433-2800
OR	Beaverton, N. R. Schultz Co.	503-643-1644
PA	Malvern, Vishay Resistive Sys. Grp.	215-644-1300
TX	Houston, Vishay Resistive Sys. Grp.	713-550-0568
UT	Salt Lake City, Component Sls., Inc.	801-268-8440
WA	Bellevue, N. R. Schultz Co.	206-454-0300
WI	Brookfield, Oasis Sls. Corp.	414-782-6660
EXP	Mayaguez, Comp Rep Assocs.	809-832-9529

Local Distributors

AZ	Phoenix, TTI, Inc.	602-966-1616
AZ	Tempe, Bell Inds.	602-966-7800
AZ	Tempe, Shelley Elctrns.	602-894-2058
CA	Chatsworth, Passive Comps., Inc.	818-341-1745
CA	Chatsworth, Shelley Elctrns., Inc.	213-998-3333
CA	Irvine, Hi-Rel Elctrns.	714-768-6656
CA	Los Alamitos, Semi-Dice, Inc.	213-594-4631
CA	San Diego, Shelley Elctrns., Inc.	619-453-7133
CA	San Fernando, Petel Elctrns., Inc.	818-365-9841
CA	San Jose, Shelley Elctrns., Inc.	408-942-9111
CA	San Jose, TTI, Inc.	408-943-9155
CA	Santa Clara, Semi-Dice, Inc.	408-980-9777
CO	Boulder, Shelley Elctrns., Inc.	303-442-2718
FL	Orlando, TTI, Inc.	305-859-1000
FL	Tampa, Impala Elctrns., Inc.	813-885-4747, 800-237-7777
FL	Tampa, Shelley Elctrns.	813-884-0946
GA	Norcross, TTI, Inc.	404-662-0911
ID	Spirit Lake, A-I Elctrns.	208-623-3111
IL	Palatine, Ohm Elctrns.	312-359-5500
MD	Beltsville, RESCO/Washington	301-937-9100
MD	Whitemarsh, RESCO/Baltimore	301-529-0500, 800-638-1242
MA	Canton, Semi-Dice, Inc.	617-821-0070
MA	Framingham, Cavalier Comps., Inc.	617-875-2000
MA	Woburn, TTI, Inc.	617-938-8800
NJ	Fairfield, CHPS, Inc.	201-882-0997
NJ	Flanders, VKR Svcs., Inc.	201-584-5235, 800-631-9362
NY	Bohemia, Justin Elctrns., Inc.	516-589-4000
NY	Bohemia, Shelley Elctrns.	516-567-7751
NY	Bohemia, TTI, Inc.	516-567-1500
NY	Farmingdale, Command Elctrns. Corp.	516-293-1212
NY	Hauppauge, Mast Distrs., Inc.	516-273-4422
OH	Cleveland, Specialized & Comps. Sls.	216-464-0404
OH	Dayton, Micro Mil Div.	513-434-8231
PA	Royersford, Hybrid Service Lab	215-948-6880
TX	Carrollton, Ohm Elctrns.	214-620-2230
TX	Fort Worth, TTI, Inc.	817-831-0441
TX	Houston, Texas Comp., Inc.	713-468-3882
WA	Kirkland, Priebe Elctrns.	206-821-4695

VISHAY-MANN SYSTEM, See Vishay Resistive Systems Group

VISHAY ANGSTROHM, 1 Precision Pl., Hagerstown, MD 21740, Tel: 301-739-8722, TWX: 710-853-6834; FSC No.: 17745; Empl.: 250; *Sls. Mgr.:* John Kinnaw; *Dist. Mgr.:* Jeff Reed

VISIONARY ELECTRONICS, 141 Parker Avenue, San Francisco, CA 94118, Tel: 415-751-8811

VISION ENGRG., INC., 570 Danbury Rd., New Milford, CT 06776, Tel: 203-355-3776, Telex: 643769; Empl.: 15; *Sls. Mgr.:* S. Phillips

VISTAR CORP., 13740 McCormick Dr., Tampa, FL 33625, Tel: 813-855-6611, Telex: 522434; Empl.: 20; *Sls. Mgr.:* Ron Rooks

VISUAL COMMUNICATIONS CO., INC., P.O. Box 986, El Segundo, CA 90245, Tel: 213-822-4727; Empl.: 9; *Sls. Mgr.:* J. Savage ..... **B•1113-1115**

Local Sales Offices & Reps

AL	Huntsville, Remco	205-553-3763
AZ	Phoenix, Bob Anderson Co.	602-266-2070
CA	Mountain View, Westech Sls.	415-961-1422
CA	San Diego, Harvey King, Inc.	619-566-5252
CA	Torrance, Assoc Reps.	213-328-6708
FL	Boca Raton, Beacon Elctrns.	305-392-3500
GA	Atlanta, Remco	404-447-6937
IL	Elmhurst, Utronix Sls.	312-834-1100
MA	Sharon, Adcour	617-784-8123
MI	Jenison, R. C. Nordstrom & Co.	616-457-5762
MI	Lathrup Village, R. C. Nordstrom & Co.	313-559-7373
MN	Eden Prairie, Bohlig & Assocs.	612-944-8404
NY	New York, Robert Smith Assocs.	212-541-4885
NY	Plainview, Robert Smith Assocs.	516-681-3155
NC	Raleigh, Remco	919-847-5079
OH	Worthington, Dynel Co.	513-434-6467
OK	Tulsa, J. B. Guenther	918-587-3801
OR	Portland, Electronic Mktg. Grp.	206-882-0962
PA	Penndel, Rayco Sls.	215-757-1899
TX	Austin, J. B. Guenther	512-472-3825
TX	Dallas, J. B. Guenther	214-691-8500
TX	Houston, J. B. Guenther	713-974-0383
VA	Fairfax, Beacon No.	703-591-1300
VA	Forest, Beacon North	804-239-8486
WA	Redmond, Elctrn. Mktg. Grp.	206-882-0962
EXP	CT, Litchfield, Intrade	203-567-5901

Local Distributors

AL	Huntsville, Component Distr.	205-883-7501
AZ	Tempe, Anjon Entprs.	602-894-1332
AR	Little Rock, Component Distr.	501-227-6278
CA	Costa Mesa, Orange County Comps.	714-979-3597
CA	Los Angeles, Electric Switch	213-660-1310
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Torrance, WBC Electro Supp.	213-328-6871
CO	Englewood, Industrial Elctrns. Inc.	303-694-9444
FL	Ft. Lauderdale, Component Distr.	305-971-4950
GA	Norcross, Component Distrs.	404-441-3320
MA	Lynn, Land Elctrn. Supp.	617-592-2220
MI	Grand Rapids, S. F. Elctrns. Supp.	616-459-0216
MN	New Brighton, Chris Elctrn. Distr.	612-631-2647
NJ	Bellmawr, Midatlantic Elctrns.	609-931-5303
NY	Elmsford, Ancar Elctrn. Supp.	914-592-7100
NY	Plainview, Plainview Elctrns.	516-249-6677
NC	Raleigh, Component Distr.	919-834-9465
OH	Aurora, IPD	216-562-8113
OH	Centerville, IPD	513-435-2086
TX	Houston, Force Elctrns.	713-772-8483
TX	Irving, Force Elctrns.	214-438-5700
VA	Falls Church, Component Distr.	703-241-8227
WA	Redmond, Paccom	206-883-9200
EXP	CT, Litchfield, Intrade	203-567-5901

VISUAL INFO. INSTITUTE, Box 33, Xenia, OH 45385, Tel: 513-376-4361, Telex: 501031 VIS INFO INST; FSC No.: 27432; Empl.: 45

Local Sales Offices & Reps

CA	San Diego, DRF Assocs.	619-292-9431
CA	San Diego, Perspective Meas.	619-259-8000
CA	San Jose, Fox Marketing	408-984-2221
CO	Bailey, Scientific Sys.	303-838-4615
MA	Clemsford, Meritron Corp.	617-250-1774
NC	High Point, EME, Inc.	919-869-3335
VA	Williamsburg, EME IV, Inc.	804-253-0171

VITEK ELCTRNS., 4 Gladys Ct., Edison, NJ 08817, Tel: 201-287-3200; *Sls. Mgr.:* Joe Griffin

VITRAMON N.A., P. O. Box 544, Bridgeport, CT 06601, Tel: 203-268-6261, TWX: 710-450-3640; Empl.: 606; *Sls. Mgr.:* Paul Davis; *Dist. Mgr.:* S. Judt

VIZ TEST EQUIPMENT, Div. VIZ Mfg., 335 E. Price St., Philadelphia, PA 19144, Tel: 215-844-2626, TWX: 710-670-2626; Empl.: 430 ..... **D•1864**

Local Sales Offices & Reps

CA	Laguna Hills, English/Damco Sls. Assocs.	714-837-3801
CA	Sunnyvale, W. W. Posey	408-746-0771
CO	Denver, Mountain Reps.	303-623-0972
FL	Ft. Lauderdale, Unirep, Inc.	305-587-7481
GA	Roswell, Henry W. Phillips Co.	404-992-3070

VIZ

Counters Power Supplies and VOM's

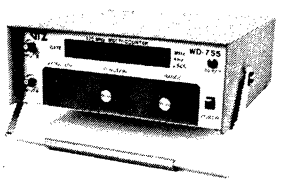
Authorized Distributors

R A G ELECTRONICS, INC.

New and Used Electronic Test Equipment
Sales • Service • Rental • Leasing

21418 Parthenia St., Canoga Park, CA 91304 • (818) 998-6500

CALL US TOLL FREE
1-800-732-3457
IN CALIFORNIA TOLL FREE
1-800-272-4225



Model WD-755

IL Park Ridge, Bob Burns & Assocs. 312-775-1233
IN Zionsville, Midwest Reps. & Assocs. .. 317-844-4555
MD Monrovia, K & D Sls. 301-865-5262
MA Milford, Jonel Sls. 617-478-4650
MI Ferndale, Hilltronics 313-398-5556
MN White Bear Lake, Yore Co. 612-770-9760
MO Raytown, Marty Taraski Sls. Co. 816-358-1442
NJ Fort Lee, TMC Sls. Corp. 201-944-8340
NY Grand Island, L. J. McTaggart Assocs. 716-773-9222
OH Cincinnati, John O. Olson Co. 513-574-7711
OR Portland, Joseph V. Belusko 503-222-4279
PA Phildelphia, Instrumentation Spec. 215-742-0898
PA Pittsburgh, John O. Olson Co. 412-341-8391
TX Dallas, Crockett Sls. Co. 214-350-3377

VL ELECTRONICS, 2775 Glendower Ave., Los Angeles, CA 90027, Tel: 213-661-8883, Telex: 821554; FSC No.: 95-3896380; Empl.: 6; *Sls. Mgr.:* Christopher Sieh; *Dist. Mgr.:* Christopher Sieh ..... **B•1117**

Local Sales Offices & Reps
CA Los Angeles, KT Elctrns. 714-432-8465
CO Denver, Andale 303-693-4331
MA Framington, Bay Colony Reps 617-620-0607

VLSI TECHNOLOGY, INC., 1101 McKay Dr., San Jose, CA 95131, Tel: 408-942-1810, Telex: 278807; Empl.: 450; *Sls. Mgr.:* Ronald C. Kasper

VOICE IDENTIFICATION, Box 714, Somerville, NJ 08876, Tel: 201-526-3408; Empl.: 7

VOICE MACHINE COMMS., INC., KTI, 1000 S. Grand Ave., Santa Ana, CA 92705, Tel: 714-541-0454; *Sls. Mgr.:* Rod Runge; *Dist. Mgr.:* Rod Runge

VOLITION SYSTEMS, P.O. Box 99628, San Diego, CA 92109, Tel: 619-270-6800, Telex: 695241 COMEX SDG; Empl.: 7

VOLTAGE MULTIPLIERS, INC., 8711 W. Roosevelt Ave., Visalia, CA 93291, Tel: 209-651-1402, Telex: 530484; FSC No.: 60211; Empl.: 70; *Sls. Mgr.:* Ken Haag ..... **A•2097**

VOLTAMPERE CORP., 146 Horton Ave., Lynbrook, NY 11563, Tel: 516-887-9443; FSC No.: 64196; Empl.: 30; *Sls. Mgr.:* Jesse Stitzer

VOLTARC TUBES, 176 Linwood Ave., Fairfield, CT 06430, Tel: 203-255-2633, Telex: 96-4337; Empl.: 180; *Sls. Mgr.:* Albert H. Katz

VOLTEX, 3460 Great Neck Rd., Amityville, NY 11701, Tel: 516-842-2772; Empl.: 55; *Sls. Mgr.:* S. Vogel ... **D•1865**

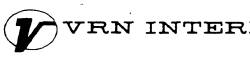
Local Sales Offices & Reps
NJ Oxford, Malin Assocs. 201-689-7398

VOLTRONICS, West St., P.O. Box 476, E. Hanover, NJ 07936, Tel: 201-887-1517, TWX: 710-986-8253; FSC No.: 18736;Multiple; Empl.: 70; *Sls. Mgr.:* Richard J. Newman

Local Sales Offices & Reps
AL Huntsville, Beacon Elctrns. 205-881-5031
AZ Glendale, Fetty/Schoenduve, Inc. 602-241-9009
AR Little Rock, Beacon Elctrns. 501-224-5449
CA El Segundo, Fetty/Schoenduve, Inc. .. 213-322-4991
CA Mountain View, Fetty/Schoenduve, Inc. 415-962-8330
CA San Diego, Fetty/Schoenduve, Inc. ... 619-292-5136
CO Boulder, Herb Bass Assocs. 303-530-7509
FL Boca Raton, Beacon Elctrns. 305-392-3500
FL Clearwater, Beacon Elctrns. 813-796-2378
FL Maitland, Beacon Elctrns. 305-647-3498
FL Melbourne, Beacon Elctrns. 305-724-8010
GA Atlanta, Beacon Elctrns. 404-256-9640
IL Palatine, R-Tek Central 312-991-4404
IA Cedar Rapids, Howard R. Brown Sls. 319-366-0635
KS Parker, S. W. Wollard Co. 913-898-6552
MD Mt. Airy, Beacon North 703-591-1300
MD Randallstown, Beacon North 703-591-1300
MA Malden, JK Assocs. 617-321-2922
MN St. Paul, Countryman Assocs. 612-645-9151
MO St. Louis, Harold Abrams & Assocs. ... 314-569-0447
NY Melville, RF Elctrn. Sls. Grp. 516-420-8890
NY Utica, B. D. Hummel Co. 315-736-7821
NC Raleigh, Beacon Elctrns. 919-787-0330
OH Chesterland, K-T/DEPCO 216-729-3588
PA Newton Square, SWR Assocs. 215-353-6711
PA Pittsburgh, K-T/DEPCO 412-367-1011
TX Dallas, Talo Prod. Inc. 214-644-6010
UT Bountiful, Herb Bass Assocs. 801-292-8991
VA Fairfax, Beacon North 703-591-1300
VA Forest, Beacon North 804-239-8486

VOTAN, 4487 Technology Dr., Fremont, CA 94538, Tel: 415-490-7600; *Sls. Mgr.:* Robert Russo

VOYAGER TECHNOLOGIES, INC., 2250 Cabot Blvd. W. Bldg. 40M, Langhorne, PA 19047, Tel: 215-750-0270; Empl.: 15; *Sls. Mgr.:* Roger J. Peirce



VRN INTERNATIONAL, Div. Vernitron, 2801 72nd St. N., Box 44000, St. Petersburg, FL 33743, Tel: 813-347-2181, Telex: 6815306, TWX: 310-681-5306; FSC No.: 84048; Empl.: 500; *Sls. Mgr.:* R. Fielder; *Dist. Mgr.:* R. Fielder ..... **A•2054-2055; D•1056**

Local Sales Offices & Reps
AZ Tempe, System Sls. of Az. 602-829-9338
CA Alhambra, MW Riedel & Co. 213-283-7694
CA Campbell, Kottmeier Assocs. 408-371-8700
CA San Diego, M.W. Riedel & Co. 619-272-2359
CO Englewood, Omega, Ltd. 303-762-1921
CT Stratford, Gerald Rosen Co. 203-375-5456
FL Boca Raton, Lawrence Assocs. 305-368-7373
FL Clearwater, Lawrence Assocs. 813-584-8110
IL Downers Grove, Circuit Sls. 312-833-2242
IN Fort Wayne, Ro Whitesell & Assocs. .. 219-432-5591
IN Indianpolis, Ro Whitesell & Assocs. ... 317-359-9283
IN Kokomo, Ro Whitesell & Assocs. 317-457-9127
KS Merriam, MTS 913-236-8557
KY Louisville, Ro Whitesell & Assocs. 502-426-7696
MA Framingham, Gerald Rosen Co. 617-879-5505
MI Grand Rapids, Ro Whitesell & Assocs. 616-942-5420
MI Southfield, Ro Whitesell & Assocs. 313-559-5454
MI St. Joseph, Ro Whitesell & Assocs. ... 616-983-7337
MN Minneapolis, PSI 612-944-8545
NM Albuquerque, Sys. Sls. of Alb. 505-881-8877
NY Buffalo, Quality Comps. 716-837-5430
NY Great Neck, Mos Assocs. 516-487-3966
NY Manlius, Quality Comps. 315-682-8885
OH Cincinnati, Ro Whitesell & Assocs. 513-521-2290
OH Cleveland, Ro Whitesell & Assocs. 216-447-9020
OH Columbus, Ro Whitesell & Assocs. 614-888-9396
OH Dayton, Ro Whitesell & Assocs. 513-298-9546
OK Broken Arrow, Genzel Sls. 918-258-8656
PA Broomall, LD Lowery 215-528-5170
PA Hummelstown, LD Lowery 717-533-7095
PA Pittsburg, Ro Whitesell & Assocs. 412-963-6161
TX Dallas, TL Mktg. 214-357-1752
UT Salt Lake City, Omega, Ltd. 801-277-8061
VA Charlottesville, LD Lowery 804-973-6672
Can Rexdale, Ont., Source Elec., Ltd. 613-592-5392

Local Distributors
AR Little Rock, Carlton-Bates 501-562-9100
CA Gardena, Bell Inds. 213-515-1800
CA Manhattan Beach, Prime Electro Prods. 213-772-1724
CA San Fernando, Petell Elec. 213-365-9841
CA San Jose, Cypress Elctrns. 408-945-8400
CA San Jose, Future 408-945-9100
CA Sunnyvale, Bell Inds. 408-734-8570
CA Thousand Oaks, Bell Inds. 818-340-1940
CO Denver, Denver-Wintronics 303-431-7161
CO West Minster, Future 303-650-0123
CT Danbury, Future 203-743-9594
CT Norwalk, Cobra Comps. 203-847-6442
CT Wallingford, Sager Elctrl. Supp. 203-265-4600
FL Clearwater, Future 813-441-4771
FL Ft. Lauderdale, Dielco 305-973-8700
FL Ft. Lauderdale, NRC Elctrns. 305-772-4500
FL Orlando, TTI Inc. 305-849-1000
FL Tampa, Impala Elctrns. 813-885-4747
GA Norcross, TTI 404-662-0911
IL Addison, Lectro Comps. 312-543-1680
IL Northbrook, Classic 312-272-9650
IN Indianapolis, Classic 317-872-4777
IA Cedar Rapids, Deeco 319-365-7551
ME Woburn, TTI Inc. 617-938-8800
MD Columbia, Future 301-995-1222
MD Rockville, M S Elctrns. 301-340-6400
MA Framingham, NOW 617-872-5876
MA Hingham, Sager Elctrl. Supp. 617-749-6700
MA Westboro, Future 617-366-2400
MI Farmington Hills, Advent Elctrns. 313-477-1650
MN Minneapolis, Aero-Space 612-884-4725
MN Minneapolis, Merit Elctrns. 612-546-5383
MO St. Louis, Olive 314-426-4500
NJ Berlin, GCI 609-768-6767
NJ East Hanover, State Elctrns. 201-887-2550
NJ Mt. Laurel, Future 609-778-7600
NJ New Brunswick, Brothers Elctrns. 201-238-2200
NJ Whippany, Tonar Ind. 201-884-1400
NM Albuquerque, Sterling 505-884-1900
NY Bohemia, TTI Inc 516-567-1500
NY E. Syracuse, Add Elctrns. Corp. 315-437-0300
NY Farmingdale, Command Elctrns. Corp. 516-293-1212
NY Farmingdale, Pride Elctrns. 516-293-4020
NY Hauppauge, Fairmont Elec. Sls. 516-231-3313
NY Hauppauge, Jaco Elctrns. 516-273-5500
NY Huntington Station, Sherburn Elctrns. 516-231-4300
NY Liverpool, Future 315-451-2371
NY Rochester, Rochester Radio Supp. 716-454-7800
NY Valley Stream, L & S Elctrns. 516-561-2474
NC Charlotte, Elctrns. Mktg. 704-394-6195
NC Raleigh, Southeastern 919-828-2311
OH Columbus, Elctrns. Mktg. 614-299-4161
OH Dayton, Bell Micro-Mil 513-434-8231
OK Tulsa, Radio 918-587-9123
PA Philadelphia, Philadelphia Elctrns. 215-568-7400
PA Philadelphia, TRW Elctrn. Supp. 215-923-8230
PA Reading, Barbey 215-376-7451
TX Ft. Worth, TTI Inc. 817-831-0441
TX Houston, Sterling 713-627-9800
TX Richardson, Altair 214-231-5166
UT Salt Lake City, Bell 801-972-6969
UT Salt Lake City, Future 801-972-8489
VA Charlottesville, Virginia Radio 804-296-4184
WA Bellevue, Future 206-881-8199
WA Seattle, Robert E. Priebe Co. 206-682-8242
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI New Berlin, Classic 414-786-5300

VTM MICROWAVES, INC., 4975 W. 80 Ave., Westminster, CO 80030, Tel: 303-426-6866; Empl.: 15

V-TRON ELCTRNS. CORP., 10 Venus Way, P.O. Box 297-S, S. Attleboro, MA 02703, Tel: 617-761-9100; Empl.: 250; *Sls. Mgr.:* Richard E. French

Local Sales Offices & Reps
CA Cerritos, Don Lumpkin & Assocs. 213-402-4589
CT Wallingford, Com-Sale 203-269-7964
FL Juniter, Southern Elctrns. Sls. Corp. ... 305-744-0028
MA Waltham, Com-Sale 617-890-0011
NH Manchester, Com-Sale 603-668-1440
NJ Haworth, Kay Sls. Assocs. 201-384-3261
TX Fort Worth, Diversified Comps. 817-249-5818
VA Portsmouth, FDB Sls. Corp. 804-484-3162

VU-DATA, 7122 Convoy Ct., San Diego, CA 92111, Tel: 619-279-6572, TWX: 910-335-1586; FSC No.: 34160; Empl.: 15

WABASH ELECTRICAL COMPONENTS GROUP, A Kearney-National Co., 1375 Swan Street, Huntington, IN 46750, Tel: 219-356-8300, TWX: 810-333-1533; Empl.: 1000

WABASH RELAY & ELCTRNS., First & Webster Sts., Wabash, IN 46992, Tel: 219-563-2191, TWX: 810-290-2722; Empl.: 250; *Sls. Mgr.:* David L. Snodgrass ..... **B•1460-1461**

Local Sales Offices & Reps
Midtec Assocs., Ltd.
AL Huntsville, Hughes Assocs., Inc. 205-533-9108
AZ Fountain Hills, Halbar Assocs., INc. ... 602-837-2464
CA Glendale, Halbar 818-246-8263
CA San Mateo, Halbar 415-349-4700
CO Aurora, Mountain View Mktg. 303-699-1665
DE Medford, Comp. Conslt. 609-654-5300
FL Altamonte Springs, APM Assocs. 305-869-6831
FL Ft. Lauderdale, APM Assocs. 305-565-0056
FL Tampa, APM Assocs. 813-886-2457
GA Huntsville, Hughes Assocs., Inc. 205-533-9108
ID Redmond, Halbar Assocs., Inc. 206-882-0990
IL Arlington Hgts., M. J. Petersen Assocs. 312-577-8200
IN Fort Wayne, M/S Sls. 219-436-3023
KS De Soto, Midtec Assoc. 913-441-6565
MD Glen Burnie, Macrotech Assocs., Ltd. 301-437-5588
MA Andover, Crawford Assocs. 617-470-2122
MI Novi, Lektronics 313-349-3304
MN Edina, PWC, Inc. 612-831-5999
MS Huntsville, Hughes Assocs., Inc. 205-533-9108
MO Florissant, Midtec Assocs. 314-837-5200
NV San Mateo, Halbar Assocs., INc. 415-349-4700
NJ Watchung, Dolan Assocs. 201-753-2671
NM Fountain Hills, Halbar Assocs., Inc. 602-837-2464

NY Penfield, Upstate Comp. Sls. 716-381-6070
NC Raleigh, Tingen Tech. Sls. 919-781-1100
OH Dayton, KW Elctrn. Sls. 513-890-2150
OH Shaker Heights, KW Elctrn. Sls. 216-491-9177
OH Worthington, KW Elctrn. Sls. 614-888-0483
OR Vancouver, Halbar Assocs., Inc. 206-696-0170
PA Medford, Comp. Consits. 609-654-5300
TX Dallas, Stevens Sls. Co. 214-350-2476
VA Glen Burnie, Macrotech Assocs., Ltd. 301-437-5588
WA Redmond, Halbar Assocs., Inc. 206-882-0990
WA Vancouver, Halbar Assocs., Inc. 206-696-0170

Local Distributors

CA Fullerton, Pyramid Elctrn. Supp. 714-773-0781
CA Santa Clara, Pyramid Elctrn. Supp. 408-727-9810
CT Wallingford, Cronin Elctrns., Inc. 203-265-3134
FL Palm Bay, Action Elctrns., Inc. 305-725-4920
IL Elk Grove Village, Nu-Way Elctrn. Distrs. 800-323-7957
MA Needham, Cronin Elctrns., Inc. 617-449-5000
NH Salem, Cronin Elctrns., Inc. 603-898-4440
WA Kent, Pyramid Elctrn. Supp., Inc. 206-872-5800

WABER ELECTRIC, See SL Waber Electric.

THE WADSWORTH ELEC. MFG. CO., INC., 20 W. 11th St., Covington, KY 41012, Tel: 606-431-0900; *Sls. Mgr.:* D. W. Phillips

WAGNER ELECTRIC CORP., Tung-Sol Div., 100 Misty Lane, Parsippany, NJ 07054, Tel: 201-386-9300

WAGO CORP., 6657 N. Sidney Pl., Milwaukee, WI 53209-3217, Tel: 414-352-1035, Telex: 260123; *Sls. Mgr.:* Michael A. Lane

WAHL INSTRUMENTS, INC., 5750 Hannum Ave., Culver City, CA 90230, Tel: 213-822-6144, TWX: 910-343-6867; Empl.: 48

WALDES KOHINOOR, 47-16 Austel Pl., Long Island City, NY 11101-4478, Tel: 718-392-3100, Telex: 126-829; Empl.: 450

WALDOM ELCTRNS., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629, Tel: 312-585-1212, Telex: 25-4604; FSC No.: 92219; Empl.: 143; *Sls. Mgr.:* E. R. Beutler

WALKER SCIENTIFIC, Rockdale St., Worcester, MA 01606, Tel: 617-852-3674, Telex: 92-0489; Empl.: 83; *Sls. Mgr.:* B. Langley

WALL, A. T., CO., 55 Service Ave., Warwick, RI 02886, Tel: 401-739-0740, TWX: 710-382-1535; Empl.: 75; *Sls. Mgr.:* Carl Gibbs; *Dist. Mgr.:* R. Huntsman

WALL-ABLE MANUFACTURING CORP., 1800 N. Clybourn Ave., Chicago, IL 60614, Tel: 312-440-1000, Telex: 312288; Empl.: 150; *Sls. Mgr.:* Dennis O'Brien ..... **C•1570-1571**

Local Sales Offices & Reps

IL Wheeling, AL&W Sls. Co. 312-541-9080
NY Dobbs Ferry, L. J. Valle, Inc. 914-693-5089

WALL INDS., 2 Franklin, Lawrence, MA 01840, Tel: 617-688-1287; Empl.: 55; *Sls. Mgr.:* Mark P. Aiello

WALL LENK, Box 3349, Dept. EEM-71, Kinston, NC 28501, Tel: 919-527-4186; Empl.: 60; *Sls. Mgr.:* Richard W. Cooper

WALMOR DATA SYSTEMS, INC., 300 E. Irving Park Rd., Wood Dale, IL 60190, Tel: 312-350-0625; Empl.: 10; *Sls. Mgr.:* Wayne D. Pickette

WAMCO, INC., 11555-A Coley River Cir., Fountain Valley, CA 92708, Tel: 714-545-5560, Telex: 678-459; *Sls. Mgr.:* Gordon R. Calvert; *Dist. Mgr.:* Sheila A. Sherman

WARD LEONARD ELEC., 31 South St., Mt. Vernon, NY 10550, Tel: 914-664-1000, TWX: 710-562-0144; FSC No.: 63743;15109; Empl.: 450; *Dist. Mgr.:* Barry Daly ..... **A•1986-1987**

Local Sales Offices & Reps

KY Louisville, Goldschmidt Elec. Sls. 502-241-0303
MD Glen Burnie, Faion Lott & Co. 301-744-4611
MA Framingham, KSA of New England ... 617-235-8940
MN Edina, Hallock Co. 612-835-7100
NY Buffalo, Rudell-Merrifield Assoc. 716-634-4300
OH Cincinnati, Goldschmidt Elec. Sls 513-641-1708
OH Painesville, Ward Leonard 216-951-2262
OH Westlake, Assoc. Elec. Comps. 216-835-9960
OK Tulsa, Hammond Elec. 918-582-4104
OK Tulsa, Mac's Elec. 918-583-3101
OR Beaverton, Steve Bryan & Assoc. 503-644-5729
PA Harrison City, Rudell-Merrifield Assoc. 412-327-0858
PA Philadelphia, S. K. MacDonald 215-545-1205
TX Dallas, Ward Leonard 214-458-8511
WA Federal Way, Ward Leonard 206-941-8888
WA Spokane, K & N Elec. Motors 509-328-3260
WI Appleton, Langstadt 414-733-3791

Local Distributors

CA Emeryville, Beck Elec. Supp. 415-652-5665
CA Sunnyvale, Independent Elec. 408-732-7101
CT E. Hartford, R & S Elctrn. Distrs. 203-528-9901
CT Naugatuck, S.C.R. Electric 203-729-8274
CT Norwalk, Park Distrs. 203-853-2010
NY Buffalo, CMH Indl. Sls. 716-684-5250
NY Buffalo, Glauber & Carpenter 716-681-1234
NY Rochester, Preferred Elec. Motors 716-342-5080
OH Cleveland, Fordes Elec. & Control 216-229-4700
OH Cleveland, Specialized Comp. Sls. 216-464-0405
OH Columbus, Columbus Elctrn. 614-294-4651
OH Dayton, Summit Inds. 513-434-8192
PA Philadelphia, Capital Elctrl. Supp. 215-225-7850
WI Milwaukee, Hunt Co. 414-383-1781
WI Milwaukee, Tech. Elec. Co. 414-353-4383

WARREN COMMS., 101 Okner Pkwy., Livingston, NJ 07039, Tel: 201-992-6200, Telex: 139-384, TWX: 710-994-4852; Empl.: 200; *Sls. Mgr.:* William Vandertulip

WARREN-KNIGHT INSTR. CO., Warren Inds., Inc., 2045 Bennett Rd., Philadelphia, PA 19116, Tel: 215-464-9300; Empl.: 50; *Sls. Mgr.:* Richard M. Marron

WAVETEK ROCKLAND SCI., 245 Livingston St., Northvale, NJ 07647, Tel: 201-767-7100, TWX: 710-991-9619; Empl.: 200; *Sls. Mgr.:* Howard Siegerman

WASATCH HIGH VOLTAGE, P.O. Box 9027, Salt Lake City, UT 84109, Tel: 801-265-9561; Empl.: 9; *Sls. Mgr.:* T. J. Bruzenak

WATERS MFG., Longfellow Ctr., Wayland, MA 01778, Tel: 617-358-2777, Telex: 948441; FSC No.: ;Multiple; Empl.: 125; *Sls. Mgr.:* Ralph Pietro

WATKINS-JOHNSON CO., 3333 Hillview Ave., Palo Alto, CA 94304, Tel: 415-493-4141, Telex: 34-8415, TWX: 910-373-1253; FSC No.: 14482; Empl.: 2800

WATKINS-JOHNSON CO., Stewart Div., 440 Mount Herman Road, Scotts Valley, CA 95060, Tel: 408-438-2100

WATT-CLOCK CORP., P.O. Box 697, Stratford, CT 06497, Tel: 203-378-2500; Empl.: 5; *Sls. Mgr.:* M. Dee

WAVECOM, 9036 Winnetka Ave., Northridge, CA 91324, Tel: 818-882-3010, TWX: 910-493-2172; FSC No.: 28979; Empl.: 93

WAVELINE, Box 718, W. Caldwell, NJ 07006, Tel: 201-226-9100, TWX: 710-734-4324; FSC No.: 00443; Empl.: 95; *Sls. Mgr.:* J. F. Harty

WAVETEK INDIANA, INC., 5808 Churchman, Beech Grove, IN 46107, Tel: 317-787-3332, TWX: 810-341-3226; FSC No.: 34280; Empl.: 900; *Sls. Mgr.:* Dick Koerner

WAVETEK ROCKLAND SCIENTIFIC, INC., 10 Volvo Dr., Rockleigh Indl. Pk., Rockleigh, NJ 07647, Tel: 201-767-7900, TWX: 710-991-9852; Empl.: 100

WAVETEK CORPORATION, 9191 Towne Centre Drive, San Diego, CA 92122, Tel: 619-450-9971, TWX: 910-335-2007; Empl.: 1206; *Sls. Mgr.:* Sam Lewis

WAYNE KERR, INC., W.K.R. Ltd., 400 West Cummings Pk., Woburn, MA 01801, Tel: 617-938-8390, Telex: 6817257 WKERR WOBN; *Sls. Mgr.:* Ken Berquist

WAYNE TRANSFORMER CO., INC., 99 Hazel St., Paterson, NJ 07503, Tel: 201-278-7674; *Sls. Mgr.:* Fred Demauro ..... **A•2340-2341**

WECKESSER CO. INC., 4444 W. Irving Park Rd., Chicago, IL 60641, Tel: 312-282-8626; Empl.: 90

WEBER, 147 W. Cedan St., Norwalk, CT 06854, Tel: 203-866-8474

WECO

WECO ELECTRICAL CONNECTORS, INC., Rt. 11, Mooers, NY 12958, Tel: 518-298-4810, Telex: 05-821840; Empl.: 15; *Sls. Mgr.:* Heiner Kammann; *Dist. Mgr.:* Heiner Kammann ..... **C•1572-1578**

Local Sales Offices & Reps

CO Englewood, Protronics Grp. 303-781-6050
FL Coral Springs, HAI Elctrns. 305-752-7520
MI Brooklyn, Engineered Comps., Inc. 517-592-3236
OH Cincinnati, Engineered Comps., Inc. ... 513-471-2949
OR Portland, SPS Elctrns. 503-297-6919
WA Redmond, SPS Elctrns. 206-323-4140
Can Montreal, QC., WECO Elec. Connectors, Inc. 514-457-3640
Can Rexdale, Ont., WECO Elec. Connectors, Inc. 416-674-1084

Local Distributors

CA Fullerton, ISI Mktg. Co. 714-773-0411
CA Santa Clara, Glynn Elctrns., Inc. 408-748-1666
CA Union City, Interwest Sys., Inc. 415-489-1820
CT Pawcatuck, Glynn Elctrns., Inc. 203-599-5373
IL Carol Stream, Lectro Comps. 312-690-0520
MA Middleboro, Glynn Elctrns., Inc. 617-947-4262
NH Salem, Glynn Elctrns., Inc. 603-893-8313
NJ South River, Kon-Tac, Inc. 201-254-5100
WA Seattle, H.D. Campvelle 206-433-1900
Can Concord, Ont., Ziereck, Ont. 416-669-1429
Can Manitoba, Winnepeg, WES Elctrns. 204-632-1260
Can Mississauga, Ont., Prelco Ltd. 416-678-0401
Can Montreal, Que., Prelco Ltd. 514-389-8051
Can Montreal, Que., Taylor Ind. Controls ... 514-334-5900
Can Nepean, Ont., Prelco Ltd. 613-726-1800
Can St. Laurent, Que., De-Taylec, Ltd. 514-331-7460
Can St. Laurent, Que., Taylor Indl. Controls, Ltd. 514-334-5900

WEED INSTR. CO., INC., 707 Jeffrey Way, P.O. Box 300, Round Rock, TX 78664-0300, Tel: 512-255-7043, Telex: 776492; Empl.: 110; *Sls. Mgr.:* Frank Ofner

WEI CORP., 1405 S. Village Way, Santa Ana, CA 92705, Tel: 714-834-9333, TWX: 910-595-1709; FSC No.: 51272; Empl.: 50; *Sls. Mgr.:* R. H. Thomason

WEIDMULLER TERMINATIONS, 821 Southlake Blvd., Richmond, VA 23236, Tel: 804-794-2877, Telex: 828376; Empl.: 31; *Sls. Mgr.:* James G. Dunn; *Dist. Mgr.:* Mort Gelfand

WEINSCHEL ENGRG., One Weinschel La., Gaithersburg, MD 20877, Tel: 301-948-3434, 800-638-2048, Telex: ITT 440702, TWX: WU 89-8352; FSC No.: 93459; Empl.: 325; *Sls. Mgr.:* Ron Bastien

WELLMAN THERMAL SYS., 1 Progress Rd, Shelbyville, IN 46176, Tel: 317-398-4411, TWX: 810-260-2616; FSC No.: 4S017; Empl.: 600; *Sls. Mgr.:* E. W. Abel; *Dist. Mgr.:* W. L. McNamee

WELLS ELCTRNS., 1701 S. Main St., South Bend, IN 46613, Tel: 219-287-5941, Telex: 25-8325; FSC No.: 219-287-0356; Empl.: 200; *Sls. Mgr.:* Michael Myers ..... **C•1580-1587**

Local Sales Offices & Reps

AL Huntsville, Southeastern Mktg. 205-882-1633
AZ Scottsdale, Luscombe Engrg. Co. 602-949-9333
CA Los Angeles, EESCO 818-242-8823
CA San Jose, Western Indl. Network 408-559-8118
CO Boulder, Luscombe Engrg. Co. 303-772-3342
CT Wethersfield, Com/Pak, Inc. 203-563-4784
FL Lighthouse Point, Jack Krutek & Assocs. 305-941-6544
GA Atlanta, L & D, Inc. 404-395-7079
IL Glencoe, Howard Benjamin Assocs. Inc. 312-835-0150
IN Greenfield, France Entprs., Inc. 317-462-6098
MD Phoenix, Phoenix Elctrn. Sls. 301-628-2066
MA Woburn, Com/Pak, Inc. 617-938-8580
MI Brighton, Michigan Mktg. & Sls. 313-229-6218
MN Minneapolis, RK Sls., Inc. 612-786-5713
MO St. Louis, Reptronics 314-576-9816
NJ Berkeley Heights, Cambridge Allen and Assocs. 201-464-0203
NJ Medford, Component Consits. 609-654-5300
NY Syracuse, T-Squared Elctrns. Co., Inc. 315-463-8592
NC Greensboro, L & D, Inc. 919-292-3201
OR Tigard, El Tech, Inc. 503-684-3458
TN Knoxville, L & D, Inc. 615-573-6511
TX El Paso, EPEC, Inc. 915-593-8481
TX Irving, AID Elctrns., Inc. 214-790-4761
VA Centerville, Phoenix Elctrns. Sls. 703-631-2924
WA Bellevue, El Tech, Inc. 206-643-4330
WI Colgate, Rep 1 & Assocs. 414-628-4016

Local Distributors

AZ Tempe, Waltronic Sls. 602-967-1020
CA Anaheim, A To Z Elctrns., Inc. 714-634-3620
CA San Jose, Cypress Elctrns., Inc. 408-945-8400
CO Wheat Ridge, Cypress Elctrns., Inc. ... 303-431-2622
FL Pompano Beach, Comps. South 305-971-0350
GA Atlanta, Prehler Elctrns. 404-447-5540

IL Chicago, Semiconductor Specialists, Inc. 312-279-1005
IN Indianapolis, Graham Elctrns. 317-634-8202
MD Gaithersburg, MS Elctrns., Inc. 301-921-0200
MA Mendon, Add Elctrn. Corp. 617-429-7945
MI Southfield, L.S.I. Mktg. 313-474-4400
MN St. Paul, Gopher Elctrns. 612-483-3322
MO Kansas City, Semiconductor Specialists, Inc. 816-452-3900
NH Hampstead, Astrum Elctrns. 603-329-5656
NJ Bellmawr, Mid-Atlantic Elctrns. Corp. .. 609-931-5303
NJ Rahway, RSR Elctrns. 201-381-8777
NY East Syracuse, Add Elctrn. Corp. 315-437-0300
NY Farmingdale, Pride Elctrns. 516-293-4020
NY Ronkonkoma, Prime Comps. 516-737-1730
OH Columbus, Elctrns. Mktg. Corp. 614-299-4161
OR Tigard, Moore Elctrns., Inc. 503-684-3100
PA Pittsburgh, Semiconductor Specialists, Inc. 412-963-7241
TX Houston, Kent Elctrns., Inc. 713-780-7770
TX Richardson, Kent Elctrns., Inc. 214-669-2600
WI Milwaukee, Marsh Elctrns. 414-475-6000

WELTEK INTL., INC., 760 W. Cotter St., South Bend, IN 46613, Tel: 219-232-5400, Telex: 23-3131; Empl.: 28; *Sls. Mgr.:* Tom Gerschoffer

WESCO ELECTRICAL CO., 201 Munson St., Greenfield, MA 01301, Tel: 413-774-4358; FSC No.: 12673; Empl.: 190; *Sls. Mgr.:* James R. DeSanty ..... **A•1198-1203**

Local Sales Offices & Reps
CA Costa Mesa, Electro-Mech Sls. Co. ... 714-642-2390
CA La Jolla, Southwest Tech. Sls. 619-454-2034
CA Santa Clara, Gagner-Toomey Assocs. 408-244-2200
CT Milford, Cuming Assoc. 203-878-3946
FL Fern Park, EIR Inc. 305-830-9600
IL Addison, Banner Tech. Sls. 312-279-6070
IN Columbus, J. H. Weaver Co. 812-372-3625
MA Framingham, Bengal Assocs. 617-877-2639
MA Randolph, Bengal Assocs. 617-961-4120
MN Bloomington, Electronic Sls. Agcy. 612-884-8291
NJ Madison, Livera-Polk Assocs. 201-377-3220
NY Glen Head, Livera-Polk Assocs. 516-759-9300
NC Raleigh, Leigh Sls. 919-872-1484
OH Wickliffe, W. Brauer & Assoc. 216-943-0601
OR Beaverton, L-D Elctrns. 503-649-6177
PA Pittsburgh, W. Brauer & Assoc. 412-921-3213
TX Dallas, Blackburn Assocs. 214-692-8885
WA Snohomish, L-D Elctrns. 206-568-0511

WESCORP ANTISTATIC PRODS., 144 S. Whisman Rd., Mountain View, CA 94041, Tel: 415-969-7717, Telex: 345507; Empl.: 15; *Sls. Mgr.:* Lourdes Rivera

Local Distributors
MA Canton, Hub Matls. 617-821-1870

Distributor

WES-GARDE COMPONENTS GROUP, INC., 190 Elliott St., Hartford, CT 06114, Tel: 203-525-6907 ..... **B•1698**

WESTAMP, 1542 15th St., Santa Monica, CA 90404, Tel: 213-393-0401, Telex: 3720078; FSC No.: 12745; Empl.: 100; *Sls. Mgr.:* Michael Mula

Local Sales Offices & Reps
CT Ridgefield, E. S. Williams Co. 203-438-7474
FL Tampa, Brawley Tech. Sls. 813-251-6816
IL Libertyville, Westamp 312-680-1979
MA Wellesley Hills, R. H. Sturdy Co. 617-235-2330
MI Troy, Xanthus 313-528-2000
MN Minneapolis, Lakeland Engrg. Equip. Co. 612-544-0321
NY Pittsford, Controlled Motion Prods. 716-381-1933
NY White Plains, Westamp 914-949-7949
OH Cincinnati, Dorsey Alexander Assocs. 513-221-7518
PA Warrendale, Superior Sys. 412-935-5230

WESTBERG MFG., INC., 3400 Westach Way, Sonoma, CA 95476, Tel: 707-938-2121; Empl.: 20; *Sls. Mgr.:* R. R. Westberg

WEST-CAP ARIZONA, Sub. of San Fernando Electric Mftg. Co., 2201 East Elvira Road, Tucson, AZ 85706, Tel: 602-294-2646

WEST COAST ELEC. MFG., 14045 Garfield Ave, Paramount, CA 90723, Tel: 213-633-1010; FSC No.: 81823; Empl.: 25; *Sls. Mgr.:* W. E. Seal

WESTCODE SEMICONDUCTORS, INC., 0-02 Fair Lawn Ave., Fair Lawn, NJ 07410, Tel: 201-791-3020, Telex: 353279; *Sls. Mgr.:* Alan J. Melnyk

WEST DIVISION, Gulton Industries, Inc., 3860 N. River Rd., Schiller Park, IL 60176, Tel: 312-678-6400, Telex: 910-227-0723; Empl.: 400; *Sls. Mgr.:* Williard J. Bell, Jr.; *Dist. Mgr.:* Williard J. Bell, Jr.

WESTEMP CORP., Box 767, Cardiff, CA 92007, Tel: 619-942-9800; Empl.: 20; *Sls. Mgr.:* J. Huston

WESTERN DATACOM, 5083 Market St., Youngstown, OH 44512, Tel: 216-788-6583, Telex: 910-333-8609; Empl.: 15; *Sls. Mgr.:* Carol Zinstine; *Dist. Mgr.:* Carol Zinstine

Local Sales Offices & Reps
CA Campbell, Data Express 408-371-2788
CA Costa Mesa, Dalcom Sys. 714-851-8142
CA Woodland Hills, Dalcom Sys. 213-703-7983
CO Englewood, Beta Distrs. 303-779-4494
CT Vernon, IMF Sls. Assocs. 203-643-0187
DC Edgewater, Commart 301-261-4344
FL Orlando, COL-INS-CO 305-423-7615
GA Atlanta, COL-INS-CO 404-491-9395
IL Downers Grove, ARC Elctrn. Assocs. 312-960-4325
MA Wakefield, IMF Sls. Assocs. 617-245-8900
MI Ann Arbor, ARC Elctrn. Assocs. 313-995-1211
MN Eden Prairie, Scientific Dvcs. 612-944-3515
NJ Northvale, Glasgal Comm. 201-768-8082
NY E. Syracuse, Ossman Computer Prods. 315-437-7052
NY Rochester, Ossman Computer Prods. 716-424-4460
NY Vestal, Ossman Computer Prods. 607-754-3264
NC Raleigh, COL-INS-CO 919-848-4006
OH Cleveland, ARC Elctrn. Assocs. 216-835-8400
OR Portland, Rush Drake 503-224-3145
PA Pittsburgh, Applied Delta 609-853-5400
TN Knoxville, COL-INS-CO 615-546-9016
TX Houston, Beta Distrs. 713-682-1234
TX Richardson, Beta Distrs. 214-783-1065
WA Seattle, Rush Drake 206-454-2383
Can Ottowa, Tempest Security Integrators 613-226-3227

WESTERN DIGITAL CORP., 2445 McCabe Way, Irvine, CA 92714, Tel: 714-557-3550, TWX: 910-595-1139; *Dist. Mgr.:* Ron Weaver

WESTERN ELECTRIC CO., INC., 222 Broadway, New York, NY 10038, Tel: 212-669-2345

WESTERN ELECTRO. MECH. CO. INC., 300 Broadway, Oakland, CA 94607, Tel: 415-452-1936; Empl.: 9; *Sls. Mgr.:* W. J. Foster

WESTERN ELCTRN. PRODS., 107 Los Molinos, San Clemente, CA 92672, Tel: 714-492-4677; FSC No.: 13988

WESTERN GEAR CORP., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744, Tel: 818-968-6525, TWX: 910-584-4856; Empl.: 1125; *Sls. Mgr.:* D. Waite

WESTERN GRAPHTEC, 12 Chrysler St., Irvine, CA 92718, Tel: 714-770-6010, 800-854-8385

WESTERN MULTIPLEX CORP., 1320 Bayport Avenue, San Carlos, CA 94070, Tel: 415-592-8832, Telex: 295114 VIA RCA; FSC No.: 94-2620670; *Sls. Mgr.:* J. P. Bartelme

WESTERN RESERVE ELCTRNS., 2150 Highland Rd., Twinsburg, OH 44087, Tel: 216-425-4951; Empl.: 45; *Sls. Mgr.:* Robert Rhodes

WESTINGHOUSE ELECTRIC CORP., Aerospace Electrical Div., P.O. Box 989, Lima, OH 45802, Tel: 419-226-3121

WESTINGHOUSE ELECTRIC CORP., Indl. Govt. Tube Div., Westinghouse Circle, Horseheads, NY 14845, Tel: 607-796-3211, Telex: 510-252-1588; Empl.: 700; *Sls. Mgr.:* R. R. Kaemmener

WESTINGHOUSE ELEC. CORP., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003, Tel: 201-429-3325

WESTINGHOUSE ELEC. CORP., Semiconductor Div., Armbrust Rd., Youngwood, PA 15697, Tel: 412-925-7272, TWX: 510-468-2840; Empl.: 600; *Sls. Mgr.:* R. L. Bonkowski; *Dist. Mgr.:* P. DelPalazzo

Local Sales Offices & Reps
AZ Tempe, Quatra Assocs. 602-820-7050
CA Agoura, Westpower Co. 818-706-2550
CA Laguna Hills, Westpower Co. 714-380-0277
CA Los Angeles, Westpower Co. 818-579-8230
CA Mountain View, Westinghouse Elec. .. 415-949-0610
CA Santa Clara, Engineering Assoc. Corp. 408-988-5001
CO Denver, Lindberg Co. 303-758-9033
CT Madison, HV Engrg. 203-421-4561
FL Altamonte Springs, Semtronic Assoc. 305-831-8233
FL Clearwater, Semtronic Assoc. 813-461-4675
FL Ft. Lauderdale, Semtronic Assocs. 305-731-2484
IL Chicago, L & W Power Corp. 312-852-6464
IA Cedar Rapids, Dy-Tronix 319-377-8275
KS Wichita, Dy-Tronix, Inc. 316-838-0884
MD Laurel, Westinghouse Elect. 301-953-8857
MA Boston, Westinghouse Elec. 617-237-6950
MA Monson, Gerber Sls. 413-267-5051
MA Newton Upper Falls, Gerber Sls. 617-969-2620
MI Plymouth, L & W Power, Corp. 313-455-0480
MN S. St. Paul, Northport Engrg. 612-457-8000
MO Bridgeton, Dy-Tronix 314-291-4777
MO Raytown, Dy-Tronix 816-356-6340
NJ Basking Ridge, Eastpower Co. 201-766-7886
NM Albuquerque, Lindberg Co. 505-881-1006
NY Ithaca, Bob Dean, Inc. 607-257-1111
NY Wappingers Falls, Bob Dean, Inc. 914-297-6406
NC Charlotte, Westinghouse 704-377-7737
OH Kettering, L & W Power, Corp. 513-293-3482
OH South Euclid, J.R. Thornberry Co. 216-321-3328
OK Tulsa, Nova Mktg. 918-743-6202
OR Tigard, Vantage Corp. 503-620-3280
PA Pittsburgh, Covert & Newman Co. 412-531-2002
PA Youngwood, Westinghouse 412-925-7272
TX Austin, NOVA Mktg. 512-343-2321
TX Dallas, Nova Mktg. 214-750-6082
TX Houston, Nova Mktg. 713-988-6082
UT Salt Lake City, Lindberg Co. 801-467-1794
WA Bellevue, Vantage Corp. 206-455-3460
WI Milwaukee, L & W Power Corp. 414-782-0799

WESTLAKE CAPACITORS, INC., 5334 Sterling Center Dr., Westlake Village, CA 91361, Tel: 818-889-4120, TWX: 910-494-4779; Empl.: 210; *Sls. Mgr.:* F. G. Edge; *Dist. Mgr.:* D. Lawrence

WESTON CONTROLS/POTS DIV., Div. Fairchild Weston Sys., Inc., Archbald, PA 18403, Tel: 717-876-1500, Telex: 83-1873, TWX: 510-656-2902; FSC No.: 94271;Multiple; Empl.: 1077; *Sls. Mgr.:* J. Cousins

WESTREX, 1140 Bloomfield Ave., W. Caldwell, NJ 07006, Tel: 201-227-7290, Telex: 64-1490, TWX: 710-734-4323; Empl.: 180; *Sls. Mgr.:* J. C. Murray

WESTREX OEM PRODUCTS, Litton Inds., 51 Penn St., Fall River, MA 02724, Tel: 617-676-1016, Telex: 651490-WNJW, TWX: 710-341-3099; *Sls. Mgr.:* J. C. Murray; *Dist. Mgr.:* Ed Cunnie

WESTRONICS INC. OF TEXAS, 2441 Northeast Pkwy., Box 4619, Ft. Worth, TX 76106, Tel: 817-625-2311, Telex: 75-8273; Empl.: 250; *Sls. Mgr.:* Paul Schultz

WEST-TRONICS, INC., 215 Park St., Bensenville, IL 60106, Tel: 312-860-3560; Empl.: 125; *Sls. Mgr.:* Will Allen

WHEDCO, INC., 6107 Jackson Rd., Ann Arbor, MI 48103, Tel: 313-665-5473; *Sls. Mgr.:* K. V. Chilton

WHEELOCK, INC., 273 Branchport Ave., Long Branch, NJ 07740, Tel: 201-222-6880, TWX: 710-722-6510; Empl.: 200; *Sls. Mgr.:* Harry J. Foster

WHITMOR WIRE & CABLE, 13161 Sherman Way, Bldg. B, N. Hollywood, CA 91605, Tel: 818-764-6296, Telex: 194479; FSC No.: 15851; Empl.: 29; *Sls. Mgr.:* Michael Weiss; *Dist. Mgr.:* Mark Lee

Local Sales Offices & Reps
CA Sunnyvale, Wirenetics Co. 408-745-6673

Local Distributors
CA Sunnyvale, Wirenetics Co. 408-745-6673
CA Valencia, Wirenetics Co. 805-257-2400

WHITSO, 9326 Byron St., Schiller Pk., IL 60176, Tel: 312-678-5200; Empl.: 200; *Sls. Mgr.:* L. McQuillen

WHITTAKER CORP., 10880 Wilshire Blvd., Los Angeles, CA 90024, Tel: 213-475-9411, Telex: 674891; Empl.: 9,600

WHITTAKER CORP., Electronic Resources Div., 100 E. Tujunga Ave., Burbank, CA 91502, Tel: 818-843-5770, TWX: 910-498-2751; FSC No.: 72152

WHITTAKER CORP., Providence Chemicals Div., King Philip Rd., P.O. Box 16069, E. Providence, RI 02916, Tel: 401-434-1770, Telex: 92-7652; Empl.: 42

WIDE BAND ENGRG. CO., INC., Box 21652, Phoenix, AZ 85036, Tel: 602-254-1570; Empl.: 10

WIDE RANGE ELCTRNS. CORP., 2119 Schultz Rd., St. Louis, MO 63146, Tel: 314-567-5366, Telex: 44-2560; Empl.: 16; *Sls. Mgr.:* Otto Rauhut

WILBRECHT ELCTRNS., 240 Plato Blvd., St. Paul, MN 55107, Tel: 612-222-2791, TWX: 910-563-3679; Empl.: 300

WILCO

WILCO CORP., 6451 Saguaro Court, Indianapolis, IN 46268, Tel: 317-293-9300 ..... **A•1296-1297**

WILCO WIRE & CABLE CO., INC., 1921 Las Plumas Ave., San Jose, CA 95133, Tel: 408-926-8880; Empl.: 28; *Sls. Mgr.:* Joe Shepherd; *Dist. Mgr.:* Ken Schmidt

WILCOXON RESCH., P.O. Box 5798, Bethesda, MD 20814, Tel: 301-770-3790, Telex: 898-342; Empl.: 26; *Sls. Mgr.:* W. Wilcoxon

WILD ROVER, See Refac Elctrns.

WILKINSON, P.O. Box 4558, Westlake Village, CA 91359, Tel: 818-889-0050, 800-822-4653, Telex: 698213; Empl.: 34; *Sls. Mgr.:* R. Cook; *Dist. Mgr.:* R. Cook

WILMAR ELCTRNS., INC., 2430 Amsler St., Torrance, CA 90505, Tel: 213-326-6668, Telex: 182417; FSC No.: 25248; Empl.: 25; *Sls. Mgr.:* Zev Heifetz

Local Sales Offices & Reps

CA Emeryville, Davis Gregory & Doll 415-428-9103
PA Philadelphia, Tech. Instr. Sls. 215-345-4110

WILMORE ELCTRNS. CO., Box 1329, Hillsborough, NC 27278, Tel: 919-732-9351, Telex: 292617; Empl.: 48; *Sls. Mgr.:* J. L. Harris ..... **D•1867-1869, 1974-1975**

WILSON, H.F., ENGRG. CO., 475 Taft Ave., Glen Ellyn, IL 60137, Tel: 312-469-8473, Telex: 72-1438; Empl.: 18; *Sls. Mgr.:* H. Wilson; *Dist. Mgr.:* R. Carroll

WILSON, H. M., CO., 11501 Chimney Rock Rd., Houston, TX 77035, Tel: 713-729-1183; Empl.: 3; *Sls. Mgr.:* H. M. Wilson

WILSON ELECTRONICS, PO Box 19000, Las Vegas, NV 89119, Tel: 702-739-1931, Telex: 684-522; Empl.: 175; *Sls. Mgr.:* J. Flatt; *Dist. Mgr.:* Mac Harrison

WILTRON, 805 E. Middlefield Rd., P.O. Box 7290, Mountain View, CA 94042-7290, Tel: 415-969-6500, TWX: 910-379-6578; FSC No.: 20944; Empl.: 600; *Sls. Mgr.:* W. Baxter

WINCHENDON GROUP INC., 3907 Lakota Rd, P.O. Box 10339, Alexandria, VA 22310, Tel: 703-960-2587

WINSLOW INTL., 2471 E. Bayshore #520, Palo Alto, CA 94303, Tel: 415-856-0552, TWX: 910-373-2060; Empl.: 8; *Sls. Mgr.:* G. Hall; *Dist. Mgr.:* M. Niland

WIN SYSTEMS, INC., P.O. Box 121361, Arlington, TX 76012, Tel: 817-274-7553, Telex: 203984

WINTEK CORP., 1801 South St., Lafayette, IN 47904-2993, Tel: 317-742-8428, Telex: 70-9079; Empl.: 14 ..... **D•1105, 1107**

WIRE GRAPHICS, INC., 215 B. Central Ave., Farmingdale, NY 11735, Tel: 516-293-1525; Empl.: 46; *Sls. Mgr.:* Nathan Stettin; *Dist. Mgr.:* Nathan Stettin

WIREMOLD COMPANY, 60 Woodlawn Street, W. Hartford, CT 06110, Tel: 203-233-6251, TWX: 710-425-6281; Empl.: 90; *Sls. Mgr.:* F. F. Keating

WONDER CORP OF AMERICA, 22 Elizabeth St., South Norwalk, CT 06856, Tel: 203-866-3033, Telex: 965838; Empl.: 140; *Sls. Mgr.:* Peter Schub

WON TRONICS, Apollo Magnetics Corp., 2720 W. Beverly Blvd., Los Angeles, CA 90057, Tel: 213-381-2500, TWX: 910-321-4348; *Sls. Mgr.:* Michael Ronzon

WOODWARD MEASUREMENT INSTRS. LTD., 236 Wineva Ave., Toronto, ON, Canada M4E 2T4

WORKMAN ELCTRN. PRODS., Box 3828, Sarasota, FL 33578, Tel: 813-371-4242, TWX: 810-864-0401; Empl.: 150; *Sls. Mgr.:* Frank Pounds

'WORLD' ENTERPRISES, INC., P. O. Drawer 1428, Waynesboro, VA 22980, Tel: 703-949-6753; *Sls. Mgr.:* Bob Walton

WORLD STORAGE TECHNOLOGY, LTD., 14251 Franklin Ave., Tustin, CA 92680, Tel: 714-838-1491, Telex: 182727; Empl.: 250; *Sls. Mgr.:* Richard McGowan

WOVEN ELCTRNS., Box 189, Mauldin, SC 29662, Tel: 803-963-5131, TWX: 810-287-2091; Empl.: 180; *Sls. Mgr.:* E. A. Ross Jr.

WRIGHT CAPACITORS, 3000 So. Orange, Santa Ana, CA 92707, Tel: 714-546-2490; Empl.: 25; *Sls. Mgr.:* Curtiss Wright

WYCO METAL, See Stantron

WYLE LABS, See Electronic Enclosures

XANADU CONTROLS, Electroid Corp., 45 Fadem Rd., Springfield, NJ 07081-3189, Tel: 201-467-8100, Telex: 139241; FSC No.: 57841; *Sls. Mgr.:* Peter Mesniaeff; *Dist. Mgr.:* Peter Mesniaeff

XCP, INC., 8 W. Main St., Dryden, NY 13053, Tel: 607-844-9143; *Sls. Mgr.:* Diane Rademacher

XEBEX DATA SYSTEMS, 6610 Buckley Dr., Cambria, CA 93428, Tel: 805-927-5008; Empl.: 4; *Sls. Mgr.:* W. E. Walker

XEDAR CORP., 2500 Central Ave., Boulder, CO 80301, Tel: 303-443-6441, Telex: 910-940-2512; *Sls. Mgr.:* Carol Lathrop

XENON CORP., 66 Industrial Way, Wilmington, MA 01887, Tel: 617-658-8940, Telex: 951142; Empl.: 45; *Sls. Mgr.:* Louis R. Panico

Xentek

XENTEK, INC., 279 S. Pacific St., San Marcos, CA 92069, Tel: 619-744-3346, TWX: 910-322-1155; FSC No.: 52360; Empl.: 430 ..... **D•1870-1873**

Advertisement

Off the shelf and customer linear and switching power supplies from 5 watts to 600 watts. Single and multiple outputs. Competitive pricing, off the shelf delivery, and high quality are the driving forces which make 'The Heart of Your System' company your best buy. All Standard Products are UL recognized and CSA Certified. Xentek also manufactures line noise eliminators known as Extreme Isolation Transformers which reduce line noise 140db. Check out our universal input EIT which solves your power distribution problem as well as eliminating line noise.

Local Sales Offices & Reps

AL Huntsville, Conley & Assocs. 205-882-0316
AZ Scottsdale, Shefler-Kahn 602-257-9015
CA Goleta, Thorson Co. 805-964-8751
CA Los Angeles, Thorson Co. 213-595-0361
CA San Diego, Robert Posten 619-744-3346
CA Sunnyvale, RDP Instr. 408-735-9040
FL Boca Raton, Conley & Assocs. 305-421-7180
FL Oveido, Conley & Assocs. 305-365-3283
FL Tampa, Conley & Assocs. 813-885-7658
GA Atlanta, Conley & Assocs. 404-447-6992
IL Chicago, Berndt & Assocs. 312-283-0713
IN Carmel, Berndt Assocs. 317-844-0114
MD Gaithersburg, Beacon North 301-869-3289
MI Southfield, Fred Gehrke & Assocs. 313-559-5363
MN Minneapolis, Berndt Assocs. 612-546-2021
MO Grandview, R. R. Burton 816-763-5385
NH Nashua, Bell Controls 603-882-6984
NJ Haddonfield, Tritek Sls. 609-429-1551
NM Albuquerque, Shefler-Kahn 505-296-0749
NY East Syracuse, Nycom 315-437-8343
NY Hartsdale, Spectrum Sls. 914-472-8600
NC Raleigh, Conley & Assocs. 919-876-9862
OH Cincinatti, Tri-State 513-761-7993
OR Portland, Backer Co. 503-297-8744
TX Dallas, Allied Comps. 214-238-0408
TX Houston, Allied Comps. 713-988-1600
TX Round Rock, Allied Comps. 512-244-1166
VA Fairfax, Beacon North 703-591-1300
WA Seattle, Baker Co. 206-285-1300
WI Milwaukee, Berndt Assocs. 414-545-8400

XERCON, INC., P.O. Box 554, Portland, OR 97207, Tel: 503-641-9525; *Sls. Mgr.:* G. Osgood

XEROX CORPORATION, 800 Long Ridge Rd., P.O. Box 1600, Stamford, CT 06904, Tel: 203-329-8700; Empl.: 103,457

XICO

XICO, INC., 120 Ocean Way, Santa Monica, CA 90402, Tel: 213-454-0302, Telex: 709577; *Sls. Mgr.:* Joe Sheppard ..... **D•1082**

XIT ROD, PO Box 128, Beaumont, CA 92223, Tel: 714-845-3986; Empl.: 4

XKD CORPORATION, 101 Cooper Court, Los Gatos, CA 95030, Tel: 408-395-3700, Telex: 171946; *Sls. Mgr.:* Bill Bourke

XSIS ELECTRONICS

XSIS ELECTRONICS, INC., 12620 W. 63rd St., Shawnee, KS 66216, Tel: 913-631-0448, Telex: 437227; FSC No.: 57051; *Sls. Mgr.:* Jerry Dehnert ..... **A•1457**

Local Sales Offices & Reps

AL Huntsville, Murcota Corp. 205-539-8476
AZ Phoenix, Anderson Co. 602-266-2070
CA Culver City, Westaironics, Inc. 213-641-4122
CA Sunnyvale, Loeswick's 408-745-6751
CO Loveland, Morbak Mktg. 303-669-8900
CT Stamford, Ashworth Assocs. 203-968-0656
IL Rolling Meadows, Sieger Assocs. 312-991-6161
KY Ft. Mitchell, G. W. Thelen Co. 606-341-8181
MD Ellicott City, VPI, Inc. 301-461-2525
MA Shrewsbury, Ashworth Assocs. 617-845-9688
MN Eden Prairie, Aldridge Assocs., Inc. 612-944-8433
NJ Fairfield, Addem Sls. 201-882-0993
NY Fayettville, R. D. Sherman 315-637-9861
TX Houston, Repmaster 713-692-8204
TX Sherman, Repmaster 214-247-6236
EXP NY, Great Neck, Ad Auriema 516-487-0700

X-TRON ELECTRONICS, INC., 1869 National Avenue, Hayward, CA 94545, Tel: 415-783-2145; FSC No.: 54166; Empl.: 12; *Sls. Mgr.:* Jackie Medina; *Dist. Mgr.:* Jackie Medina

XYCOM, 750 N. Maple Rd., Saline, MI 48176, Tel: 313-429-4971, TWX: 810-223-8153; Empl.: 225; *Sls. Mgr.:* Dan Lewis; *Dist. Mgr.:* Bill Nemeth

XYLOG CORP., 150 Tillman St., Westwood, NJ 07675, Tel: 201-664-7997; Empl.: 25; *Sls. Mgr.:* Milton Frank ..... **D•1875, 1976**

Local Sales Offices & Reps

NJ Hillsdale, Rosano Assocs. 201-664-5716
NJ Livingston, E.B. Sussman 201-992-5331

XYTEG CORPORATION, 103 Central Avenue, Clifton, NJ 07011, Tel: 201-772-3444

XYZTEK CORP., 8000 E. Prentice Ave. Ste. B7, Englewood, CO 80111, Tel: 303-850-9400; Empl.: 15

YAMAICHI ELECTRONICS, 2471 E. Bayshore Rd. #530, Palo Alto, CA 94303, Tel: 415-493-3756; *Sls. Mgr.:* Kathy Fioretti

Local Sales Offices & Reps

CA Downey, Buffa Co. 213-923-4618
CA San Mateo, J. E. Lape Co. 415-345-3021
CT Bloomfield, Zaslon Sls. 203-242-7781
FL Coral Springs, H. A., Inc. 305-752-7520
GA Stone Mountain, H & H Mktg. 404-296-9830
MA Westboro, Zaslow Sls. 617-393-8150
MI Livonia, Transworld Elctrns. 313-525-5353
MN Minneapolis, Dan'l Engrg. 612-854-7550
NH Londonderry, Zaslow Sls. 603-432-8907
NJ Wayne, G. T. Assocs., Inc. 201-694-6040
OH Mayfield Heights, Transworld Elctrns. 216-461-8351
OR Beaverton, Ravencraft, Inc. 503-646-9261

YARDNEY BATTERY DIV., Yardney Corp., 82 Mechanic St., Pawcatuck, CT 02891, Tel: 203-599-1100, Telex: 6813114, TWX: 710-470-0260; FSC No.: 87362; Empl.: 300; *Sls. Mgr.:* Herman G. Lewis, Jr. ..... **D•1443**

YELLOW SPRINGS INSTR., Box 279, Yellow Springs, OH 45387, Tel: 513-767-7241, Telex: 205437; Empl.: 400; *Sls. Mgr.:* R. Heggemann

Local Sales Offices & Reps

AZ	Tempe, Elec-Com Assocs.	602-967-8023
CA	Pasadena, RDX Corp.	213-681-3451
CA	Santa Clara, Nelson Elctrn.	408-980-1950
CO	Boulder, Grady Moore & Assocs.	303-494-3351
GA	Atlanta, Craft Assocs.	404-256-0420
IL	Lansing, Van Meter Inst.	312-474-3580
IN	Indianapolis, RDP Corp.	317-788-4296
KS	Overland Park, Advanced Indl. Sys.	913-432-8065
MA	Norwell, Bordewieck Engrg.	617-659-4915
MI	Grand Rapids, Smith Instr. Equip.	616-245-1195
MI	Midland, Smith Instr. Equip.	517-496-2950
MI	Warren, Smith Instr. Equip.	313-755-3110
MN	Minneapolis, Trask Engrg.	612-537-2434
MO	Ellisville, Advanced Indl. Sys.	314-391-0366
NJ	Scotch Plains, RJM Sls.	201-322-7880
NM	Albuquerque, Elec-Com Assocs.	505-898-6101
NY	Syracuse, Labtronics	315-455-7314
OH	Cleveland, RDP Assocs.	216-659-3138
OH	Dayton, RDP Assocs.	513-253-6175
PA	Pittsburgh, RDP Assocs.	412-487-5055
TX	Lewisville, Milestek	214-436-1597
VA	Richmond, Advance Control Equip.	804-270-7182

Local Distributors

CA	Pasadena, RDX Corp.	213-681-3451
GA	Atlanta, Craft Assocs.	404-256-0420
IL	Chicago, Newark Elctrns.	312-638-4411
MA	Norwell, Bordwieck Eng. Sls.	617-659-5915
MN	Minneapolis, Trask Engrg.	612-537-2434
NJ	Scotch Plains, RJM Sls.	201-322-7880
OH	Dayton, RDP Corp.	513-253-6175
TX	Lewisville, Milestek	214-436-1597

YEW CORP., See Yokogawa Corp. of America

YOKOGAWA CORP. OF AMERICA, 2 Dart Rd., Shenandoah, GA 30265, Tel: 404-253-7000, TWX: 714-567-1256; Empl.: 70; *Sls. Mgr.:* J. V. Stegenga

YORK METAL PRODUCTS, INC., 34-20 12th St., Long Island City, NY 11367, Tel: 718-932-3660; Empl.: 45; *Sls. Mgr.:* Harold Miller

ZECO, INC., 2075 H Bering Dr., San Jose, CA 95131, Tel: 408-286-8856; *Sls. Mgr.:* Conie Johnson; *Dist. Mgr.:* Conie Johnson

YORK TECHNOLOGY, INC., Research Park, 139 Wall Street, Princeton, NJ 08540, Tel: 609-924-7676, Telex: 3762780

YUASA BATTERY (AMERICA), INC., 9728 Alburtis Ave., Santa Fe Springs, CA 90670, Tel: 213-949-4266, Telex: 696272; Empl.: 5,000; *Sls. Mgr.:* Les Biggins ..... **D•1445**

Local Sales Offices & Reps

CA	Diablo, Main Engrg. & Mktg. Assocs.	415-837-2193
CA	Westminster, West Elctrn Sls.	714-898-0120
CO	Englewood, Frontier Reps.	303-799-6063
CT	Horth Haven, Kitchen & Kutchin	203-239-0212
GA	Roswell, Edco Sls.	404-587-1886
IL	Cary, Ellinger Sls.	312-639-1850
IA	Cedar Rapids, R.W. Kunz & Assocs.	319-396-5386
KS	Prairie Vlg., R.W. Kunz & Assocs.	913-648-3535
MD	Baltimore, S. K. Macdonald Co.	301-254-3380
MA	Burlington, Kitchen & Kutchin	617-229-2660
MN	Minneapolis, Johnson Co.	612-941-8526
MO	St. Louis, R.W. Kunz & Assocs.	314-966-4977
NJ	Berkeley Hgts., Cambridge Allen & Assocs.	201-464-0203
NJ	Carlstadt, Yuasa Battery (Amer.) E. Reg. Off.	201-896-8800
NY	Rochester, Ossman Comps. Sls.	716-424-4460
NY	Syracuse, Ossman Comps. Sls.	315-455-6611
NY	Vestal, Ossman Comps. Sls.	607-754-3264
OH	Columbus, McFadden Sls.	614-459-1280
OK	Tulsa, Barry Sls.	918-749-7775
OR	Portland, Power Sources Unlimited	503-292-0820
PA	Philadelphia, S. K. Macdonald Co.	215-545-1205
TX	Houston, Barry Sls.	713-784-5860
TX	Richardson, Barry Sls.	214-234-0255
WA	Lynwood, Power Sources Unlimited	206-784-3336
Can	Pointe-Claire, Que., Tech Trek, Ltd.	514-697-3385
Can	Rexdale, Ont., Tech Trek, Ltd.	416-674-1717

ZAMBRE CO., INC., 2134 Old Middlefield Way, Mountain View, CA 94043, Tel: 415-968-9176

ZAX CORP., 2572 White Rd., Irvine, CA 92714, Tel: 714-474-1170, 800-421-0982, Telex: 183829; Empl.: 32; *Sls. Mgr.:* Hal Horrocks

ZEHNTEL, INC., 2625 Shadelands Dr., Walnut Creek, CA 94598, Tel: 415-932-6900, TWX: 910-385-6300; Empl.: 480; *Sls. Mgr.:* N. Vinson; *Dist. Mgr.:* N. Vinson

CARL ZEISS, INC., One Zeiss Drive, Thornwood, NY 10594, Tel: 914-681-7670, Telex: RCA 221834, TWX: WV64-6928

ZENDEX CORP., 6700 Sierra La., Dublin, CA 94566, Tel: 415-828-3000, TWX: 910-389-4009; *Sls. Mgr.:* James F. Bairey

ZENITH CONTROLS, 830 West 40th St., Chicago, IL 60609, Tel: 312-247-6400, Telex: 25-3703; Empl.: 125; *Sls. Mgr.:* V. Helford

ZENITH TRANSFORMER CO., INC., 1728 West 130th St., Gardena, CA 90249, Tel: 213-321-4551

ZENITH CRT & COMPONENTS OPERATIONS, 1000 Milwaukee Ave., Glenview, IL 60025, Tel: 312-391-7733; *Sls. Mgr.:* Norm Berkowitz

ZENITH SYSTEMS & COMPONENTS GROUP, Zenith Electronics Corp., 1000 Milwaukee Ave., Glenview, IL 60025, Tel: 312-391-7733, Telex: 254396; *Sls. Mgr.:* Norm Berkowitz

Local Sales Offices & Reps

AL	Huntsville, Naylor Assocs.	205-830-1957
CA	Lomita, Comp. Mktg. Assoc.	213-326-1460
CA	Los Altos, Elrepco	415-962-0660
FL	Pompano Beach, VG Sls.	305-971-0900
IL	Chicago, M. Gottlieb Assoc.	312-775-1151
IN	Indianapolis, Latronics	317-846-5788
MD	Columbia, Robert Elec. Sls.	301-995-1900
MI	Southfield, M. Gottlieb Assoc.	313-569-5501
MN	Eden Prairie, Rockmore Sls.	612-941-1390
NJ	Springfield, F. F. Sylvester	201-376-3324
NY	Ithaca, Bob Dean, Inc.	607-257-1111
NY	Wappingers Falls, Bob Dean, Inc.	914-297-6406
NC	Triangle Park, Naylor Assocs.	919-286-7007
OK	Tulsa, Bonser-Philhower Sls.	918-744-9964
OR	Portland, Earl & Brown Co.	503-245-2283
SC	Greenville, Naylor Assocs.	803-297-9969
TN	Knoxville, M. Gottlieb Assoc.	615-966-5613
TX	Houston, Bonser-Philhower Sls.	713-531-4144
TX	Richardson, Bonser-Philhower Sls.	214-234-8438
WA	Seattle, Earl & Brown Co.	206-284-1121

ZENRAD CIRCUITS CO., 529 E. Gutierrez St., Santa Barbara, CA 93103, Tel: 805-963-3527; FSC No.: 33180; Empl.: 10; *Sls. Mgr.:* A. Radford

ZERO CORP., 777 Front St., Burbank, CA 91503, Tel: 213-846-4191, TWX: 910-498-2237; Empl.: 1400; *Sls. Mgr.:* J. J. Roderer

ZERO-EAST DIV., 288 Main St., Monson, MA 01057

ZETA LABS., 3265 Scott Blvd., Santa Clara, CA 95054, Tel: 408-727-6001, TWX: 910-338-7336; FSC No.: 31260; Empl.: 237; *Sls. Mgr.:* C. W. Frank

ZEUS INDL. PRODS. INC., P.O. Box 298, Raritan, NJ 08869, Tel: 201-526-0800, 800-526-3842, TWX: 710-480-9346; FSC No.: 32039; Empl.: 150; *Sls. Mgr.:* John Worley; *Dist. Mgr.:* Arthur M. Silverman ..... **C•1697**

ZEXCO, 7661 Densmore, #8, Van Nuys, CA 91406, Tel: 818-997-7895

ZIATECH, 3433 Roberto Ct., San Luis Obispo, CA 93401, Tel: 805-541-0488, Telex: 4992316; Empl.: 25; *Sls. Mgr.:* Jim Eckford

ZIERICK MFG. CORP., 44 Radio Circle, Mt. Kisco, NY 10549, Tel: 914-666-2911, TWX: 710-571-2143; Empl.: 120; *Sls. Mgr.:* L. T. Noyes

ZIPPERTUBING CO., P.O. Box 61129, Los Angeles, CA 90061, Tel: 213-321-3901, TWX: 910-346-6713; Empl.: 120; *Sls. Mgr.:* Terry Plummer

ZI-TECH INSTR. CORP., 2151 Park Blvd., Box 60490, Palo Alto, CA 94306, Tel: 415-326-2151, Telex: 334-447; Empl.: 15; *Sls. Mgr.:* J. Ziman

ZYLAB CORP., 233 E. Erie, Chicago, IL 60611, Tel.: 312-042-2201; Telex: 383422 ZYLAB CGO.

ZYMOS CORP., 477 N. Mathilda Ave., Sunnyvale, CA 94086, Tel: 408-730-8800, 408-730-5400, TWX: 910-339-9530; *Sls. Mgr.:* Jeff Jacobsen

YEW

SWITCHBOARD METERS & PANEL METERS

AUTHORIZED DISTRIBUTORS

METERMASTER

FOR

Panel Meters • Test Equipment • Components
Sales, Modifications, Repair and Calibration

METERMASTER LOCATIONS:

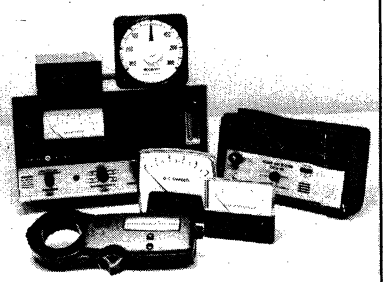
ARIZONA	
Phoenix	(602) 437-1425
Tucson	(602) 792-3411
CALIFORNIA	
Los Angeles	(213) 685-4340
Palo Alto	(415) 960-8500
San Diego	(619) 560-4841
GEORGIA	
Atlanta	(404) 446-0166
ILLINOIS	
Chicago	(312) 250-0606
MASSACHUSETTS	
Boston	(617) 523-2580
MINNESOTA	
Minneapolis	(612) 332-6117
MISSOURI	
St. Louis	(314) 454-0241
NEW MEXICO	
Albuquerque	(505) 292-3330
OHIO	
Cleveland	(216) 651-4100
OKLAHOMA	
Tulsa	(918) 582-1444
PENNSYLVANIA	
Pittsburgh	(412) 261-4548
TEXAS	
Austin	(512) 473-8876
Dallas	(214) 271-5671
Houston	(713) 733-9814
WISCONSIN	
Milwaukee	(414) 643-0554
ALL OTHER STATES	**(800) 962-8128**

YEW®

AUTHORIZED DISTRIBUTOR

SUNSHINE

THE SOURCE FOR METERS & TEST EQUIPMENT



Offices

1810 Grant Avenue/Philadelphia, PA 19115
(215) 673-6500 in PA, NJ, DE
8019 Belair Road/Baltimore, MD 21236
(301) 661-5900 in MD, VA

Local Direct Dial Phones

(203) 563-9232 in Hartford, CT
(203) 773-3441 in New Haven, CT

(302) 652-8585 in Wilmington, DE
(301) 621-5077 in Wash., DC Area

(804) 627-4388 in Norfolk, VA
(804) 649-1159 in Richmond, VA

85
86 Trademark and Logofinder Directories

These Directories are presented as a service to EEM users in order to quickly identify the manufacturers of products commonly referred to by their trademark names and those who show graphic symbols as identifiers on their products. EEM assumes no liability as to the legality or ownerships of such trademarks nor to the proper use thereof. All information shown herein is based on correspondence with the various manufacturers of the products shown.

In the interests of conserving space, only the trademarks and symbols themselves are shown along with the manufacturer which claims their ownership. No attempt has been made here to use trademarks in their proper formats wherein the trademark name is followed by the common name of the product, inasmuch as these Directories are intended as a service to EEM users only.

ABLATAFLUX - Hy-Cal Engrg.
ABLE - Action Instrs.
ABLEBOND - Ablestik Laboratories
ABLECAST - Ablestik Laboratories
ABLEFILM - Ablestik Laboratories
ABLESTIK - Ablestik Laboratories
ABLETHERM - Ablestik Laboratories
ABSORBO-MOP - Clean Room Prods.
ABSORBO-WIPE - Clean Room Prods.
ABSTAT - Anderson-Bell
ABTAB - Anderson-Bell
ACCELEREX - Sel-Rex
ACCELEREX - Sundstrand Data Control
ACCELEVATOR - Titan Technologies
ACCELOGRAPH - Humphrey
ACCENT I - Pyle Industries
ACCENT R - National Information Sys.
ACCESS - Gandalf Technologies
ACCESSOR - Applied Control
ACCESS PROCESS - Amphenol
ACCESS 100 - Amphenol
ACCU/CAD - Accugraph
ACCUCHART - Gould
ACCU-COAT - Aremco Prods.
ACCUCOM - International Data Sciences
ACCU-CURVE - Ametek/Rodan
ACCU-CUT - Aremco Prods.
ACCUDATA - Honeywell
ACCUDEX - Aerotech
ACCU-DIALS - Rogan
ACCU-DRILL - Aremco Prods.
ACCUFILM - Bishop Graphics
ACCUFLEX - Eagle Signal Controls
ACCU-FLO - Beckman Instrs.
ACCUFORCE - Ametek, Inc
ACCU GUARD - AVX Corporation
ACCULAB - Beckman Instrs.
ACCULINE - Hollis Engrg.
ACCULOCK - Emerson, Indl. Controls
ACCULOG - Emerson, Indl. Controls
ACCUMA - Coherent
ACCUMARK PIQ - Stolzberg Research
ACCUPOWER - Emerson, Indl. Controls
ACCUSCALES - Bishop Graphics
ACCUSONIC - Ocean Resch. Equip.
ACCUSPEDE - Emerson, Indl. Controls
ACCUSTAT - PSG Inds.
ACCU-STRATES - Accumet Engrg.
ACCU-STRIP - Ideal Industries
ACCU TONE - Magnetic Systems
ACCUTRACE - Beckman Instrs.
ACCUTRIM - Vishay Resistive Sys. Grp.
AC-CUTROL - Electrol
ACCUTROL - Vectrol
ACCUVEL - Bishop Graphics
ACE CAPACITORS - Corning Glass Works
ACE II - Chicago Lock
ACE MEMORY EXPANSION - Consolink
ACE-O-PAX - Norton Chemplast
ACOUSTAZIP - Zippertubing
ACROD - Acme Elec. Heating
ACROM - Acme Elec. Heating
ACRYLI-CAL - The Meyercord
ACRYLWELD - Hardman
ACTA - Beckman Instrs.
ACTAGRADE - Beckman Instrs.
ACTIONATOR - Honeywell
ACTION DIAGRAMMER - Database Design
ACTION PAK - Action Instrs.
ACTION PIN - AMP
ACTIVAIR - Activair
ACTIVATOR - Elcom Industries
ACTO - Systron-Donner Instr.
ACUDAT - Analogic
ACU-MIN - Moody Tools
ACU-PROBE - EDL
ACU-THERM - EDL
ACU-THERM ANALOG - EDL
ADAM - E & L Instruments
ADAPTABEACON - Edwards
ADAPTABEL - Edwards
ADAPTA-STATION - Borroughs
ADAPT-A-SWITCH - Arrow Hart
ADAPTATONE - Edwards
ADC PORT - Analog Devices
ADD - Wayne Kerr
ADD-A-PAK - International Rectifier
ADD 8000 - E & L Instruments
ADJUST-A-SEELS - APM-Hexseal
ADJUSTOHM - Ward Leonard Elec.
ADJUSTA-TORQ - General Electro-Mechanical
ADLC - Micom Systems
AD-MU-00 - Ad-Vance Magnetics
AD-MU-48 - Ad-Vance Magnetics
AD-MU-78 - Ad-Vance Magnetics
AD-MU-80 - Ad-Vance Magnetics
ADRE - Bently Nevada
ADSORBOSIL - Alltech
ADSORBOSIL-PLUS - Alltech
ADSORBOSPHERE - Alltech
AD/380 - Auto-trol Tech.
AEGIS - Kalglo Elctrns.
AEP - Applied Engrg. Prods.
AEROFOIL - RTE Aerovox
AEROGLASS RM - Aluminum Filter
AEROGRAPH - Varian
AEROKRAFT - RTE Aerovox
AEROMET - RTE Aerovox
AERONAUTIC - Raway Bearing
AEROPAK - RTE Aerovox
AEROPOLE - RTE Aerovox
AEROSAFE - RTE Aerovox
AEROSTAT - Simco
AEROSTOR - RTE Aerovox
AEROVAR - RTE Aerovox
AE-16 ROSIN - Bow Solder Prods.
AE-21 NOCHAR - Bow Solder Prods.
AFIT - Factron/Schlumberger
AGAIN & AGAIN - SAFT America
AGASTAT - Amerace Corporation
AGELESS OSCILLATOR - Spectracom
AGGREGOMETER - Chrono-log
AIMSERT - Aimsco
AIMSLOCK - Aimsco
AIR CELL - Union Carbide Corporation
AIR DOCTOR - Simco
AIRFUGE - Beckman Instrs.
AIR-JRT - FTS Sys.
AIR MAZE - Heat Systems-Ultrasonics
AIROUT - Isochem Products
AIR PAC - Hobson Bros.
AIRPAX - Airpax
AIRPOWER - Avionic Instrs.
AIRTRIM - Sprague-Goodman Elctrns.
AJAXOMATIC - Ajax Magnethermic
AKG - AKG Acoustics
AKROBIN - Akro-Mils
ALAUTRONEX - Sel-Rex
ALCOLITE - Alco Elctrn. Prods.
ALCOSWITCH - Alco Elctrn. Prods.
ALFCO - Aluminum Filter
ALGCO - Auburn Mfg.
ALGOCLAD - Sel-Rex
ALLACAST SYSTEM - Allaco Prods.
ALLEN-HEAD - Allen Mfg.
ALLIGATOR - Mueller Elec.
ALLMETAL - Allmetal Screw Products
ALLOY MONITOR - Sensor
ALLROS - Alpha Metals
ALNICO 8 HE - Thomas & Skinner
ALNICO 9 NB - Thomas & Skinner
ALPA - Heitz, Karl
ALPAC - Semtech
ALPAC E - Semtech
ALPAC JR. - Semtech
ALPAC SR. - Semtech
ALPAC T - Semtech
ALPAC 3 JR - Semtech
ALPAC 3T - Semtech
ALPAC 50 - Semtech
ALPAC 50-R - Semtech
ALPHA - Ehrhorn Technological Opers.
ALPHA - Singer
ALPHABON - Alpha Wire
ALPHA I - Crystaloid Elctrns.
ALPHA-KIT - Contact East
ALPHAPLOT - Alpha Merics
ALPHA TONE - American Microsignal
ALPHATRON - Varian
ALPHLOC - Alpha Wire
ALSIMAG - 3M, Tech Ceramic Resources
ALTI-CODER - Kollsman Instr.
ALTUS LTC - Altus
ALUMALOY - Lab-Line Instrs.
ALUMAPAK - Sprague Elec.
ALUMA-TRAK - Zero
ALUMIFOAM - Times Fiber Communications
ALUMIFOIL - Times Fiber Communications
ALUMINEX - CTS Corporation
A-LUM-O-AIRE - Carey Elctrn. Engrg.
ALU-SOL - Multicore Solders
AMBIDEX - Aerotech

AMBITROL - Power Designs
AMDOS - Advanced Micro Devices
AMP - AMP Distributor Marketing Div
AMPACT - AMP
AMPAK - Pacer Industries
AMP-BLADE - AMP
AMP-CLAMP - Simpson Elec.
AMP EDGE - AMP
AMPERITE - Amperite
AMP-FIT - AMP
AMP-IN - AMP
AMPIP - AMP
AMPLASTIC - AMP
AMP-LATCH - AMP Distributor Marketing Div
AMP-LEAF - AMP
AMPLI-BOND - AMP
AMPLIBRIDGE - Gould
AMPLICENTER - Harris
AMPLICOLUMN - Paso Sound Prods.
AMPLIFLEX - AMP
AMPLIMATE - AMP
AMPLIMITE - AMP Distributor Marketing Div
AMPLIMITE - AMP
AMPLI-PRESS - AMP
AMPLISEAL - AMP
AMPLITE-END - AMP
AMPLIVAR - AMP
AMPLIVERSAL - AMP
AMPLI-VOX - Perma Power Elctrns.
AMP-LOK - AMP
AMPMODU - AMP
AMP-O-LECTRIC - AMP
AMP-O-MATIC - AMP
AMPOMATOR - AMP
AMPORTAPOWER - AMP
AMPOWER - AMP
AMP-REG - Computer Prods.
AMPROBE - Amprobe Instr.
AMPSEAL - AMP
AMP STACK - AMP
AMPSULATION - AMP
AMP-TAB - AMP
AMP-TAPEMATIC - AMP
AMP-TAPETRONIC - AMP
AMP TEK - Amptek
AMPTEK - Amptex
AMPTRAN - Amprobe Instr.
AMP-TRAP - Gould
AMRAD - Amrad & Transcon Mfg.
AMRON - Eldre Corporation
AM SERIES - Adatek
AM SYS - Advanced Micro Devices
AM25S557/558 - Advanced Micro Devices
AM2903 - Advanced Micro Devices
ANA-LED - Simpson Elec.
ANALOG CONNECTION II - Strawberry Tree Computers
ANALOG CONNECTION PC - Strawberry Tree Computers
ANALOK - Analog Devices
ANALYTICAL TITRA-KIT - Analytical Meas.
ANGAR - Automatic Switch
ANHYDROGUIDE - Fiberguide Industries
ANTEX - Newman, M. M.
ANTI-STATIC ((N))79 - Merix Chem.
ANTI-STATIC ((N))79-QL - Merix Chem.
ANY DIP - Vector Electronic
A. P. BONDEZE - Phelps Dodge Magnet Wire
APC - NEC Information Systems
APC III - NEC Information Systems
APCO - American Plasticraft
APC-7 - Amphenol
APOLANE - Alltech
APOLLO - Kalart Victor
AP-PAK - MPI
AQUADAG - Acheson Colloids
AQUAMETER - Beckman Instrs.
AQUAPAK - Electrovert USA
AQUA PURE - AMF
AQUA-SOL - Kenco Industries
AQUA-SURE - Kenco Industries
AQUA-THERM - Dolph, John C.
AR - Amplifier Research
ARAX - Multicore Solders
ARC-QUENCH - Kaiser Systems
ARC-QUENCHER - Kaiser Systems
ARCOLEC - Arcolectric
ARCOLYTICS - Arco Elctrns.
ARCO OR AE - Soshin Elec.
ARCUSTEP - Arc Systems
AREMCOBOND - Aremco Prods.
AREMCOLOX - Aremco Prods.
ARGENTOMERSE - Technic
ARKOMAX - Arnold Engineering
ARMAFLEX - Armstrong World Inds.
ARMOR-DUR - Shure Bros.
ARMORED POLY-THERMALEZE 2000 - Phelps Dodge Magnet Wire
ARMORED XECON - Chomerics
ARMORTITE - Okonite
ARMORWEAVE - Antenna Specialists
ARNOX - Arnold Engineering
AROSET - Ashland Chemical
ARTBRUSH - Control Systems
ARTEMIS - Metier Management Sys.
ARTIST - Control Systems
ARTISTEK 4115 - Control Systems
ARTLIB - Control Systems
ARTWORKER - Wayne Kerr
ARULAB - Laboratory Products
ASCI - Advanced Sys. Concepts
ASCO - Automatic Switch
A-SCOPE - Varian
ASENCO - Associated Engrg. Mfg.
ASPEN - Aspen Ribbons
ASTRA - Beckman Instrs.
ASTRA - NEC Information Systems
ASTRACIDE - Heat Systems-Ultrasonics
ASTRACIDE-D - Heat Systems-Ultrasonics
ASTRACIDE-S - Heat Systems-Ultrasonics
ASTRAMAX - Heat Systems-Ultrasonics
ASTRAMIXER - Heat Systems-Ultrasonics
ASTRAPREP - Heat Systems-Ultrasonics
ASTRASHEAR - Heat Systems-Ultrasonics
ASTRASON - Heat Systems-Ultrasonics
ASTRASTAT - Heat Systems-Ultrasonics
ASTRAWELD - Heat Systems-Ultrasonics
ASTRO-AIRE - Astro Dynamics
ASTRO BOA FLEX - Astrolab
ASTRO-BUBBLE - Astro Packaging
ASTRO-CELL - Astro Packaging
ASTRO-COBRA-FLEX - Astrolab
ASTROFLO - Astro Dynamics
ASTROGARD - Astronautics Corporation of America
ASTRO-GRAPH - Astro-Med
ASTROLIFT - Astro Dynamics
ASTROLIGHT - ElectroPhysics
ASTROLINE - Hollis Engrg.
ASTROLOK - Astrolab
ASTRO-POUCH - Astro Packaging
ASTRO-SUPRABUBBLE - Astro Packaging
ASTRO/348 - Amphenol
ASYMPTOTIC CALORIMETER - Hy-Cal Engrg.
ASYNC EXCHANGE - Intelligent Technology
ATHENA-11 - Metis
ATO - Littelfuse
ATOM - Sprague Elec.
ATOMSOLVE - Atomergic Chemetals
AUDIODISCS - Capitol Magnetic Prods.
AUDIO HAILER - Audio Equip.
AUDIOLARM - Bell, Floyd
AUDIO-MASTER - Shure Bros.
AUDIOPAK - Capitol Magnetic Prods.
AUDIOTAPE - Capitol Magnetic Prods.
AUDIOVOICE - Paso Sound Prods.
AUGTENNA - Teledyne Micronetics
AURION-X - Sel-Rex
AUROBOND - Sel-Rex
AUTHENTI-KEY - Analytics Communications Sys.
AUTOBALANCE - Ballantine Labs.
AUTO CAD - Autodesk
AUTOCAL - Datron Instrs.
AUTOCON - Sprague Elec.
AUTO-DRAFT - Auto-trol Tech.
AUTO-FLOW - Keuffel & Esser
AUTOFUSE - Littelfuse
AUTO-GAIN - ITHACO
AUTOGRAPH - Acurex-Autodata
AUTOGRAPH - Gerber Sys. Technlgy.
AUTOJUMPER - Autosplice
AUTO-KLEAN - AMF
AUTO LINEAR - Jan Hardware Mfg.
AUTOLUG - Autosplice
AUTOMAC - Cardinal Control
AUTOMAGNETIC - RFL Inds.
AUTOMEMORY - Pacific Meas.
AUTOMET - E-Systems
AUTOMETRONIC - Ballantine Labs.
AUTOPART - Gerber Sys. Technlgy.
AUTOPATH - Gerber Sys. Technlgy.
AUTOPIN - Autosplice
AUTO-PLEXOR - Automation Displays
AUTOPOLAR - Teledyne Micronetics
AUTO-RANGER - Unholtz-Dickie
AUTOSAL - Guildline Instrs.
AUTOSEIS - Kinemetrics
AUTO-SNAP - Automation Displays
AUTOSPLICE - Autosplice
AUTOSTAT - Static
AUTOSWITCH - Bytex
AUTOTAB - Autosplice
AUTOTAK - Howell Instrs.
AUTOTEMP - Howell Instrs.
AUTO TRACKING - Sencore
AUTRONEX - Sel-Rex
AVANPAK - Avantek
AVDELOK - Avdel
AVEX - Avdel
AVILOK - Avibank Mfg.
AVMATIC - Avdel
AVSAFE - Avdel
AVSEAL - Avdel
AVSERT - Avdel
AVTAINER - Avdel
AX - San-O Industrial
AXIMAX - EG & G Rotron
AXIOHM - Ward Leonard Elec.
AYCAD - Aydin
B - Bourns
BACK PACK - International Instrumentation
BACKPACKER - Lyon Metal Prods.
BACK TO BACK 'R'S (RR) - Regency Systems
BAFCO BUFFER - Venable Industries
BAILATCH - Hartwell
BALANCE MASTER - Bently Nevada
BAL-CON - Eby
BALDWIN - BLH Elctrns.
BALLISTRAK - Flow Technology
BALL-LOK - Avibank Mfg.
BALPLAN MICROSCOPES - Bausch & Lomb
BAM-8 - Berkeley Process Control
BANDOMATIC - Burndy Corporation
BAND-SCAN - Sequential Info. Sys.
BANSHEE - Cybersonic
BANTAM - Burndy Corporation
BANTAM ROTA-CRIMP - AMP
BARB-PREP - Alltech
BARGUARD - Control Module
BAR-LOK - Dennison Mfg.
BARRIER/CAP - American Technical Ceramics Corporation
BARRYMOUNT - Barry Controls
BASE COMMANDER - Antenna Specialists
BASIC CONTROLLER - Action Instrs.
BASICPAC - Acurex-Autodata
BAT - Blatek Inds.
BATTERY*CHECK - Electronic Specialists
BAY/TRONIX - Bay Prods.
BAZOOKA - Air-Vac Engrg.
BDT - Sel-Rex
BEAMSCAN - Photon
BEAMSCAND - Photon
BEANBUILDER - Sencore
BEAR - Norton
BEAR PAW - Jobmaster
BEAR-TEX - Norton
BEAU - Beau Products
BEAVER - Cornell-Dubilier Electronics
BECON - Teledyne Kinetics
BEE LINE - Hughes Aircraft
BEEPER BOOSTER - Antenna Specialists
BELDFOIL - Belden
BELDSOL - Belden
BELDURE - Belden
BELGARD - Aqualarm
BELLCO - Bell
BEL-RINGER - Bell, Floyd
BELT-LINE - U.S. Terminals
BEMCOIL - Bemco
BENCHMARK - Beckman Instrs.
BENCHMARK 20 - Motorola Semiconductor Prods.
BENCHMASTER - Advance Engrg.
BENCHMASTER - Tenney Engrg.
BENDER - Fancort Industries
BERGCON - Du Pont Connector Systems
BERGLANCE - Du Pont Connector Systems
BERGPIN - Du Pont Connector Systems
BERGPOST - Du Pont Connector Systems
BERGSTIK - Du Pont Connector Systems
BERLON - National Beryllia
BERLOX - National Beryllia
BERLOX-STRATE - National Beryllia
BERYLCO - Cabot Berylco
BESPONDER - Vega Precision Labs.
BET - Motorola Semiconductor Prods.
BETA-K - Centerflex Techn.
BETA-KIT - Contact East
BEV-A-LINE - Thermoplastic Processes
BIG BUG BOX - International Instrumentation
BIG INCH - Haydon Switch & Instr.
BIG MACK - Sencore
BIG MOMMA - Antenna Specialists
BIG PAC - New Haven Wire & Cable
BIG-7 - Holub Industries
BIMET - Handy & Harman
BIMORPH - Vernitron Piezoelectric
BINAVERTER - Metric Sys.
BIOGAMMA - Beckman Instrs.
BI-OPTIC - Breeze-Illinois
BIOSENSOR - Beckman Instrs.
BIO-SOLV - Beckman Instrs.
BIOTRONETTE - Lab-Line Instrs.
BIO-VIAL - Beckman Instrs.
BIOX - IVEK
BIPAX - Tra-Con
BI-PRO - Breeze-Illinois
BIROX - DuPont de Nemours, E. I.
BISCUIT - EG & G Rotron
BI-SHELL - Breeze-Illinois
BI-SHIELD - Breeze-Illinois
BISIC - Trio-Tech Intl.
BISTABLE AMPLIFIER - Cross Elctrns.
BISYNC EXCHANGE 3270 - Intelligent Technology
BISYNC EXCHANGE 3780 - Intelligent Technology
BIT - Transformer & Coil Products
BIT-DRIVER - Belden
BIT GUARD - AVX Corporation
BIT LITE - Belden
BITMOS - Motorola Semiconductor Prods.
BIT-P - Transformer & Coil Products
BIT PAD ONE - Summagraphics
BIT PAD TEN - Summagraphics
BITRAC - Transducer Systems
BI-TRIM - American Technical Ceramics Corporation

BIVAR - Waldom Elctrns.
BLACK BEAUTY - Sprague Elec.
BLACK BOX - Micom Systems
BLACK MAGIC - Recoton
BLACO - Baron-Blakeslee
BLACO-TRON - Baron-Blakeslee
BLAK-RAY - UVP
BLENDMASTER - Hull
BLEND-OHM - Methode Elctrns.
BLOCK PAC - Powercube
BLO-COOL - FTS Sys.
BLO-HARD - Heat Systems-Ultrasonics
BLOW-GLOW - FIC
BLUE BIZ - Computer Terminal Sys.
BLUE CHIP - Mepco//Electra
BLUE DART - Emcon
BLUE DOT - GTE Sylvania Lighting Prods.
BLUE DOT - Maury Microwave
BLUE LYNX - Techland Systems
BLUE MACS - T&B/Ansley
BLUE MAX - Computer Terminal Sys.
BLUE RIBBON - Amphenol
BLUE RIBBONS - Aspen Ribbons
BLUE SHOWER - Tech Spray
BLUE STREAK - Computer Terminal Sys.
BLUE STUFF - Tech Spray
BLUE WIX - Computer Terminal Sys.
BODE BOX - Venable Industries
BOKER - Cooper Group
BOMB-TAIL - AMP
BONARC - Tafa
BONDALUM - Craig Systems
BONDEZE-M - Phelps Dodge Magnet Wire
BOOMERANG - Benthos
BORAL - KBI
BORD PAK - Buckeye Stamping
BOSTFLEX - BIW Cable Sys.
BOSTGARD - BIW Cable Sys.
BOSTRAD - BIW Cable Sys.
BOUYOUCOS - Beckman Industrial
BOXER - IMC Magnetics
BP-1500 - Dataproducts
BP-2000 - Dataproducts
BR - Babcock
BRADYPACK - Brady, W. H.
BRADYSLEEVE - Brady, W. H.
BRAKE-PAK - Ambi-Tech Inds.
BRANDENBURG - ZI-TECH Instr.
BREWEAVE - Brew, Richard D.
BRICKWALL - Wavetek Rockland Scientific
BRIDGESENSOR - Calex Mfg.
BRIFLON - Brim Elctrns.
BRIMCROM - Brim Elctrns.
BRIMFLEX - Brim Elctrns.
BRIMFLYX - Brim Elctrns.
BRIMGARD - Brim Elctrns.
BRIMLITE - Brim Elctrns.
BRIMLON - Brim Elctrns.
BRIMPRENE - Brim Elctrns.
BRISTOL - Bristol Babcock
BRITE-EYE - Shelly Associates
BRITE-LITE - National Semiconductor Optoelectronics
BRITEWRITER - NEC Information Systems
BRIV - Avdel
BRONCO 66 - Teledyne Western Wire & Cable
BROOKSMITE - Brooks Instr.
BROWN DEVIL - Ohmite Mfg.
BRUDIC - Electro-Craft
BRYON - Brim Elctrns.
BSO/ASSEMBLER - Boston Systems Office
BSO/C - Boston Systems Office
BSO/COM-1 - Boston Systems Office
BSO/COM-2 - Boston Systems Office
BSO/DEBUG - Boston Systems Office
BSO/MLIB - Boston Systems Office
BSO/MLINK - Boston Systems Office
BSO/OBJCNV - Boston Systems Office
BSO/PASCAL - Boston Systems Office
BSO/PLANNER - Boston Systems Office
BSO/PLM - Boston Systems Office
BSO/TEKLD - Boston Systems Office
BSO/UMD - Boston Systems Office
BSO/XL - Boston Systems Office
BTM - True Data
BUBBL-BOARD - Bubbl-Tec
BUBBL-BOARD - PCM-PAC Cyber-Metric
BUBBL-BOX - Bubbl-Tec
BUBBL-CONTROL - Bubbl-Tec
BUBBL-MACHINE - Bubbl-Tec
BUBBL-PAC - Bubbl-Tec
BUBBL-PAC - PCM-PAC Cyber-Metric
BUBBL-TEC - Pacific Cyber/Metrix
BUCHANAN - Amerace Corporation
BUGBOOKS - E & L Instruments
BUG BOX - International Instrumentation
BUG CAGE - International Instrumentation
BUG TAG - International Instrumentation
BUG TRAY - International Instrumentation
BULBEX - Avdel
BULK METAL - Vishay Resistive Sys. Grp.
BULL DRIVER - Vaco Prods.
BULLET BOND - Communications Technology
BULLET-NOSE - Sealectro
BULLS-EYE - Hughes Aircraft
BULLSEYE - Motorola Semiconductor Prods.
BULPLATE - Sprague Elec.
BUNTING - NL Bearings/NL Industries
BUSCOMM - Trendata/Standard Memories
BUSDAC - Advanced Micro Devices
BUSDRIVER - Micom Systems
BUSS - Bussmann
BUSTLE - NES, (Nationwide Electronic Systems)
BUT STAKS - SL Electronics
BUTTERFLY - Licon
BUTTONEER - Dennison Mfg.
BW AUTOMATIC - Black & Webster
BW ORBITAL - Black & Webster
BYTAC - Norton Chemplast
BYTE BUCKET - Analog & Digital Peripherals, (ADPI)
BYTEDAC - Precision Monolithics
BYTESAVER - Cromemco
BYTE-WIDE - Zenith Systems & Components Group
B-1000 - Dataproducts
CABLEMASTER - Chatsworth Data Corp
CABLEMATIC - Ripley
CABLE-RAP - Amrad & Transcon Mfg.
CABLE SENTRY - Zenith CRT & Components Operations
CACHETAPE - Cipher Data Prods.
CADAPPLE - T & W Systems
CADCO - Cadillac Plastic & Chem.
CADDY-PACK TRANSPORTERS - ADE
CADNICA - Sanyo Elec.
CADON - Monsanto
CADRAFT - Summit CAD
CAEON 27 & 28 - Caig Labs.
CAERE - Caere
CAGE KEEPER - International Instrumentation
CAI - Communication
CALCART - Ballantine Labs.
CALL-TAPER - Electro Physics
CAMAC - Kinetic Sys.
CANCEL - ADE
CANOLITE - Manhattan Elec. Cable
CANOLON - Manhattan Elec. Cable
CAP BUS - Eldre Corporation
CAPLET - Augat/Pylon
CAP-RANGER - Ohmite Mfg.
CAPS - ITT Cannon
CARAVEL - EG & G Rotron
CARBOFLOW - Microwave Filter
CARB-O-LOCK - General Elec.
CARBOLOY - General Elec.
CARBOLUBE - Carbone Lorraine Inds.
CARBON STAX - PCK Elastomerics
CARBOSPHERE - Alltech
CARDCON - TRW Connector
CARDGARD - Airpax
CARD-O-PULL - Bivar
CARTRIFILE R - Tri-Data
CARY - Varian
CASEY CLIP - Communications Technology
C-A-S-H - Standard Logic
CATALOG 100 - Workman Elctrn. Prods.
CAT DEVICE - Union Carbide Corporation
CATFACE - Catronix
CATFEM - Catronix
CATHORAD - Judd Wire
CATSOFT - Catronix
CATSOLID - Catronix
C.A.T.T. - Gulton Inds.
CATT - Piezo Elec. Prods.
CATV KNIGHT DESIGN - Belden
CATYLATOR - Hydrocap
CAVITENNA - Amplifier Research
CA20BSC - ICCI
CA20SNA - ICCI
C-B - Caddell-Burns Mfg.
CBE - Westinghouse Elec.
CB-MATE - Bird Elctrn.
C-BOX - IET Labs
CC ENVELOPED BY Q - Coil-Q
C-CON - Concept Industries
CC-4 - Additive Products
CC-4 - PCK Technology
CC-80 - Auto-trol Tech.
CDS 224 - Concord Data Systems
CE-CON - Eby
CEEMETER - Alpha Comps.
CELANESE - Celanese Plastics
CELANEX - Celanese Plastics
CELCI - Tecknit (Eastern Facility)
CELCON - Celanese Plastics
CELL-COMPILER - VLSI Technology
CELLFLEX - Cablewave Sys.
CELLULINE - Belden
CELSIDOT - Solder Absorbing Technology (SAT)
CELSIMETER - Solder Absorbing Technology (SAT)
CELSIPOINT - Solder Absorbing Technology (SAT)
CELSISTRIP - Solder Absorbing Technology (SAT)
CEMOS - Integrated Device Technlg.
CENTAUR - EG & G Rotron
CENTIGRID - Teledyne Relays
CENTI-LOC - ITT Cannon
CENTOHM - Ward Leonard Elec.
CENTRA-GAP - Thomas & Skinner
CENTRICORE - Magnetic Metals
CENTRISAFE - Trio-Tech Intl.
CENTRONIC - Centronic
CENTRY - Leeds & Northrup Instrs.
CENTUM - Yokogawa of America
CENTURION - Lutron Elctrns.
CENTURY - Beckman Instrs.
CENTURY 2000 C - Electrovert USA
CENTURY 2000 S - Electrovert USA
CEO - Solid State Systems
CERACIRCUIT - Sprague Elec.
CERADOT - CTS Corporation
CERAFIL - Murata Mfg., Ltd.
CERAFORM - PCK Technology
CERALAM - AVX Corporation
CERALOCK - Murata Mfg., Ltd.
CERA-LYTIC - Sprague Elec.
CERAMABOND - Aremco Prods.
CERAMACAST - Aremco Prods.
CERAMACOAT - Aremco Prods.
CERAMA-DIP - Aremco Prods.
CERAMAG - Stackpole, Electronic Components
CERAMICA 3 - Mica Corporation
CERAMIKIT - Sprague Elec.
CERAMIPEC - Murata Mfg., Ltd.
CERAMO - Thermo Electric
CERAMOCOUPLE - Thermo Electric
CERAMOLITHIC - Centralab
CERASEAL - AVX Corporation
CERASTAT - Murata Mfg., Ltd.
CERATRCLS - CTS Corporation
CERATRIM - CTS Corporation
CERATRON - Murata Mfg., Ltd.
CERCHIP - Sprague Elec.
CERMAX - ILC Technology
CEROD - Sprague Elec.
CEROL - AVX Corporation
CERT - Times Fiber Communications
CERTACELL - Koep Precision Standards
CERTAVOLT - Koep Precision Standards
CER-T-FIED - Berg, W. M.
CERTI-CRIMP - AMP
CERTI-LOK - AMP
CERTI-SEAL - AMP
CFS - Tensolite
CHALLENGER - Equipto Elctrns.
CHAMP - AMP
CHAMP-LOK - AMP
CHAMPOMATIC - AMP
CHAN-L-WIRE - Wiremold
CHANNELITE - Channel Inds.
CHANNELMAX - ITT Electro-Optical Prods.
CHANNELTRON - Galileo Electro-Optics
CHARABAND - Dataproducts
CHARGE-MASTER - Simco
CHARGE PLUS - Dattilo Electronics
CHARGE PLUS JR. - Dattilo Electronics
CHASE-FOSTER - Keene Laminates
CHASSIS-TRAK - General Devices
CHEAPTALK - Datavoice
CHECK-LITE - Adalet-PLM Div
CHEK-SORT - Lundy Elctrns. & Systems
CHEMFLUOR - Norton Chemplast
CHEMGRIP - Norton Chemplast
CHEMINAX - Raychem
CHEM-MATE - Beckman Instrs.
CHEMOLOGY - Chemtronics
CHEM-O-SOL - Whittaker
CHEM-O-THANE - Whittaker
CHEMTRON - COSAR
CHEMWARE - Norton Chemplast
CHEM-WIK - Chemtronics
CHIP - Forma Scientific
CHIPMUX - Barnes Engrg.
CHIPSCRETE - Motorola Semiconductor Prods.
CHIPSWITCH - Crydom
CHIRASIL-VAL - Alltech
CHLOROTHENE NU - Dow Chemical
CHLOROTHENE VG - Dow Chemical
CHOBERT - Avdel
CHOICE - Bowmar Instrument
CHO-NECTOR - Chomerics
CHO-SEAL - Chomerics
CHO-SHRINK - Chomerics
CHO-SIL - Chomerics
CHO-THERM - Chomerics
CHRO-BAR - VIZ Test Equipment
CHROMAFILTER - Panelgraphic
CHROMAFUSE - Panelgraphic
CHROMAGOLD - Zenith Systems & Components Group
CHROMA-LINE - Simpson Elec.
CHROMASCREEN - Panelgraphic
CHROMATO-VUE - UVP
CHROMA 80 - Memorex
CHROMA 90 - Memorex
CHROM-O-SCOPE - Capintec Instrs.
CHRONO-LUME - Chrono-log
CHRONO-PAR - Chrono-log
CHRONOTROL - Barber-Colman
CHV - Brim Elctrns.
CI - Curtis Inds.
CIHS - Tensolite
CIMRON - Behlman, California Instrs.
CIMRON - Elin
CINCH - Inconix
CINCHNET - Inconix
CINCH PAC - Inconix
CIP - Tensolite

CIPHER X - Technical Communications Corporation
CIRCBORD - Vector Electronic
CIRCLE "B" - Bristol Saybrook
CIRC-O-GIDE - Bivar
CIRCUITIP - AMP
CIRCUITMATE - Beckman Industrial
CIRCUITRIM - VRN International
CIRCUIT-STRIP - A P PRODUCTS INCORPORATED
CIRKITBLOCK - Powercube
CIRTRAK - DuPont de Nemours, E. I.
CJ - Omega Engrg.
CJ BEARINGS - Dixon Inds.
CLASP - Standard Microsystems
CLASPCON - MOLEX
CLASSETTE - Audiotronics
CLASSIC - Carter Motor
CLASSY CHASSIS - Gimix
CLEAN CYCLE - Inmac
CLEANLINE - Controlled Envir. Equip.
CLEAN MACHINE - Mann, Henry
CLEAN-N-DRI - Clean Room Prods.
CLEAN PAL - Clean Room Prods.
CLEAN SOUND - Recoton
CLEAR-ALL - Nu-Concept Computer Sys.
CLEARFLEX - Carol Cable
CLEAR-PASS - Sprague Elec.
CLEARSIGHT - Communications Technology
CLEAR SIGNAL - Inmac
CLEERTREND - Leeds & Northrup Instrs.
CLETALOY - Superior Carbon Prods.
CLINCHER - Du Pont Connector Systems
CLINCHER - Jamesbury
CLIP - Wonder Corp of America
CLIP-AC - Adtech Power
CLIPLITE - Visual Communications
CLIPPER - Mueller Elec.
CLIPSLEEVES - Brady, W. H.
C-LITES - Genisco Technology
CLOCK-CHIP - MF Elctrns.
CLORINOL - Sprague Elec.
CLOSE - Adelie Corporation
CLUSTERNET 3270S - Intelligent Technology
CLUZ - FIC
C-L-X - Okonite
C-MOD-COMPANION - Lorain Prods.
CMS 1000 - Racal-Milgo
CMS 2000 - Racal-Milgo
CMTS - Wiltron
COAX EXCHANGE - Intelligent Technology
COAXICLAMP - AMP
COAXICON - AMP Distributor Marketing Div
COAXICON - AMP
COAXITUBE - Precision Tube
CO-AX MAGI-T - CES Elctrns.
COAXWITCH - Bird Elctrn.
COBRA - B & K Precision, Industrial Electronics Product Group
CODEBEAM - Codenoll Technology
CODEDATA - Codenoll Technology
CODELED - Codenoll Technology
CODELINK - Codenoll Technology
CODELOGIC - Codenoll Technology
CODE NO. 249 - Oak Switch Sys.
CODESTAR - Codenoll Technology
CODISTOR I - Codi Semiconductor
COHRLASTIC - CHR Inds.
COIL-FIX - Tra-Con
COLE BOSTON - Cole-Hersee
COLLARLOK - ESNA
COLLINS - Collins Avionics
COLOR BRITE - GTE Sylvania Lighting Prods.
COLOR-BRITE - Perma Power Elctrns.
COLORMASTER - Lance Inds.
COLOR PLOT - Trilog
COLORTHERM - General Electric
COLORWARE - Advanced Elctrns. Design
COL-PREP - Alltech
COLUMBIA - Union Carbide Corporation
COMBAT - Wayne Kerr
COMBAT BN - Sohio Engineered Materials
COMBO - Chomerics
COMBO - ETI Systems
COMBO POLASTRIP - Chomerics
COMBO-RAK - Fancort Industries
COMBO-SLIDE - Fancort Industries
COMBO STRIP - Chomerics
COMBO-2 - Chomerics
COMCAB - Communication Cables & Connectors
COMDAC - Precision Monolithics
COMET - Computer of America
COMFORDOME - Vaco Prods.
COMFORM I - Pace
COMLINE - Piezo Technology
COMM/SCOPE - M/A-Com. Cable/Home Communicatios Comm/Scope Coaxial Cable
COMPAC - Semtech
COM PAC - Vicon Industries
COMPACT - Transformer & Coil Products
COM-PAK - Lambda Electronics
COM-PAK MARK II - Lambda Electronics
COMPAK 4 - Kalart Victor
COMPARASCOPE - Vision Engrg.
COMPARATOR - Cambridge Technology
COMPLIMITER - Spectra Sonics
COMPLOT - Houston Instrument
COMPONICS - Surgeonics Ltd.
COMPOSITION EDITOR - VLSI Technology
COM-PREP 838 - Pressure Controls
COMPRESSION-STEP - Unholtz-Dickie
COMPROTENN - Tenney Engrg.
COMPUCOM - Paso Sound Prods.
COMPUFONE - Computalker
COMPULIFT - Litton Potentiometer
COMPULYTIC - Sprague Elec.
COMPUSEIS - Kinemetrics
COMPUSTAT - PSG Inds.
COMPUTACH - Sensor
COMPUTAMITE - Cornell-Dubilier Electronics
COMPUTER LABS - Digital Equip.
COMPUTERSCOPE - R. C. Elctrns.
COMPUTEST - Ballantine Labs.
COMPU-THERM - RdF Corporation
COMPUTRAK - Gulton Inds.
COMPUTROL - Austin Electronics
COMSHEL - Sinclair Radio Labs.
COMSTATE I - Atlantic Research
COMSTATE II - Atlantic Research
COMSTOC - Keuffel & Esser
COMTROL I - Computrol Kidde Automated Sys.
CONCENTRIKIT - CTS Corporation
CONCEPT/32 - Gould
CONCERTMASTER - Hartley Prods.
CONCO-FOAM - Consolidated Electronic Wire & Cable
CODENET - Codenoll Technology
CONDOR - IMC Magnetics
CONDUCTING TWENTY/TWENTY - Allaco Prods.
CONDUCTO-LUBE - Cool-Amp Conducto-Lube
CONDUCTROX - Ferro
CONDUCTWEEZ - Pace
CONDULON - Pervel Inds.
CONDUX - Hardman
CO-NETIC - Magnetic Shield
CONFIDENCER - Roanwell
CONFLAT - Varian
CONFUZZ - Tecknit (Eastern Facility)
CONHEX - Sealectro
CONMAX - Tecknit (Eastern Facility)
CONSERVER - Bailey Controls
CONSIL - Handy & Harman
CONSIL - Tecknit (Eastern Facility)
CONSIL-C - Tecknit (Eastern Facility)
CONSIL-R - Tecknit (Eastern Facility)
CONSOCARD - Consolink
CONSOLMATIC - Hull
CONSTELLATION - Nova Elec.
CONTACT KLEEN - Chemtronics
CONTACT-SERT - Hybricon
CONTELNET - Contel Info. Sys.
CONTINENTAL - Sencore
CONTINUAC - Lortec Power Sys.
CONTINUUM - Strategic Sys. Power Sys. Operations
CONTROFLEX - Tapeswitch of America
CONTROFLUXER - Adtech Power
CONTROLLED MAGNETIC - Shure Bros.
CONTROL PLUS - MKS Electronics
CONVERT-A-PAK - Belden
CONVERT-A-PAK - Teltone
CONVERT-A-UNIT - Teltone
CONVERTEMP - EDL
CONVEYOR-CURE - American Ultraviolet
CONXRITE - Visual Communications
COOL-AMP - Cool-Amp Conducto-Lube
COOLANOL - Monsanto
COOL GLO - Bishop Graphics
CO-ORD - C0-ORD Switch
CO-ORD - LVC Inds.
COPALUM - AMP
COPLAMOS - Standard Microsystems
COPPERBRITE - Engelhard
COPPERPLY - National-Standard
COPPER SWEAT - Bow Solder Prods.
COPPERTHERM - Keene Laminates
COPY CARV - Miller Dial
COPYCORDER - Hecon
CORBY KEY - Corby Inds.
COREMOUNT - Hallmark Metals
CORNER-MATE - Hardigg Inds.
CORNING - Corning Glass Works
CORONALOC - ENI Power Sys.
CORPORATE LINK - Shure Bros.
CORRGARD - Siecor
CORRIB - Ohmite Mfg.
CORTEM - Carbone Lorraine Inds.
CORTITE - Carbone Lorraine Inds.
CORVEL - Polymer
CORX ELIMINATOR - Lee Data Corporation
COUNT MODULES - Practical Automation
COUNTOMATIC - Electromatic Controls
COUNTROLLER - Veeder-Root
COVEROHM - Ferro
CP/M - GMR
CP/M COURRENT 86 - GMR
CPPC - Clifton Precision
C-PROBE - International Instrumentation
C-PROBE II - International Instrumentation
C-PROBE V - International Instrumentation
CPX - Cuplex
CQUAM - Motorola Semiconductor Prods.
CRADLE - Gould
CRADLECLIP - Electrovert
CRAIG - Kalart Victor
CRALAB - Dimco-Gray
CRAMOLIN - Caig Labs.
CRANEGARD - Dillon, W. C.
CREDENZA - Lutron Elctrns.
CRESCENT - Cooper Group
CRESCENT - Waldes Kohinoor
CRICKET - Sencore
CRIMP-ACON - Methode Elctrns.
CRIS-PIC - Kalart Victor
CRITERIA SYSTEM - Reliability
CRL - Centralab
CROCODILE CLIP - Mueller Elec.
CROMA-FLEX - Advance Wire & Cable
CROMA TWIST - Advance Wire & Cable
CROMA WEAVE - Advance Wire & Cable
CROMIX - Cromemco
CROSSOVER - Middleburg
CROSSPOINT - Dio-Rey
CROSS WORD - Data Processing Design
CROUZET - Crouzet Controls
CRT - Daburn Elctrns. & Cable
CRT - Dotronix
CRTBUG - Motorola Semiconductor Prods.
CRT-PAC - Semtech
CRYOTERM - Maury Microwave
CRYO-TORR - CTI-Cryogenics
CRYSTOGRAPH - International Instruments
CRYSTOGRAPH - Sigma Instrs.
C/SCRIPT II - Commercial Sys. Labs.
CSI - CSI Capacitors
CSI - Markem
CS3 - TransKinetic Sys.
CTC-71 - Alpha Metals
CT-FLEX - Dixon Inds.
CUBATH - Sel-Rex
CUBELITE - Visual Communications
CUBIC - Memorex
CUCLAD - 3M-Electronic Products
CUE/SPLICE - Tapecon
CUPAC - Semtech
CURCUIT FIX - Datak
CURRENT GUN - Bell, F. W.
CURTIS INDACHRON - Curtis Instrs.
CUSIL - GTE Wesgo Technical Ceramics & Metals
CUSTOM/POWER - Trio Labs.
CUSTOM STRIPMASTER - Ideal Industries
CUTMETER - Veeder-Root
CVP TESTER - Workman Elctrn. Prods.
C-W - Caddell-Burns Mfg.
CYBERBLAST - Cybersonic
CYBERCOMMAND - Cybersonic
CYBERTONE - Cybersonic
CYCLEASE - Ram Chemicals, Whittaker
CYCLEMASTER - Midland-Ross
CYCL-FLEX - Eagle Signal Controls
CYCLOHM - Howard Industries
CYCLON - Gates Energy Prods.
CYCLONAIR - EG & G Rotron
CYCLONOME - Sigma Instrs.
CYCLO-RUBBER - Hardman
CYCLOTAR - Alan Gordon Entprs.
CYCOM MCG - American Cyanamid
CYLINDICATOR - Namco Controls
CY232 - Cybernetic Micro Sys.
CY250 - Cybernetic Micro Sys.
CY300 - Cybernetic Micro Sys.
CY360 - Cybernetic Micro Sys.
CY480 - Cybernetic Micro Sys.
CY500 - Cybernetic Micro Sys.
CY512 - Cybernetic Micro Sys.
CY525 - Cybernetic Micro Sys.
CY600 - Cybernetic Micro Sys.
CY750 - Cybernetic Micro Sys.
C2R - General Semiconductor Ind.
C-21 - Hughes Aircraft
DAC PORT - Analog Devices
"DACQ" - Ajax Magnethermic
DAFLEX - Daburn Elctrns. & Cable
DAFLON - Daburn Elctrns. & Cable
DAG - Acheson Colloids
DAGLAS - Phelps Dodge Magnet Wire
DAISY DEPOT - Inmac
DAISYWORDPRO - Computers International
DAISYWRITER - Computers International
DAKA WARE - Davies, Harry, Molding
DALAMID - Beckman Instrs.
DALITE - Daburn Elctrns. & Cable
DANAMETER - Racal-Dana Instrs.
DANYON - Daburn Elctrns. & Cable
DAPEX - Rogers
DAPRENE - Daburn Elctrns. & Cable
DARIS - Sundstrand Data Control
DASH-ABEL - Data I/O
DASHER - Data General
DASOFT-16 - Dasoft Design Systems
DASOFT-8 - Dasoft Design Systems
D-A-T-A - Continental Data Sys.
D.A.T.A.BOOK - D.A.T.A.
DATA-BOY - Mimic
DATABS - Brady, W. H.

DATACEL - Sigma Instrs.
DATACOLLECTOR - Digital Products
DATACOM 1000 - Western DataCom
DATACOM 1023 - Western DataCom
DATACOM 424 - Western DataCom
DATACRYPTOR - Racal-Milgo
DATA DEFENDER - Ring King Visibles
DATA DESIGNER - Database Design
DATA DIRECTOR - Zehntel
DATADUCT - Computer Cable & Prods.
DATAGARD - SL Waber
DATAGUARD - Control Module
DATAKOAT - Datak
DATALENE - Belden
DATALERT - TEC
DATALIFE - Verbatim
DATA LINK CONTROL - Micom Systems
DATALITE - Dialight
DATA MANAGER - Bently Nevada
DATA MARK - Memorex
DATA-MATE - Weed Instr.
DATA-MONITOR - TEC
DATANETWORK - Honeywell Info. Sys.
DATA-PAD - TEC
DATA PANEL - TEC
DATA-PATCH - Atlantic Research
DATA PLOT - B-G Instruments
DATARIBBON - Dataproducts
DATASAVER - Cuesta Systems
DATA-SCREEN - TEC
DATASCRIBE - Alpha Merics
DATASEEKER - Dataprobe
DATASEIS - Kinemetrics
DATA SENTRY - General Electric
DATASTAR - Clinton Elctrns.
DATASWITCH - Wheelock
DATASYSTEM - Davong Systems
DATATAB - ALTEK
DATA TALKER - Comspec
DATA TECH 9600 - Atlantic Research
DATA TORK - GSE
DATA-TOUCH - TEC
DATA-TRAP - Spectral Dynamics
DATA-VOICES - Datawest
DATA-VU - Clinton Elctrns.
DATAWAFER - Display Interface
DATAWAND - MSI Data
DATAWATCH - Metrix Instrument
DATAX II - Data Translation
D-A-T-T - Continental Data Sys.
DAYMAX - ILC Technology
DAYONITE - Vicon Industries
DB - Beckman Instrs.
DDC - ILC Data Device
DDS - Westronics of Texas
DDT - Digital Equip.
DEACTIGEL - Alltech
DEACTIGLAS - Alltech
DEARBORN - Sprague Elec.
DEC - Digital Equip.
DECAP - Dynaloy
DECATRAN - Amprobe Instr.
DECI-CENTER - Aries Elctrns.
DECI-FLEX - Aries Elctrns.
DECIGRID RELAY - Genicom
DECISION - Beckman Instrs.
DECMAIL-PLUS - Data Processing Design
DECO - Digital Elctrns.
DECOHM - Davis Elec.
DEC-RANGER - Ohmite Mfg.
DECTAPE - Digital Equip.
DECUP - Eldre Corporation
DECUS - Digital Equip.
DEFLECTRON - CELCO
DEFOREST - Dumont Oscilloscope Labs.
DEI MOTOR GUARD - Diversified Elctrns.
DEKABOX - Electro Scientific Inds.
DEKABRIDGE - Electro Scientific Inds.
DEKADIAL - Electro Scientific Inds.
DEKAPACITOR - Electro Scientific Inds.
DEKASTAT - Electro Scientific Inds.
DEKAVIDER - Electro Scientific Inds.
DEKTAK - Sloan Technology
DELINEASCOPE - Kalart Victor
DELMICA - Del Elctrns.
DELTA - Electron
DELTAFILM - Sprague Elec.
DELTA-KIT - Contact East
DELTAPLY - Sprague Elec.
DELTA SHEAR - Bruel & Kjaer Instrs.
DELTAVERTA - Hybrid Systems
DELTA 1000 - Honeywell
DELTRONIX - Delta Elctrns.
DEMOD - General Magnetics
DENFLEX - Dennis Chemical
DENSE PAK - Everett/Charles Contact Prods.
DENSI-LUX - Lektralab Technologies
DENSI-METER - Lektralab Technologies
DENSI-TIMER - Lektralab Technologies
DENSITROL - Princo Instrs.
DEPENDABLES - Pioneer Magnetics
DEPEND-A-BOND - Alpha Metals
DEPENDAC - Lortec Power Sys.
DEPENDEX - High Voltage Engrg.
DESCO - Dietz Design
DESICOTE - Beckman Instrs.
DESIGNER'S - Motorola Semiconductor Prods.
DESIGNERS CONTROL - Industrial Computer Designs
DESIGNER SERIES - IVO Inds.
DESK MATE - Electronic Solutions
DESKTOP GENERATION - Data General
DETECTAVERSE - Magnum Opus Custom Elctrn. Engrg.
DEVICEDIRECTOR - Digital Products
DEVICE SHUNT - Gordon, L., Packaging
DEWPROBE - Honeywell
DFA - Pall Ultrafine Filtration
DGX - Engelhard
DIAGLUTO - Beckman Instrs.
DIAL-A-GAIN - Unholtz-Dickie
DIAL-A-LIGHT - Plant Specialties
DIAL-A-LIMIT - Astrosystems
DIAL-A-SPEED - Plant Specialties
DIALATCH - Hartwell
DIAL-A-TEMP - Hexacon Elec.
DIALATROL - Honeywell
DIAL-IT - Holub Industries
DIALNET 3000 - Micom Systems
DIALTEMP - Omega Engrg.
DIAMFILE - Jonard Industries
DIAMOND GRIP - AMP
DIATON - AMF
DIAZO-JET - Teledyne Rotolite
DIB - Varo Semiconductor
DI-CAP - Dielectric Labs.
DIEKUT STIK-ONS - Bishop Graphics
DIF FILTERS - ESC Elctrns.
DIFILM - Sprague Elec.
DIGIBEZEL - NOBEX
DIGIBRIDGE - GenRad
DIGI-CAL - Analogic
DIGICHEK - Applied Control
DIGI-CLOCK - Veeder-Root
DIGI-CON - Veeder-Root
DIGICOUNT - Itek Measurement Sys.
DIGIDECADE - Digitran
DIGI DESIGNER - E & L Instruments
DIGIDIAL - Beckman Instrs.
DIGI-DRIVES - Sequential Info. Sys.
DIGIFEEDER - IVEK
DIGI-FLEX - Veeder-Root
DIGI-KLIPS - Components
DIGILEVER - Digitran
DIGILINE - Itek Measurement Sys.
DIGI-LOCK - Sequential Info. Sys.
DIGILOGGER - NES, (Nationwide Electronic Systems)
DIGILOGIC - Scientific Columbus
DIGI-MASTER - Veeder-Root
DIGIMITE - Thermo Electric
DIGIPLAN - PKS - Digiplan Ltd.
DIGI-PLATE - Dynatronix
DIGIPOT - Digitran
DIGI-POWER - Secoinsa/Digi Power
DIGISCALE - Itek Measurement Sys.
DIGISCAN-800 - TEKTITE CORP.
DIGISEC - Itek Measurement Sys.
DIGISEIS - Kinemetrics
DIGI-SHAFT - Computer Conversions
DIGI-SNAP - Sperry, A. W., Instrs.
DIGISPENSE - IVEK
DIGI STABLE - Varian Associates
DIGISTROBE - Power Instrs. Products
DIGISWITCH - Digitran
DIGITEC - Digitec
DIGITEMP - Delta Design
DIGITEMP - Delta Design
DIGITENN - Tenney Engrg.
DIGITRAC - Transducer Systems
DIGITRAK - EDO Western
DIGITRONIC - Despatch Inds.
DIGIVIDER - Digitran
DIGS - Sundstrand Data Control
D I LINE - Ungar
DI-MIN-ODE - General Semiconductor Ind.
DIM-N-GLO - Lutron Elctrns.
D/IMUX - Coastcom
DIODE GUN - Amperex Elctrn.
DIODE-LITE - Dialight
DIO-REY - Crosspoint
DIP-A-DIP - Micro Electronic Sys.
DIP ALARM - Projects Unltd.
DIPATCH - Aries Elctrns.
DIP BITE - Minelco - A Talley Ind.
DIP-C - Grayhill
DIP FLASH - Projects Unltd.
DIP-GATE - E.P.E.
DIP GUARD - AVX Corporation
DIP/LOC - Everett/Charles Contact Prods.
DIPLOMATE - AMP
DIP-PAK - Fidelity Chem. Prods.
DIPSERT - Mann, Henry
DIPSPENSER - Techni-Tool
DIPSTIK - Stanford Applied Engrg.
DIPSWITCH - Armtec Industries
DIRECTOR - Struthers-Dunn
DIRECTRON - Sanford-Miller
DIRECTWELD - ITT-Higbie Mfg.
DISCACHE - Motorola Semiconductor Prods.
DISCAN - Antenna Specialists
DISCO - Panduit
DISCOHM - Ward Leonard Elec.
DISK-A-TAPE - Wire Graphics
DISKCOVER - Ring King Visibles
DISKLIKE R5232 - Analog & Digital Peripherals, (ADPI)
DISKPLAY - Ring King Visibles
DISPOSA-PURGE - Alltech
DISS-O-PAD - Bivar
DISTEC - Helm Instr.
DISTIK - Stanford Applied Engrg.
DI-T - Transformer & Coil Products
DITRONIC - Rayovac Corporation
DIVIDOHM - Ohmite Mfg.
DK - Beckman Instrs.
D-LASAR - UCCEL Corporation
DMATIC - Digital Media
DM/PL - Houston Instrument
DOCUFAX - Alden Electronics
DOLFLEX - Dolph, John C.
DOLPHON - Dolph, John C.
DOLPH-SPRAY - Dolph, John C.
DOMINO - Sprague Elec.
DONNER - Systron-Donner Inertial
DOORBELL - Unitrode
DOORWAY TO MEMORY - KLC
DO-T - Transformer & Coil Products
DOTITE - Engelhard
DOTPLOT - Integral Data Sys.
DOT-X - Dotronix
DOUBLE/BUBBLE - Hardman
DOUBLE-DIP - Grayhill
DOUBLE-SEAL - Jamesbury
DOUBL-GARD - Southco
DPL - Chemtronics
DPL - National Information Sys.
DPL-2 - Chemtronics
DPR - Hardman
DPT - Xanadu Controls
DP-20 - Dataproducts
DP-55 - Dataproducts
DRAGON - Okonite
DREEFS - Dreefs Switch
DRIFT-LOCK FLUXMETER - Walker Scientific
DRILLDIRECTOR - Humphrey
DRI-MARK - The Meyercord
DRM - Catalyst Research
DRM 2 - Catalyst Research
DROSS-X - Multicore Solders
DRUMSTICK - Transamerica Delaval
DRYFIT - Sonnenschein Batteries
DSLK - Pall Ultrafine Filtration
D-SODR SYSTEMS - Pace
DTC - Data Terminals & Communications
DTF - Frequency Elctrns.
DT25 - Data Technology
DU - Beckman Instrs.
DUALATCH - AMP
DUALAY - Okonite
DUAL BUS - Microbar Systems
DUALCON - MOLEX
DUAL FLEX - Standard Grigsby
DUAL-SHORE - ITT Cannon
DUAL-SHRINK - Zeus Indl. Prods.
DUAL THIN LINE (DTL) - International Instrumentation
DUAL-TROL - Veeder-Root
DUNCO - Struthers-Dunn
DUO-BOND - Antenna Specialists
DUOBOND - Belden
DUOBOND PLUS - Belden
DUOFOIL - Belden
DUOSIL - Tecknit (Eastern Facility)
DUOSTAT - Duotone
DUOTRONIC - Edwards
DUO-TYNE - AMP
DUO-VAC - Lab-Line Instrs.
DUO-VOLT - Sigma Instrs.
DUOWATT - Motorola Semiconductor Prods.
DURACELL - Duracell Intl.
DURA CLAD - AIE Magnetics
DURACOLOR - Carol Cable
DURA-CON - Antenna Specialists
DURA-CON - TRW Connector
DURAD - Champlain Cable
DURA-DRY - FTS Sys.
DURA-FLEX - Antenna Specialists
DURA FLO - Kurz Instruments
DURAFOAM - Carol Cable
DURA-LAY - International Wire Products
DURALCO - Cotronics
DURANT - Eaton Corp
DURAPOT - Astrosystems
DURASEL - Alpha Comps.
DURA-STRAND - International Wire Products
DURATHERM - BIW Cable Sys.
DUROTHERM - Hexacon Elec.
DUR-X-THANE - Whitmor Wire & Cable
DYAD - Clare
DYKANOL - Cornell-Dubilier Electronics
DYMA - Dyma Engrg.
DYMAC - Spectral Dynamics
DYNAC - Dynisco
DYNACLAD - Exide
DYNA-CORE - Alpha Metals
DYNA-CRIMP - AMP
DYNAFORM - Amphenol
DYNA-JET - B & K Precision, Industrial Electronics Product Group
DYNAKROME - Beckman Instrs.
DYNALOAD - Transistor Devices
DYNAMASTER - Bristol Babcock
DYNAMAX - Alan Gordon Entprs.
DYNAMIC DATA MANAGER - Bently Nevada
DYNA-MITE - LH Research
DYN/AMP - Halmar Electronics
DYNA-PEAK - B & K Precision, Industrial Electronics Product Group
DYNAPHASE - Stanton Magnetics
DYNAPOUR - Ajax Magnethermic

DYNA-PRIME - Beckman Instrs.
DYNA-RACE - Grant Hardware
DYNASHIELD - Computer Cable & Prods.
DYNASOAP - Heat Systems-Ultrasonics
DYNASOLVE - Dynaloy
DYNASTAT - Static
DYNA-SWITCH - Dillon, W. C.
DYNATACH - Electric Tachometer
DYNA-TEMP - EDL
DYNATIME - Electrodynamics
DYNATRAC - ITHACO
DYNATROL - Automation Prods.
DYNAYOKE - CELCO
DYNETIC - Shure Bros.
DYNOGRAPH - Beckman Instrs.
DY-NOS-STICK - Nu-Concept Computer Sys.
D^3 - Frederick Elctrns.
E - Electro Switch
EAGLE A - Eagle Magnetic
EAGLE AA - Eagle Magnetic
EAGLE AAA - Eagle Magnetic
EAGLE TRICLAD - Eagle Magnetic
EARSPLITTER - Kolin Inds.
EASCO - Easco/K-D Tools
EASI/ARIMA - Winchendon Group
EASYBASE - PC International
EASY-FLO - Handy & Harman
EASYMATCH - Alford Mfg.
EASY-METER - Sperry, A. W., Instrs.
EASY PEEL - Brand-Rex
EASY-STRIP - Holub Industries
EASYTRAK - PC International
EATON - Eaton
EB-CON - Eby
EBR - Varo Semiconductor
ECCOBOND - Emerson & Cuming
ECCOCOAT - Emerson & Cuming
ECCOFLOAT - Emerson & Cuming
ECCOFOAM - Emerson & Cuming
ECCOL - Sprague Elec.
ECCO LITE - Emerson & Cuming
ECCOSHIELD - Emerson & Cuming
ECCOSIL - Emerson & Cuming
ECCOSORB - Emerson & Cuming
ECCOSPHERES - Emerson & Cuming
ECD - Electronic Controls Design
E-CELL DEVICES - Plessey Electro-Products
ECG - Philips ECG
ECHO GEL II - Communications Technology
ECHORDER - RIL Elctrns.
ECHORDETTE - RIL Elctrns.
ECLIPSE - Jobmaster
ECLIPSE S100, S200, S300, M600 - Data General
ECLIPSE S/20, S/120, MV/4000 - Data General
ECLIPSE MV/6000, MV/8000 - Data General
ECL-3211 - Emulogic
ECOALUBE - E/M Lubricants
ECOM - Trendata/Standard Memories
ECONOCAP - Motorola Semiconductor Prods.
ECON-O-CLAD - Engelhard
ECONOCODER - Astrosystems
ECONOCOUNTER - Veeder-Root
ECONO-CRIMP - Automatic Connector
ECONOFIRE - EMCA
ECONO-FLEX - Veeder-Root
ECON-O-GIDE - Bivar
ECONO-HEAT - Aremco Prods.
ECONO JET - Teledyne Rotolite
ECONO-LAP - Accumet Engrg.
ECONO-LINE - Oak Switch Sys.
ECONOLINE - Sprague Elec.
ECONO-MASTER - Veeder-Root
ECONOMATE - AMP
ECONOMITE - Chicago Switch
ECONOMITE - ITW Switches
ECONOPAK - Electrovert USA
ECONO-POLISH - Accumet Engrg.
ECONOPOT - New England Instr.
ECONO-SKAN - Skan-A-Matic
ECON-O-TAPE - Engelhard
ECON-O-TEMP - Barksdale Controls
ECONO ZIP - Textool Products
ECONO ZIP - 3M-Electronic Products
ECS - Environmental Container Sys.
ED - Dreefs Switch
EDDYSTONE - MARCONI INSTRUMENTS
EDGECON - MOLEX
EDGEGARD HOOD - Baker
EDGE-ON - Burndy Corporation
EDGE-PAC - Elfab
EDGE-TITE - Burndy Corporation
EECOFLEX - EECO
EFG - Saphikon
E-GUN - Varian
EHVQ - TII Electronics
8010/8011 - Dataproducts
8020/8021 - Dataproducts
EIKONIXSCAN - Eikonix
EJECT-A-DIP - Aries Elctrns.
E-KOTE - Acme Chemicals & Insulation
ELASTIC STOP NUTS - Esna
ELASTIPAR - Times Fiber Communications
ELASTO-FLEX II - Craig Systems
ELAST-O-FLUOR - Norton Chemplast
ELASTOFOAM - Tecknit (Eastern Facility)
ELASTOMET - Tecknit (Eastern Facility)
ELCOM - Elcom Systems
ELECPAC - Wilbrecht Elctrns.
ELECTRIC LACQUER - Dolph, John C.
ELECTRICORD - Pacific Electricord
ELECTRIC WORKHORSE - Innotronics
ELECTRIX - Patton-MacGuyer
ELECTRLOY - Molecu-Wire
ELECTROCOM - Electrocom Inds.
ELECTROCOMP - Beckman Instrs.
ELECTROCRAFT - GC Elctrns.
ELECTRODAG - Acheson Colloids
ELECTRODUCT - Electrovert
ELECTROFEED - Black & Webster
ELECTRO-FLEX - Electro Space Fabricators
ELECTROFLO - Electrovert USA
ELECTROFORM - Electrovert USA
ELECTROLAB - Digiac
ELECTRO-LAP - Okonite
ELECTROLERT - Leeds & Northrup Instrs.
ELECTROMATE - Beckman Instrs.
ELECTROMAX - Leeds & Northrup Instrs.
ELECTRO-PAC - Instrumentation & Control Sys.
ELECTROPANE R - Libby Owens-Ford
ELECTROPREP - Electrovert USA
ELECTRO-PROBE - Sperry, A. W., Instrs.
ELECTROPUNCH - Black & Webster
ELECTRO-SHIELD - Estes Engrg.
ELECTROTABLE - Black & Webster
ELECTRO-TAP - AMP
ELECTRO-TY - Electrovert
ELECTRO-WASH - Chemtronics
E.L.F. - NEC Information Systems
ELF - Winchendon Group
ELINCO - EDO /Elinco
ELITES - E & L Instruments
ELLMETER - Alpha Comps.
ELMET - Philips Elmet
ELNIKORD - Elnik Instrs.
ELPH - Thermo Electric
ELTEX - Frederick Elctrns.
ELVOX - Paso Sound Prods.
ELVUX - Paso Sound Prods.
EL-100 - Electrol
EL-120 - Electrol
EL-200 - Electrol
EL-300 - Electrol
EMCAP - Emcon
EMFLON - Pall Ultrafine Filtration
EMI MESH STRIP - Chomerics
EMLOCK - Cablewave Sys.
EMR - Fairchild - Weston - Telemetry
EMRALON - Acheson Colloids
ENCLAD - Engelhard
ENCLOZ - Fastex
ENCODER MIKE - Oriel
ENDUR - Rogers
ENDURA - Wonder Corp of America
ENDURAGLAS - Beckman Instrs.
ENERCON - Amerace Corporation
ENERGIZED - Alpha Metals
ENERGIZER - Union Carbide Corporation
ENERGY-MISER - Kalglo Elctrns.
ENERSCAN - Despatch Inds.
ENP - Communication Machinery
ENTRELEC - Cogenel/Entrelec
ENVEX - Rogers
ENVIRO-BLOC - Siecor
ENVIRO-BOND - Siecor
ENVIROBRIDGE - Beckman Instrs.
ENVIROEAR - Beckman Instrs.
ENVIROFLOW - Beckman Instrs.
ENVIROGAUGE - Beckman Instrs.
ENVIROLINE - Beckman Instrs.
ENVIROMETER - Beckman Instrs.
ENVIRONETTE - Lab-Line Instrs.
ENVIRONOL - RTE Aerovox
ENVIRO-SKAN - Skan-A-Matic
ENVIROSTAT - Simco
ENVIRO-SWITCH - Giannini Petro Marine
ENVIROTRANS - Beckman Instrs.
ENZTRATE - Beckman Instrs.
E-PAC - Instrumentation & Control Sys.
EPIBASE - Motorola Semiconductor Prods.
EPICAP - Motorola Semiconductor Prods.
EPION - Solid State Devices
EPITRAN - Solid State Devices
EPLATRONICS - Epsilon-Lambda Elctrns.
EPOCAP - Hardman
EPOCEL - Pall Ultrafine Filtration
EPOCRETE - Hardman
EPOCURE - Hardman
EPOLAST - Hardman
EPOMARINE - Hardman
EPOS - SPS Software Products & Services
EPOSET - Hardman
EPOSOLVE - Hardman
EPO-TEK - Epoxy Technology
EPOWELD - Hardman
EPOXER - CHEM-MIXX
EPOXYCAST - ISOREG
EPOXYLITE - Epoxylite
EPSCO - Mel Tec
EPSILAM-10 - 3M-Electronic Products
EPTAK - Eagle Signal Controls
E-QUALIDYNE - Shure Bros.
EQUIPTO - Equipto Elctrns.
EQUITY - Flow Technology
ERDAC - Macrodyne
EREM - Erem
ERGO KEY - Advanced Input Devices
ERNIPRESS - Erni Comps.
ERNST DREEFS - Dreefs Switch
ERSA - Caig Labs.
ESC, CLIP/STRIP - Interconics, Bussing Sys. Oper.
ESCOM - Antex Electronics
E/SERIES - Timeplex
ESLOK - ESNA
E-SOLDER - Acme Chemicals & Insulation
ES•P - Augat/ES•P.
ESSEX - Hamilton Standard Controls
ESTAR - Sprague Elec.
ESTAREL - Sprague Elec.
ETHAFOAM - Dow Chemical
ETHERNET NODE PROCESSOR - Communication Machinery
ETHOCEL - Dow Chemical
EUA - Kurz Instruments
EUC/ARDA - Electrovert USA
EVA - Kurz Instruments
EVEREADY - Union Carbide Corporation
EVERFAST - Ambroid
EVERLASE - Coherent
EVERLUBE - E/M Lubricants
EVERMARK - Coherent
EVERMARK - Laser
EVERMATIC - Coherent
EVERMIX - Coherent
EVERPULSE - Coherent
EVERPULSE - Laser
EVERSCRIBE - Coherent
EVERSHIELD - E/M Lubricants
EVERSTRIP - Coherent
EVERSTRIP - Laser
EVERTRIM - Coherent
EXAR - Champlain Cable
EXBUG - Motorola Semiconductor Prods.
EXCALIBER - Sinclair Radio Labs.
EXCELITE - Thermoplastic Processes
EXCELIX - Excel Technology Intl.
EXCELON - Thermoplastic Processes
EXCELTA - Erem
EXCELTRONIC - Scientific Columbus
EXCHANGE SERIES - Intelligent Technology
EXORBUG - Motorola Semiconductor Prods.
EXORBUS - Motorola Semiconductor Prods.
EXORCISER - Motorola Semiconductor Prods.
EXORDISK - Motorola Semiconductor Prods.
EXORMACS - Motorola Semiconductor Prods.
EXORSET - Motorola Semiconductor Prods.
EXORSET 35 - Motorola Semiconductor Prods.
EXORTERM - Motorola Semiconductor Prods.
EXPAND-A-RAK - Love Controls
EXPAND-MATE - Beckman Instrs.
EXPANDOMATIC - Beckman Instrs.
EXPEEDITER - Teledyne Rotolite
EXPRESSDIALER - Rath Microtech
EXTRALYTIC - Sprague Elec.
EXTRUSOL - Multicore Solders
EYECOM II - Spatial Data Systems
EYECOM III - Spatial Data Systems
EYECOM 109 PTS - Spatial Data Systems
EYRING - Eyring Research Inst.
E-Z CIRCUIT - Bishop Graphics
E-Z-DUO - The Wadsworth Elec. Mfg.
E-Z-ENTRY - Berg, W. M.
EZE-STIK - Fitchburg Coated Prods.
E-Z-HOOK - E-Z-Hook
EZ INSERTA - Garry Mfg. , of Brand-Rex
EZ-PRO - American Automation
E-Z-READER - Percon
E-Z-RED - The Wadsworth Elec. Mfg.
E-Z-TAK - Thielex Plastics
E-Z-TRIM - Bourns
FA - Bacon Inds.
FABMIKA - Sprague Elec.
FABRITEMP - Trans-Met Engrg.
FACT - Hughes Aircraft
FAIRLOC - Sterling Instr.
FALLBACKER - Dataprobe
FALT TRAP - Gould
FAMES - Decision Graphics
FANDIAL - Lutron Elctrns.
FAN-PAN - UNITRACK
FAS'N-IT - Ambroid
FAST - ABA Electromechanical Sys.
FAST - Fairchild Camera & Instr.
FASTAIRE - Humphrey
FASTEMP - Amprobe Instr.
FAST FIT - Cambridge Prods.
FASTIN-FASTON - AMP
FAST-MASK - E.P.E.
FASTON - AMP
FASTPAK - Teccor Elctrns.
FASTRESS - Spectro Equipment

FAST STEPPER - Grover Patent Products
FAST 5000 - American Computer Hardware
FAULHABER - Micro Mo Electronics
FAULT FINDER - Venable Industries
FAULTFINDER - Wiltron
FCM-CS - FCM Plastics
FD - Tech Spray
FEATHER - EG & G Rotron
FE, FI, FO - Transformer & Coil Products
FENICULOY - Molecu-Wire
FERRETRAC - Ferretec
FERRINOX - Thomson-CSF Comps.
FERROSORB - Microwave Filter
FERROTITE - Murata Mfg. , Ltd.
FERRUPS - Best Power Technology
FEURLON - Rogers
FFA - Bacon Inds.
FIBERDATA - ITT Electro-Optical Prods.
FIBERDATA - Valtec
FIBER FONE - Aetna Telecommunications Labs.
FIBERFRAY INSULATION - Sohio Engineered Materials
FIBERLAB - Math
FIBERLINK - Math
FIBER-LITE - Dolan-Jenner Inds.
FIBERLOY - Rogers
FIBER MASTER - L & L Special Furnace
FIBERTEMP - Trans-Met Engrg.
FIBERVISION - Math
FIBER VUE - Bausch & Lomb
FIBREYE - Galileo Electro-Optics
FIDELEX - Fidelity Chem. Prods.
FIDELPLATE - Fidelity Chem. Prods.
FIELDLAB - Beckman Instrs.
FIELDMOUSE - Mouse Sys.
FIELD-PRO - Cover Craft
FILE EXCHANGE - Intelligent Technology
FILMBRID - Merrimac Inds.
FILMISTOR - Sprague Elec.
FILMITE - Sprague Elec.
FILMTRIM - Sprague-Goodman Elctrns.
FILTER CABLE - Vitek Elctrns.
FILTER-CLEAN - Hollis Engrg.
FILTEROL - Sprague Elec.
FILTER-SOLV - Beckman Instrs.
FINAL AIR - Aluminum Filter
FINAL KOTE - Tech Spray
FINELINE - Measurements Group
FINGER-PAC - Elfab
FINGRIP - Burndy Corporation
FIN-PAC - Semtech
FIP - NEC Elctrns. USA
FIREFLY - Dupree
FIRON - EMCA
FIT - Alpha Wire
FIVEBUG - Motorola Semiconductor Prods.
5-WAY - Superior Elec.
FIXMASTER - Rexnord Chemical Prods.
FLAME-EYE - Barber-Colman
FLAMENOL - General Electric
FLAMEOTROL - Barber-Colman
FLAMON - Bailey Controls
FLASH TRACK - R. C. Elctrns.
FLASHBLAST - Maxwell Labs.
FLASH CUTTER - Ewald Instrs.
FLASH FRONT - Panelgraphic
FLATGAGE - Tencor Instr.
FLAT-HEAD - Signal Transformer
FLAT-PAK - International Instruments
FLAT PAK - Opto 22
FLAT-PAK - Sigma Instrs.
FLATSO - KDI Electronics
FLATSTACK - Microtran
FLAT STORE - Standard Logic
FLEX - Advanced Elctrns. Design
FLEXAGUIDE - Airtron
FLEX'ATOR - Ametek, Inc
FLEXBRAID - Communications Technology
FLEXCON - Air-O-Tronics Prods.
FLEX-E-BELT - Berg, W. M.
FLEX-E-GEAR - Berg, W. M.
FLEX-E-GRIP - Berg, W. M.
FLEX-E-PITCH - Berg, W. M.
FLEXFOAM - Carol Cable
FLEXFOIL - Carol Cable
FLEXI-BIN - Borroughs
FLEXI-BLOCK - AMP
FLEXIBOX - Powerbox
FLEXIBUS - Xycom
FLEXI-COOL - FTS Sys.
FLEXI-DRY - FTS Sys.
FLEXI FILE 21 - Tri-Data
FLEXI-GLOVE - Clean Room Prods.
FLEXILAYER - Parlex
FLEXITE - Markel
FLEXI-WEAVE - Brand-Rex
FLEXLEAD - Markel
FLEX-LOCK - Namco Controls
FLEXLOK - Burndy Corporation
FLEXMAX - Sanders
FLEXMAX CIRCUITS - Flexprint Div
FLEXOLON - Tensolite
FLEXOPRENE - Standard Wire & Cable
FLEXPAC - Thomas & Betts
FLEXPRINT - Sanders
FLEXRAD - Judd Wire
FLEXSTRIP - T&B/Ansley
FLEXTAC - Hypertronics
FLEXTECH - Markel
FLEXTENSION - Tech Spray
FLEX-TEX - W. L. Gore
FLEX-THANE - Berg, W. M.
FLEXTIME - Hecon
FLEXVYN - Tensolite
FLEX-WELD - T&B/Ansley
FLEXWELL - Cablewave Sys.
FLEXYDISK - BASF Sys.
FLEXY-MARKER - Datak
FLIC - Augat
FLIGHTLINE - Advance Engrg.
FLIP - Mini-Systems
FLIP CHIP - Digital Equip.
FLIP-PAK - Transamerica Delaval
FLIP-RAK - Fancort Industries
FLOATING BEAM - GSE
FLOCELL - Heat Systems-Ultrasonics
FLOPPY COPPY - Applied Data Communications
FLOPPYTAPE - Cipher Data Prods.
FLO-RITE - Kester Solder
FLOTRAC - Hull
FLOTROL - Lorain Prods.
FLOW MODULATOR - Emerson, Indl. Controls
FLUENT - Creare
FLUITROL - Heat Systems-Ultrasonics
FLUOR-ADE - Beckman Instrs.
FLUORALLOY - Beckman Instrs.
FLUOROGLIDE - Norton Chemplast
FLUOROSINT - Polymer
FLUORO-XECON - Chomerics
FLUOR-X - Nuclear Resch.
FLUSH-SEAL PRESSURE PLUGS - Allen Mfg.
FLUX-OFF - Chemtronics
FLUX-OFF NR - Chemtronics
FLUX STRIPPER S - Tech Spray
FLUX STRIPPER W - Tech Spray
FLYFORWARD - Sierracin/Power Systems
FOAC - Motorola Semiconductor Prods.
FOAMCONE - Teledyne Micronetics
FOAMFLEX - Cablewave Sys.
FOAM/FOIL - Tapecon
FOCAL - Digital Equip.
FOCEST - Materials Resch.
FOMAT - Controlled Envir. Equip.
FONE-A-LERT - Bell, Floyd
FONO-MAGIC - R-Columbia Prods.
FOOTROL - General Control
FOREDOM - Foredom Elec.
FORESIGHT - Penn Video
FORMKOTE - E/M Lubricants
FORM-TRAN - EWC
FORMULA 1 - Antenna Specialists
FORMULA 111 - Chemtronics
FORTIFIER - Inmac
FOS-FLO - Handy & Harman
FOTOCERAM - Corning Glass Works
FOTOFET - Teledyne-Crystalonics
FOTOFOIL - Miller Dial
FOTOFORM - Corning Glass Works
FOTONIC - Mechanical Techn.
4+ (FOUR PLUS) - Soundlier
4-PAC - Avantek
4100 PRINTER - Ramtek
44 RESIN - Kester Solder
44XLA - Photodyne
FPL - Sequential Info. Sys.
FREEDOM INVERTER - Ocean Marine Instrument
FREESPRING - Holub Industries
FREEZ-IT - Chemtronics
FREON - DuPont de Nemours, E. I.
FREON TF - Chemtronics
FRICTION-AIRE - Blue M, A Unit of General Signal
FRIGICHIP - Melcor/Materials Elctrn. Prods.
FRIGITOTE - Melcor/Materials Elctrn. Prods.
FRISKEM - Infinetics
FRK - EFRATOM
FROST-OFF - Merix Chem.
FRT - EFRATOM
F-SYSTEM - Electromatic Controls
FTM - Oak Switch Sys.
FUJI - Collmer Semiconductor
FULL-VIEW - Brooks Instr.
FULMAR - IMC Magnetics
FUNDAMENTAL - International Instrumentation
FUSECOR - Whitmor Wire & Cable
FUSEPLUG - Arco Elctrns.
FUSETRON - Bussmann
FUSIONBRAZED - ITT-Higbie Mfg.
FUSIONWELD - ITT-Higbie Mfg.
FUSON - The Meyercord
FUTURA - Beckman Instrs.
FUTURA - Teledyne Rotolite
FUZZ BUTTONS - Tecknit (Eastern Facility)
FWACO - Aimsco
FYRESTAN - Leeds & Northrup Instrs.
GALAXY - Nova Elec.
GAMMA-MATE - Beckman Instrs.
GAMMATROL - Nuclear Resch.
GAP-KAP - Centralab
GARALEASE - Ram Chemicals, Whittaker
GARALYST - Ram Chemicals, Whittaker
GARD-A-MATIC - Shure Bros.
GARDSMAN - West
GAROX - Ram Chemicals, Whittaker
GAS CHROM - Alltech
GASK-O-SEAL - Parker Seal Grp.
GATES - Gates Energy Prods.
GATEWAY - Inconix
GATLIN GUN - Mann, Henry
GC/AUDIOTEX - GC Elctrns.
GC/CALECTRO - GC Elctrns.
GEFE - IVO Inds.
GEL/CELL - Johnson Controls
GELYTE - SAFT America
GEMCOR - General Electro-Mechanical
GEMINI - Plastiglide Mfg.
GEMINI - Temescal
GEMINI SOLAR - E^2 Technology
GE-MOV - General Electric
GEMTIME - Veeder-Root
GENGUIDE - General Cable
GEO-MARINE - Glenair
GEOPRENE - General Electric
GEOSOL - Belden
GEOVIEW - Lexidata
GEPEG - General Elec.
GEREL - General Elec.
G-GG DUST MAGNET - Clean Room Prods.
GHOST - Gimix
GIANT - General Instrument
GIANT II - General Instrument
GIBSON GIRL - Benjamin electroproducts, inc.
GIGAFIL - Murata Mfg. , Ltd.
GIGA-TRIMS - Johanson Mfg.
GLASGUARD - AVX Corporation
GLASPLY - Pannier
GLASS AMP - General Instr.
GLASS-K - Corning Glass Works
GLENNITE - Gulton Inds.
GLOBE - Johnson Controls
GLO-BOX - L & L Special Furnace
GLO-DOT - Industrial Devices
GLO-STAT - GTE Sylvania Lighting Prods.
GLYDER - Lutron Elctrns.
GMR/OS - GMR
GMX - Gimix
GO-ANA - General Optronics
GOAT - Craig Systems
GO-DATALINK - General Optronics
GO-DIG - General Optronics
GO-DIP - General Optronics
GO-DIP-1300 - General Optronics
GO ECL - General Optronics
GO-HOLOSCAN - General Optronics
GOLD CONNECTION - Recoton
GOLD DOT - Hughes Aircraft
GOLD-FISH - Ideal Industries
GOLD LINE - Arnold Magnetics
GOLD LINE - Barksdale Controls
GOLDLINE - Powercube
GOLDMARK - Centralab
GOLD TOP - General Electric
GO-LED-1300 - General Optronics
GOLH - General Optronics
GOLS - General Optronics
GOLT - General Optronics
GOOD IMPRESSIONS - Inmac
GORDON/MORSE - Alan Gordon Entprs.
GORE-SHIELD - W. L. Gore
GORE-TEX - W. L. Gore
GORE-WRAP - W. L. Gore
CORGUIDE OPTICAL WAVEGUIDES - Corning Glass Works
GP/DUROID - Rogers
GRAB'M QUIK - Brim Elctrns.
GRADIENT-SOLV - Beckman Instrs.
GRADUATE - Elco
GRAF/BAR - Science Accessories
GRAF/PEN - Science Accessories
GRALAB - Dimco-Gray
GRAND SLAM - Potter Instr.
GRANT - Science/Elctrns.
GRAPHALLAST - Graphite Metallizing
GRAPHALLOY - Graphite Metallizing
GRAPHICS-II - Data Processing Design
GRAPHIC TRACE - Gould
GRAPHILM - Graphite Metallizing
GRAPHMETEX - Graphite Metallizing
GRAPHOVER 9500 - New Media Graphics
GRAPHPAC - Alltech
GRASIS - Andrew
GRAUEL - Eastern Marking Machines
GRAYMATTER - IQ Systems
GREAT LAKES DIGITAL - Controls Unlimited
GREENIE - Ideal Industries
GREEN PEAK CELL - Sensor Techn.
GRI - Risk, George, Inds.
GRIDPAK - Andrew
GRID ZIP - Textool Products
GRID ZIP - 3M-Electronic Products
GRIPEZE - Phelps Dodge Magnet Wire
GRIPLET - Du Pont Connector Systems
GRIP-O-GIDE - Bivar
GRIPRING - Waldes Kohinoor
GRIPWELL - Hartwell
GRNET - GenRad
GRO-LUX - GTE Sylvania Lighting Prods.
GROMMES - Precision Elctrns.
GROMMET STRP - Electrovert
GROMSTRIP - ICO-Rally
GSAP - Alan Gordon Entprs.

GTC - Gould
GUARD-TEMP - EDL
GURU - Ann Arbor Terminals
GXT - Du Pont Connector Systems
GYROFLEX - Singer
GYROSURVEYOR - Humphrey
HACKENSACK - Carolina Steel & Wire
HAILER JR - Audio Equip.
HALLOGIC - TRW Optoelectronics
HALL-PAK - Bell, F. W.
HALLTRON - Ohio Semitronics
HAM-MATE - Bird Elctrn.
HAMPTON MFG. - Mann, Henry
HAND-AID - Assem-Pro Instrs.
HAND-HOLE - Siecor
HANDI-GRIP - Ideal Industries
HANDY ALUMIBRAZE - Handy & Harman
HANDY FLUX - Handy & Harman
HANDY HI-TEMP - Handy & Harman
HANDYPIN - Autosplice
HANDYTAB - Autosplice
HARDKOAT - Datak
HARD LAYER PREKOTES - Alltech
HARDSET - Hardman
HAROSYN - Harowe Servo Controls
HART - Nu-Concept Computer Sys.
HAWK - International Data Sciences
HC HOLTZER - Eastern Air Devices Motor
HC 4027 - Trilog
HDC - Pall Ultrafine Filtration
HD DETERGENT - Clean Room Prods.
HDSDEBUG - Motorola Semiconductor Prods.
HDS-200 - Motorola Semiconductor Prods.
HDS-400 - Motorola Semiconductor Prods.
HDT - Allaco Prods.
HEAT GUARD - Hexacon Elec.
HEATHKIT - Heath
HEATH/ZENITH - Heath
HEAT-LES - Pall Ultrafine Filtration
HEAT PROBER - Wahl Instruments
HEATRAM - Power Designs
HEATRAX - ICO-Rally
HEET SPREADER - Opto 22
HEAT SPY - Wahl Instruments
HEBBAR - Melles Griot
HECO - Heinemann Elec.
HEI - Huntington Electric
HEINEMANN - Heinemann Elec.
HEJET - Pamran
HELIAX - Andrew
HELI-CAL - Helical Prods.
HELICOP HUT - Craig Systems
HELIFLEX - Alltech
HELIFLUX - Schonstedt Instr.
HELIOTEK - Spectrolab
HELIPOT - Beckman Instrs.
HELITRIM - Beckman Instrs.
HELI TUBE - Antex
HELI-TUBE - Newman, M. M.
HELIX - Elcon Products International
HELIX - National Electric Cable
HELMETER - Helm Instr.
HELM-PAK - Helm Instr.
HENCOL - Cole-Hersee
HEPTAWATT - SGS Semiconductor Corporation
HERAWIT - Heraeus-Volkert
HERCULES - Union Carbide Corporation
HERGA - Pres-Air-Trol
HERGAIR - Pres-Air-Trol
HERMASEAL - Durakool
HERMEFLEX - Singer
HERMETICOOL - Tenney Engrg.
HERO - Mohawk Data Sciences
HETERO-CAVITY - Security Plastics
HETROCOLOR - Television Microtime
HETRON - Ashland Chemical
HEX-A-CORN - APM-Hexseal
HEXDIPS - International Rectifier
HEXETCH - Plasma-Therm
HEXFETS - International Rectifier
HEXSEALS - APM-Hexseal
HEX WIK - Hexacon Elec.
HEYCO - Heyco Molded Products
HEYCONNECTOR - Heyco Molded Products
HGA/TRANSTECH - HGA Elctrns.
HG BRIGHT GOLD - Technic
HIATT CLIPS - Electrovert
HI-BLUE CELL - Sensor Techn.
HICKORY BRAND - Siecor
HI-COAT - Murata Mfg., Ltd.
HI-CON - Panduit
HI-COR - Alpha Metals
HI-DAMP - Barry Controls
HI-EFF - Alltech
HI-EX - WALTER KIDDE
HI FY - Varian
HIGH DENSITY PLUS - Teradyne Connection Sys.
HIGH-LITE - Schott Glass Technologies
HIGH-MILEAGE - Mann, Henry
HI-GRIP - Holub Industries
HI-JUL - Sprague Elec.
HI-LIFE - Sprague-Goodman Elctrns.
HI-LINE - General Electric
HI LO - EG & G Rotron
HI-LUME - Lutron Elctrns.
HI-MARKS - Holub Industries
HI-MEG - Dolph, John C.
HINET - Digital Microsystems
HINIL - Teledyne Semiconductor
HI-P - Barksdale Controls
HIPAD - Houston Instrument
HIPEC - Dow Corning
HI-PERFORMANCE - Micro Component Technlg.
HIPLOT - Houston Instrument
HIPOTRODE - Hipotronics
HIPPO-CLIP - Mueller Elec.
HI-RISE - Wells Elctrns.
HI-SCALE - Heyco Molded Products
HI-SPEED - Holub Industries
HIT - Transformer & Coil Products
HITCHHIKER - Alan Gordon Entprs.
HITEFINDER - Teledyne Gurley
HI TENSION - Genisco Memory Prods.
HI-THERM - Dolph, John C.
HI-VAR - Sprague Elec.
HI-Z - Ross Engrg.
HK68 - Heurikon Corporation
HK68-A - Heurikon Corporation
HMC - American Electronic Labs.
HOBBY-WRAP - OK Industries
HOLLI-CUTTER - Hollis Engrg.
HOLLINGSWORTH - Waldom Elctrns.
HOLTITE - Augat
HOMALITE-LR - SL Homalite
HOMETAXIAL - RCA Solid State
HOMIDOLAIN - Star Porcelain
HONEY BEE - Hurst Mfg.
HOPSTRETCHER - Gabriel Elctrns.
HORIZON - Pyle Industries
HORNET - Hexacon Elec.
HOSTESS - Control Systems
HOT BOX - L & L Special Furnace
HOT LINE - Warren Comms.
HOT LIPS - Triton Mfg.
HOT-SHOT - Capintec Instrs.
HOT SHOT - Union Carbide Corporation
HOT SPOTZ - Zippertubing
HOT TIP - Contact
HOT VAC 2000/4000 - Ungar
HRTMP - The Meyercord
HT - Alltech
HT-X - Alltech
HT-1000 - Hafstrom Technical Products
HT-300 - Hafstrom Technical Products
HUB-CLAMP - Sterling Instr.
HUB-LOCK - Sterling Instr.
HUGOLD AIR PRESS - Black & Webster
HUMBUG - Star-Kits
HUMI-CHEK - Beckman Instrs.
HUMISEAL - HumiSeal
HUSKY - Clean Room Prods.
HVCMOS - Supertex
HY-A-SIL - Sanford-Miller
HYBRIDER - Sencore
HYBRIDGE - Alford Mfg.
HYDENT - Burndy Corporation
HYDRAMOTOR - ITT General Controls
HYDRIVE - Infodex
HYDROFEED - Components
HYDRO-FLOW - Kenco Industries
HYDRO-PURGE - Alltech
HYDRO-X - Multicore Solders
HYFEN - Burndy Corporation
HYFLUX - Indiana General/ Emm
HYGRADE - Markel
HYGROLINE - Beckman Instrs.
HYGROTEST - Testoterm
HYJOULE - Associated Research
HYLINK - Burndy Corporation
HYLOK - Burndy Corporation
HYLUG - Burndy Corporation
HYPASS - Sprague Elec.
HYPERGRAF - Lundy Elctrns. & Systems
HYPERION - Lutron Elctrns.
HYPERSCAN - Lundy Elctrns. & Systems
HYPER SEL - Alpha Comps.
HYPERTAC - Hypertronics
HYPERTAC - Industrial Elctrn. Hardware
HYPOINT - Burndy Corporation
HYPOT - Associated Research
HYPRESS - Burndy Corporation
HYRING - Burndy Corporation
HY-THERM - Hy-Cal Engrg.
IAP - Data Translation
IB GRAPH - Data Processing Design
IBR - Varo Semiconductor
I.C. - Illinois Capacitor
ICD BUS - Industrial Computer Designs
ICECAP - Integrated Circuit Engrg. (ICE)
ICE CUBE - Powercube
ICEMAN - Motorola Semiconductor Prods.
ICE PAC - Powercube
IC-KOOLER - UNITRACK
ICKYPIC II - Communications Technology
ICS - Beckman Instrs.
ICSOTIMER - Instrumentation & Control Sys.
IC-6000 - Inficon Leybold-Heraeus
I.D. - Summagraphics
IDA - Catalyst Research
IDEA - Harris
IDEACOMM - IDE Associates
IDEADISK - IDE Associates
IDEAGRAPH - IDE Associates
IDEAMAX - IDE Associates
IDEAMINI - IDE Associates
IDEA MINICOMM - IDE Associates
IDEAMINIMAX - IDE Associates
IDEANET - IDE Associates
IDEASHARE - IDE Associates
IDEATAPE - IDE Associates
I-DIT - Transformer & Coil Products
IDOL - SMC Software Sys.
I-DOT - Transformer & Coil Products
IDT - MOLEX
IEE-APOLLO - Industrial Elctrn. Engrs.
IEE-ARGUS - Industrial Elctrn. Engrs.
IEE-ATLAS - Industrial Elctrn. Engrs.
IEE-AURORA - Industrial Elctrn. Engrs.
IEE-DAYSTAR - Industrial Elctrn. Engrs.
IEE-DAYSTAR NOVA - Industrial Elctrn. Engrs.
IEE-ELECTRA - Industrial Elctrn. Engrs.
IEE-FLIP - Industrial Elctrn. Engrs.
IEE-HERCULES - Industrial Elctrn. Engrs.
IEE-JUPITER - Industrial Elctrn. Engrs.
IEE-PANELSWITCH - Industrial Elctrn. Engrs.
IEE-POLARIS - Industrial Elctrn. Engrs.
IEE-PRECI-DIP - Industrial Elctrn. Engrs.
IEE-PROSWITCH - Industrial Elctrn. Engrs.
IEE-THINPANEL - Industrial Elctrn. Engrs.
IEE-THINSWITCH - Industrial Elctrn. Engrs.
IEE-THRIFTSWITCH - Industrial Elctrn. Engrs.
IEE-TITAN - Industrial Elctrn. Engrs.
IGNITOR - Union Carbide Corporation
IMAGESCOPE - Galileo Electro-Optics
IMAGEVIEW - Lexidata
IMCAIR - IMC Magnetics
IMCOM - IMC Magnetics
IMCON - Andersen Labs.
IMCOOL - IMC Magnetics
IMCUBE - IMC Magnetics
IMLEC - Inter-Market
IMMERSION GOLD - Sel-Rex
IMOX - Advanced Micro Devices
IMPAC - Microwave Semiconductor
IMPAC - Modular Audio Prods.
IMPAC - New Haven Wire & Cable
IMPAC - Velonex
IMPACT - Documation
IMPACT-O-GRAPH - Chatsworth Data Corp
IMPAC 3 - Semtech
IMPERIAL LINE - Ungar
IMPERVITRAN - Micron Inds.
IMPLION - Frequency Sources
IMS - Inmos
INCA - Kalglo Elctrns.
INCHWORM - Burleigh Instrs.
INCOR - Indiana General/ Emm
INCRE-LOCK - Sequential Info. Sys.
INCUSIL - GTE Wesgo Technical Ceramics & Metals
INDAC - Digital Equip.
INDOX - Indiana General/ Emm
INDUCT-A-RING - Unholtz-Dickie
INDUCTOSYN - Del Elctrns.
INDUCTOSYN - Farrand Controls
INDUCTRIC - Keytek
INDUSTRIAL TIMER - Veeder-Root
INDUSTRIAL 24KT GOLD - Technic
INDUSTRITE - BIW Cable Sys.
INDUSTROL 812 - Research
IND 68000 - Indocomp
INFINITRON - Bourns Instrs.
INFO-GEN - Info-Pros
INFO-REPORTER - Info-Pros
INFORMATION PLANNER - Database Design
INFOS - Data General
INFO-SORT - Info-Pros
INLINE - Microwave Filter
INMAC PLUS - Inmac
INNOVATION AUTO LOADER - Reliability
INSET - Materials Resch.
INSIGHT - Penn Video
INSTA-CODE - Panduit
INSTALINK460 - Micom Systems
INSTAMUX470 - Micom Systems
INSTAMUX470I - Micom Systems
INSTANET - Micom Systems
INSTANT LETTERING - Datak
INSTANT OPTIMA - Scientific-Atlanta
INSTAR - Video Logic
INSTA-SET - Barber-Colman
INSTA-TEST - Grand Transformers
INSTATHERM - Barnes Engrg.
INSTATRUNK - Micom Systems
INSTROBE 90 - Video Logic
INSUL-BOLT - Augat/Pylon
INSULBOND - Permagile-Salmon Ltd.
INSULCAST - Permagile-Salmon Ltd.
INSULCURE - Permagile-Salmon Ltd.
INSULET - Augat/Pylon
INSULINK - Burndy Corporation
INSULSPLICE - Autosplice
INSULTEK - Intl. Elctrn. Resch.
INSULTEK - IERC
INSULTITE - Electronized Chemicals
INSULUBE - Intl. Elctrn. Resch.
INSULUBE - IERC
INSULUG - Burndy Corporation
INSU-SHIELD - Manhattan Electric Cable
INTEGRAL SEAL - Parker Seal Grp.
INTEGRATED NETWORK ARCHITECTURE - Digital Communications

INTEGRA-TEST - Varian
INTELLIGENT DISPLAY - Siemens Comps.
INTELLIGENT 3270 - Mohawk Data Sciences
INTELLISPLAYS - National Semiconductor Optoelectronics
INTENNA - Microwave Filter
INTER-ACCESS - Elcom Industries
INTERCAP - International Comps.
INTERCEPT. - Intersil
INTERCEPTER - Surgeonics Ltd.
INTERCHECK - Guildline Instrs.
INTERCHIP - International Comps.
INTERFACE 33 - Amco Engrg.
INTER-KEY - Atlantic Research
INTERKIT - International Comps.
INTERLIFE - Dixon Inds.
INTERNALIGN - Bowmar Instrument
INTERNATIONAL CERTIFICATION PROGRAM - Pulver Laboratories
INTEROHM - International Comps.
INTERPACT - Dixon Inds.
INTERPIN - Interdyne
INTERROSPONDER - Vega Precision Labs.
INTERSHAKE - Atlantic Research
INTERSPEC SWITCHES - Arrow Hart
INTERVIEW - Atlantic Research
INTERVOX - International Comps.
INTER-8-WEAVE - Magnetic Shield
INTEX-TALKER - Intex Micro Systems
INTRACON - Dynatech
INTRA-CONNECTOR - A P PRODUCTS INCORPORATED
INTRALUX - American Volpi
INTRASCOPE - American Volpi
INTRASPOT - Vicon Industries
INTRA-SWITCH - A P PRODUCTS INCORPORATED
INTROVOICE - Voice Machine Comms.
INTUIT - Noumenon
INVERTRON - Behlman , California Instrs.
INVERTRON - California Instruments
INVERTRON - Elin
IOCHROME - Materials Resch.
I/O MODULE - Motorola Semiconductor Prods.
ION-AIR - Static
ION-FLOW - Static
IONOGRAPH - Alpha Metals
I/OS - GMR
IPAC - Instrumentation & Control Sys.
IPS - Dataroyal
IP-3 - Complexx Systems
IR-DETEC - Visual Communications
IR EYE - IR Scientific
IRIS - Point 4 Data
IRISCORDER - Hamamatsu Photonics K.K.
IRMA - Digital Communications
IRMACOM - Digital Communications
IRMAKEY/3270 - Digital Communications
IRMALETTE - Digital Communications
IRMALINE - Digital Communications
IRMALINK - Digital Communications
IRMAPRINT - Digital Communications
IRONCLAD - Exide
IRON GRIP, V-GRIP - Equipto
ISAFIL - Control Concepts
ISC-108 - ERM
ISLATROL - Control Concepts
ISO-PAK - Computer Prods.
ISOBASE - Endevco
ISOCHEMBOND - Isochem Products
ISO-CURVE - Fenwal Elctrns.
ISODAMP - E-A-R
ISODRIVE - Zehntel
ISOFARAD - Sprague Elec.
ISOFORMER - ACD-Elcor Products
ISO-GATE - Dionics
ISOGUARD - ISOREG
ISOLENE - Hardman
ISOMUL - Isochem Products
ISO-OHM - Ferro
ISOPAC - Semtech
ISOPLY - ACD-Elcor Products
ISOPODS - Hughes Aircraft Co
ISOPOLAR - Data Precision
ISOREX - ACD-Elcor Products
ISOSHEAR - Endevco
ISO-SHIELD - Belden
ISOSHIELD - ISOREG
ISOTHERM - Victory Engrg.
ISOTHERMAL - Motorola Semiconductor Prods.
ISOTRON - Endevco
ISOTRONICS - Isotronics
ISO-V-AC - VIZ Test Equipment
ISO-VERTER - Love Controls
ISO-VOLTS - Motorola Semiconductor Prods.
ISOWATT - RCA Solid State
ISO-WEAVE - International Instrumentation
I SUPPLY - Calex Mfg.
I.T. (INTEGRATED TESTING) - LTX
I-T-E - Brown Boveri Elec.
ITECO - Industrial Test Equip.
ITRON - Noritake Elctrns.
IT-200 - Micro Component Technlg.
IVES - EECO
IXF - Piezo Technology
JACKEY - Allen Mfg.
JAICO - Jaidinger Mfg.
JANETTE - Eastern Air Devices Motor
JANSET - Jan Hardware Mfg.
JART - Scientific Columbus
JBUG - Motorola Semiconductor Prods.
JED-1 - Scientific Columbus
JELLY BEANS - RDI/Reed Devices
JELLYCLEAN - Communications Technology
JEM - Howell Instrs.
JEM-1 - Scientific Columbus
JEM-2 - Scientific Columbus
JENSEN - Jensen Tools
JET - Scientific Columbus
JETCAL - Howell Instrs.
JET-FLECS - MOLEX
JETFLOW - Ajax Magnethermic
JET PLATER - Sel-Rex
JET PORT STOCK - Bailey Controls
JIF-TEMP - EDL
JOBMAG - Jobmaster
JOLTA - Jan Hardware Mfg.
JONES - TRW Connector
JOTDRAFT - Datak
JR. EXEC - Solid State Systems
JTC - Gould
JUMO - Jumbo Process Control
JUST-WRAP - OK Industries
KALAR - Hardman
KALENE - Hardman
KALEX - Hardman
KALOTRON - Thermosen
KARADIO - ATR Elctrns.
KARATCLAD - Sel-Rex
KARI - ZI-TECH Instr.
KARRY-ALL - Fancort Industries
K-BAR - Kurz Instruments
K CONNECTOR - Wiltron
K-D - Easco/K-D Tools
K-DET - Hurst Mfg.
KELVIN KLAMPS - Electro Scientific Inds.
KEMET - Kemet, Union Carbide Corporation, Elctrns.
KEMFUZE - Bel Fuse
KEMID - Norton Chemplast
KEY CONNECTOR - XCP
KEYPHASOR - Bently Nevada
KEYTEK - Keytek
K-FILM - Ferro
KGS-80 - Kogyosha
KIFIS - Kollsman Instr.
KILOBYTE - Vertex Inds.
KILO-PAC - Velonex
KILOVOLT STAC - Semtech
KIMBAR - Schweitzer
KIMFAN - Schweitzer
KIMFOL - Schweitzer
KIMFONE - Schweitzer
KING Q - Vanguard Elctrns.
KINGSPLICE - Autosplice
KINOPTIK - Heitz, Karl
KK - MOLEX
KLEEN-ALL - Tech Spray
KLEEN LINE - Electronic Specialists
KLEENSTREAM - Beckman Instrs.
KLEEN-STRIP - National Wire & Cable
KLEENTROL - R-Columbia Prods.
KLEER-PAK - Sprague Elec.
KLINA - Beckman Instrs.
KLIPPON - Weidmuller Terminations
KLIPRING - Waldes Kohinoor
KLIP SELS - International Rectifier
KLIPSOCKET - Chicago Switch
KLIPSOCKET - ITW Switches
KLIPTITE - Kulka Smith
KLIXON - Texas Instrs.
KLYSTRODE - Varian Associates
KNOBPOT - Bourns
KOA - KOA Speer Elctrns.
KOAOHM - KOA Speer Elctrns.
KOLEBINS - Kole Ind.
KONEKT-ALL - Jonard Industries
KONFORM - Chemtronics
KONTACT - Chemtronics
KONTACT 60 - Jonard Industries
KOOL-CURE - UVP
KOOLER-GUIDE - UNITRACK
KOOLER-KAGE - UNITRACK
KOOLER-KROWN - UNITRACK
KORLESS ELECTRODES - Micro-Coax Components
KORONA-GUARD - Belden
KORTON - Norton Chemplast
KORVEX - Norton Chemplast
KRECO - Kreckman, Herb
KRONAGOLD - E/M Lubricants
KRONAPLATE - E/M Lubricants
KRYTERION - Everett/Charles Test Equip.
K-SET - Michigan Magnetics
KSI - Hybrid Elctrns.
KSI - Kates Sci. Instrs.
K-TROL - Electrol
KV-PAC - Semtech
KWICK-KONNECT - Sealectro
KWIKI - Lightning Protection
KWIK-SNAP - Accurate Elctrns.
KWIK-TAB - Accurate Elctrns.
KWIK-TIE - Accurate Elctrns.
KWIK-WAY - The Meyercord
KW PAC - Semtech
KYNAR - Pennwalt
KYNAR FLEX - Pennwalt
K1 KERNEL - Communication Machinery
K40 - American Research & Engineering
LAB - Transformer & Coil Products
LAB-DATAX - Data Translation
LA BELLE CRYSTAL - Saphikon
LAMBDA - Electrovert USA
LAMPLIGHTER - Cardinal Control
LAMTAC - Hypertronics
LANCE-A-LOCK - Lance Wire & Cable
LANCELOK - AMP
LAND - Zenith Systems & Components Group
LAPFLO - Pace
LARGE FLANGE TSN - Avdel
LASE-A-LIGN - Laser
LASERBLADE - Penn Resch. (PRC)
LASER GEM - Laser Techn.
LASERMATIC - General Laser
LASERSCAN - Penn Resch. (PRC)
LASERSCRIBE - Quantronix
LASERTRAC - Coherent
LASERTRAC - Laser
LASERTRIM - Apollo Lasers
LASTEC - Laser Techn.
LAT-CON - Panduit
LAVOLAIN - Star Porcelain
LAZARAN - Beckman Instrs.
L-BOX - IET Labs
LCA - Bacon Inds.
LC² MOS - Analog Devices
LEAD EDGE - Texas Instrs.
LEAD SHUNT - Gordon, L., Packaging
LEAGUE EMBLEM - American Radio Relay League
LEAK-PRUF - Alpha Metals
LEARNING TREE - Integrated Computer Systems
LE CARBONE - Carbone Lorraine Inds.
LECTRA-LOAD II - RTE
LECTR-AU-LYTE - Sel-Rex
LECTRODUCT - Lectro Magnetics
LECTROLESS - Sel-Rex
LECTRO LINE - Lectro Magnetics
LECTRO-NIC - Sel-Rex
LECTRONICCOMPASS - Humphrey
LECTRO-PLAQUE - Simco
LECTRO-QUIP - Illinois Lock
LECTROSHIELD - Lectro Magnetics
LECTROVENT - Lectro Magnetics
LED - Allaco Prods.
LEDCO - Wilbrecht Elctrns.
LEDDICON - EEV
LED-EYE - Shelly Associates
LED-PAK - Dolan-Jenner Inds.
LEEBOND - Leepoxy Plastics
LEECAST - Leepoxy Plastics
LEE-STRIP - Atlee
LEKTRON - Paso Sound Prods.
LENSCOTE - Metavac
LEPAK - Lepel
LERLOY - Engineering & Elctrn. Devices
LEROY - Keuffel & Esser
LEV CHEK - Hexacon Elec.
LEVELAIR - Electrovert USA
LEVEL-LINK - Transamerica Delaval
LEVEL-LOC - Shure Bros.
LEVEL/PAK - Square D
LEVOLIER - McGill Mfg.
LGH - AMP
LG-1 - Analog & Digital Peripherals, (ADPI)
LIBAT - Plainview Elctrns.
LID - Amperex Elctrn.
LIFEGARD - Antenna Specialists
LIFELINE - Instrumentation & Control Sys.
LIGHT WATCHMAN - Ripley
LILBUG - Motorola Semiconductor Prods.
LIL ELF - Data-Design Labs.
LIMITRON - Bussmann
LINE BACKER - Antenna Specialists
LINE CHECK - Electronic Specialists
LINEGARD - SL Waber
LINEMATE - Coherent Communications Sys.
LINE MISER - Gandalf Data
LINE-O-LITE - Industrial Devices
LINEPLEXER - Timeplex
LINE-SAVER - Kalglo Elctrns.
LINE SWITCH 25 - TRW Connector
LINE TAMER - Shape Magnetronics
LINE 2 - Topaz Electronics
LINISTOR - Keystone Carbon
LINK/CHEK - Com/Tech Systems
LINK/1 - Timeplex
LISA - Centigram
LISTENER - Dataprobe
LITE - United Foam Plastics
LITE-BOND - International Wire Products
LITE-MIKE - EG&G
LITETOUCH - Brady, W.H.
LITEX - Screenprint/Dow
LITHIODE - Catalyst Research
LITHOCON - Princeton Elctrn. Prods.
LITTELITES - Littelfuse
LITTLE CAESAR - ITT Cannon
LITTLE DEVIL - Ohmite Mfg.
LITTLE DIPPER - Techni-Tool
LITTLE GEM - Equipto
LITTLE GEM - Sjoberg, C., & Son
LITTLE GRIPPER - Techni-Tool
LITTLE-MITE - LH Research
LITTLE REBEL - Ohmite Mfg.

LITTLE 7 - Holub Industries
LITTL-LYTIC - Sprague Elec.
LIXI - Lixi
LMB - LMB Heeger
LOADGARD - Helm Instr.
LOADMAX - Raytheon Ocean Sys.
LOAD-PAK - Transamerica Delaval
LO CAP - Consolidated Electronic Wire & Cable
LOCKIT-SOCKET - U.S. Terminals
LOCK-O-SEAL - Parker Seal Grp.
LOCKWELL - Hartwell
LO-COG - PITTMAN
LOCO II - Motorola
LOCOST - Julie Resch. Labs.
LOC-TRAC - Alpha Wire
LO-EX - WALTER KIDDE
LO-G - Barry Controls
LOGCELL - Fifth Dimension
LOG DAC - Analog Devices
LOGICAL CONNECTION - A P PRODUCTS INCORPORATED
LOGICATOR - Bowmar Instrument
LOGIC II - B & B Motor & Control
LOGIC TIMER - Durgin & Browne
LOGISCOPE - Intech
LOGO-LITE - Zero
LOHMETER - Alpha Comps.
LOKON - Allen Mfg.
LO à METAL ELEMENT RESISTORS - RCL Electronics
LO à METAL ELEMENT RESISTORS - Shallcross
LO-MITE - Ohmite Mfg.
LONGFELLOW - Waters Mfg.
LONGHAIR - Stanton Magnetics
LONG LIFE - Berg, W. M.
LONG RANGER - Automatic Timing & Controls
LONG RANGER - Efector
LO-PROFILE - Aries Elctrns.
LORAIN - Lorain Prods.
LO-RISE SOCKETS - Wells Elctrns.
LO-SMOKE - BIW Cable Sys.
LOW BOY - Stancor/Hamilton Standard Controls
LOW-PEAK - Bussmann
LOW-VAR - Republic Elctrns.
LOXARMOR - Okonite
LOX THERMISTOR - Victory Engrg.
LPB - Unimax Switch
LPKF - LPKF Pacific
LPS - LPS Chemical Products
LR SERIES - E & L Instruments
LSC - Saphikon
LSHV - BIW Cable Sys.
LS56K - Complexx Systems
LTN & LTNM - Fenwal Elctrns.
LUBE-LOK - Electrofilm
LUBRI-BOND - Electrofilm
LUBRI-SHINE - Tech Spray
LUCALOX - General Electric
LUCKY LOGGER - Venable Industries
LUFKIN - Cooper Group
LUFT - Luft Instrs.
LUMAPAC - EWC
LUMI - Chrono-log
LUMIGRAPH - Sigma Instrs.
LUSTRAN ABS - Monsanto
LUSTREX - Monsanto
LUSTRE-ZINC - Titchener, E. H.
LUS 76.8 - Complexx Systems
LUXICON - Dolan-Jenner Inds.
LX-CJ - Omega Engrg.
LXD - LXD
LYRIC - EG & G Rotron
L-500 - Belden
MAC DISK - Davong Systems
MACO - Barber-Colman
MACOR - Corning Glass Works
MACROLOADER - Macrolink
MACROSTART - Macrotronix
MACRO-T - Motorola Semiconductor Prods.
MACROTROL - Macrotronix
MACRO-X - Motorola Semiconductor Prods.
MACRO-3 - Macrolink
MACSBUG - Motorola Semiconductor Prods.
MACSYM - Analog Devices
MAE - Lundy Elctrns. & Systems
MAGEN - Haverly Systems
MAGIC SPELL - Star-Kits
MAGIC TIP - Hunter Tools
MAGI-START - Vernitron Piezoelectric
MAG-MASTER - Belden
MAG-MASTER - Magnum Elec.
MAGMOD - General Magnetics
MAGNAGUIDE - Electron
MAGN-A-PAK - International Rectifier
MAGNA Q - Vanguard Elctrns.
MAGNA-SET - Princo Instrs.
MAGNATORC - IMC/Hansen
MAGNA-VISUAL - Jobmaster
MAGNEFORM - Maxwell Labs.
MAGNEMETRICS - Walker Scientific
MAGNEPAINT - Micro-Circuits
MAGNESEARCH - RFL Inds.
MAGNE-SETTE - Temescal
MAGNESIL - Magnetics
MAGNESTIR - Lab-Line Instrs.
MAGNETIC TWEEZER - Orbit Inds.
MAGNETOOL - Jobmaster
MAGNETREATER - RFL Inds.
MAGNETTE - Heinemann Elec.
MAGNION - Walker Scientific
MAGNI-WHIRL - Blue M, A Unit of General Signal
MAGNUM - Belden
MAGNUM - Unitrode
MAGSTRIP - Magnum Elec.
MAGSTRIPE - American Magnetics
MAGTECH - Magnetic Technology
MAGTERM - Magnum Elec.
MAGTERM - Zierick Mfg.
MAINTAINER - IVEK
MAJOR - EG & G Rotron
MANCHEX - Exide
MANIX - Mann, Henry
MANSON - Okonite
MAN-TRIX - Mantex
MANUMATIC - Varian
MAN-U-SERT - Universal Instrs.
MAP - CPSI
MARAGLAS - Acme Chemicals & Insulation
MARASET - Acme Chemicals & Insulation
MARCOFLEX - Oak Switch Sys.
MARELCO - Marel Instr.
MARINEFAX - Alden Electronics
MARINE-MATE - Bird Elctrn.
MARK C - Cole Instr.
MARK-EL - Acme Model Engrg.
MARKET-COM - Aiphone
MARK I - Technical Devices
MARK II - Technical Devices
MARK IV - Omega Engrg.
MARK IV - Technical Devices
MARK IX - Technical Devices
MARK TEN B - Delta Prods.
MARK V - Technical Devices
MARK VII - Technical Devices
MARK X - Memorex
MARK XI - Memorex
MARK 4 - Auto-trol Tech.
MARNAV - Markat
MARZ - Materials Resch.
MAS - Transformer & Coil Products
MAS-CON - Panduit
MASQ-MATIC - Sel-Rex
MASSBUS - Digital Equip.
MAS/TER - ITT Cannon
MASTERCHIP - Master Logic
MASTERCOUNT - Master Elctrn. Controls
MASTERELAY - Master Elctrn. Controls
MASTERFLASH - Master Elctrn. Controls
MASTER FLOW - Master Appliance
MASTER-MITE - Master Appliance
MASTERTIME - Master Elctrn. Controls
MAT - Transformer & Coil Products
MATEC - Motorola Semiconductor Prods.
MATE-N-LOK - AMP
MATHPAC - Acurex-Autodata
MATRI DOT - Practical Automation
MATRIX IV - Zero
MAXBASIC - National Information Sys.
MAXBRITE - Melles Griot
MAX-C - Sprague-Goodman Elctrns.
MAXCAP CAPACITORS - Sohio Engineered Materials
MAX-COAX - Skan-A-Matic
MAX-E-PITCH - Berg, W. M.
MAX I - Leeds & Northrup Instrs.
MAXI CHIP - AVX Corporation
MAXI-COLOR - Belden
MAXI-DRY - FTS Sys.
MAXIPOWER - Trio Labs.
MAXI-PULSE MP10K - Photon Sources
MAXI-QUBE - American Technical Ceramics Corporation
MAXI-6 SHIELD - Computer Prods.
MAXLOK - Avdel
MAXXI-MIXXER - CHEM-MIXX
MCI-II - Hollis Engrg.
M.C.M. - Electro-Craft
MCS - Diversified Case
MCSL - Electro-Craft
MCT - Micro Component Technlg.
MCT-2000 - Micro Component Technlg.
MC-20 - Excellon Automation
MC-30 - Excellon Automation
MDC - Maida Development
MDOS - Motorola Semiconductor Prods.
MDS - Mohawk Data Sciences
MDTL - Motorola Semiconductor Prods.
MD-001 - Eaton , Test Sys.
MD-300 - Eaton , Test Sys.
MEA - Mechanized Electronic Assembly
MEASUROMETER - Analogic
MECL - Motorola Semiconductor Prods.
MEDI-SAFE - Brand-Rex
MEGAHOST - RI/Control Systems
MEGALINK - Computrol Kidde Automated Sys.
MEGANET - Megatest
MEGAPLEX - Computrol Kidde Automated Sys.
MEGASORB - Varian
MEGASTAR - RI/Control Systems
MEGATROMETER - Penn Airborne Prods.
MEGAVOICE - Paso Sound Prods.
MEG-CHEK - Associated Research
MEGMETER - Ross Engrg.
MEG-O-VOLT - Sperry, A. W., Instrs.
MEKTHERM - Rogers
MEKTRON - Rogers
MELDIN - Dixon Inds.
MEMBUS - Motorola Semiconductor Prods.
MEMORASE - UVP
MEM-O-REE - Mylee Digital Sciences
MEMORY MAG - EG&G Geometrics
MEMOTRON - Hughes Aircraft
MEMPAC - Varta Batteries
MEMTRON - Memtron Technologies
MEREDIAN - Leeds & Northrup Instrs.
MET - Sprague Elec.
MET - Transformer & Coil Products
META-CAST - Mereco Products
META-DUCT - Mereco Products
METAL ANALYZER - Sensor
METALARC - GTE Sylvania Lighting Prods.
METALAST - Electro Physics
METALASTIC - Chomerics
METAL DEVIL - Ohmite Mfg.
METALEX - Chomerics
METAL GLAZE - TRW Resistive Products
METAL-MITE - Ohmite Mfg.
METALOK - Burndy Corporation
METAL V-SEAL - Parker Seal Grp.
METAMETER - Bristol Babcock
METANET - Sprague Elec.
METAPART - Mereco Products
METASIGNATURE - Bristol Babcock
METATERGE - Mereco Products
METATRONIC - Bristol Babcock
METEOR - E^2 Technology
METFILM - Sprague Elec.
METH-PREP - Alltech
MET-L-FLEX - Barry Controls
MET-LOC - Deutsch Fastener
METOXILITE - Semtech
METRE GRIP - Mereco Products
METRI-GAP - Lion Precision
METRISITE - Gould
METRO CARTS - Inter Metro Industries
METRO-COLOR - Belden
METROLOGGER - Metrosonics
METRON - Metron Optics
METRON MARKER - Metron Optics
METROREADER - Metrosonics
ME-2 - Scanbe
MG - MG Electronics
M-GAGE - Tencor Instr.
M/G ULTRA TEST - General Hardware Mfg.
MHO-GUN - Beckman Instrs.
MHTL - Motorola Semiconductor Prods.
MHW - Phoenix Wire
MICA - Micro Associates
MICAL - Topflight
MICAMP - Avantek
MICAP - Tobe Deutschmann Labs.
MICAPAK - Mica Corporation
MICAPLY - Mica Corporation
MIC-PAC - Microwave Semiconductor
MICRICON - Research
MICRISTAR - Research
MICRO-ACOUSTIC - Frazier
MICRO-AMPSYN - CGIS, A COMSAT
MICROAUTOSTAT - Static
MICRO BEAD - Victory Engrg.
MICROBUG - Motorola Semiconductor Prods.
MICROCAP - American Technical Ceramics Corporation
MICROCELL - Kistler-Morse
MICRO CHART - Micro Logic
MICROCLAREED - Clare
MICRO-CLEAN - Hollis Engrg.
MICROCOAX - Micro-Coax Components
MICRO-COMPACT - CGIS, A COMSAT
MICRO-C/PROBE - International Instrumentation
MICRODATA - Microdata
MICRO-DIP - EECO
MICRO-FERRUPS - Best Power Technology
MICROFIBRE - Balston
MICRO-FILE - Scanbe
MICRO-FILTER - RFI Corporation
MICROFLASH - EG&G
MICROFLECTOR - Microflect
MICROFLEX - Eagle Signal Controls
MICROFLEX - National Electric Cable
MICRO-FOIL - RdF Corporation
MICROFORK - Murata Mfg. , Ltd.
MICROFUGE - Beckman Instrs.
MICRO-GATOR - Mueller Elec.
MICRO HANDLER - Bulova Sys. & Instr.
MICROHEX - Sealectro
MICRO I - Delevan
MICRO-J - Johnson, E. F.
MICROJOULE - Scientific Columbus
MICROKEY - Advanced Input Devices
MICRO-KLEAN II - AMF
MICROLAB - Beckman Instrs.
MICROLAN - Fast Feedback Technologies
MICRO-LINE - Thermoplastic Processes
MICRO-LOC - BEI Motion Sys.
MICROMASTER - Inmac
MICRO-MASTER - Keuffel & Esser
MICROMATE - Personal Micro Computers
MICRO MATRIX - Digital Products
MICRO MELT - Ajax Magnethermic
MICRO-MINAC - Singer

MICROMINIM - Standard Wire & Cable
MICRO-MITE - Vibra-Metrics
MICRO MO - Micro Mo Electronics
MICROMODULE - Motorola Semiconductor Prods.
MICRONET - Sidereal
MICRONIK 100 - Honeywell
MICRONOVA - Data General
MICRONOX - Caddock Electronics
MICRO/OMNITRAK - Flow Technology
MICRO-OPTIC - Dolan-Jenner Inds.
MICRO-PAC - Semtech
MICROPAC - Xycom
MICROPAINT - Micro-Circuits
MICROPAN - Vicon Industries
MICROPIN - ITT Cannon
MICROPLEXER - Timeplex
MICROPLOT - Gulton Inds.
MICROPORT 8 - Telesis Laboratory
MICRO POWER - Rayovac Corporation
MICROPROBE - Huntron Instrs.
MICROPROCESS - UCCEL Corporation
MICRO-PROFESSOR-MPF - Multitech Elctrns.
MICROPROX - Bently Nevada
MICROPUCK - TRAK Microwave
MICRORANGER - Sencore
MICROREG - Sierracin/Power Systems
MICROSCAN - Vicon Industries
MICROSCANNER - Photo Resch.
MICRO-SCREEN - AMF
MICROSCRIBE - Houston Instrument
MICROSEAL - E/M Lubricants
MICROSERIES - Datak
MICROSERIES - Itek Measurement Sys.
MICRO-SLIDE - Grant Hardware
MICROSOCKET - ITT Cannon
MICROSOL - ITT General Controls
MICROSPOOLER - Consolink
MICRO SPRINT - Qume
MICRO-STAC - Semtech
MICROSTAT - Ecosoft
MICRO-STEDI - Hexacon Elec.
MICROSTEPPER - Mesur-Matic Elctrns.
MICROSTREAMER - Cipher Data Prods.
MICRO-SYNCLAMPS - Timber-Top
MICROSYSTEM - Applied Micro Technlg.
MICROSYSTEM 6/10 - Honeywell Info. Sys.
MICRO-T - Johnson, E. F.
MICRO-T - Motorola Semiconductor Prods.
MICRO TECH - Sprague Elec.
MICROTEMP - Micro Devices Product Group
MICROTENN - Tenney Engrg.
MICROTEST - Fast Feedback Technologies
MICROTESTER - Microtest Systems
MICROTHERM - Canadian Thermostats & Control Dev. Ltd.
MICROTIP - Heat Systems-Ultrasonics
MICROTOUCH - Microavionics
MICROTOX - Beckman Instrs.
MICROTRAC - Leeds & Northrup Instrs.
MICRO UPOWER-DIP - Integrated Circuits
MICRO UPOWER-MINI - Integrated Circuits
MICRO-UPS - Cuesta Systems
MICRO-VECTORBORD - Vector Electronic
MICRO VIEW - Micro Logic
MICROWAFER - Stanton Magnetics
MICROWIPE - Clean Room Prods.
MICROWIRE - PCK Technology
MICRO WYND II - AMF
MICROYRE - Tensolite
MICROZONE - Beckman Instrs.
MICRO ZOOM - Bausch & Lomb
MICRO 9 - Penn Resch. (PRC)
MIDA - Motorola Semiconductor Prods.
MIDAS TOUCH - International Instrumentation
MIDAX - Data Translation
MIDGET - Midget Louver
MIDGET - Sprague Elec.
MIDGIE - Aptronics Corporation
MID-RISE SOCKETS - Wells Elctrns.
MID-TEMP. - Fenwal Elctrns.
MIGHTY-MITE - LH Research
MIGHTY MITE - Sencore
MIGHTY-MITE-A - LH Research
MIGHTY MUX - Point 4 Data
MIGHTY-TUFF - Flambeau Products
MIKBUG - Motorola Semiconductor Prods.
MIL-ENE - W. L. Gore
MILIBRIDE - Belden
MILLIKEN - Teledyne Camera Sys.
MILLITORR - Varian
MIL-LOC - Deutsch Fastener
MILMASTER - Electron-Machine
MIL-ON 941877 - W. L. Gore
MIL POWER - Trio Labs.
MILROS - Alpha Metals
MIL-SPEC - Rolm Mil-Spec Computers
MINA - Andrews Bearing
MINA - Miniature Precision Bearings
MINA - MPB
MINA - Split Ball Bearing
MINAPAR - Andrews Bearing
MINAPAR - Miniature Precision Bearings
MINAPAR - MPB
MINAPAR - Split Ball Bearing
MIND - Contel Info. Sys.
MIN-E-PITCH - Berg, W. M.
MINERALIGHT - UVP
MINI-RAYCORDER - Raymond Engrg.
MINI-AKTOR - Alltech
MINIATURE - DAN-L
MINI BEE - Hurst Mfg.
MINI BITE - Minelco - A Talley Ind.
MINIBLOC - Motorola Semiconductor Prods.
MINI-BLOK - Bivar
MINIBOX - Westlake Capacitors
MINI-BREAKER - Mechanical Products
MINIBRIDGE - Elctrn. Devices
MINIBUG - Motorola Semiconductor Prods.
MINI-BULK - Baron-Blakeslee
MINI/BUS - Rogers
MINIBUTTON - Digitran
MINICAM - Alan Gordon Entprs.
MINI-CATOR - Industrial Devices
MINICHINE - Pace
MINI-CONSOLE - Techmar
MINICOUNTER - Veeder-Root
MINI-CUBE - American Technical Ceramics Corporation
MINI-DATA - Raymond Engrg.
MINI-DEK - Braemar
MINIDIP - Corning Glass Works
MINI-DIP - EECO
MINI-DOT - Industrial Devices
MINIDUCTOR - Transformer & Coil Products
MINIFAX - Alden Electronics
MINIFLYX - Brim Elctrns.
MINI-GATOR - Mueller Elec.
MINIGUN - Raychem
MINI HANDLER - Bulova Sys. & Instr.
MINIKEY - Digitran
MINILEVER - Digitran
MINI-LINK - Aries Elctrns.
MINILOAD - Bird Elctrn.
MINILOK - Burndy Corporation
MINILYTIC - Sprague Elec.
MINI-MAP - CPSI
MINI/MATE - RTE
MINIMATHPAC - Acurex-Autodata
MINI-MAX - Union Carbide Corporation
MINIMAX/LSI - Teradyne Connection Sys.
MINI MEG - Integrated Digital Products
MINI-METER - Sperry, A. W., Instrs.
MINI-METOXILITE - Semtech
MINI-METRIC - Allen-Bradley , Electronics Group
MINI MICROTEMP - Micro Devices Product Group
MINI-MIKE - Chicago Switch
MINI-MIKE - ITW Switches
MINI MITE - Thermo Electric
MINI MODEM - Cermetek Microelectronics
MINI-MONITOR - Bird Elctrn.
MINIMOTOR - Micro Mo Electronics
MINI-MOUNTS - Christiansen Radio
MINI-NET - Centralab
MINI-PAL - Sundstrand Data Control
MINI-PRINT - Veeder-Root
MINIPROBE - Sperry, A. W., Instrs.
MINIPROGRAMMER - Cole Instr.
MINISAT - Powertech
MINISEAL - Raychem
MINI-SENSOR - Ametek/Rodan
MINISERT - Du Pont Connector Systems
MINISERVO - Esterline Angus Instr.
MINI-SLIDE - Industrial Devices
MINISPLICE - Autosplice
MINISTAC - Semtech
MINISTEPPING - Metis
MINISTIC - Semtech
MIN-ISTOR - Quality Thermistor
MINI-STUD - Semtech
MINISWITCH - Digitran
MINI-SYNCLAMPS - Timber-Top
MINI-T - Motorola Semiconductor Prods.
MINITAC - Hypertronics
MINITAN - Corning Glass Works
MINIT-CURE - Allaco Prods.
MINI-TECH - International Data Sciences
MINITERM - Computer Devices
MINI-TEST - International Data Sciences
MINITHIN - Thermax Wire
MINITRIEVE MH - Lyon Metal Prods.
MINI TRIM - Kappa Networks
MINNI E - Amphenol
MINNISCRUBBERS - Tech Spray
MINOS - Beckman Instrs.
MINPAC - Watkins-Johnson
MIN-TAUR - Nova Elec.
MIPS - Tasker Systems
MIRA-BRITE - International Wire Products
MIRROPANE - Libby Owens-Ford
MISER - Teradyne Connection Sys.
MITE - LH Research
MIXER MASTER - Veeder-Root
MIX-KIT - Hardman
MIZAR THE VMEBUS AUTHORITY - Mizar
MKS - Centralab
MKS BARATRON - MKS Instrs.
MKS PROTEC-TORR - MKS Instrs.
MK 280 - Yardney Battery
MK-60 - Yardney Battery
MK-95 - Yardney Battery
MLP - American Technical Ceramics Corporation
MLZ-DAQ - Heurikon Corporation
MLZ-VDC - Heurikon Corporation
MLZ-90 - Heurikon Corporation
ML-54/40 - Teledyne Rotolite
MMD-1 - E & L Instruments
MMMOST - TeleVideo Sys.
MM200 - TransKinetic Sys.
MODBUS - Gould
MODCOM-C - Virginia Plastics
MODEL T - Hurst Mfg.
MODEL 204 - Computer of America
MODEMULATOR - Com/Tech Systems
MOD-FIELD - Dataprobe
MODICON - Gould
MOD POT - Allen-Bradley , Electronics Group
MOD-U-BOX - CTS Electronics
MODUCAL - Pannier
MODU/FLEX - Industrial Fabricating
MODULAIR - EG & G Rotron
MODULAR CASE - Diversified Case
MODULAR SOFTWARE - Applied Micro Technlg.
MODULASONE - Adaptive Science
MODULE - Surgeonics Ltd.
MODULE-MASQ - Sel-Rex
MODULE-MATIC - Sel-Rex
MODULENS - Pannier
MODULE-X - Sel-Rex
MOD-U-LINE - CTS Electronics
MODULINE - Oak Switch Sys.
MODULITE - Pannier
MODUL/MATIC PTM-11 - Lektralab Technologies
MODULOAD - Bird Elctrn.
MODULOK - Burndy Corporation
MODULYNX - Superior Elec.
MODUPAC - Analogic
MODUPERF - Data Specialties
MODUPULSE - Vicon Industries
MODU-RAY - Kalglo Elctrns.
MOD-U-SERT - Universal Instrs.
MODUTRIM - Sprague-Goodman Elctrns.
MODVUE - Gould
MODWAY - Gould
MOE - PCK Elastomerics
MOHAWK - EG & G Rotron
MOISTURPUMP - Electro Impulse
MOKEP - Motorola Semiconductor Prods.
MOLAN - Harrel
MOLD-EASE - Merix Chem.
MOLDED HEAT - Sierracin/Thermal Sys.
MOLECULOY - Molecu-Wire
MOLEX - Waldom Elctrns.
MOLGARD - Ram Chemicals, Whittaker
MOLINDICATOR - Alltech
MOLYDAG - Acheson Colloids
MOLYKOTE - Dow Corning
MONITOR SYSTEM - Beckman Instrs.
MONITRON - Dennison Kube
MONITRONIX - TransKinetic Sys.
MONOBOLT - Avdel
MONOBRID - ILC Data Device
MONOCERAM - SFE Technologies
MONOCHIP - Interdesign
MONOCHIP - Master Logic
MONO-GLASS - Centralab
MONO-KAP - Centralab
MONOLYTHIC - Sprague Elec.
MONOMAX - Motorola Semiconductor Prods.
MONO-PAK - Centralab
MONOPANEL - Centralab
MONOPAX - Tra-Con
MONOPLEX - Shure Bros.
MONOPOXY - Hardman
MONOZOOM - Bausch & Lomb
MONTAC - Monsanto
MON-X - Monsanto
MOPS - Codi Semiconductor
MOPS - Trio Labs.
MORE LEEWAY - Lee Data Corporation
MORNICK - COSAR
MOS - Baker, J. T., Chemical
MOS - Microwave/Sys.
MOSAIC - Motorola Semiconductor Prods.
MO•SORB - Motorola Semiconductor Prods.
MOSP - Microwave/Sys.
MOTEST - Motorola Semiconductor Prods.
MOTOCHIP - Motorola Semiconductor Prods.
MOTOGARD - Power Control
MOTOMATIC - Electro-Craft
MOTOR MIKE - Oriel
MOUSEWINDOW - Mouse Sys.
MOVIE MASTER - Di/An Controls
MOXIE - Canadian Thermostats & Control Dev. Ltd.
MP - Tech Spray
MPC - Delta Design
MPC - Maury Microwave
MPF - Maury Microwave
MP-30 - Alan Gordon Entprs.
MR. BATTERY - N.C.E.
MR. BATTERY - Power Group International
MRC - Milwaukee Resistor
MR. CLEAN - Chicago Switch

MR. CLEAN - ITW Switches
M/R THERMALEZE - Phelps Dodge Magnet Wire
MS - Miller-Stephenson Chem.
MS-DOS - GMR
MSI - Magnetic Systems
MSI - MSI Data
MSP - Joslyn Elctrn. Sys.
MTM - Raymond Engrg.
MTNS - General Instrument
MTOS - General Instrument
MTTL - Motorola Semiconductor Prods.
MU-CAPS - Republic Elctrns.
MUCON - Republic Elctrns.
MUFFIN - EG & G Rotron
MULILINK - Davong Systems
MULTI-BEAM - Banner Engrg.
MULTI-CAGE - Electronic Solutions
MULTI-CJ - Omega Engrg.
MULTI-COMP - Sprague Elec.
MULTI-CONN - Vector Electronic
MULTI-COOL - FTS Sys.
MULTICORE - Multicore Solders
MULTI/COUNT - HH Controls
MULTIDEX - Oak Switch Sys.
MULTIDIAL - Spectrol Elctrns.
MULTIDUCTOR - Ajax Magnethermic
MULTIERASER - Bytek Computer Systems
MULTIFIRE - Ferro
MULTIFLASH - EG&G
MULTIFLEX - Gordon, Claud S.
MULTIFORM - Corning Glass Works
MULTIGARD - Helm Instr.
MULTI-LINK - Belden
MULTIMAX - Sanders
MULTI MITE - Thermo Electric
MULTIMOD - Powertec
MULTI MODEM - Multi-Tech Systems
MULTI-MODE TONOTRON - Hughes Aircraft
MULTI-MODULE - Universal Instrs.
MULTI-OS - Davong Systems
MULTI-PAC - Elfab
MULTI PAK - Data-Design Labs.
MULTIPAK - General Cable
MULTIPAK - Gordon, Claud S.
MULTI-PAK - Motorola Semiconductor Prods.
MULTIPAK - PTX-Pentronix
MULTI PICTURE SYSTEM - Evans & Sutherland Computer
MULTIPLE MICROFLASH - EG&G
MULTIPLIER - Hollingsworth Solderless Terminal
MULTI-POINT - EDL
MULTIPOWER - Triq Labs.
MULTI-PRODUCT WAFER - VLSI Technology
MULTIPROGRAMMER - Bytek Computer Systems
MULTI-PURE - Multicore Solders
MULTI-PURGE - Alltech
MULTIREED - Thermosen
MULTISPOOL - Digital Products
MULTI-STATION - Spectragraphics
MULTISTRIKE - Qume
MULTI-STRIP - W. L. Gore
MULTI-SWAGE - Bead Elctrns.
MULTISYN - Del Elctrns.
MULTITERM - A & B Technical Services
MULTI-TET - W. L. Gore
MULTI TOOL - Grover Patent Products
MULTI-TOTE - Veeder-Root
MULTI-TRAN - Sperry, A. W., Instrs.
MULTITUBES - Casso-Solar
MULTIWATT - SGS Semiconductor Corporation
MULTIWIRE - Circuitech
MULTIWIRE - Multiwire
MULTIWIRE - PCK Technology
MUSIC LOVERS - Shure Bros.
MU-STAT - Princo Instrs.
MV EZ KLEEN - Research Prods.
MVI-100 - Colorgraphic Communications
MVP - Topaz Electronics
MX - MOLEX
MXM-100 - TransKinetic Sys.
MX2503 - Meterex
MX2570 - Meterex
MX2572 - Meterex
MX2575 - Meterex
MX2578 - Meterex
MX3501 - Meterex
MX3505 - Meterex
MX7107D - Meterex
MYSTAIRE - Heat Systems-Ultrasonics
MYSTR - Waters Mfg.
M100 - Brelonix
M-100 - Dataproducts
M100L - Dataproducts
M-120 - Dataproducts
M2 PATCH - International Instrumentation
M20 - Data Technology
M9 - Penn Resch. (PRC)
NAFOAM - National Wire & Cable
NAFOIL - National Wire & Cable
NANALINE - Bel Fuse
NANOCON - Yamaichi Electronics
NANOHEX - Sealectro
NANOTIP - Heat Systems-Ultrasonics
NANOTRAN - Computer Prods.
NARRATOR - General Instrument
NARR-O-GIDE - Bivar
NARROW-CAPS - Republic Elctrns.
NAVITAR - D. O. Industries
NAVLINE - Veeder-Root
NAVTRAK - EDO Western
NCE - Alan Gordon Entprs.
NCS 100 - Atlantic Research
NEGATOR - Ametek, Inc
NELCO - Whittaker
NELSON - Nelson Stud Welding TRW
NELSON-ROSS - Polarad Elctrns.
NEPTUNE - SFE Technologies
NES - NES, (Nationwide Electronic Systems)
NETCOMMANDER - Digital Products
NETIC - Magnetic Shield
NETLINK - Digital Communications
NETPAC - Acurex-Autodata
NETRIM - Weston Controls/Pots
NETWORK REVELATION - Cosmos
NETWORK 90 - Bailey Controls
NEUTROLOY - Molecu-Wire
NEUTROLOY NSX - Molecu-Wire
NEUTRONEX - Sel-Rex
NEUTRO-STAT - Simco
NEWDAMP - Bacon Inds.
NGK - NTK Technical Ceramics
NICAD - SAFT America
NICHOLSON - Cooper Group
NICKEL-PLUS - International Wire Products
NICKELPLY - National-Standard
NICKEL SWITCH - CTS Fabri-Tek Connector
NICORO - GTE Wesgo Technical Ceramics & Metals
NICUSIL 3 - GTE Wesgo Technical Ceramics & Metals
NIGHTSUN - Spectrolab
NIGUARD - AVX Corporation
N II - Genisco Memory Prods.
90° SWEEP - Astrolab
9000 SERIES - Ramtek
9050 SERIES - Ramtek
9400 SERIES - Ramtek
9600C - Comspec
99XL - Photodyne
NISENSOR 35 - Molecu-Wire
NITROPHYL - Rogers
NOALOX - Ideal Industries
NOBRUSH - Georator
NO-FRILLS - Micom Systems
NOHKEN - ZI-TECH Instr.
NO-MAR - PIC Design
NO-NIK - Clauss Cutlery
NONTACT VISITEMP - Trans-Met Engrg.
NORAC - BIW Cable Sys.
NORBATHERM - Cross Elctrns.
NORDBAK - Rexnord Chemical Prods.
NORELCO - North American Philips Lighting
NORFA - Elnik Instrs.
NORPAK - Square D
NORSMAN - Viking Connectors
NORTH SEEKER - Humphrey
NO-SLIP - PIC Design
NOSTAT-X - Caypin Industries
NOVA - B & B Motor & Control
NOVA- - Data General
NOVA - Lutron Elctrns.
NOVADISC - Data General
NOVA II - E^2 Technology
NOVIMIDE - Isochem Products
NOXIDE - Solder Absorbing Technology (SAT)
NPI - Nano Pulse Industries
N-S ROCKET WIRE - National-Standard
NTKK - NTK Technical Ceramics
NU-BLAC - Star Porcelain
NUCLESTAT - NRD
NUCON - TRW Cylindrical Connector
NULL-KOTE - Princo Instrs.
NU-LOK - TRW Cylindrical Connector
NUMATRON - Leeds & Northrup Instrs.
NUMERIPATH - Giddings & Lewis Elctrns.
NUMERIPOINT - Giddings & Lewis Elctrns.
NURL-LOC - Elctrn. Molding
NUSYN - Mesur-Matic Elctrns.
NUTSERT - Avdel
NUTSERT - Avibank Mfg.
NVRM - Catalyst Research
NYEBAR - Nye, William F.
NYETACT - Nye, William F.
NYGRIP - Weckesser
NYLAFLOW - Polymer
NYLASINT - Polymer
NYLATCH - Hartwell
NYLATRON - Polymer
NYLEZE - Phelps Dodge Magnet Wire
NYLOCLIP - Burndy Corporation
NYLOX - Hardman
NYMPH - SaRonix
NYTYE - Heyco Molded Products
NYZIN - Yardney Battery
N-ZEMS - Corning Glass Works
OAK TIP - Oak Switch Sys.
OCTA-SCAN - EDL
OCTOMUX - Minntronics Corporation
OCTRON - GTE Sylvania Lighting Prods.
ODS - Wiremold
OHMEX-AG - Transene
OHMICONE - Ohmite Mfg.
OHMITRAN - Ohmite Mfg.
OHMITROL - Ohmite Mfg.
OHM-RANGER - Ohmite Mfg.
OILDAG - Acheson Colloids
OILON PV - Polymer
OILOSTATIC - Okonite
OKOCLAD - Okonite
OKOCORD - Okonite
OKOGUARD - Okonite
OKOLENE - Okonite
OKOMETAL - Okonite
OKOPRENE - Okonite
OKOSEAL - Okonite
OKOSHEATH - Okonite
OKOTHERM - Okonite
OMEGA - Compucorp
OMEGA C-J - Omega Engrg.
OMEGACLAD - Omega Engrg.
OMEGAFILM - Omega Engrg.
OMEGALABELS - Omega Engrg.
OMEGALAQ - Omega Engrg.
OMEGALINE - Omega Engrg.
OMEGALOK - Omega Engrg.
OMEGA METER - Kenco Industries
OMEGANET - Compucorp
OMEGAPAD - Omega Engrg.
OMEGAPELLETS - Omega Engrg.
OMEGASCOPE - Omega Engrg.
OMEGASTIKS - Omega Engrg.
OMEGATEMP - Omega Engrg.
OMEGATITE - Omega Engrg.
OMEGA TWELVE PAK - Omega Engrg.
OMMI-COAT - Nuclear Resch.
OMNEPHASE - International Controls and Measurements
OMNETIME - International Controls and Measurements
OMNEYE - Hughes Aircraft
OMNI - Haverly Systems
OMNI-AMP - Omega Engrg.
OMNI-BLOK - Littelfuse
OMNIBUS - Topaz Electronics
OMNI CELL - Chomerics
OMNICLOSURE - Techmar
OMNICON - Bausch & Lomb
OMNIFAX - Telautograph
OMNIFEROUS - Wavetek Rockland Sci.
OMNIFLO - Flow Technology
OMNI-GLOW - Industrial Devices
OMNIGRAPHIC - Houston Instrument
OMNI III - Sloan Technology
OMNIMARK - Scientific Technlg.
OMNIMODE - Racal-Milgo
OMNIMUX - Racal-Milgo
OMNIPROX - Scientific Technlg.
OMNISCAN - Vicon Industries
OMNISCRIBE - Houston Instrument
OMNI-SHIELD - Belden
OMNI-SPRA - Tech Spray
OMNI-STRIPPER - Mann, Henry
OMNY-BUS - Methode Elctrns.
OMNY-PAC - Methode Elctrns.
ONEBUG - Motorola Semiconductor Prods.
ONSERTER - Universal Instrs.
OOPS PROOF - Beckman Industrial
OPCOA - Refac Elctrns.
OPEN WINDOW - Lee Data Corporation
OPSYCA - Pirelli Cable
OPTACH - HH Controls
OPTALIGN - TRW Connector
OPTASPLICE - TRW Connector
OPTAXIAL - Scientific Technlg.
OPTEC - Auto-trol Tech.
OP-TEC - Opto Technology
OPTECON - Data Technology
OPTEL - Refac Elctrns.
OPTEMP - Beede Electrical Instr.
OPTI-CODER - Sequential Info. Sys.
OPTIGUARD - Dow Corning
OPTIMA - Erem
OPTIMA - Optima Enclosures
OPTIMA - Scientific-Atlanta
OPTIMA SERIES - Verbatim
OPTIMATION - Julie Resch. Labs.
OPTIPROM - Photobell
OPTI-SCAN - Sequential Info. Sys.
OPTI-SENSOR - Sequential Info. Sys.
OPTITHERM - Barnes Engrg.
OPTI-TRACK - Auto-trol Tech.
OPTODATA - Scientific Radiation
OPTOFLEX - Scientific Technlg.
OPTOLITE - Oak Switch Sys.
*OPTOMETER - United Detector Tech.
OPTOMUX - Opto 22
OPTO PACK - Sensor Techn.
OPTORELAY - Scientific Technlg.
OPTOSAFE - Scientific Technlg.
OPTOSWITCH - Applied Electro Technlg., Int.
OPTOSWITCH - Scientific Technlg.
OPTOWARE - Opto 22
ORANGEBOX - Micom Systems
ORANGE DROP - Sprague Elec.
ORASORB - Sel-Rex
ORIGINAL BRIGHT GOLD - Sel-Rex
OROCLAD - Technic
OROMERSE - Technic
OROSENE - Technic
OROTEMP - Technic
OROTHERM - Technic
ORTHONOL - Magnetics
ORTHOSIL - Thomas & Skinner
ORTHOSTAR - TRW Microwave
OSCC - M/A-COM Omni Spectra
OSHINO - Oshino Electric Lamp Works, Ltd.

OSM - M/A-COM Omni Spectra
OSP - M/A-COM Omni Spectra
OSSM - M/A-COM Omni Spectra
OS-124 - Monsanto
OTA - RCA Solid State
OVERLAY - RCA Solid State
OXIFIRE - Ferro
OXSIL - Sprague Elec.
OXY-PURGE - Alltech
OXYTRON - Sel-Rex
O-30 - General Elec.
P & B - Potter & Brumfield
PACE - A & D Elec. Instrs.
PACENTER - Pace
PACE/PAK - International Rectifier
PACER - Ajax Magnethermic
PACER - Sprague Elec.
PACHYDYNE - Ajax Magnethermic
PACKAGED POWER - Computer Prods.
PACPOLE - Electrovert
PACX - Gandalf Data
PACXNET - Gandalf Data
PADLA - Macrolink
PAESAR - Lutron Elctrns.
PAGE KOM - Soundlier
PAGEPAC - Harris
PAK-DRIVES - Sequential Info. Sys.
PAK-RAK - UNITRACK
PAK-X-TRAC - Nu-Concept Computer Sys.
PALCO - GTE Wesgo Technical Ceramics & Metals
PALLABAR - Technic
PALLADEX - Sel-Rex
PALLADIUM RT - Technic
PALLAMERSE - Technic
PALLNIC - Engelhard
PALORO - GTE Wesgo Technical Ceramics & Metals
PAMUX - Opto 22
PANALYZER - Panametrics
PANAPRESS - PanaVise Prods.
PANCAKE - Wiremold
PANDUCT - Panduit
PANELCODER - Disc Instruments
PANELKEY - Advanced Input Devices
PANEL MITE - Tech Labs.
PANELS INC. - Controls Unlimited
PANELTONE 87D - Panelgraphic
PAN-L-CLAD - Photo Chem. Prods. Cal.
PAN-L-SCREW - Dupree
PAN-L-TEMP - EDL
PAN-TERM - Panduit
PANTHER - Okonite
PANTHER CABLE - Computer Cable & Prods.
PAN-TY - Panduit
PARABESTOS 4500 - Paramount Tube
PARABOLIX-100 - Merix Chem.
PARACONVERTER - LNR Communications
PARAFORMER - Adtech Power
PARAMEDROP - M/A-Com. Cable/Home Communicatios Comm/Scope Coaxial Cable
PARAMETER - M/A-Com. Cable/Home Communicatios Comm/Scope Coaxial Cable
PARA-QUIN - Paramount Tube
PARARECEIVER - LNR Communications
PARASOL - Berkeley Process Control
PARATHERM - Paramount Tube
PARBAK BACK-UP RING - Parker Seal Grp.
PARTGARD - Helm Instr.
PARTILOK - Ferro
PASCO - Motorola
PASS-THRU - Universal Instrs.
PATCHMASTER - TRW Connector
PATCHMATE - ADC Magnetic Controls
PATHE - Heitz, Karl
PATHFINDER - Astro-Med
PATHFINDER - Astronautics Corporation of America
PATHFINDER - Summit CAD
PATHFINDER - Teledyne Gurley
PATRIOT - Aydin
PATRIOT - EG & G Rotron
PATTON-MACGUYER - Patton-MacGuyer
PCA - Judd Wire
PCB IMPAC - Semtech
PC DAX - Data Translation
PC-EYE - Chorus Data Systems
PC LAB - Data Translation
P-C-LITE - Visual Communications
PCMS - RACET Computes, Ltd.
PCREADER - Caere
PCSCANNER - Caere
PCSCAN-NET - Caere
PC THERM - Data Translation
PC TOUCH - Touch Technology
PC-6 - Princeton Elctrn. Prods.
PDOS - Eyring Research Inst.
PDP - Digital Equip.
PDS DIFFUSION SOURCES - Sohio Engineered Materials
PEAC - Barnes Engrg.
PEAC - Decision Graphics
PEAKLITE - Penn Keystone
PED-A-VAC - Pace
PEEL-A-WAY - Advanced Interconnections
PEE-WEE - Mueller Elec.
PEGI - Adalet-PLM Div
PELASPAN PAC - Dow Chemical
PELCOLOY - Molecu-Wire
PEM - Penn Engrg. & Mfg.
PEMFLEX - Penn Engrg. & Mfg.
PEMHEX - Penn Engrg. & Mfg.
PEMSERT - Penn Engrg. & Mfg.
PEM-SERTER - Penn Engrg. & Mfg.
PEN-ENTRY - Wire Graphics
PENFILE - Jonard Industries
PENNLON - Dixon Inds.
PENN-TRAN CORP. - Penn-Tran
PENNTUBE - Dixon Inds.
PEN-RAY - UVP
PENTAFLOW - Pamotor
PENTAPLUG - Communications Technology
PENTAWATT - SGS Semiconductor Corporation
PEP-500 - Princeton Elctrn. Prods.
PERI-APOLLAR - Heitz, Karl
PERMACOTE - Miller Dial
PERMAFOAM - Carol Cable
PERMALINE - Carol Cable
PERMANODE - Sel-Rex
PERMA-PROBE - Beckman Instrs.
PERMA-PROBE - Varian
PERMA-RESIN - Photo Chem. Prods. Cal.
PERMA-SLIK - E/M Lubricants
PERMOHM - Belden
PERM-O-PAD - Bivar
PETCAT - Catronix
PETKITTEN - Catronix
PHASE - Beckman Instrs.
PHASE/AMP - Halmar Electronics
PHASOR - Ajax Magnethermic
PHENOWELD - Hardman
PHI-DECK - Phi Technologies
PHILIPS - AKG Acoustics
PHISTOL - Beckman Instrs.
PHONE/SCRIBER - Alpha Comps.
PHOTACT - Keuffel & Esser
PHOTOCOMP - Macro Electronics
PHOTO ETCH - Datak
PHOTOLOGIC - TRW Optoelectronics
PHOTO-LUX - Photo Chem. Prods. Cal.
PHOTOMOD - Clairex Electronics
PHOTO-OPTIC - Dolan-Jenner Inds.
*PHOTOPS - United Detector Tech.
PIANO-DIP - Grayhill
PICABOND - AMP
PIC-A-DIP - Micro Electronic Sys.
PICK-A-BACK - Flow Technology
PICO - Remex Cam Operations
PICOCLAREED - Clare
PICO MEG - Integrated Digital Products
PICOMIN - Endevco
PICO-PAC - Velonex
PICOPROBE - GGB Industries
PICOREED - Clare
PICO-SKAN - Skan-A-Matic
PICOTRIAX - Endevco
PICOTRIM - Voltronics
PICTURE SYSTEM 2 - Evans & Sutherland Computer
PIDCOM - Beckman Instrs.
PIDG - AMP
PIELEFORK - Murata Mfg. , Ltd.
PIELEOSCILATOR - Murata Mfg. , Ltd.
PIEZITE - Endevco
PIEZOFET - Wilcoxon Resch.
PIEZOTITE - Murata Mfg. , Ltd.
PIGMY-HIPPO - Mueller Elec.
PIL - Transformer & Coil Products
PILL - EMC Technology Inc
PIN - Gandalf Data
PIN BAR - Lear Siegler
PINCOMM - Trendata/Standard Memories
PINGUIDE - Mann, Henry
PINHEAD - Sprague Elec.
PINLITES - Refac Elctrns.
PINNED DRIVE - Berg, W. M.
PINSETTER - MOLEX
PINWRITER - NEC Information Systems
PIP - Transformer & Coil Products
PISTONCAP - Sprague-Goodman Elctrns.
PITMO - PITTMAN
PITRAN - Stow Labs.
PIXIE - Endevco
PIXIEPOT - Duncan Electronics
PLANAR PAK - Avantek
PLAN-VU - Alan Gordon Entprs.
PLAQOHM - Ward Leonard Elec.
PLASMAFLUX - Walker Scientific
PLASMA-LUX/PLASMALUX - Cherry Electrical Prods.
PLASMA-POWER - Crestronics
PLASMASCOPE - SAI Technlg.
PLASMA-SETTE - Temescal
PLASMLOC GENERATOR - ENI Power Sys.
PLASTI-BOND - AMP
PLASTI-CAL - The Meyercord
PLASTIDOME - Andrew
PLASTIFLEX - Auburn Mfg.
PLASTIFORM - Jobmaster
PLASTI-GRIP - AMP
PLASTILEASE - Ram Chemicals, Whittaker
PLASTINITE - Fastex
PLAST-N-GLASS - Chemtronics
PLAST'O'WIRE - Electronic Controls
PLATANEX - Sel-Rex
PLATANIUM - Sel-Rex
PLATINUM N - Technic
PLATINUM TP - Technic
PLD*PLUS - Data Plus
PLDTEST - Data I/O
PLID - Linear Technlg.
PLIDAX - Norton Chemplast
PLIKE - Hunter Tools
PLOTAMATIC - Allen Datagraph
PLS - Microwave/Sys.
PLUGBORD - Vector Electronic
PLUGGEM - Kel-Am
PLUGMOLD - Wiremold
PLUG STAT - Control Products
PLUMB - Cooper Group
PLUMBICON - Amperex Elctrn.
PLUS-C - Sprague-Goodman Elctrns.
PLUS 80 - Mohawk Data Sciences
PLYCON - Methode Elctrns.
PLYO-DUCT - Methode Elctrns.
PMA - Automatic Connector
PMMA - Automatic Connector
POCKET FLOW - Kurz Instruments
POCKET-PROBE - EDL
POGO CONTACT - Augat/Pylon
POGO LAMP - Dupree
POINTFINDER - Teledyne Gurley
POKE-HOME - Amphenol
POLAFRAME - Chomerics
POLA-H - Chomerics
POLARHEX - Hughes Aircraft
POLARING - Chomerics
POLASHEET - Chomerics
POLASTICK - Chomerics
POLASTRIP - Chomerics
POLY A - Alltech
POLY-CLEAN - Hollis Engrg.
POLYCOHR - CHR Inds.
POLY-DIMENSIONAL - Amco Engrg.
POLYDIP - Communications Technology
POLYDOME - Dorman Bogdonoff
POLYFLEX - Judd Wire
POLYGARD - Ferro
POLYHAL - Judd Wire
POLY I - Alltech
POLY-LOK - Siecor
POLYMET - Polymer
POLY-META-SYMBOLICS - Step Engineering
POLYPENCO - Polymer
POLYPLANAR - Advanced Micro Devices
POLY-PLANAR - ERA Poly-Planar
POLYRAD - Brand-Rex
POLY S - Alltech
POLYSWITCH - Raychem
POLYTWIST - Poly-Scientific
POP RIVETS - POP Fasteners
PORCUPINE - Chomerics
PORO-KLEAN - AMF
PORON - Rogers
PORTA-CURE - American Ultraviolet
PORTAMETRIC - Electro Scientific Inds.
PORTANIM - Berkeley Nucleonics
PORTA-PACK - Brady, W. H.
PORTA-PEAK - Helm Instr.
PORTA-PROCESSOR - Teledyne Micronetics
PORTASENSRM - Scientific Technlg.
PORTATEMP - Trans-Met Engrg.
PORTA-TEST - Varian
PORTION-AIRE - Glenmarc Mfg.
PORTIONATOR - Glenmarc Mfg.
POS - American Computer Hardware
POSI-CRIMP - Teledyne Ansonia
POSI-GROUND - Hexacon Elec.
POSI-LOCK - Sealectro
POSISTOR - Murata Mfg. , Ltd.
POSITRAK - Delta Design
POS-NEG - Datak
POWER-DYNE - Raymond Engrg.
POWERACE - A P PRODUCTS INCORPORATED
POWERBASE - Motorola Semiconductor Prods.
POWERBLOCK POWER SYSTEM - Powertech
POWER BUS - UNITRACK
POWER CELL - Catalyst Research
POWERCENTER - Topaz Electronics
POWER COMMANDER - RIL Elctrns.
POWER CONTROL - Power Controls
POWERDIAL - Lutron Elctrns.
POWER DIRECTOR - Antenna Specialists
"POWER DRIVE" - Recoton
POWER-DYNE - Raymond Engrg.
POWERFET - Teledyne-Crystalonics
POWERFLEX - Ajax Magnethermic
POWERFLEX - Sigma Instrs.
POWER GREMLIN - Atlas Energy Sys.
POWER GROUP - N.C.E.
POWER GUN - Bell, F. W.
POWERITE - Sencore
POWER LINE DISTURBANCE MONITOR - Liebert
"POWER LINE EMULATOR" - Ratelco
POWERLOGIC - Topaz Electronics
POWERLYTIC - Sprague Elec.
POWERMAKER - Topaz Electronics
POWER MASTER - Shure Bros.
POWER MEG - Pacer Industries
POWEROHM - Ferro
POWER-O-MATIC 90 - Blue M, A Unit of General Signal

POWERPAC - Microwave Semiconductor
POWER PROCESSOR - Powercube
POWER SENTRY - Surgeonics Ltd.
POWERSTAT - Superior Elec.
POWER-STRIPMASTER - Ideal Industries
POWER-STYLE - Square D
POWERTAP - Motorola Semiconductor Prods.
POWERTHERM - Gentron
POWER TO SPARE - Union Carbide Corporation
POWERTRON - Industrial Test Equip.
POWER VERTER - Alpha Comps.
POWERVISION - C-COR Elctrns.
POW-R-DISC - Westinghouse Elec.
POW'R ETCH - Datak
POWRFILM - Ohmite Mfg.
POWR-RIB - Ohmite Mfg.
POW-R-TOW - Berg, W. M.
POWR-TRAK - Adatek
POW-R-VEE - Berg, W. M.
POXYLUBE - General Devices
PRACTIGUIDE - Fiberguide Industries
PRAM - Harris Semiconductor
PRECISION DUSTER - Tech Spray
PRECISION-MASTER - Ideal Industries
PRECISTA - Erem
PREKOTE - Alltech
PREKOTE - Tech Spray
P/REL - Standard Grigsby
PREM - Prem Magnetics
PRE-MET - Sel-Rex
PRE-PACK - Lutron Elctrns.
PRE-SAT - Alltech
PRES-BOND - Press-On Prods.
PRES-LOC - Deutsch Fastener
PRES-MOUNT - Press-On Prods.
PRES-PAK - Press-On Prods.
PRESSERTS - Precision Metal Prods.
PRESS-FIT - Sealectro
PRESSLITE - Oak Switch Sys.
PRESSURETROL - Honeywell
PRES-TO-HEAT - Triton Mfg.
PRE-VENT - GNB Batteries
PRIMELINE - PrimeLine-Soltec Distbn.
PRINCESS LINE - Ungar
PRINCETON 8500M - Princeton Elctrn. Prods.
PRINTDIRECTOR - Digital Products
PRINTMATE - MPI
PRINTOHM - Sprague Elec.
PRINT STIX - Topflight
PRISM - Integral Data Sys.
PRISM 1003A-B - Western DataCom
PRITCHARD PHOTOMETER - Photo Resch.
PROB-A-LARM - Princo Instrs.
PROBE-IT - A P PRODUCTS INCORPORATED
PROBE PAK - Everett/Charles Contact Prods.
PROBEYE - Hughes Aircraft
PRO-CALC - Macro Electronics
PROCESS 5375 - SermeTel
PROCESS 87-D - Panelgraphic
PRO/COMM - ETI Electronics
PRODUCER - Zehntel
PRODUCERS - Recoton
PROFESSIONAL - Components
PROGRAMMER'S TOOLBOX - Pacific Microcomputers
PROLOID - Teledyne Micronetics
PROMAX 500 - General Elec.
PRONET - Proteon
PRONG-LOCK - Waldes Kohinoor
PRONTO - Sperry Univac
PRONTO - Thermo Electric
PROPHET - Timeplex
PROPIMAX - EG & G Rotron
PRO-SET - Blue M, A Unit of General Signal
PROSE 2000 - Telesensory Speech Sys.
PRO-STAR - Blue M, A Unit of General Signal
PROTAB - CMV Software Specialists
PROTECTOCOATS - Alpha Metals
PROTECTOGLOVE - Clean Room Prods.
PROTECTOMATIC - Schott Glass Technologies
PROTECTOSWITCH - Black & Webster
PROTECTOX - Technic
PROTISTOR - Carbone Lorraine Inds.
PROTO-CLIP - Global Specialties
PROTOLOY - Molecu-Wire
PROTONEX - Sel-Rex
PROTO-PAK - International Instrumentation
PROTRIP - CMV Software Specialists
PRO-TRONIX - Blue M, A Unit of General Signal
PSM - Adatek
PSS - Paso Sound Prods.
PS 300 - Evans & Sutherland Computer
PTC - Pacific Transducer
PTM-66 - Lektralab Technologies
PUL-A-DIP - Micro Electronic Sys.
PULL-THRU - Hughes Aircraft
PULSAR - Heat Systems-Ultrasonics
PULSAR II - E^2 Technology
PULSERAD - Pulsar Products
PULSISTOR - Victory Engrg.
PUPPETS - Bishop Graphics
PUR-A-GOLD - Sel-Rex
PURE CORE - Alpha Metals
PURE-LINE - Dixon Inds.
PURITAN - Tansitor Elctrns.
PURSE LOCK - Fastex
PUSH BITE - Minelco - A Talley Ind.
PV - Du Pont Connector Systems
PVB - Electro Scientific Inds.
PVCA - Brand-Rex
PWR-PAC - Elfab
PYLE DRIVER - Pyle Industries
PYRAD 1000 - Champlain Cable
PYR-AU-BOND - Sel-Rex
PYROBOND-PT-1300 - Ultra Carbon
PYROMARK - Tempil
PYRO PANEL - Research
PYRO-TECH - Ultra Carbon
PYROTERM - Testoterm
PYROTEST - West
PYROTRON - Bailey Controls
PYROVIEWER - ElectroPhysics
PZT - Vernitron Piezoelectric
P-132 - Dataproducts
P-80 - Dataproducts
QALTA - Macrolink
QCC - Alpha Wire
Q-CEPT - Interconnect Devices
Q COMPOUND - Communications Technology
Q-FLEX - Sundstrand Data Control
QIKLATCH - Burndy Corporation
QIKSTACK - Burndy Corporation
QL/77 - Sperry Univac
QO CIRCUIT BREAKERS - Square D
QUIK/BUS - Rogers
Q-RING - Parker Seal Grp.
Q-S - Q-S Products
QS^2 - W. L. Gore
QUAD - CVC Prods.
QUAD-LED - Dialight
QUAD PAK - Opto 22
QUADRADAR - ITT Gilfillan
QUADRAPHASIC CONVERSION - Data Precision
QUADRA-POWR - Jamesbury
QUADRA-TONE - Audiosone
QUAD-SPRING - Garry Mfg., of Brand-Rex
QUALIMETRIC - BASF Sys.
QUANTACHRON - Matrix
QUANTITATE - Beckman Instrs.
QUANTUM ASSEMBLY SYSTEMS - Mann, Henry
QUANTUM L - Memorex
QUANTUM REACH - M/A-Com. Cable/Home Communicatios Comm/Scope Coaxial Cable
QUARTERBACK - Cipher Data Prods.
QUAT 2 - Clean Room Prods.
QUICK ALERT - C-COR Elctrns.
QUICK CONNECT - Warren Comms.
QUICK DRAW - L & L Special Furnace
QUICKDRAW - Summit Engineering
QUICK-E-POLES - Wiremold
QUICK FIRE - General Electric
QUICK GRIP - Antenna Specialists
QUICKIE - Du Pont Connector Systems
QUICKLINK - Gandalf Technologies
QUICKLINK - Lee Data Corporation
QUICKTIP - Leeds & Northrup Instrs.
QUICK-TRACER - VIZ Test Equipment
QUICK-WEDGE - Kedman
QUICK-2-LOCK - Berg, W. M.
RT/DUROID - Rogers
QUIKCIRCUIT - Bishop Graphics
QUIK KLIPS - Brim Elctrns.
QUIK/PIK - Akro-Mils
QUIK-WRAP - Jonard Industries
QUIL - Motorola Semiconductor Prods.
QUINSTEP - Berger-Lahr
QUIN-TONE - Audiosone
QUINTRONIC - Berger-Lahr
QUME TRAK - Qume
QVT - Qume
QWIK-GARD GFI - Square D
QWIK STRIP - Spectra-Strip Operations
QWIK-TY - Glenair
QWINT SYSTEMS - Qwint Systems
Q-1012 - Megatest
Q2 - Megatest
Q-8000 - Megatest
RABBIT - Advanced Micro Devices
RACK-ALL - Fancort Industries
RA-CON - Eby
RADIAX - Andrew
RADI-FLUX - Hy-Cal Engrg.
RAHAM - General Microwave
RAILITE - Tensolite
RAINBOW - Oak Switch Sys.
RAINBOW RECORDER - CELCO
RAISEDLAY - Engelhard
RALLY - Wonder Corp of America
RALLY RAP - ICO-Rally
RAMANEL - Ram Chemicals, Whittaker
RAMASET - Ram Chemicals, Whittaker
RAMBUS - Motorola Semiconductor Prods.
RAM PART - Ram Chemicals, Whittaker
RANCHO - Teledyne Western Wire & Cable
RANCHOPRENE - Teledyne Western Wire & Cable
RANGE RIDER - International Data Sciences
RAPID RACK - Scanbe
RAPIDRIV - Vaco Prods.
RAPID-SET - Mereco Products
RAPID-SYN - Rapidsyn
RAP-TIGHT - All-States
RATAC II - Raytheon Ocean Sys.
RATE/CON - Com/Tech Systems
RATIOHMIC RESISTANCE - Data Precision
RATIO-PROBE - Capintec Instrs.
RATIO-SCOPE - Capintec Instrs.
RAYCHRON - Bristol Saybrook
RAYCORDER - Raymond Engrg.
RAYFOAM - Raychem
RAYMASTER - Gates, Geo. W.
RAYMER - Cetec Raymer
RAYOSCAN - Leeds & Northrup Instrs.
RAYOTUBE - Leeds & Northrup Instrs.
RAYSISTOR - Raytheon
R.B.M. - Hamilton Standard Controls
R-BOX - IET Labs
RBS—AC - Control Technology
RBS—DC - Control Technology
RC-BOX - IET Labs
RC5PLUS - Stanton Magnetics
REACTALLOY - EMCA
READY SEAL - Norton Chemplast
READY-SOLV - Beckman Instrs.
REAL-AL - Acme Chemicals & Insulation
REALITY - Microdata
REBAM - Bently Nevada
RE-CIRK-IT - Heinemann Elec.
RE-COIL - Miller, L.C.
RECON MICA - Stanley Elctrns.
RECORD-A-TEMP - EDL
RECTIGRAPH - Esterline Angus Instr.
RECTODYNE - Christie Elec.
RED ARROW - Savoy Elctrns.
REDDI-BLENDER - Tra-Con
RED-EYE - Capintec Instrs.
RED HAT - Automatic Switch
REDI AIR - Automatic Switch
REDI-BAR - Hoffman, P. R., , Materials Processing
REDI-TROL - Electrol
RED LIGHTNING - Superior Flux & Mfg.
RED LINE - Warren Comms.
RED MARVEL - Superior Flux & Mfg.
RED TOP - Sprague Elec.
REEDAC - Gordos Arkansas
REEDLAYS - Computer Components
REEL-QUIK - Alpha Wire
REEVELEC - Reeve Electronics
REF BLOC - Hy-Cal Engrg.
REF CEL - Hy-Cal Engrg.
REFERENCE - Hartley Prods.
REFLEX - Christie Elec.
REFLEX - National Electric Cable
REFRACTOSYN - HH Controls
REGAL - Commercial Elec. Heating Devices & Mfg.
REGATRAN - Electronic Measurements
REGATRON - Electronic Measurements
REGEN - Electrol
REGENCY BALLOON - Regency Systems
REGENT - Applied Digital Data Systems
REGENT - Carter Motor
REGULYTIC - Sprague Elec.
RELIABRAZE - Alpha Metals
RELI-ACON - Methode Elctrns.
RELIACOR - Alpha Metals
RELIALAB - Tenney Engrg.
RELI-ALOK - Methode Elctrns.
RELIANCE - Reliance Fuse
RELI-APAC - Methode Elctrns.
RELI-APLANE - Methode Elctrns.
RELI-APLUG - Methode Elctrns.
RELIAROS - Alpha Metals
RELIASOLV - Alpha Metals
RELIA-TEMP - EDL
RELIATEMP - Tenney Engrg.
RELIFLEX - Du Pont Connector Systems
RELPAC - Reliability
RELY-OHM - Engelhard
REMDACS - Intersil
REMEX - Remex Cam Operations
REMOBS - Teltone
REMOVE-A-PAD - Dynaloy
REMOV-IC - Solder Removal
REMRAD - Nuclear Resch.
REPLENISHER - IVEK
RESCU - Antenna Specialists
RESIDUMETER - Jobmaster
RESISTWEEZ - Pace
RES-LOK - Sinclair Radio Labs.
RESOLON - Duncan Electronics
RESOMICS - Murata Mfg., Ltd.
RETIP - Solder Removal
REVELATION - Cosmos
REVER-SYNCLAMPS - Timber-Top
RF•MACRO - Motorola Semiconductor Prods.
RGA - UTI Instruments
RHENEX - Sel-Rex
RHENIUM A - Technic
RHEOMET - Kester Solder
RHINO-HIDE - Pacific Electricord

RHODEX - Sel-Rex
RHODIUM SULPHATE TP - Technic
RHYMAS - Universal Instrs.
RIA-SET - Beckman Instrs.
RIBBON WRAP - W. L. Gore
RIB-CAGE - Du Pont Connector Systems
RIBFLEX - Ward Leonard Elec.
RIB LOCK - Genisco Technology
RIGEL II - Androtek/dmi
RIGIDAMP - Barry Controls
RIGIMESH - Pall Ultrafine Filtration
RIMBUG - Motorola Semiconductor Prods.
RING ALERT - Potter & Brumfield
RINGER - Sencore
RING-GUN - Waldes Kohinoor
RING-JECTOR - Waldes Kohinoor
RING-MOUNT - Waldes Kohinoor
RING-O-MAT - Waldes Kohinoor
RIPPLE ROUND - Alpha Metals
RISTON - DuPont de Nemours, E. I.
RITEOHM - Ohmite Mfg.
RITE WIRE - Brim Elctrns.
RIVETLESS NUT PLATE - Deutsch Fastener
RIVET-LOC - Sealectro
RKC - Syscon Intl.
R-LITES - Genisco Technology
R/M PREDICTOR - UCCEL Corporation
RMS09 - Motorola Semiconductor Prods.
RMS68K - Motorola Semiconductor Prods.
ROBOT - Heitz, Karl
ROBOTEC - Power Designs
ROBOT MONITOR - Schneider Instr.
ROCK-WIPE - Cherry Electrical Prods.
ROLCOM - Coors Porcelain
ROLI - Transamerica Delaval
ROLLAWAY - Fancort Industries
ROLL-MARK - The Meyercord
ROLLPIN - Esna
ROLLTEMP - Trans-Met Engrg.
ROLOX - Hardman
ROL-PAK - Waldes Kohinoor
ROMHOGLAS - Lundy Elctrns. & Systems
ROMIS - Bently Nevada
ROSITE - Rostone
ROTA-CRIMP - AMP
ROTA-SLIDE - C & K Components
ROTOCODE - Cherry Electrical Prods.
ROTO-DROSS - Atlantic Magnetics
ROTOLITE MARK III - Teledyne Rotolite
ROTOPULSER - Dynapar
ROTO-TELLITE - MSC Prods./Eaton
ROTO-TRACK - Barnes Engrg.
ROTRAN - Inland Motor
ROW-L-ER - Berg, W. M.
ROYALITIC - Industrial Midwec Capacitors
ROYTRON - Westrex
RPR-300 ROUTER - Calay Systems
RP32 - Adatek
R-SYSTEM - Electromatic Controls
RS23 - Data Technology
SE/DUROID - Rogers
RT FILE - Contel Info. Sys.
RTI - Reproduction Technologies
RTM - Catalyst Research
RTS/EMULATOR - Com/Tech Systems
RUBICON - Penn Airborne Prods.
RUBRGLAS - APM-Hexseal
RUF-NEK - Hughes Aircraft
RULON - Dixon Inds.
RUSH - Eraser
RUSTRAK - Gulton Inds.
RUTHENEX - Sel-Rex
RUTHENIUM TP - Technic
RUTILCON - Taiyo Yuden (USA)
RX GEARS - Instru-Lec
SAFE-ALARM - Thermax Wire
SAFELINE - GTE Sylvania Lighting Prods.
SAFE-PAK - Transamerica Delaval
SAFESCAN - Dolan-Jenner Inds.
SAFE-T-GRIP - Ideal Industries
SAFE-T-KLIP - Industrial Devices
SAFETY-SPEC - Cadillac Plastic & Chem.
SALI - Adalet-PLM Div
SAL-MET - LMB Heeger
SAMP - Control Elctrns.
SAMR - Brelonix
SAM-100 - Brelonix
SANS-A-FUSE - Workman Elctrn. Prods.
SANTOPRENE - Monsanto
SANTOTRAC - Monsanto
SAUCER - EG & G Rotron
SAV-CON - Glenair
SAVER - Data Processing Design
SCA - Semicoa
SCAMP - Control Elctrns.
SCAN - GenRad
SCAN-NET - Caere
SCAN-X - Del Elctrns.
SCAT - C-COR Elctrns.
SC-CONSIL - Tecknit (Eastern Facility)
SCOPE--MOBILE - Tektronix
SCOPESCAN - Scope
SCOTCH - Magnetic Audio/Video Products
SCOTCHFLEX - 3M-Electronic Products
SCULPTURED CIRCUITS - Advanced Circuit Technlg.
SDOS - Software Dynamics
SEALECTROBOARD - Sealectro
SEALECTROCARD - Sealectro
SEALECTROSWITCH - Sealectro
SEALECTROSWITCH - Techniques
SEALINK - Burndy Corporation
SEALKLEEN - Pall Ultrafine Filtration
SEALOX - National Beryllia
SEALPAK - American Zettler
SEAL-TRIMS - Johanson Mfg.
SEASPACE - Exide
SECRE/DATA - Com/Tech Systems
SECS - EMM/SESCO
SECUR-A-TACH - Dennison Mfg.
SECUR-A-TIE - Dennison Mfg.
SECURE-COPY - Video Automation Systems
SE-CUR-IT - Ambroid
SECURSTRIP - Control Module
SF/DUROID - Rogers
SEED - Belden
SEELBOLTS - APM-Hexseal
SEELRIVITS - APM-Hexseal
SEELSKREWS - APM-Hexseal
SE EYELETS - POP Fasteners
SEISMOPROBE - Bently Nevada
SELCO - Selco Products
SELECTASHAFT - Centralab
SELECTION - Beckman Instrs.
SELECT-MATE - Beckman Instrs.
SELECT-O-TEMP - Hexacon Elec.
SELECTROL - Thermo Electric
SELF-LOC-K - AirBorn
SELF SCAN - PlasmaGraphics
SELISTOR - Eastern Delta
SEL-MASQ - Sel-Rex
SEMI + - Advanced Circuitry
SEMIAC - Alpha Comps.
SEMI/DYNE - LogiMetrics
SEMINAR PROGRAM - E & L Instruments
SEMIPACK - Semikron
SEMISTACK - Semikron
SEMITRON - Bussmann
"SE" MONOGRAM - Sprague Elec.
SEMS - EMM/SESCO
SENSABLE - Hy-Cal Engrg.
SENSALL - National Sonics/Xertex
SENSA-TOUCH - Miller Dial
SENSCOR - Sensor
SENSIMETER - Hy-Cal Engrg.
SENSISTOR - Unitrode
SENSOHM - Ferro
SENS-O-MATIC - RMS Electronics
SENSOR-MATE - Weed Instr.
SENTARA 324 - Honeywell
SENTINEL - Timeplex
SENTINEL - WALTER KIDDE
SENTRILINE - Bird Elctrn.
SENTROL - AMF
SENTRY - Sentry Mfg.
SEO-GRIP - Weckesser
SEQUENTORR - Sloan Technology
SERDEX MODULES - Analog Devices
SERENDIP - Teledyne Relays
SERIES 1000 - Diversified Case
SERIES 2000 - Diversified Case
SERIES 21 - Mohawk Data Sciences
SERIES 3000 - Diversified Case
SERIES 4000 - Diversified Case
SERIES 6000 - Microdata
SERIES 72 - Advanced Automation Concepts
SERIES 8000 - Microdata
SERMABOND - SermeTel
SERMALOY - SermeTel
SERMALUBE - SermeTel
SERMASEAL - SermeTel
SERVA-BENCH - Barry Controls
SERVA-LEVL - Barry Controls
SERVICEMASTER - International Comps.
SERVODISC - PMI Motors, Kollmorgen
SERV-RITE - Gordon, Claud S.
SES - Transene
SETS-1 - EMM/SESCO
7MAG - Merix Chem.
7X, SEVENX - ECD
70 PSI - Chemtronics
7000 SERIES - Applied Engrg. Prods.
'SF' FURNACES - S. F. Products Corporation
SF2600 - Santa Fe Textiles
SGL POWER MASTER - SL Waber
SHAWMUT - Gould
SHAWNEE - Automatic Timing & Controls
SHAWNEE - Efector
SHEAR-SEAL - Barksdale Controls
SHERLOCK - Analytics Communications Sys.
SHIELD CELL - Chomerics
SHIELDFLEX - Magnetic Metals
SHIELDMESH - Chomerics
SHIELDMU - Magnetic Metals
SHIELDSCREEN - Chomerics
SHIELD TAPE - Chomerics
SHIELD-VU - Chomerics
SHIELD WRAP - Chomerics
SHOCKWATCH - Media Recovery
SHOOTING STAR - Wilson Electronics
SHO RATE - Brooks Instr.
SHORT STOP - Ambi-Tech Inds.
SHORTSTOP - Underwriters Safety Device
SHRINKDOWN - Markel
SHURITE - Shurite Meters
SHX - Andrew
SIDE WINDER - Stancor/Hamilton Standard Controls
SIERRACORE - Sierracin/Thermal Sys.
SIGMASIAN - Tencor Instr.
SIGNAFAX - Alden Electronics
SIGNAGUARD - Signatron
SIGNALEX - Staver
SIGNALOCK - LogiMetrics
SIGNATURE - Bristol Babcock
SIGNET - Siecor
SILASTIC - Dow Corning
SILCAD - Yardney Battery
SILCAN - Bow Solder Prods.
SILCORO 60 - GTE Wesgo Technical Ceramics & Metals
SILENT PARTNER - Industrial Computer Designs
SILFARED - Metavac
SIL-FOS - Handy & Harman
SILGAR - Alpha Comps.
SILICA-SEAL - Ferro
SILIC-O-NETIC - Heinemann Elec.
SILICON EXPRESS - VLSI Technology
SILIC-O-RINGS - APM-Hexseal
SILIKROMES - APM-Hexseal
SILKON 35 - Chemtronics
SILOHM - Carbone Lorraine Inds.
SIL-PAD - Bergquist
SIL-PREP - Alltech
SILVAINT - Murata Mfg. , Ltd.
SILVALOY - Engelhard
SILVERCAP - Del Elctrns.
SILVERCEL - Yardney Battery
SILVERFILM - Industrial Midwec Capacitors
SILVER-GRIP - PIC Design
SILVER II - Rayovac Corporation
SILVER-SHIELD - International Wire Products
SILVER STAX - PCK Elastomerics
SILVERWELD - Bourns
SILVREX - Sel-Rex
SIMCO-STAT - Simco
SIMON - Harris Semiconductor
SIMPLIFIER - Compucorp
SIMPSON 260 - Simpson Elec.
SIMULINE - Comstron
SINGLE-BRITE - Perma Power Elctrns.
SIOV - Siemens Components
S.I.R. - Engd. Prod.
SIR - Geophysical Survey Sys.
S.I.R. GASKET - Norton Chemplast
SIVICON - Amperex Elctrn.
6000 SERIES - Ramtek
66XLA - Photodyne
SKAN-COAX - Skan-A-Matic
SKID-MATE - Hardigg Inds.
SKINI-DIP - MERET
SKINNY DIP - SFE Technologies
SKINNY MINNIE - Antenna Specialists
SKIPPER - EG & G Rotron
SKY CAP - AVX Corporation
SKYLARK - Lutron Elctrns.
SKYPHONES - Astronautics Corporation of America
SKY-TIE - Adalet-PLM Div
SLAPSHOT PULSERS - Plasma Research
SLC - Tusonix
SLEEPATRON - Gardiner Elctrns.
SLEEV-SCRU - Augat/Pylon
SLENDYNE - Shure Bros.
SLIDELINE - Duncan Electronics
SLIDE LITE - Leecraft Mfg.
SLIM-CAPS - Republic Elctrns.
SLIM JIM - Michigan Magnetics
SLIM JR. - Hexacon Elec.
SLIMLIME - Remex Cam Operations
SLIMLINE - Hartwell
SLIMLINE - Micro Peripherals
SLIMLINE - NES, (Nationwide Electronic Systems)
SLIMLINE - Potter & Brumfield
SLIMPAC - Semtech
SLIMPAK - American Zettler
SLIM-SNAP - Sperry, A. W., Instrs.
SLIM SR. - Hexacon Elec.
SLIMSWITCH - Digitran
SLIM-TRACK - Barnes Engrg.
SLIP-LOCK - U.S. Terminals
SLIP-SYNC - Chadwick-Helmuth
SLIT-N-WRAP - Vector Electronic
SLO-BLO - Littelfuse
SLO-SYN - Superior Elec.
SLYD-PAK - Thielex Plastics
SMART - Standard Microsystems
SMART ASCII - ECD
SMART BITE - Minelco - A Talley Ind.
SMARTBUFFER - Data-Match
SMART COUNTERS - Nu-Metrics
SMART MONITOR - Bently Nevada
SMARTPOWER - Motorola Semiconductor Prods.
SMARTSCOPE - Branden, T. G.
SMARTSWITCH - Motorola Semiconductor Prods.
SMARTWARE - Gould
SMART 1 - Aerotech
SMITTY - Hunter Tools
SMS - Microwave/Sys.
-S/N- - Measurements Group
SNA EXCHANGE - Intelligent Technology

SNAIL - Augat/Pylon
SNAPAK - Airpax
SNAPBLOCKS - Kulka Smith
SNAP-II - CPSI
SNAP-III - CPSI
SNAPLITE - Leecraft Mfg.
SNAP-LOCK - Namco Controls
SNAP-ON - Vibra-Metrics
SNAP-PAK - Waldes Kohinoor
SNAPSEELS - APM-Hexseal
SNAPSHOT - Bently Nevada
SNAP SINK - Thermal Prods. Group
SNAP STAT - Control Products
SNAP-TACT - Tran-Trol
SNAPTRACK - RDI/Reed Devices
SNAPTROL - CTS Corporation
SNAPTUBE - Zeus Indl. Prods.
SNAP-WRAP - Amphenol
SNIPE - Oak Switch Sys.
SOC - San-O Industrial
SOCKET-SERT - Hybricon
SOCKETS-PLUS - Perma Power Elctrns.
SOC-PAC - Elfab
SODEREZE - Phelps Dodge Magnet Wire
SODER-MASK - Solder Removal
SODER-WICK - Solder Removal
SODR-X-TRACTOR - Pace
SOF SWABS - Clean Room Prods.
SOFT LAYER PREKOTES - Alltech
SOFTPULSE - Penn Resch. (PRC)
SOFT SWITCHING - Elgin Electronics
SOFTY - Clauss Cutlery
SOIC - Motorola Semiconductor Prods.
SOLAR - E^2 Technology
SOLAR INFRARED - Casso-Solar
SOLAR UNITUBE - Casso-Solar
SOLATRON/ACUVOLT - Sola
SOLAVOLT INTERNATIONAL - Motorola Semiconductor Prods.
SOLDAPAK - Electrovert USA
SOLDER COATER-LEVELER - Hollis Engrg.
SOLDERCON - MOLEX
SOLDEREX - Sel-Rex
SOLDER FORMS - Kester Solder
SOLDER MASTER - Hexacon Elec.
SOLDER-OFF - Kester Solder
SOLDER-QUIK - Assem-Pro Instrs.
SOLDERQUIK - Raychem
SOLDERSLEEVE - Raychem
SOLDERTACTS - Raychem
SOLDER-WRAP - United Solder Wrap
SOLDR-MITE - Wall Lenk
SOLID-TUBES - Elctrn. Devices
SOLIDVIEW - Lexidata
SOLISTRAND - AMP
SOLOK - Du Pont Connector Systems
SOLO-PHONE - Shure Bros.
SOLU ALARM - Beckman Instrs.
SOLU BRIDGE - Beckman Industrial
SOLU CHEK - Beckman Industrial
SOLU CORDER - Beckman Instrs.
SOLU METER - Beckman Industrial
SOL-U-SALT - Sel-Rex
SOLU SWITCH - Beckman Instrs.
SOLUTION 555 - Beckman Instrs.
SONABOX - Heat Systems-Ultrasonics
SONA GRAPH - Kay Elemetrics
SONALERT - Mallory Capacitor
SONARGAGE - Scope
SON-CASTER - Ansonics
SONICATOR - Heat Systems-Ultrasonics
SONIC SENTRY - Delta Prods.
SONIMIST - Heat Systems-Ultrasonics
SONOBAR - Shure Bros.
SONODYNE - Shure Bros.
SONOGAGE - Tencor Instr.
SONOSOLDER - Sonobond
SONOSORT - Tencor Instr.
SONOWELD - Sonobond
SON-TECTOR - Ansonics
SOOPERSPOOLER - Consolink
SOSHIN - Soshin Elec.
SOUNDCASTER - Paso Sound Prods.
SOUND DIRECTOR - Argos Prods.
SOUND MASTER - Covox
SOUND MASTER - SPECO
SOUND POWER - Vidaire Electronics Mfg.
SOUND SCENE - Shure Bros.
SOUND SCOPE - Shure Bros.
SOUND-WRITE - Ring King Visibles
SOURCE 2 - Topaz Electronics
SPACE MISER - Mepco//Electra
SPADE-LOK - AMP
SPARK GUN - Vernitron Piezoelectric
SPASAVER - Chicago Switch
SPASAVER - ITW Switches
SPEC - Associated Spring, Barnes Grp.
SPECO INTERNATIONAL - SPECO
SPECTRA - Photo Resch.
SPECTRA-BOND - Spectra-Strip Operations
SPECTRA-COAX - Spectra-Strip Operations
SPECTRACOM - Spectracom
SPECTRA-FLEX - Spectra-Strip Operations
SPECTRA-GP - Spectra-Strip Operations
SPECTRA-GUARD - Spectra-Strip Operations
SPECTRAGUIDE - SpecTran
SPECTRALMASTER - Barnes Engrg.
SPECTRA SCAN - Photo Resch.
SPECTRASCOPE - Spectral Dynamics
SPECTRA-STRIP - Spectra-Strip Operations
SPECTRATESTER - Spectral Dynamics
SPECTRA-TWIST - Spectra-Strip Operations
SPECTRAY - Leeds & Northrup Instrs.
SPECTRA-ZIP - Spectra-Strip Operations
SPECTROL - Hamilton Standard Controls
SPECTROLINE - Spectronics
SPECTRONIC - Bausch & Lomb
SPECTROSIL - Thermal Amer. Fused Quartz
SPECTRUM MONITOR - Cushman Elctrns.
SPEC 55 - Raychem
SPEECH DIRECTOR - Argos Prods.
SPEECHMAKER - Cognitronics
SPEECH 1000 - Telesensory Speech Sys.
SPEEDEE MIXXER - CHEM-MIXX
SPEEDFEED - Qume
SPEEDFOIL - Armstrong World Inds.
SPEEDIAL - Lutron Elctrns.
SPEEDIP - Mann, Henry
SPEEDOMAX - Leeds & Northrup Instrs.
SPEED SERVO - Esterline Angus Instr.
SPEED-WRAP - OK Industries
SPEEDY-TYS - Waldom Elctrns.
SPEMCO - SPEMCO Switches
SPHERE - Infosphere
SPHER-O-DYNE - Shure Bros.
SPHINCTER - Augat/Pylon
SPIKE-SPIKER - Kalglo Elctrns.
SPINGUARD - AVX Corporation
SPINKOTE - Beckman Instrs.
SPINWRITER - NEC Information Systems
SPIRADEL - Allen Avionics
SPIRAFIL - Cablewave Sys.
SPIRAL - EG & G Rotron
SPIRALTRON - Galileo Electro-Optics
SPIRAL WRAP - Sierracin/Thermal Sys.
SPIRAP - AMP
SPIRA-SHIELD - Magnetic Shield
SPIRFLAME - Solder Absorbing Technology (SAT)
SPIROBAND - Electrovert
SPLIT - Andrews Bearing
SPLIT - Miniature Precision Bearings
SPLIT - MPB
SPLIT - Split Ball Bearing
SPLITFORM - Microtran
SPLIT/TRAN - Signal Transformer
SPOOLX - Algo
SPORTSMAN - Rayovac Corporation
SPOT CHECK - Pacific Transducer
SPOT-MASK - E.P.E.
SPOTMATIC - Auric
SPOTMETER - Photo Resch.
SPOT-ON - Multicore Solders
SPRAGUE - Sprague Elec.
SPRING LOC - Garry Mfg., of Brand-Rex
SPRINGTER - Augat/Pylon
SPRING-THING - Southco
SPRINT - DuPont de Nemours, E. I.
SPRINT - EG & G Rotron
SPRINT 11 PLUS - Qume
SPRITE - EG & G Rotron
SPUTTER-RING - Temescal
SPUARESTIX - Aries Elctrns.
SQUINT-SKAN - Skan-A-Matic
S.R.M. - Sealectro
S-R-4 - BLH Elctrns.
SSS-SOLVENT SOLUBLE HOLDER - Tech Spray
S-SYSTEM - Electromatic Controls
STABELEX - Industrial Midwec Capacitors
STABILARC - ISOREG
STABILENE - Keuffel & Esser
STABIL-GLOW - Blue M, A Unit of General Signal
STABILINE - Superior Elec.
STABILIZER - Hollis Engrg.
STABIL-THERM - Blue M, A Unit of General Signal
STAB-L - Sprague-Goodman Elctrns.
STABLE-K - Republic Elctrns.
STABL-LEVL - Barry Controls
STABON - Stackpole, Magnet
STACER - Ametek, Inc
STACKRACK - Stackbin
STACPAC - Semtech
STA-FLUX - Hollis Engrg.
STAKE FASTENER - Dupree
STAKELOCK - Middleburg
STAK'M QUIK - Brim Elctrns.
STAK PAK - Zippertubing
STAK RAK - Zippertubing
STANCAP - Stanley Elctrns.
STANCOR - Hamilton Standard Controls
STANCOTE - Standard Wire & Cable
STANDARD ENCLOSURES - Ango Electronics
STANDARD LINE - Ungar
STAND-IN - Beckman Instrs.
STANFLEX - Standard Wire & Cable
STANOMERSE - Technic
STANTRON - Stantron
STAPLE-PRUF - Carol Cable
STAR - Star Micronics
STAR ALARM - Star Micronics
STAR CHIP - Mepco//Electra
STARDUSTER - Antenna Specialists
STARTROL - Vectrol
STARWHEEL - Applied Solar Energy
STATHAM - Gould
STATI-BAN - Thielex Plastics
STATIC-FREE - Chemtronics
STATICIDE - ACL
STATIC WATCH - Nu-Concept Computer Sys.
STATI-EX - Solder Absorbing Technology (SAT)
STATI-KOTE - Thielex Plastics
STATION MATE - Complexx Systems
STATI-PRO - Thielex Plastics
STAT-O-SEAL - Parker Seal Grp.
STAT PRUF - Cover Craft
STATUS-INDICATOR - Industrial Elctrn. Engrs.
STATUS SEEKER - Dataprobe
STAT VAC - Data-Design Labs.
STAVOLT - Christie Elec.
STEDI-HEAT - Hexacon Elec.
STEEL-TOUGH - Ideal Industries
STEMCO - Hamilton Standard Controls
STENAFAX - Fitchburg Coated Prods.
STEP - Step Engineering
STEP-CCI - Step Engineering
STEPPER MIKE - Oriel
STEREOHEDRON - Stanton Magnetics
STEREOWAFER - Stanton Magnetics
STEREOZOOM - Bausch & Lomb
STETTNER-TRUSH - Stettner Elctrns.
STI - Scientific Technlg.
STICKY FINGERS - Instrument Specialties
STICKY MAT - Controlled Envir. Equip.
STICPAC - Semtech
STIKI-BAK - Acme Chemicals & Insulation
STIK KLIPS - Daburn Elctrns. & Cable
STIKON - RdF Corporation
STIK-ON - Sierracin/Thermal Sys.
STOPSLIP - Solder Absorbing Technology (SAT)
STOREDARC - Nelson Stud Welding TRW
STORTZ TEMP-O-LARM - PSG Inds.
STRAIGHTSHOOTER - Motorola Semiconductor Prods.
STRAINRITE - Star Porcelain
STRAPON - RdF Corporation
STRAPPING - Electrovert
STRATE-BREAKS - Coors Porcelain
STRATO-THERM - AMP
STRIPAC - Microwave Semiconductor
STRIPALL - Teledyne Kinetics
STRIPETTE - Lundy Elctrns. & Systems
STRIP-E-ZEE - Engineering & Elctrn. Devices
STRIPMASTER - Ideal Industries
STRIP MIX - Alltech
STRIP-MOUNTS - Bivar
STRIP-N-STICK - CHR Inds.
STRIPSWITCH - EECO
STRIPTROL - CTS Corporation
STRIPTWEEZ - Pace
STROBEACON - Kemlite Labs.
STROBETTE - Power Instrs. Products
STROBEX - Chadwick-Helmuth
STROBRITE - U.S. Scientific Instrs.
STRONGHOLD - Teradyne Connection Sys.
STRUCTURAL AVEX - Avdel
STS-16 CBX - Solid State Systems
STUK - Ambroid
STURDI-STAND - Hexacon Elec.
STYCAST - Emerson & Cuming
STYLINE - Vicon Industries
STYLUS - Point 4 Data
STYRACON - Sprague Elec.
STYROFOAM - Dow Chemical
STYRON - Dow Chemical
SUB-LITE-WALL - Zeus Indl. Prods.
SUB-MINAX - Amphenol
SUB-OUNCER - Transformer & Coil Products
SUBSTITUTER - Sencore
SUB-SUB-OUNCER - Transformer & Coil Products
SUCROSE-SOLV - Beckman Instrs.
SUEFSCAN - Tencor Instr.
SULFAMEX - Sel-Rex
SUMMAGRID - Summagraphics
SUMMIT - Plastiglide Mfg.
SUN*DISK - Sunol Systems
SUN-FLEX - Sun-Flex
SUN GUN - GTE Sylvania Lighting Prods.
SUN*LOGIC - Sunol Systems
SUN*MAC - Sunol Systems
SUN*NET - Sunol Systems
SUN STICK - GTE Sylvania Lighting Prods.
SUNSWITCH - Ripley
SUNVERTER - Abacus Controls
SUN WIPE - Clean Room Prods.
SUPER - Kenyon Magnetics
SUPER ADD 3 - TRW Connector
SUPERBRIDGE - Motorola Semiconductor Prods.
SUPERBUG - Motorola Semiconductor Prods.
SUPER CAESAR - ITT Cannon
SUPER CHAMP - AMP

SUPERCHIPS - American Technical Ceramics Corporation
SUPER-COMPACT - CGIS, A COMSAT
SUPERCON - Superior Elec.
SUPERCORDER - Astro-Med
SUPER-D - TRW Connector
SUPER-DISK - ALTEK
SUPERDISK - Factron/Schlumberger
SUPERECTIFIER - General Instr.
SUPER ERECTA SHELF - Inter Metro Industries
SUPER EZ KLEEN - Research Prods.
SUPERFAST - Semtech
SUPERFAST - TRW Connector
SUPER-FLEX - Berg, W. M.
SUPERFLEX - Carol Cable
SUPERFLOOD - GTE Sylvania Lighting Prods.
SUPER-GRAPH - Aremco Prods.
SUPERGUIDE - Fiberguide Industries
SUPERIBBON - TRW Connector
SUPERIO - Motorola Semiconductor Prods.
SUPERIOR CONNECTION - Superior Flux & Mfg.
SUPER-K - Republic Elctrns.
SUPERLEAD - Motorola Semiconductor Prods.
SUPERLINK - Motorola Semiconductor Prods.
SUPERLITE - United Foam Plastics
SUPERLOAD - Motorola Semiconductor Prods.
SUPER MACK - Sencore
SUPER MAX-C - Sprague-Goodman Elctrns.
SUPER-MITE - LH Research
SUPERMIUM - Brush Magnetic Heads
SUPER-MOD - TRW Connector
SUPER MOD - TRW Connector
SUPERMON - Motorola Semiconductor Prods.
SUPEROX - Alltech
SUPERPAC - Xycom
SUPER-PLAST - Stock Drive Prods.
SUPERPOT - Consolidated Resistance America
SUPERPOWER - Marathon Battery
SUPERPOWER - Motorola Semiconductor Prods.
SUPER PUNCH - Shure Bros.
SUPER Q - Alltech
SUPER Q - MSI Electronics
SUPERREEL - Memorex
SUPER/REG - Trio Labs.
SUPERSAFE - Superior Flux & Mfg.
SUPERSAVER - GTE Sylvania Lighting Prods.
SUPER SCANNER - Antenna Specialists
SUPER SCORPION - Antenna Specialists
SUPERSERT - Avdel
SUPER-SHEAR - E.P.E.
SUPERSLICE - Advanced Micro Devices
SUPER SLICE - Advanced Microcomputers
SUPER SNA - Mohawk Data Sciences
SUPER-SNAP - Mepco//Electra
SUPER SOFT - Penn Resch. (PRC)
SUPER-SOURCE - Temescal
SUPERSTRATE - Materials Resch.
SUPER-STRIP - A P PRODUCTS INCORPORATED
SUPER-SUN - Pacific Microcomputers
SUPERSWITCH - ITW
SUPERSWITCH - Thomson-CSF Comps.
SUPER SWITCHER - Powertec
SUPER-SYNCLAMPS - Timber-Top
SUPER-TORQUE - Beede Electrical Instr.
SUPERTRAK - Gulton Inds.
SUPERTRUNK - M/A-Com. Cable/Home Communicatios Comm/Scope Coaxial Cable
SUPER-TWISTAGUIDE - Airtron
SUPER/UNI - RTE
SUPERUTIL - Motorola Semiconductor Prods.
SUPER 17 - Kalart Victor
SUPER 21 - Mohawk Data Sciences
SUPER-40 - Airtron
SUPER 48 - Coherent
SUPPLYST - VIZ Test Equipment
SUPRASHIELD - Alpha Wire
SURE-HOLD - Sencore
SURE-LOCK - Pacific Electricord
SURE-SEAL - ITT Cannon
SURE SITE - Transamerica Delaval
SURFACE STAX - Teledyne Kinetics
SURGE GARD - Ametek/Rodan
SURGE-MASTER - MCG Elctrns.
SURGESTOPPER - Brooks Mfg.
SURGITRON - Joslyn Elctrn. Sys.
SURMETIC - Motorola Semiconductor Prods.
SUS-TENSION - Lektralab Technologies
SVP - Siemens Components
SWEEP CHANALYST - VIZ Test Equipment
SWEMAR - Leader Instrs.
SWIDGET - CW Industries
SWIFTACHMENTS - Dennison Mfg.
SWIFT SERVICE - RCD Components
SWING-SEAL - Jamesbury
SWITCH-PAK - Computer Prods.
SWITCH-A-ROO 232 - International Instrumentation
SWITCHER-100 - International Instrumentation
SWITCHGUARD - Qualidyne Sys.
SWITCHMATE - ADC Magnetic Controls
SWITCHMODE - Motorola Semiconductor Prods.
SWIVEL-BLADE - Ideal Industries
SWIVLTOP - Moody Tools
SWR AUTOTESTER - Wiltron
SY-BONDEZE - Phelps Dodge Magnet Wire
SY-LENT - Berg, W. M.
SYLGARD - Dow Corning
SYLVANIA - GTE Sylvania Lighting Prods.
SYLVANIA - McGuirk Electronics
SY/MAX - Square D
SYMBUG - Motorola Semiconductor Prods.
SYNAMP - CML MACARR
SYNCH-LOCK - Sequential Info. Sys.
SYNCHROMATIC - Schott Glass Technologies
SYNCHRON - IMC/Hansen
SYNCHROSTEP - PMI Motors, Kollmorgen
SYNCHROTEL - Kollsman Instr.
SYNCHROVISION - Schott Glass Technologies
SYNCLAMPS - Timber-Top
SYNC-LOC - Bristol Saybrook
SYNDEXER - A. S. R. Servotron
SYNTAX - Ultra Carbon
SYNTHAR - Industrial Midwec Capacitors
SYNTHAVISION - Mathematical Applications Group/CAD/CAM
SYNTHINOL - Consolidated Electronic Wire & Cable
SYNTHITE - Dolph, John C.
SYSTEM V/68 - Motorola Semiconductor Prods.
SYSTEM-10-FABRITEMP - Trans-Met Engrg.
SYSTEM 128 - Electromatic Controls
SYSTRAC - Systron-Donner Inertial
SYSTRON - Systron-Donner Inertial
S-42 ALLOY - Sel-Rex
T - Ideal Industries
TABL-TOP - Sel-Rex
TAB-WELD RESISTORS - Square D
TACHLITE - Power Instrs. Products
TACH-PAK - Airpax
TACH-TROL - Airpax
TACTI/SHEET - C.A.M. Graphics
TAFALOY - Tafa
TAG-RING - Glenair
TAIL/EXTENDER - Com/Tech Systems
TAK-ETTE - Power Instrs. Products
TAK-YANK - Thielex Plastics
TALAR - Singer
TAMELOX - Ohmtek
TANFILM - TRW Resistive Products
TANITE - Sprague Elec.
TANKARD - Automatic Timing & Controls
TANKARD - Efector
TANOX - Sprague Elec.
TANTALEX - Sprague Elec.
TANTAPAK - Sprague Elec.
TANTIN - TRW Resistive Products
TANTOROID - Sprague Elec.
TAPE CABLE - Brand-Rex
TAPE/FOIL - Tapecon
TAPEMASTER - Holub Industries
TAPE PAK - Ideal Industries
TAPERLOCK - Cablewave Sys.
TAPER-TITE - Norton Chemplast
TAPESWITCH - Tapeswitch of America
TAPE TRAN - Comspec
TAPIT - Chicago Switch
TAPIT - ITW Switches
TAPOLENE - Tappan Wire & Cable
TA'POT - Howell Instrs.
TAPTONE - Benthos
TARGET - Ashland Chemical
TARNIBAN - Technic
TARZAN - EG & G Rotron
TASCORE - Thomas & Skinner
TASKMASTER - Summit Engineering
TATTLETHERM - Everest Interscience
TAURUS - Nova Elec.
TAURUS LAB - Taurus Computer Products
TAURUS ONE - Taurus Computer Products
TAZ - Siemens Components
TC - ComDesign
TC - Gould
TC850 - Wall Lenk
TDL - Hollis Engrg.
TDM - Transistor Devices
TDMD - Transistor Devices
T-DOT - Anaren Microwave
T-DOT - Westemp
TDQ - Phoenix Wire
TDR - Transistor Devices
TDRD - Transistor Devices
TDRS - Transistor Devices
TEACHWARE - Digiac
TEAM SYSTEMS - Test & Measurement Systems
TEC-CUT - Techni-Tool
TECH - Altek
TECHCLEAN - Tech Spray
TECH-CRAFT - Lear Siegler
TECHANCELL - Altus
TECHNACELL - Elpower
TECHNIC CASH REGISTER - Technic
TECHNIC CY(-)LESS COPPER - Technic
TECHNIC CY(-)LESS GOLD - Technic
TECHNIC GOLD - Technic
TECHNI-GOLD - Technic
TECHNI-PLATINUM - Technic
TECHNI-RHODIUM - Technic
TECHNI-RITE - Gulton Inds.
TECHNI SILVER CY(-)LESS - Technic
TECHNISTRIP AU - Technic
TECHNOTERM - Testoterm
TECHNOVENT - Testoterm
TECH-TIN - Technic
TECKAIRE - Tecknit (Eastern Facility)
TECKSHIELD - Tecknit (Eastern Facility)
TECKSTIK - Tecknit (Eastern Facility)
TECKSTRIP - Tecknit (Eastern Facility)
TECLAB - Kalamazoo Technical Furniture
TEC-LITE - TEC
TEC-TAC - Techni-Tool
TEC-TUFF - Techni-Tool
TEE-LOCK - General Elec.
TEENY-TINY-MITE - LH Research
TEGLAR - Andrew
TEK - Tektronix
TEL-A-TONE - Bell, Floyd
TELCO - GC Elctrns.
TELCON - Inter-Technical Grp.
TELE-BEAM II - Kalart Victor
TELECAP - Sprague Elec.
TELE-CONNECT - SYT
TELEFILTER - Sprague Elec.
TELE HEADPHONE - R-Columbia Prods.
TELEMAX - Thermax Wire
TELE-PAC - Elfab
TELE-POWER POLES - Wiremold
TELEPRODUCTS - Atlantic Research
TELEQUIPMENT - Tektronix
TELESOLUTIONS - TeleVideo Sys.
TELESPONDER - Vega Precision Labs.
TELE-TEST - Bytex
TELETICKTER - A & B Technical Services
TELEVAC - Fredericks
TELEVISION TUBE CADDY - Argos Prods.
TELEWORD - Telesensory Speech Sys.
TELEWRITER - Telautograph
TELEXPLUG - Teleface
TELFLEX - Chemtronics
TELTRON T-1000 - Lundy Elctrns. & Systems
TEM/GUIDE - UTE Microwave
TEMPCAL - Howell Instrs.
TEMPERATURE ON THE SPOT - Temptronic
TEMPEREX - Sel-Rex
TEMPGARD - Tenney Engrg.
TEMPILABELS - Tempil
TEMPILAQ - Tempil
TEMPIL PELLETS - Tempil
TEMPILSTIK - Tempil
TEMPLATE - Megatek
TEMP-MASTER - Blue M, A Unit of General Signal
TEMP-METER - Alpha Comps.
TEMP-O-GIDE - Bivar
TEMPOSONICS - Temposonics
TEMP-PLATE - Wahl Instruments
TEMP-R-GLAS - CHR Inds.
TEMP-R-TAPE - CHR Inds.
TEMPSISTOR - Midwest Comps.
TEMP-TEX - W. L. Gore
TEMPTRIM - Beckman Instrs.
TENBUG - Motorola Semiconductor Prods.
TENNA/FLEX - Cablewave Sys.
TENSILE-FLEX - International Wire Products
TENSOL-THERM - Tensolite
TENTYPE - Tencor Instr.
TENULINE - Bird Elctrn.
TERM-ACON - Methode Elctrns.
TERMALINE - Bird Elctrn.
TERMALUM - AMP
TERMAPOST - Raychem
TERMASHIELD - AMP
TERMI-BLOK - AMP
TERMI-FOIL - AMP
TERMI-GRID - AMP
TERMINAL-MASTER 1 - A & B Technical Services
TERMINUS - Poly-Scientific
TERMINYL - AMP
TERMI-PLATE - AMP
TERMI-POINT - AMP
TERMI-TWIST - AMP
TESTDRIVE - Dymek
TEST-GLO - Ideal Industries
TESTO - Testoterm
TESTOVENT - Testoterm
TETCO - Electric Tachometer
TETRA ETCH - W. L. Gore
TETRA-THIN - W. L. Gore
TETRINOX - Caddock Electronics
TETTEX - Tettex Instruments
TEXBUG - Motorola Semiconductor Prods.

TEX-L 88 - National Electric Cable
TEXTOOL - Textool Products
TEXTOOL - 3M-Electronic Products
TEXTRO KLEAVE - Textro
TEXTUR TOUCH - C.A.M. Graphics
TFR - Warren Comms.
T HEAD - AMP
THE BLACK HOLE - International Instrumentation
THE BUS MASTERS - Comark
THE DIPPER - Midland-Ross
THE FERRET - General Electric
THE GREAT PROTECTORS - United Foam Plastics
THE HEART OF YOUR SYSTEM - Xentek
"THE HOUSING AUTHORITY" - International Instrumentation
THE INTELLIGENT CABLE - Contel Info. Sys.
THE MASKER - Soundlier
"THE MOTHER OF INVENTION" - International Instrumentation
THERMAC - Research
THERMACON - Dexter Research Ctr.
THERMAIR - Thermo Electric
THERM-AL - Acme Chemicals & Insulation
THERMALEZE - Phelps Dodge Magnet Wire
THERMASPLICE - AMP
THERMATRACE - Barnes Engrg.
THERMAZIP - Zippertubing
THERMCOAT - Omega Engrg.
THERMCOAT CO & COL - Omega Engrg.
THERMILINEAR - Yellow Springs Instr.
THERMIVOLT - Yellow Springs Instr.
THERMO-CABLE - Thermo Electric
THERMOCHUCK - Temptronic
THERMOFLAG - Staver
THERMO-GRIP - Ideal Industries
THERMOHM - Leeds & Northrup Instrs.
THERMOLAIN - Star Porcelain
THERMOLIMIT - Raychem
THERMOMATIC - Teledyne Rotolite
THERMOPAD - Motorola Semiconductor Prods.
THERMOPAD II - Motorola Semiconductor Prods.
THERMOPART - Pace
THERMO PRO - L & L Special Furnace
THERM-O-SCOPE - Capintec Instrs.
THERMO-SHRINK - Ideal Industries
THERMO SPOTTER - Heath
THERMOSTREAM - Temptronic
THERMO-STRIP - Ideal Industries
THERMOTAB - Teccor Elctrns.
THERMOTERM - Maury Microwave
THERM-O-TRAC - Hexacon Elec.
THERMOTRAK - Westemp
THERMOVANE - Staver
THERMOWATT - Motorola Semiconductor Prods.
THERMOZONE - Temptronic
THER-MULTIMETER - E^2 Technology
THE SOURCE - Pyle Industries
THE SWITCHER SOURCE - Trio Labs.
THE TERMINATOR - Optical Fiber Technologies
THE WORK MANAGEMENT SYSTEM - LWFW, Group
THIN-HEET - Safeway Products
THINISTOR - Victory Engrg.
THINKING CAP - Global Specialties
THINLAY - Handy & Harman Elctrn. Matls.
THINLINE - Republic Elctrns.
THINPAK - American Zettler
THIN SHEET NUTSERT - Avdel
THIN THREE DISK ENCLOSURE - International Instrumentation
THIN-TRIMS - Johanson Mfg.
THINVERTER - Arnold Magnetics
THIN-WALL - Berg, W. M.
THIRSTY WIPE - Clean Room Prods.
THORKOM - Viking Connectors
THOROUGHBRED - SMC Software Sys.
THREDS - Southco
THREDSEAL - Parker Seal Grp.
3C - Spectra-Strip Operations
THREE-D - Berg, W. M.
3S-WICK - Solder Absorbing Technology (SAT)
3-WIRE LINE - Ungar
33XLC - Photodyne
THRIFT/MATE - GTE Sylvania Lighting Prods.
THRULINE - Bird Elctrn.
THRU-PASS - Sprague Elec.
THUMB MITE - Tech Labs.
THUM-PLUGS - Thielex Plastics
THUM-TAK - Thielex Plastics
THYRISTROL - Cross Elctrns.
TI-BALL - Varian
TIBOR - KBI
TIEMASTER - Mann, Henry
TI GOLD - ULVAC North America
TI HARD - ULVAC North America
TII - TII Electronics
TIMECHECK - Vicon Industries
TIME ELECTRONICS - ZI-TECH Instr.
TIMEFAX - Fitchburg Coated Prods.
TIMEMARK - Fitchburg Coated Prods.
TIME-O-LITE - Veeder-Root
TIMEPLEXER - Timeplex
TIMEPRINT - Fitchburg Coated Prods.
TINEON - Leecraft Mfg.
TINITRON - Bussmann
TINNIT - Datak
TINSIL - Bow Solder Prods.
TINY-GLOW - Industrial Devices
TINY L - AIE Magnetics
TINYMAX - Torwico Elctrns.
TINY-MITE - Industrial Devices
TINY-MITE - LH Research
TINYMITE - Renbrandt
TINY-PAK - Mini-Systems
TINY TRIM - Kappa Networks
TISSUMIZER - Heat Systems-Ultrasonics
TITAL - KBI
TITAN - Titan Technologies
TI-TITE - Daburn Elctrns. & Cable
TI-WRAPS - Brim Elctrns.
TKC - Teledyne Kinetics
TLC - Du Pont Connector Systems
TLC STICK - Alltech
T-LITE - Sylvania Miniature Lighting
TLR - Avdel
TM - ComDesign
TMA - Step Engineering
TMOS - Motorola Semiconductor Prods.
TMS - Raychem
TOBOL - Tobe Deutschmann Labs.
TOCOS - Hi-Tech Components
TOCOS - Tocos America
T-O-D - Therm-O-Disc
TOEI - SEKAI Elctrns. of Amer.
TOGGLE-DIP - Grayhill
TOG-L-DIM-R - Power Controls
TOKEN/NET - Concord Data Systems
TOKIN - Tohoku Metal Inds.
TONG TEST - Columbia Elec. Mfg.
TONOTRON - Hughes Aircraft
TOOLHEAD - Southco
TOP-SLOT - Aries Elctrns.
TORK PAK - Raymond Engrg.
TORMAX - IMC Magnetics
TOROYD - Universal Mfg.
TORQ SWITCH - Torq
TORQSYN REMOTE POSITIONER - Vernitron
TORQ TITE - CW Industries
TORQUE PACK - Raymond Engrg.
TORQUE-PEAK - Standard Pneumatic Motor
TORQUE WATCH - Waters Mfg.
TOUCH DRY - Markem
TOUCH-MASTER - Blue M, A Unit of General Signal
TOUCH MOUSE - Touch Technology
TOUCH-PEN - Sun-Flex
TOUCHSCREEN - Dorman Bogdonoff
TOUCH-TEST - Sencore
T.P.M. - Macro Electronics
T-PROBE - Westemp
TRA-BOND - Tra-Con
TRA-CAST - Tra-Con
TRACE - Beckman Instrs.
TRACE CONTROL - Gould
TRACER-FLO - Trio-Tech Intl.
TRACKER - Huntron Instrs.
TRACS - GenRad
TRACTORADIO - ATR Elctrns.
TRA-DUCT - Tra-Con
TRAKFET - Analog Devices
TRANCELL - Koep Precision Standards
TRANQUIL-ARC - Nelson Stud Welding TRW
TRANSACTIVE DPIS - Analogic
TRANSACTOR - Computerwise
TRANS-BOX - Flambeau Products
TRANSCAP - Tusonix
TRANSDUKTOR - Transduktor
TRANSENE-100 - Transene
TRANS-EYE - Shelly Associates
TRANSFILTER - Vernitron Piezoelectric
TRANSHEAT - BTU Engrg.
TRANSIL - Thomson-CSF Comps.
TRANSKON - MOLEX
TRANSLEX - ECD
TRANSLOCK - Surgeonics Ltd.
TRANSMET - Transmet
TRANSMUX - Granger
TRANSPAC - ERA Transpac
TRANSTERM - Computerwise
TRANSVOLT - Guildline Instrs.
TRANSZORB - General Semiconductor Ind.
TRA-PAX - Tra-Con
TRA-PRIME - Tra-Con
TRASAR - Andrew
TRA-SEAL - Tra-Con
TRA-STRIP - Tra-Con
TRC ICE POINT - Omega Engrg.
TREASURETRON - Gardiner Elctrns.
TREPOSLIDE - Beckman Instrs.
TRI - Data Precision
TRIAC KOOLER - UNITRACK
TRIDAK - Tridak
TRIDUNDANT - LNR Communications
TRIFURON - MOLEX
TRIGAC - Singer
TRIGARD - Joslyn Elctrn. Sys.
TRIGGER LOCK - Hartwell
TRIG-R-HEAT - Wall Lenk
TRILOBYTE - Trilobyte Computer Corporation
TRILOG - Trilog
TRIMET - Handy & Harman
TRIMFET - Motorola Semiconductor Prods.
TRIMIT - Bourns
TRIM KIT - American Technical Ceramics Corporation
TRIMLINE - ESC Elctrns.
TRIMPOT - Bourns
TRIM-STEP - Datametrics • Dresser Inds.
TRIMSTRIPS - Southco
TRI MUX - Complexx Systems
TRI-ONIC - Gould
TRIPLATE - Alpha Inds.
TRIPLE FLEX - Shure Bros.
TRIPLEGARD - Joslyn Elctrn. Sys.
TRIPLEMATIC - Hardman
TRI-POINT - Automatic Switch
TRI-ROUNDULAR - Fastex
TRI-STATE BOX - Electro Standards Lab.
TRITON I - Teledyne Rotolite
TROL-A-TEMP - EWC
TROLEX - CTS Corporation
TRON - Bussmann
TRONOX - Activair
TR-SERIES - Paso Sound Prods.
TRUARC - Waldes Kohinoor
TRU/BLU - Timeplex
TRU-CAL - EDL
TRUE ANGLE - Stock Drive Prods.
TRUE BLUE - PIC Design
TRUE METRIC - Stock Drive Prods.
TRUFLEX - Texas Instrs.
TRU-GLIDE - Jonathan Mfg.
TRU-MITE - Datametrics • Dresser Inds.
TRU-ROTA - Datametrics • Dresser Inds.
TRU-SPEC - Macom Inds.
TRU-TAC - Datametrics • Dresser Inds.
T-SCREEN - Siecor
TSN - Avdel
T-SOFT - Taurus Computer Products
TSU-SR - Tri-Data
TTE - TTE
TUBE-PAC - Semtech
TUFCON - W. L. Gore
TUFFCOTE - Tensolite
TUF-FLEX - Pacific Electricord
TUFFLITE - Tensolite
TUFF-TAINER - Flambeau Products
TUF STUF - Clean Room Prods.
TUF-TIES - Amrad & Transcon Mfg.
TULIP - Thomas & Betts
TULOX - Blum, Julius
TUNER RUNU - Chemtronics
TUN-O-POWER - Chemtronics
TUN-O-WASH - Chemtronics
TURBO - Brand-Rex
TURBOCRYL - Brand-Rex
TURBOGLAS - Brand-Rex
TURBOLASE - Photon Sources
TURBOLEX - Brand-Rex
TURBO-PROBE - Flow Technology
TURBOSIL - Brand-Rex
TURBO-SLOT - IMC Magnetics
TURBOSOL - Brand-Rex
TURBOTHERM - Brand-Rex
TURBOTUF - Brand-Rex
TURBOZONE - Brand-Rex
TURBULA - Impandex
TURN-LOC - Deutsch Fastener
TURN-ON - Heyco Molded Products
TUTOR - Motorola Semiconductor Prods.
TUTORETTE - Audiotronics
TU-WIRE - Lutron Elctrns.
TV BUG - Motorola Semiconductor Prods.
TWENTY/TWENTY - Allaco Prods.
TWENTY/TWENTY - Bacon Inds.
TWG/ARIMA - Winchendon Group
TWIN-CAP - American Technical Ceramics Corporation
TWIN LIGHT - Sylvania Miniature Lighting
TWINTRACK - Qume
TWISTAGUIDE - Airtron
TWISTER - Micro Component Technlg.
TWIST-LITE - MSC Prods./Eaton
TWIST-LOK - Sprague Elec.
TWIST N FLAT - Spectra-Strip Operations
TWIST-PROTECT - Electronic Specialists
TWIST TIES - Brim Elctrns.
TWO BUS - Eldre Corporation
2-METER - Sencore
22XLC - Photodyne
2-4-1 - Signal Transformer
TWYSTRON - Varian Associates
TX3 - Complexx Systems
TX7 - Complexx Systems
TYGON - Blum, Julius
TYKON - TRW Connector
TYPESET-8 - Digital Equip.
TYPOTRON - Hughes Aircraft
TYTEX - Exide
UAR/T - General Instrument
UBIQUITOUS - Wavetek Rockland Sci.
UCAR - Union Carbide Corporation
UCCAP - UCCEL Corporation
U C-PROBE - International Instrumentation
UGLY - Elpac Power Sys.
UGX - Andrew
UHX - Andrew

UHXII - Andrew
UIC-600 - Princeton Elctrn. Prods.
ULTI-MATE - Victor Elec. Wire & Cable
ULTRA CELL - Sensor Techn.
ULTRA-CLEAN - Hollis Engrg.
ULTRA-CLEAN - Lab-Line Instrs.
ULTRA COMPACT - Transformer & Coil Products
ULTRA F - Ultra Carbon
ULTRAFILTER - Ultrapar
ULTRA-FLEX - Mueller Elec.
ULTRA-FLUX - Engelhard
ULTRA-GLOW - AMF/Electro Comps.
ULTRA-GOG 300 - American Ultraviolet
ULTRAGRAF - Lundy Elctrns. & Systems
ULTRA-GROUND - Topaz Electronics
ULTRAGUARD - Emergency Power Engineering
ULTRA-HI Q - Rutherford Resch. Prods.
ULTRA-ISOLATOR - Topaz Electronics
ULTRA-KAP - Centralab
ULTRALINK - Creare
ULTRA-LITE - Wonder Corp of America
ULTRALLOY - Arco Elctrns.
ULTRA-LOC - BEI Motion Sys.
ULTRA-PAK - Alltech
ULTRAPAK - Electrovert USA
ULTRAPURE - Kester Solder
ULTRAR - Atomergic Chemetals
ULTRA-SEAL - Kenco Industries
ULTRA-SOL - Kenco Industries
ULTRA-SPEC 100 - American Ultraviolet
ULTRA-STRATES - Accumet Engrg.
ULTRA-TECH - Mueller Elec.
ULTRA-TEMP - Aremco Prods.
ULTRATERM - Videx
ULTRATHIN - Champlain Cable
ULTRAVOX - Paso Sound Prods.
ULTREX - Baker, J. T., Chemical
ULTROL - Brand-Rex
UMB - TransKinetic Sys.
UMD - Boston Systems Office
UNIBLOC - Motorola Semiconductor Prods.
UNIBUS - Digital Equip.
UNICIRCUIT - Sprague Elec.
UNICOAT - Bacon Inds.
UNI-CORE - Alpha Metals
UNICORN - Motorola Semiconductor Prods.
UNI-COVER - Cover Craft
UNI-CURVE - Fenwal Elctrns.
UNIDEX - Aerotech
UNIDEX - Oak Switch Sys.
UNIDIALER - Rath Microtech
UNIDOS - Motorola Semiconductor Prods.
UNIDYNE - Shure Bros.
UNI-LOCK - Veeder-Root
UNI MAG - EG&G Geometrics
UNIMEC - MEC A/S
UNI-MODULE - Universal Instrs.
UNIMORPH - Vernitron Piezoelectric
UNIPAK - Data I/O
UNIPAK - United Foam Plastics
UNIPLY - Power Designs
UNIPROX - Applied Electro Technlg., Int.
UNIRAY - MCE Semiconductor
UNIREEL - Interdyne
UNIRING - Burndy Corporation
UNI-RON - Shure Bros.
UNI-ROTOR - Astro Dynamics
UNISENS - Scientific Technlg.
UNISERT - Unicorp
UNISET - Amicon
UNISPHERE - Shure Bros.
UNI-STRAND - Belden
UNISWITCH 1021 - Western DataCom
UNISYSTEM - Pacific Microcomputers
UNIT - Avantek
UNI-TERM - American Technical Ceramics Corporation
UNITRACK - UNITRACK
UNITWIST - Jan Hardware Mfg.
UNIVERSAL - Mueller Elec.
UNIVERSAL DISK ENCLOSURE (UDE) - International Instrumentation
UNIVERSAL PH DOSER - Analytical Meas.
UNIVERSAL PILOT HOUSING - Sylvania Miniature Lighting
UNIWATT - Motorola Semiconductor Prods.
UNIWELD - Endicott Coil
UNREEL - Belden
UPC - Atlas Energy Sys.
UPOWER - Integrated Circuits
UPOWER-DIP((+2)) - Integrated Circuits
UP-TIMER - Xanadu Controls
UP-WRITE - Ring King Visibles
URESOLVE - Amicon
URESOLVE - Dynaloy
USER-DESIGNED - VLSI Technology
U S SOFTWARE - United States Software
US-2 - Scanbe
U-TILE-MU - Amuneal Mfg.
UTILI-TAP - AMP
UTILI-TENSHUN - AMP
UVTRON - Hamamatsu Photonics K.K.
VACION - Varian
VACOIL - Transene
VACOMATIC - Vaco Prods.
VACOMBO - Vaco Prods.
VACOTOTAL - Vaco Prods.
VACPAC - Hull
VACREL - DuPont de Nemours, E. I.
VACSORB - Varian
VACTROL - EG & G Vactec
VACULOY - Alpha Metals
VACU-SEALED - Benthos
VACUTEC - Atomergic Chemetals
VADAC - E-Systems
VAGABOND - Shure Bros.
VAL-AN - Zero
VALUEMASTER - Advance Engrg.
VALU SWITCHER - Powertec
VAM - Bently Nevada
VAN DE GRAAFF - High Voltage Engrg.
VANTAGE POINT - Industrial Computer Designs
VAPOPAK - Electrovert USA
VAPORFLO - Tenney Engrg.
VARA-TEMP - Hexacon Elec.
VARAX - Adtech Power
VARIAC - Technipower, A Penril
VARICON - Elco
VARICOUNTER - Veeder-Root
VARIDAC - Perkin-Elmer
VARITEMP - Master Appliance
VARITRIM - Voltronics
VARI-TWIST - Belden
VARI-VAC - Vactronic Lab. Equip.
VARY-TALLY - Veeder-Root
VAST - Harris
V BALL - Vernay Laboratories
VCAP - Video Automation Systems
VDAC - Standard Microsystems
VECOR - Vidaire Electronics Mfg.
VECO VAMP - Victory Engrg.
VECTORBORD - Vector Electronic
VECTOR-PAK - Vector Electronic
VEE CAL - Vitramon N.A.
VEEDER-DECADE - Veeder-Root
VEEDERLINE - Veeder-Root
VEEDOMETER - Veeder-Root
VEE JEM - Vitramon N.A.
VEKTON - Norton Chemplast
VELCOR - Television Microtime
VELOSTAT - 3M , Static Control Sys.
VELVET TOUCH - Chartpak
VENDACARD - XCP
VENDACODER - XCP
VENT-RAK - General Devices
VENT RAK - Vent-Rak
VERAFLEX - Shure Bros.
VEREX - Verbatim
VERICARD - Honeywell
VERI-DRIVE - Todd Prods.
VERIGRAPH - International Instruments
VERINET - VLSI Technology
VERNISTAT - Perkin-Elmer
VERNITORQ - Vernitron
VEROBLOC - BICC-Vero Elctrns.
VEROBOARD - BICC-Vero Elctrns.
VEROBOX - BICC-Vero Elctrns.
VEROCASE - BICC-Vero Elctrns.
VEROLOCK - BICC-Vero Elctrns.
VERORACK - BICC-Vero Elctrns.
VEROWIRE - BICC-Vero Elctrns.
VERSA - Square D
VERSABUG - Motorola Semiconductor Prods.
VERSABUS - Motorola Semiconductor Prods.
VERSACAD - T & W Systems
VERSACAD ADVANCED - T & W Systems
VERSACAD ENTRY LEVEL - T & W Systems
VERSACAGE - UNITRACK
VERSACON - Teradyne Connection Sys.
VERSA-CUT - Photon Sources
VERSADOS - Motorola Semiconductor Prods.
VERSA-FLEX - Photon Sources
VERSA-LASE - Photon Sources
VERSA-MARK - Photon Sources
VERSAMODULE - Motorola Semiconductor Prods.
VERSAMOUNT - UNITRACK
VERSANET - Motorola Semiconductor Prods.
VERSAPLEX - Lutron Elctrns.
VERSA-PROBE - EDL
VERSA-RANGE - Blue M, A Unit of General Signal
VERSA-STRIP - Photon Sources
VERSA-TEMP - EDL
VERSA-TRAN - Honeywell
VERSAWATT - RCA Solid State
VERSAWATT - SGS Semiconductor Corporation
VERTI-GO STACKABLE - Middleburg
VERTI-LYTIC - Sprague Elec.
VERTISOCKETS - Aries Elctrns.
VERT-O-GIDE - Bivar
VFA - Photon Sources
VIBRALARM - Vibra-Metrics
VIBRALERT - Metrix Instrument
VIBRA LOK - TRW Cylindrical Connector
VIBRAMIKE - Alpha-M
VIBRAMITE - Vibra-Metrics
VIBRASCOPE - Spectral Dynamics
VICOAX - Vicon Industries
VIDAIRE - Vidaire Electronics Mfg.
VIDEOBRIDGE - Electro Scientific Inds.
VIDEO/FILTER - Panelgraphic
VIDEO LAB - Data Translation
VIDEOLINK - Vicon Industries
VIDEOMASTER - Lance Inds.
VIDEO STICKS - Chemtronics
VIDEOTERM - Videx
VIDOMET - Penn Video
VII - Vicon Industries
VII - Visual Info. Institute
VINYLINK - Burndy Corporation
VINYL STIX - Topflight
VINYLUG - Burndy Corporation
VIP - Struthers-Dunn
VIP - Wells Elctrns.
VIP - Zero
VIRTRONICS - VirTis
VISCOFILM - Industrial Midwec Capacitors
VISHAY - Vishay Resistive Sys. Grp.
VISICORDER - Honeywell
VISICOUNTER - Veeder-Root
VISIGRAPH - Trans-Met Engrg.
VISI-GUARD - Joslyn Elctrn. Sys.
VISI-PITCH - Kay Elemetrics
VISOMET - ZI-TECH Instr.
VISTAL - Coors Porcelain
VITACOTE - ESICO
VITAMIN Q - Sprague Elec.
VITEL - Viking Connectors
VITR-AU-LESS - Ferro
VITREOSIL - Thermal Amer. Fused Quartz
VITROHM - Ward Leonard Elec.
VITROLAIN - Star Porcelain
VIVISUN 20/20 - Aerospace Optics
VK - Vitramon N.A.
V-LINE - GSE
VLSI - Baker, J. T., Chemical
VMC 68/2 - Motorola Semiconductor Prods.
VMEASY - Electronic Solutions
VMEBUG - Motorola Semiconductor Prods.
VME MODULE - Motorola Semiconductor Prods.
VME/10 - Motorola Semiconductor Prods.
VN-TC - Brand-Rex
VOCAL MASTER - Shure Bros.
VOICE DIRECTOR - Argos Prods.
VOICEGATE - Shure Bros.
VOICE HARP - Covox
VOICE MASTER - Covox
VOICE WARE - Centigram
VOL-CON - Ideal Industries
VOLPI TRONIC - American Volpi
VOLTECTOR - Heat Systems-Ultrasonics
VOLTECTOR - Sperry, A. W., Instrs.
VOLTOHMYST - VIZ Test Equipment
VOLTPROBE - Amprobe Instr.
VOLTRONICS - Voltronics
VOLTSENSOR - Calex Mfg.
VOL-U-METER - Brooks Instr.
VOPAC - Centigram
VORTEX & VORTEX II - Sperry Univac
VOXCOM - Tapecon
VO3 SYSTEM - Calay Systems
VP - Vitramon N.A.
V-PAC - Reliability
VPR - Vermont Precision Resistor
VPS - Vicon Industries
VPS-RF - Vicon Industries
VTAC - Standard Microsystems
VTAM - Sperry Univac
VTI - VLSI Technology
V TIP - Vernay Laboratories
VUE GUARD - Panelgraphic
VUE POINT - General Digital
VULCAN - Contact
VULCAN - Harris
VULCANEX - Electrical Plastics
VULCANIZED XECON - Chomerics
VULKAFLEX - General Electric
VULKENE - General Electric
VUMATIK - Honeywell
VUTRONIK - Honeywell
V V C - Codi Semiconductor
VX SUPER REFRACTORY - GTE Wesgo Technical Ceramics & Metals
VY - Vitramon N.A.
VYCOR - Corning Glass Works
VYDYNE - Monsanto
VYLINK - Brand-Rex
VYNA-KOTE - Spectra-Strip Operations
V-53 - Vishay Resistive Sys. Grp.
V77 - Sperry Univac
WAFER-BATCHER - Plasma-Therm
WAFERCON - MOLEX
WAFER-SPHERE - Jamesbury
WAIT-A-BIT - AIE Magnetics
WALSCO - GC Elctrns.
WAMCO - Miller, W. A.
WAND - Megatek
WATCHDOG PROGRAMMABLE TIMERS - Square D
WATER-BLOC - Siecor
WATERTITE - Okonite
WATERWEB - Heat Systems-Ultrasonics
WATER WELDER - Henes Prods.
WATTCHER - Bird Elctrn.
WATT-MISER - Watt-Clock
WATT-SHAVER - Solid State Systems
WATTSHAVER - Solid State Systems
WATTS-ON - Tech Labs.
WAVEDIPPER - Electrovert USA
WAVEFORM ANALYZER - Sencore
WAVEGUARD - Krohn-Hite

WAVELABS - Systron-Donner Inertial
WAVEMETER - Burleigh Instrs.
WEDGE-EZE - Automatic Connector
WEDGE-EZE, WEDGE-LOCK, ECONOCRIMP - Arco Elctrns.
WEDGE-LOCK - Automatic Connector
WEDGELOCK - Standard Grigsby
WEECOIL - Syscon Intl.
WEECON - Tusonix
WEIGHLITE - Kistler-Morse
WELCON - Wells Elctrns.
WELDOHM - Belden
WELDOX - Hardman
WELLER - Cooper Group
WELTEK - Weltek Intl.
WE'RE WARNING YOU... - Projects Unltd.
WESCO - West Coast Elec. Mfg.
WESTACH - Westberg Mfg.
WESTAT - Wescorp Antistatic Prods.
WESTON NETRIM - Weston Controls/Pots
WET-SPEC - Electrol
WHEELER - Varian
WHETSTONE - Integrated Digital Products
WHISPER - EG & G Rotron
WHISPERCABLE - Thermax Wire
WHITE BOX - Omega Engrg.
WHIZZARD - Megatek
WHYTE BOX - Omega Engrg.
WIBA - Electrovert
WIDEBETA - Beckman Instrs.
WIDETRACK - Qume
WILBRAZ - Wilkinson
WILD ROVER - Refac Elctrns.
WILSON - Wilson Electronics
WILTRON - Wiltron
WIMA - Inter-Technical Grp.
WINC - Advanced Elctrns. Design
WINCHESTER REPEATER - Raymond Engrg.
WING-NUT - Ideal Industries
WIRE-LUBE - ideal Industries
WIRE NUT - Ideal Industries
WIREPLIER - Vaco Prods.
WIRE PREPPER - Ideal Industries
WIRETEMP - Trans-Met Engrg.
WIRE-WRAP - Hollis Engrg./Wire-Wrap
WIRE WRAP SOCKETS - Midland-Ross
WISS - Cooper Group
WISSH - Workman Elctrn. Prods.
WITE BOX - Omega Engrg.
WONDER MASK - Tech Spray
WONDER WIPE - Clean Room Prods.
WOOD ELECTRIC - Potter & Brumfield
WORD-II - Data Processing Design
WORD SLICE - Analog Devices
WORDSMITH - Documation
WORKHORSE - Rayovac Corporation
WORLD-CHIP - Advanced Micro Devices
WORLDCOM 200 - Western DataCom
WRAP/BUS - Rogers
WRAP-CAP - Ideal Industries
WRAPOST - Auto-Swage Prods.
WRINLAY PROCESS - Photo Chem. Prods. Cal.
WRITE-BAR - Percon
WSH - Tech Spray
WSM - Tech Spray
WX SERIES - Wall Lenk
WYBAR - Eraser
WYTE BOX - Omega Engrg.
W2AU BALUN - Microwave Filter
XACTEMP - Gordon, Claud S.
XACTGLAND - Gordon, Claud S.
XACTHEAD - Gordon, Claud S.
XACTLOK - Gordon, Claud S.
XACTOHM - Gordon, Claud S.
XACTPAK - Gordon, Claud S.
XACTSEAL - Gordon, Claud S.
X-AIR - Isochem Products
XCELITE - Cooper Group
X-CITERS - Michigan Magnetics
XDOS - Motorola Semiconductor Prods.
X-DUCER - Motorola Semiconductor Prods.
XECON POLASTRIP - Chomerics
XELON - Times Fiber Communications
XENOLITE - Christie Elec.
XERSIN - Multicore Solders
XLAN - Complexx Systems
XL-TC - Brand-Rex
X-OLENE - Okonite
X-STATIC - Illinois Lock
XTRADUR - Hexacon Elec.
XTRA•GUARD - Alpha Wire
XTRALITE CASES - Diversified Case
X-VAR - Fidelity Chem. Prods.
XYMOX - Brady, W. H.
YELLOW JACKET - Sprague Elec.
YELLOW 77 - Ideal Industries
YEW - Yokogawa of America
YEWFLO - Yokogawa of America
YIELD MAX - Monsanto
YODAC - Yokogawa of America
ZAP STRAP - International Instrumentation
ZEBRA - Data Specialties
ZEBRA - Tecknit (Eastern Facility)
Z EIGHT SMART CARD - VersaLogic
ZELRAD - Judd Wire
ZEN - Zenrad Circuits
ZEPHER - Berkeley Nucleonics
ZEPPELIN - Alan Gordon Entprs.
ZERO AMP - Spectra Sonics
ZERO CENTURION - Zero
ZERODUR - Schott Glass Technologies
ZERO-FLOW - Engelhard
ZERO-HALLIBURTON - Zero
ZEROMATIC - Beckman Instrs.
ZERO-PLY - Zero
ZERO QUIP - Zero
ZERO-SPACE SERIES - Zero
ZERO-TRAK - Zero
ZESTRON - COSAR
ZETABON - Dow Chemical
ZIFCON - MOLEX
ZIFTAC - Hypertronics
ZIP - Textool Products
ZIPCON - MOLEX
ZIP DIP - Textool Products
ZIP DIP - 3M-Electronic Products
ZIP-EX-2 - Chomerics
ZIP-IN - Equipto
ZIP-LOC - Deutsch Fastener
ZIPPERTUBING - Zippertubing
ZIP STRIP - Textool Products
ZIP STRIP - 3M-Electronic Products
ZIP SYS. - Automation Dynamics
ZIPTAPE - Zippertubing
ZITEX - Norton Chemplast
Z-LINE - Pulizzi Engineering
ZORB - General Semiconductor Ind.
ZT - Zippertubing
Z-TROL - Electron-Machine
ZYINDEX - Zylab
ZYP - ZyMOS
0-CON - Wavetek Rockland Scientific
020BUG - Motorola Semiconductor Prods.
1500XP - Photodyne
1800A/B - Photodyne
4-PAC - Avantek
800 DIPSERT IC BASE - Solder Removal

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
AAK Corp.	601	Acurex-Autodata	602	Advanced Input Devices	603	Alarm Controls	605
Abacus Controls Inc.	601	ADAC Corporation	602	Advanced Interconnections Corp.	603	Alberox Corp.	605
Abbott Transistor Labs.	601	Adaptive Intelligence	602	Advanced Sys. Concepts, Inc.	603	Alco Elctrn. Prods., Inc.	605
Abbott Transistor Labs.	601	Adatek, Inc.	602	Austin Electronics	620	Alden Elctrns., Inc.	606
Abbott Transistor Labs.	601	ADC Magnetic Controls Co.	602	Ad-Vance Magnetics, Inc.	603	Alden Products Co.	606
ACC Electronics	601	Addelco Corp.	602	Aerospace Optics Inc.	604	Alden Sys.	606
Accessories for Elctrns.	601	Additive Products Div.	602	AES Corp.	604	Algo, Inc.	606
Accuprobe, Inc.	602	Afil Datatrol	604	Aetna Engrg.	604	Allen Avionics, Inc.	606
Accurassembly	602	Afil Datatrol	604	Aiphone	604	Allen-Bradley Co.	606
ACDC Electronics	602	Advance Conversion Devices Co.	603	AirBorn, Inc.	604	Allen, Robert G., Co., Inc.	607
Acopian Corp.	602	Advanced Automation Concepts	603	Air Electro Supply, Inc.	604	Allied Systems Corp.	607
Acromag	602	Advanced Circuit Technology	603	Airflyte Elctrns. Co.	604	All-States	607
Action Instrs.	602	Advanced Coatings & Chem.	603	Airpax Corporation	604	Alltech Assocs., Inc.	607
Action Instrs.	602	Advanced Color Technlg.	603	Air-Vac Engrg.	605	Alpha Inds., Inc.	607
Active Control Instrmn.	602	Advanced Electronic Packaging	603	Akro-Mils	605	Alpha-M-Corp.	607

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Alpha-M Corp.	607	American Elctrns	608	Amtek Sys., Inc.	611	Applied Communications	613
Alpha Products, Inc.	607	American HV Test Systems, Inc.	608	Amuneal Mfg.	611	Applied Control	613
Alpha Wire Corp.	607	American Insulated Wire Corp.	608	Analog Devices	612	Applied Electro Technlg., Int.	613
Alps Electric (USA), Inc.	607	American Laser Sys., Inc.	608	Analogic Corp.	612	Applied Engrg. Prods.	613
Aluminum Filter	607	American Microsemiconductor	608	Analog Modules, Inc.	612	Applied Research Inc.	614
Amco Engrg. Co.	608	American Research & Engineering	608	AND	612	Applied Solar Energy Corp.	614
Amdahl Communications Sys. Div.	608	American Switch Corp.	608	Anderson Elctrns., Inc.	613	A P Products Incorporated	614
Amecon, Inc.	608	American Tech. Ceramics	609	Andersen Labs., Inc.	613	Aptronics Corporation	614
AME Corp.	608	American Zettler	609	Anderson Power Prods.	613	Arcolectric Corp.	614
Amerex	608	Amlan Inc.	609	Ango Electronics Corp.	613	ARC Systems, Inc.	614
American Aerospace Controls	608	AMP Products Corp.	610	APA Division	613	ARGA Controls	614
American Automation	608	AMP Incorporated	610	A. P. Circuit Corp.	613	Argos Prods.	614
American Computer Hardware	608	Amplifier Research	611	Apex Microtechnology Corp.	613	Aries Elctrns., Inc.	614
American Cyanamid Co.	608	Amprobe Instr.	611	Apollo Magnetics Corp.	613	Ark Elctrns. Corp.	615
American Cyanamid Co.	608	Amptek, Inc.	611	Appleton Papers Inc.	613	Armiger & Assocs., Inc.	615

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Armtec Industries, Inc.	615	A-Systems Inc.	619	Automated Prod. Equip. Corp.	620	AVX Corporation	621
Arnold Magnetics	615	A T & T	619	Automatic Coil Corp.	620	Axiom Corp.	621
Aromat Corp.	615	Athena Controls, Inc.	619	Automatic Connector	620	Axis, Inc.	621
Arra Inc.	616	Atlantic Scientific Corp.	619	Automatic Timing & Controls Co.	620	Aydin Microwave	621
Arrow Hart Div.	616	Atlas Energy Sys.	619	Autosplice, Inc.	620	Babcock Inc.	621
Arstan Products Intl. Ltd.	617	Atlas Sound Div.	619	Auto-Swage Prods., Inc.	620	Bailey Controls Co.	621
Ashland Chemical Co.	617	Atlee Inc.	619	Auto-trol Tech.	620	Bailey Controls Co.	621
Asmann Components	617	Atmosphere Controls Prods.	619	Avantek, Inc.	620	Bailey Controls Co.	621
A. S. R. Servotron, Inc.	617	ATR Elctrns., Inc.	619	Avantek, Inc.	620	Ballantine Labs.	621
Assem-Pro Instrs.	617	ATV Research, Inc.	619	Avantek, Inc.	620	Ball Electronic Display Div.	622
Associated Circuits Inc.	617	Audiosone Inc.	619	Avel-Lindberg Inc.	620	Balzers Optical Grp.	622
Associated Spring, Barnes Grp.	618	Augat Inc.	619	Avex Electronics	620	B & B Motor & Control Corp.	622
Astec USA, Ltd.	618	Augat Fiberoptics	619	Avibank Mfg.	620	B & K Precision Prod. Grp.	622
Astron Corp.	618	Ault, Incorporated	619	Avionic Instrs. Inc.	621	Barksdale Controls Div.	622
Astrosystems Inc.	618	Austron Inc.	620	Avtel Div., Unitron Inc.	621	Barnes & Reinecke, Inc.	622

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Barncs Engrg. Co.	622	Belting Inds. Co., Inc.	626	BLH Elctrns.	627	Bren-Tronics, Inc.	631
Barnes Engrg. Co.	622	Bently Nevada Corp.	626	Bliley Elec. Co.	627	Bren-Tronics, Inc.	631
BASF Sys.	623	Berkeley Nucleonics Corp.	626	Blue M, A Unit of General Signal	628	Brevel Motors Inc.	631
Basic Measuring Instrs.	623	Bertan Assocs.	626	Bodine Elec. Co.	628	Briggs, C. A., Co.	631
BBC-Metrawatt/Goerz	623	Bertsch U.S.	626	Boonton Elctrns. Corp.	628	Brim Elctrns.	631
B-D Crystal Entprs., Inc.	623	B-G Instruments	626	Bosch, Robert, Corp.	628	Bristol Saybrook	631
Beau Products Div.	623	B. H. Elctrns.	626	Boschert Inc.	628	Brooks Instr. Div.	631
Behlman Engrg. Corp.	624	Bikor	627	Boston Systems Office	629	Bruel & Kjaer Instrs. Inc.	631
BEI Motion Systems Co.	624	Bio-Imaging Research	627	Bourns, Inc.	629	Brush Magnetic Heads	631
Belden	624	Biospherical Instrs., Inc.	627	Bowmar/ALI	630	Bubbl-Tec	631
Bel Fuse	625	Bird Elctrn.	627	Brady, W. H., Co.	630	Buckeye Stamping Co.	631
Bell, Floyd, Assocs., Inc.	625	EG&G Birtcher	666	Brailsford & Co.	630	Buehler Prods., Inc.	632
Bell, F. W., Inc.	625	Bivar, Inc.	627	Brand-Rex	631	Bumper Products	632
Bell Inds.	625	BLACK BOX Corp.	627	Braxton Mfg.	631	Burgess Switch Co.	632
Bellofram Corp.	626	Blatek Inds., Inc.	627	Breeze-Illinois, Inc.	631	Burleigh Instrs.	632

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Burr-Brown	632	C & K Comps.	634	CHEM-MIXX Corp.	637	Clarostat Mfg.	640
Bussco Engrg.	632	Canyon Elctrns.	635	Chemtronics Inc.	638	Clauss Cutlery Co.	640
Bytex Corp.	632	Capar Components Corp.	635	Cherry Electrical Prods. Corp.	638	Clifton Precision	640
Caddock Electronics, Inc.	633	Carbone USA Corp.	635	Chessell Corp.	638	Coastcom	640
Calibron Instrs.	633	Sohio Engineered Mtls. Co.	783	Chicago Laser Systems, Inc.	638	Codenoll Technology Corp.	641
California DC	633	Carol Cable Co., Inc.	636	Chomerics	638	Codenoll Technology Corp.	641
California Eastern Labs. Inc.	633	Carpenter Mfg. Co., Inc.	636	Chorus Data Systems	638	Codenoll Technology Corp.	641
California Instruments	633	Carter Mfg.	636	Chorus Data Systems	638	Codenoll Technology Corp.	641
California Microwave	633	Carter Motor	636	CHR Inds.	638	Codenoll Technology Corp.	641
Calmark Corp.	633	Caton Connector Corp.	636	Christie Elec. Corp.	638	Cohu	641
Cal-Power Corp.	634	Elgin Electronics	673	Chrono-log Corp.	638	Cole Hersee	641
Cal-R, Inc.	634	Celesco Transducer Prods., Inc.	636	Cincinnati Sub-Zero	638	Cole Instr. Corp.	641
Cambridge Digital Sys.	634	Ceramaseal	637	Cipher Data Prods., Inc.	638	Colorado Crystal Corp.	641
C.A.M. Graphics Co.	634	CGTI	637	Clairex Elctrns.	640	Compac	642
C.A.M. Graphics Co.	634	Chartpak	637	Clare Division	640	Component Research Co., Inc.	642

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
CompuPro	642	Conklin Instr. Corp.	644	Crosspoint	648	Cybernetic Micro Sys.	651
Comp-U-Staff	642	Connor-Winfield Corp.	644	Crouzet Controls, Inc.	648	CYTEC Corp.	651
Computer Cable & Prods. Inc.	642	Conrac Div.	644	CSI Capacitors	648	Daburn Elctrns. & Cable	651
Computer Cable & Prods. Inc.	642	Consolidated Electronic Wire & Cable Corp.	644	C-Tek, Inc.	649	Daico Inds., Inc.	651
Computer Cable & Prods. Inc.	642	Contact Electronics Inc.	644	CTS Corp.	649	Dai-Ichi Shoji of Amer., Inc.	651
Computer Conversions Corp.	643	Controlled Envir. Equip. Corp.	645	CTS Corp., Berne Div.	650	Dai-Ichi Shoji of Amer., Inc.	651
Computer Dynamics	643	Controlled Power Co.	645	CTS Fabri-Tek, Inc.	650	Dai-Ichi Shoji of Amer., Inc.	651
Computer Maintenance Corp.	643	Control Prods. Div.	645	CTS Fabri-Tek, Inc.	650	Dale Electronics, Inc.	651
Computer Power Inc.	643	Control Sciences, Inc.	645	Cuplex, Inc.	650	D & B Power, Inc.	653
Computer Products, Inc.	643	Control Technology	645	CurrenTechnology Corp.	650	DataCon, Inc.	653
Computer Products, Inc.	643	Converter Concepts, Inc.	645	Curtis Instrs., Inc.	651	Data Delay Devices, Inc.	654
Computer Products, Inc.	643	Cooner Wire Co.	645	Custom Cable	651	Datametrics • Dresser Inds.	654
Comstron Corp.	643	Coors Porcelain	645	Custom Control Sys.	650	Datapower, Inc.	651
Concord Data Systems	644	Corcom, Inc.	645	Custom Sci. Instrs.	651	Data Specialties, Inc.	655
Condor Systems, Inc.	644	Cromemco	648	Cybernetic Micro Sys.	651	Data Tech, Div. of Penril Corp.	655

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Datel	655	DGS Assocs.	658	Dixson, Inc., Instrument Div.	661	Dynamics, Div. of Waugh Controls Corp.	663
Datron Sys.	655	Dianachart Inc.	659	Dontech Inc.	661	Dynatech Corp.	663
Datum Inc.	655	Di/An Controls, Inc.	659	Doran Mfg. Co.	661	Dynatech Corp.	663
Davong Systems, Inc.	656	Dielectric Labs.	659	Doran Mfg. Co.	661	Dynatec International	663
Daytronic Corp.	656	Digelec, Inc.	659	Dow Corning Corp.	661	Dynatronix, Inc.	663
DCI, Inc.	656	DigiMax Instrs. Corp.	659	Dow-Key Div., Kilovac Corp.	661	Dynatronix, Inc.	663
Deak Technology	656	Digital Graphic Sys.	659	Drake, R. L., Co.	661	Dynatronix, Inc.	663
Dearborn Wire & Cable Co.	656	Digital Products, Inc.	659	Dranetz Technologies, Inc.	661	Dysan Corp.	663
dek, inc.	656	Digital Media	659	Dreefs Switch, Inc.	662	Dzus Fastener	663
DEL Elctrns. Corp.	656	Digitran Co.	659	Dreefs Switch, Inc.	662	Eagle Magnetic Company, Inc.	663
Delta Electronic Ind. USA	657	Dionics	659	Dukane Corp.	662	EAO Switch Corp.	663
Deltron, Inc.	658	Distributed Computer Sys.	660	DY-4 Systems, Inc.	663	E-A-R Div.	664
Dennison Kybe	658	Distributed Logic Corp. (DILOG)	660	Dylon Data Corp.	663	EASCO/K-D Tools	664
Densitron Corp.	658	Diversified Technlg.	660	Dylon Data Corp.	663	Eastern Air Devices Motor Div.	664
Deutsch Fastener	658	Diversified Technlg.	660	Dynamics, Div. of Waugh Controls Corp.	663	Eaton Corp.	664

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Eaton Corp.	664	EIP Microwave Inc.	667	Electrol Co.	669	Elctrn. Precision Comps.	671
Eberhard Mfg. Co.	664	Elantec, Inc.	667	Electrol Co.	669	Electronic Research Co.	671
ebm Inds., Inc.	664	Elcom Systems, Inc.	667	Electro-Magnetic Processes, Inc.	669	Electronic Solutions	671
Eby Co.	665	Eldec Corp.	667	Electromatic Controls Corp.	669	Electronic Space Sys. Corp.	671
ECO Instrs. Div.	665	Electrac, Inc.	667	Electro Mechanical Design Services, Inc.	669	Electronic Specialty Div., ElecSpec. Corp.	671
Ectron Corp.	665	Electrical Instr. Svc.	667	Electro-Mechanisms	669	Electronized Chemicals Co.	671
Edac Inc.	665	Electro-Craft Corp.	668	Electro-Mech Comps.	669	Electro-Optical Inds.	671
EECO Incorporated	665	Electrocube	668	Electronic Components Groupe	669	Electro Scientific Inds.	671
EFRATOM, a div. of Ball Corp.	666	Electrodynamics, Inc.	668	Electronic Concepts, Inc.	669	Electro-Space Fabricators, Inc.	671
EG & G Almond Instruments	666	Electro-Dynamics Dev. Co.	668	Electronic Controls Design	670	Electro Switch Corp.	672
EG & G Gamma Scientific	666	Electrofilm	668	Electronic Dev. Corp.	670	Electro Vector, Inc.	672
EG & G Reticon	666	Electro Impulse	668	Elctrn. Devices	670	Electrovert, Inc.	672
EG & G Rotron	666	Electro Industries	668	Electronic Instr. & Specialty	670	Elfab Corp.	672
EG & G Rotron	666	Electrol Co.	669	Electronic Measurements Inc.	670	Elgar Corp.	672
EG & G Wakefield Engrg.	667	Electrol Co.	669	Electronic Navigation Inds.	671	Elgenco, Inc.	672

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Elmwood Sensors Inc.	673	Enerco, Inc.	675	ETI Systems	677	FCM Plastics	679
Elpac Comps.	673	Engineered Comps. Co.	675	ETM Electromatic	677	Fema Elctrns. Corp.	679
Elpac Power Sys.	673	Engineered Prods. Div. of Acme Elec. Corp.	675	ETRI	677	Fenwal Elctrns.	679
Eltec Instrs.	674	ENI Power Sys.	675	Eubanks Engrg.	677	Ferretec Inc.	679
Eltec Instrs.	674	Entech Systems, Inc.	675	Eubanks Engrg.	677	Ferro	679
EMCA	674	Entran Devices, Inc.	675	EWC, Inc.	678	Ferrotran Elctrns. Co., Inc.	680
EMCO High Voltage Co.	674	Epoxy Technology, Inc.	675	Exact Electronics	678	FIC Corp.	680
Emcor Products	674	Epsco, Inc.	675	Exar Integrated Sys.	678	Fifth Dimension, Inc.	680
Emerson, Indl. Controls Div.	674	Equipto Elctrns. Corp.	675	Exatron Automatic Test Equip.	678	Fil-Coil Economy Intl., Inc.	680
EMICO Inc.	674	Erni Comps. Corp.	676	Fabricast	678	Filter Concepts Inc.	680
E/M Lubricants, Inc.	674	ESC Elctrns. Corp.	676	Fairchild Microprocessor Div.	679	Filtron Co., Inc.	680
Empro Mfg. Co., Inc.	674	Estes Engrg. Co.	676	Fairchild Weston, Data Recorders	679	Fincor	680
Enclosure Corp.	674	E-Systems	676	Fair-Rite Prods.	679	First Computer Corp.	680
Endevco	674	E-T-A Circuit Breakers	676	Faria, Thomas G., Corp.	679	Fischer-America Inc.	680
Endicott Resch. Grp., Inc.	674	ETI Electronics	677	Fasco Industries, Inc.	679	Flex-Core Div.	680

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Flex-Key Corp.	680	Fujitsu America, Inc.	682	Genisco Memory Products Corp.	685	Greenray Inds., Inc.	689
Floating Point Sys.	680	Furman Sound	683	Gentron Corp.	685	Greibach Instrs. Div.	689
Fluke, John, Mfg. Co.	680	Gamma High Voltage Resch.	683	Georator Corp.	686	GRIM Corporation	689
FMC Corp.	681	GAP Instr.	683	GGB Inds., Inc.	686	GSI Corp.	689
Foredom Elec. Co.	681	Gardiner Solder Co.	683	Gilway Technical Lamp	686	GTE Microcircuits	689
Fox Elctrns.	681	Gemini, Inc.	684	Gimix, Inc.	686	GTE Sys.	690
Franek, John, Co., Inc.	681	General Devices Co., Inc.	684	Gimix, Inc.	686	Antex Div.	613
Frederick Components	682	General Electric Co.	684	Glassman High Voltage Inc.	686	Guardian Electric Mfg.	690
Freed Transformer Co., Inc.	682	General Filter Prods. Div./ AMF Cuno	679	Golden Pacific Electronics	686	Hacker Instrs.	690
Frequency Control Prods., Inc.	682	General Inds.	684	Gordos Corp.	687	Hamlin, Inc.	690
Frequency Devices, Inc.	682	General Instr.	684	Gore, W. L., & Assocs., Inc.	687	Hammond Mfg. Co.	691
Frequency Elctrns.	682	General Microwave Corp.	685	Gould Inc.	687	Hampton Prods.	691
Frequency Selective Networks	682	General Resistance, Inc.	685	Granger Assocs.	688	H & T Components Inc.	692
Fresnel Optics	682	General Robotics Corp.	685	Graphite Metallizing Corp.	688	Harrel, Inc.	692
Fujitsu America, Inc.	682	Genicom Corp.	685	Grayhill, Inc.	689	Hartman Sys.	692

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Hasco Comps., Inc.	692	Hitachi Denshi America Ltd.	695	Humphrey, Inc.	697	Image Makers of Pittsford	699
H-A-Z Laboratories	692	Hi-Tech, Inc.	695	Hybricon Corp.	697	Image Technlg. Methods Corp.	699
HDS Inc.	692	Hitran Corp.	695	HyComp Inc.	697	IMC Magnetics Corp.	699
HDS Inc.	692	HMW Enterprises Inc.	695	Hydrocap Corp.	697	Inconix Corp.	700
Headway Resch., Inc.	692	Hobart Engrg.	695	Hypertronics Corp.	697	Inconix Corp.	700
Heat Systems-Ultrasonics	692	Hobson Bros.	695	Hytek Microsystems Inc.	698	Inductive Prods. Inc.	700
HEI, Inc.	692	Holaday Industries, Inc.	696	ICS, Inc.	698	Industrial Computer Designs	701
Hellesens Battery Engrg., Inc.	693	Holmberg Elctrns. Corp.	696	Ideal Precision Meter	698	Industrial Control Co.	701
Heraeus-Volkert Inc.	693	Honeywell Info. Sys.	696	IEC Corporation	698	Industrial Devices, Inc.	701
Hewlett-Packard Co.	693	Honeywell Optoelectronics	696	IERC	698	Industrial Elctrn. Engrs., Inc.	702
Hexacon Elec. Co.	694	Hopkins Engrg.	696	IET Labs, Inc.	699	Industrial Elctrn. Hardware	702
Heyco Molded Products	694	Hottinger Baldwin Measurements	696	ILC Data Device Corp.	699	Industrial Test Equip. Co.	703
Hipotronics	694	Hughes Aircraft Co.	696	Illinois Capacitor, Inc.	699	Inficon Leybold-Heraeus, Inc.	703
Hiram Jones Elctrns.	695	Hugin Inds. Inc.	697	Illinois Lock Co.	699	Infocap, Inc.	703
Hisonic, Inc.	695	HumiSeal Div.	697	Image Graphics, Inc.	699	Infodex, Inc.	703

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Information Transfer Indl.	703	Interface Engrg.	705	Inter-Technical Grp., Inc.	706	Janco Corp.	710
Information Transfer Indl.	703	Interlok	705	Intronics, Inc.	707	Jan Hardware Mfg. Co., Inc.	710
Infosphere, Inc.	703	Inter-Market, Inc.	705	IEI-Iskra Electronics, Inc.	698	JBM Electronics, Inc.	711
Injectorall Elctrns. Corp.	703	International Comps. Corp.	705	ISL Products Intl. Ltd.	707	J-B-T Instrs., Inc.	711
Inland Motor, Specialty Prods.	703	International Crystal Mfg. Co.	705	Isotemp Research, Inc.	707	JDK Controls, Inc.	711
Inmos Corp.	703	International Electro-Magnetics	705	Itek Measurement Sys.	707	Jensen Tools, Inc.	711
Instrulab Inc.	704	International High Voltage Elctrns., Inc.	705	ITT Cannon	707	Jerome Industries Corp.	711
Instruments for Industry, Inc.	704	International Instruments	706	ITT Comps.	708	Jettron Prods. Inc.	711
Instrument Specialties Co., Inc.	704	International Mfg. Svcs.	706	Jennings	711	Jewell Electrical Instrs., Inc.	712
Integrated Circuits Inc.	704	International Microelectronic Prods.	706	ITT Pomona Electronics	709	JFW Inds., Inc.	712
Integrated Computer Sys.	704	International Microsystems	706	ITT Schadow	709	JMJ Technical Prods., Inc.	712
Interactive Computer Products	705	International Sensor Systems	706	ITW Switches	709	JMK, Inc.	712
Interconnection Technology, Inc.	705	International Transducer	706	Iwatsu Instruments, Inc.	710	JM Transformer Co., Inc.	712
Interdesign, Inc.	705	Interoptics	706	IXYS Corp.	710	Jobmaster Corp.	712
Interelectronics Corp.	705	Interswitch	706	James Electronics	710	Johanson Dielectrics, Inc.	712

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Johanson Mfg. Corp.	712	Kay Elemetrics Corp.	714	KeyTek Instr. Corp.	718	Kulite Semiconductor Prods.	720
Jori Resources	713	KDI Electronics, Inc.	714	Kikusui Intl. Corp.	718	Kulka/Smith Inc.	720
JSC Wire & Cable	713	KEC Elctrns., Inc.	714	Kilovac Corp.	719	Kurz Instrs.	721
Judco Mfg. Inc.	713	Keene Ray Proof	714	Kinemetrics, Inc.	719	Laakmann Electro-Optics	721
Judd Wire	713	Kel-Am	715	Kinetic Sys.	719	Lambda Electronics	721
Julie Resch. Labs. Inc.	713	Keltec Florida	715	Kistler-Morse	719	Lambda Semiconductors	721
Kahgan Elctrns. Corp.	713	Kelvin	715	KLC/Karl Lambrecht Corp.	719	Landis & Gyr, Inc.	721
Kaiser Systems, Inc.	713	Kemet	715	KMC Systems Inc.	719	Lansing Research Corp.	721
Kalmus & Assocs., Inc.	714	Kenco Inds., Inc.	716	KOA Speer Elctrns.	719	Laser Inc.	722
K&L Microwave, Inc.	714	Kepco, Inc.	717	Kole Ind.	720	L-Com Inc.	722
K & M Elctrns., Inc.	714	Kessler-Ellis Prods.	717	Kollmorgen Corp., Industrial Drives Div.	711	LDJ Incorporated	722
Kappa Networks Inc.	714	Kester Solder	717	Kollsman Instr.	720	Leach Corp.	722
Karkar Electronics	714	Keyan Inds., Inc.	718	KR Electronics, Inc.	720	Leach Corp.	722
Kavlico Corp.	714	Keystone Carbon Co.	718	Krohn-Hite Corp.	720	LEA, Inc., A Dynatech Co.	722
Kaye Instruments, Inc.	714	Keystone Elctrns. Corp.	718	Krystinel Corp.	720	Lear Siegler, Inc.	722

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Ledex Inc.	723	Linear Technology Inc.	725	Macrodyne	727	Manage, Inc.	729
Leecraft Mfg. Co. Inc.	723	Line Elec. Prods.	725	Macro Electronics Corp.	727	M & T Chemicals Inc.	729
Leeds & Northrup Instrs.	724	Linseis Inc.	725	Magnavox Advanced Prods & Sys	718	Mantex Corp.	729
Leepoxy Plastics	724	Littelfuse, Inc. (Electronic Div.)	725	Magnecraft Elec. Co.	727	Marconi Instrs.	729
Lemo U.S.A. Inc.	724	Litton Applied Technology	726	Magnetek	727	Markat Div.	729
Lenco Elctrns., Inc.	724	Litton Encoder Div.	726	Magnetic Instrumentation Inc.	727	Markenrich Corp.	729
Lenox Laser	724	LNR Communications, Inc.	726	Magnetico Inc.	728	Marquardt Switches Inc.	729
Lestronics, Inc.	724	Locus	726	Magnetic Shield Div.	728	Marway Prods. Inc.	730
Lexidata Corp.	724	Logitek Inc.	726	Magnetic Technology	728	Materials Resch.	730
LH Research, Inc.	724	Lorain Prods.	726	Magnum Elec.	728	Math Assocs.	730
Liberty Controls, Inc.	724	LuTechnology, Inc.	726	Recyclene Products	768	Math Assocs.	730
Lightning Protection Corp.	725	Lyn-Tron, Inc.	727	Maida Development Co.	728	Matrix Corp.	730
Lincoln Laser Co.	725	Mabuchi Motor America Corp.	727	Malco	728	Matrix Sys. Corp.	730
Lindgren R. F. Enclosures, Inc.	725	Machine Components Corp.	727	Mallory Capacitor Co.	728	Matrox Elctrn. Sys.	730
Linear Technology Corp.	725	Mac Panel Co.	727	Mallory Timers	729	Maurey Instr. Corp.	730

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
maxon DC motor		MEISSNER		μA		MTI	
Maxon Precision Motors, Inc.	731	Meissner Inds.	733	Microavionics	735	Micro Technology, Inc.	737
mc		melcor		STATNETICS INC.		Microtest	
McCoy Electronics Co.	731	Melcor/Materials Elctrn. Prods.	733	Microcap	735	Microtest Systems, Inc.	737
MCE		MELLES GRIOT		MICROCAP			
MCE Semiconductor	731	Melles Griot	733	Microcap	735	Microtran Co. Inc.	737
MCG		MEL TEC A DIVISION OF ERSCO INC.		MCT			
MCG Elctrns.	731	Mel Tec	733	Micro Component Technlg., Inc.	735	Microtran Co. Inc.	737
McGILL ENGINEERED SWITCHES				μd		MAG	
McGill Mfg. Co., Inc.	731	Memodyne Corp.	733	Micro Digital Assocs., Inc.	735	Microwave Applications Grp.	737
MCL INC. LAGRANGE ILL.		Memory Protection Devices inc.		Micro Electronic Systems Inc.		MFC MICROWAVE FILTER COMPANY, INC.	
MCL Inc.	731	Memory Protection Devices, Inc.	733	Micro Electronic Sys., Inc.	735	Microwave Filter Co., Inc.	737
McLEAN MIDWEST SUBSIDIARY OF ZERO CORPORATION		Mepco//Electra A NORTH AMERICAN PHILIPS COMPANY		MLC		MSC	
McLean Midwest	732	Mepco/Electra, Inc.	733	Micro Logic Corp.	735	Microwave Semiconductor Corp.	737
3M		MERET, inc.		Micro Mo		M/S	
3M-Electronic Products Division	732	MERET, Inc.	734	Micro Mo Electronics, Inc.	735	Microwave/Sys.	737
3M		MERIX®		micronel®		NEL Unit MIDLAND ROSS	
3M Co., Static Control Sys. Div.	732	Merix Chem. Co.	734	Micronel U.S.	735	Midland-Ross Corp.	737
MDB		W		Ω		NEL Northern Engineering Laboratories Inc	
MDB Sys.	732	Methode Electronics, Inc.	734	Micro-Ohm Corp.	736	Midland-Ross Corp.	737
		METROSONICS		MICROPLEX, INC.		MCI	
MDF Products Inc.	732	Metrosonics	734	Microplex, Inc.	736	Midwest Comps.	738
MS		mcl		MICROSONICS			
Measurement Sys., Inc.	732	Metuchen Capacitors, Inc.	734	Microsonics Inc.	736	MIL Electronics, Inc.	738
UNIMEC		MF		MICRO SWITCH a Honeywell Division		M	
MEC A/S	732	MF Elctrns. Corp.	734	Micro Switch	736	Millen Components	738
MEI		MG		MICRO/SYS			
Mechanical Entprs.	732	MG Electronics	735	Micro/Sys.	737	Millivac Instrs., Inc.	738
		M M		MTI MICRO-TECHNICAL INDUSTRIES		MILROSS	
Mechanized Electronic Assembly	733	Michigan Magnetics, Inc.	735	Micro-Technical Inds.	737	Milton Ross Co.	738

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Milwaukee Resistor Corp.	738	Motion Control Devices, Inc.	740	Namco-Leuze; A Namco Controls Affiliate Co.	745	New-Tone Electronics, Inc.	747
Mini-Circuits Lab.	739	Motorola, Inc., Components Div.	741	Natel Engrg. Co., Inc.	745	NIC Components Corp.	747
Mini Computer Technlg.	739	Motorola Semiconductor Prods.	741	National Controls Corp.	745	Nichicon (America) Corp.	747
Mini-Systems, Inc.	739	Motor-Tronics Inc.	742	National Electric Cable	745	Nicolet Paratronics	747
Mitsubishi Elctrns.	739	Motronics Corp.	742	National Instruments	745	Nitto Denko America, Inc.	747
Mizar Inc.	739	MTE Corp.	742	National Power Technlg.	745	NJE Corporation	747
MKS Instrs., Inc.	739	M-Tron Inds., Inc.	742	National Semiconductor Optoelectronics	745	NKK Switches of America, Inc.	747
Modular Devices	739	Mueller Elec. Co.	743	National Tel-Tronics	745	Non-Linear Systems/ Div. of Kaypro Corp.	748
Modular Power Sys. Inc.	739	Multi Prods. Intl.	743	National Wire & Cable Corp.	746	North American Soar Corp.	748
Modutec	739	Multiwire Div.	744	NCR Comten, Inc.	746	North Atlantic Instr. Div.	748
Mohawk Data Sciences	740	Cord Electronics, Inc.	646	NCR Comten, Inc.	746	North Hills Elctrns.	748
Monitor Prods. Co., Inc.	740	Murata Erie North America, Inc.	744	NES, Inc.	746	Nova Elec. Mfg. Co.	749
Monolithic Sys.	740	MuShield Co.	745	Netcom	746	NRD	749
Moody Tools	741	MWS Wire Inds.	745	Newman, M. M., Corp.	746	NTK Technical Ceramics	749
Morris, J. I., Co.	741	Namco Controls — An Acme-Cleveland Co.	745	Newport Electronics	746	Nu Data	749

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Numerix Corp.	749	Optimized Devices, Inc.	751	Pacific Microcomputers, Inc.	753	PCA Elctrns.	755
NWL Transformers	749	OPT Inds.	751	Pacific Power Source Corp.	753	PCB Piezotronics	755
Nytronics Comps. Group, Inc.	749	Optoelectronics, Inc.	751	Pacific Resistor Co.	753	PC Transformer Corp.	756
Oak Switch Sys. Inc.	750	Opto 22	752	PacTec Corp.	753	Pearson Elctrns. Inc.	756
Oaktron Inds., Inc.	750	Orbit Instrument of Cal.	752	Paine Instrs.	754	Penn Fibre & Spec.	756
Odell, M. P., Co.	750	Orionics, Inc.	752	Paladin	754	Penn Resch. Corp. (PRC)	756
Ohio Semitronics, Inc.	750	Osborne Transformer	752	Pamotor	754	Penn Transformer Co.	756
Ohmite Mfg. Co.	750	Oscillatek Corp.	752	Panametrics	754	Perkin-Elmer Corp.	756
Ohmtek, Inc.	750	Oshino Electric Lamp Works, Ltd.	752	Panasonic, Ind'l Electrn. Comps.	754	Permagile-Salmon Ltd.	756
Omega Engrg., Inc.	751	Oslo Controls Inc.	752	Panduit Corp.	754	Perma Power Elctrns.	756
Omnibyte Corp.	751	Otto Engrg.	752	Panel Components Corp.	755	Phalo Corp.	756
Opamp Labs, Inc.	751	Ovenaire-Audio-Carpenter	753	Pan-Magnetics Intl., Inc.	755	Philips Television Sys., Inc.	756
Optek	751	Pace Inc.	753	Paraline Transformer Corp.	755	PHI Technologies, Inc.	756
Optical Fiber Technlgs., Inc.	751	Pacer Industries, Inc.	753	Paramount Tube, Inc.	755	Phoenix Contact	756
Optima Enclosures	751	Pacific Instrs. Inc.	753	Pass & Seymour, Inc.	755	Phoenix Microsystems	757

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Photodyne Inc.	757	Potter Co.	759	Powertron	762	Preston Scientific	764
Pico Elctrns.	757	Power Components Co.	759	PPD, Inc.	762	Primeline-Soltec Distbn.	764
Piconics Inc.	757	Power Conversion Prods.	759	PPM, Inc.	762	Prime Power, Inc.	764
Piezo Elec. Prods., Inc.	757	Power Designs Inc.	760	Precicontact, Inc.	762	Princo Instrs., Inc.	764
Piezo Technology Inc.	757	Power Dynamics	760	Precision Components, Inc.	763	Probe Master, Inc.	764
Pioneer Magnetics	758	Power General	760	Precision Electrn. Comps.	763	Programmed Test Sources, Inc.	765
Pirelli Cable Corp.	758	Power Group International	760	Precision Filters	763	Projects Unltd.	765
Pittman Corp.	758	Powermark	760	Precision Resistive Prods., Inc.	763	Proteon, Inc.	765
Pittman Corp.	758	Power-One, Inc.	761	Precision Resistor Co., Inc.	763	Proteon, Inc.	765
Plastic Capacitors, Inc.	758	Power Pac Inc.	761	Precision Tech. Sewing	763	Prototek, Inc.	765
Plastiglide Mfg.	758	Power-Pak, Inc.	761	Premier Metal Prods.	763	Pulnix America, Inc.	765
PMI Motors, Kollmorgen Corp.	758	Power Products Group	762	Prem Magnetics Inc.	764	Pyle Inds., Inc.	765
PolyPhaser Corp.	759	Power-Sonic Corp.	762	Premier Microwave Corp.	764	Q-Tech Corp.	765
Portescap U.S.	759	Power Systems	762	Presidio Comps., Inc.	764	Qualidyne Sys.	765
Portescap U.S.	759	Powertec, Inc.	762	Pressure Controls, Inc.	764	Quality Thermistor	765

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Quam-Nichols Company Quam-Nichols Co.	766	Reactel, Inc.	768	RON® Res-Net Corp.	769	RIS Rochester Instr. Sys.	770
QUANTUM DATA Quantum Data Inc.	766	REEVES-HOFFMAN Reeves-Hoffman Div.	768	Rexnord Rexnord Chemical Prods. Inc.	769	ROD-L ELECTRONICS, INC. ROD-L Electronics, Inc.	771
QSI Quartic Systems, Inc.	766	Refac Elctrns. Corp.	768	RFI RFI Corporation	770	R I Roean Industries, Inc.	771
QWINT SYSTEMS Qwint Systems	766	regdon solenoids Regdon Corp.	769	RF MONOLITHICS RF Monolithics, Inc.	770	ROGAN Rogan Corporation	771
RSC Radio Switch Corp.	766	REGENT Regent Controls	769	Rhombus Inds.	770	ROGERS Rogers Corp.	771
Ram Chemicals, Div. Whittaker Corp.	766	re RE•Instruments Corp.	769	RIFA RIFA, Inc.	770	ROSE Rose Enclosures Sys., Inc.	771
RANSCO Ransco Inds., Inc.	766	LAW R. E. Law Instrument, Inc.	769	Ripley	770	ROSS Ross Engrg. Corp.	771
RAYOVAC® RAYOVAC Corporation	766	Reliability Inc.	769	GRI Risk, George, Inds.	770	ROWE Rowe Industries, Inc.	771
RAYTHEON Raytheon Ocean Sys. Co.	766	RENCO Renco Corporation	769	RMF RMF Prods., Inc.	770	RTE Aerovox Inc. FILTER DIVISION RTE Aerovox Inc.	771
RCD RCD Components Inc.	767	Renco Elctrns.	769	RMS RMS Electronics, Inc.	770	RTE DELTEC RTE Deltec Corporation	771
RC Electronics Inc. R. C. Electronics, Inc.	767	Repco Repco Incorporated	769	Roanwell	770	RTS Systems RTS Systems, Inc.	772
RCL Shallcross RCL Electronics, Inc.	767	RTI Reproduction Technologies Inc.	769	RO RO ASSOCIATES RO Assocs.	770	SAFT Saft America	772
RCL Shallcross RCL • Shallcross	767	Republic Electronics Republic Electronics, Inc.	769	ROBBINS MYERS Robbins & Meyers, Inc.	770	sage LABORATORIES, INC. Sage Laboratories, Inc.	773
RdF CORPORATION RdF Corporation	767	Republic Packaging Corp.	769	Robinson Robinson Nugent, Inc.	770	SAMARIUS Samarius, Inc.	773
RDI / Reed Devices Inc. RDI/Reed Devices Inc.	767	Resistors, Inc.	769	Robison Elctrns.	770	S & H INDUSTRIES, INC. S & H Inds.	774

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Sangamo Capacitor Div.	774	Seiko Instrs. U.S.A., Inc.	777	Shokai Far East, Ltd.	779	Skan-A-Matic	781
Sanyo Elec. Inc.	774	Sel-Rex Div.	777	Shure Bros.	779	Skydyne Div.	781
SaRonix	763	Semiconductor Circuits	777	Sidereal Corp.	779	Slaughter Co.	781
Savoy Elctrns.	775	SemiKron Intl., Inc.	765	Siemens Corp.	779	Sloan Company	782
Sawtek Inc.	775	Sensitive Research Instrs.	777	Sierracin/Magnedyne	779	SMC Software Sys.	782
Saxton Prods.	775	Sensor Electronics, Inc.	778	Sierracin/Power Systems	779	Kulka Smith, Inc.	782
Schaevitz Engrg.	775	Sensym, Inc.	778	Sigmapower, Inc.	780	SMK Elctrns. Corp., U.S.A.	783
Schroff Inc.	776	Serial Lab Prods., Inc.	778	Sigma Systems Corp.	780	Sokol Crystal Prods., Inc.	783
Scientific Columbus, Inc.	776	Servo-Tek Prods. Co.	778	Signal Transformer	780	Sola Elec. Co. Div. of General Signal Co.	783
Scientific Radiation Corp.	776	SL Waber	782	Silonex Inc.	780	Solid State Scientific	783
Scientific Technlg.	776	Shallco Inc.	778	Simpson Elec. Co.	780	Soltec Corp.	783
Scientific Technlg.	776	Shalltronix Corp.	778	Singer Co.	781	Sonnenschein Batteries Inc.	783
Seacor, Inc.	776	Shelly Associates, Inc.	778	S.I.R. Atlanta	781	Soshin Elec. Co., Ltd.	783
Seattle Computer Prods. Inc.	777	Shinano Kenshi Corp. (SKC)	779	Sitco Antennas	781	Souriau, Inc.	783
Security Plastics Inc.	777	Shogyo Intl. Corp.	779	Sjoberg, C., & Son, Inc.	781	Southco, Inc.	783

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Southern Computer Corp.	784	Stacoswitch	784	STD Microsystems	787	Sylvania Electronic Components	790
SP America Inc.	784	Staco Transpower	784	Sterling Trasformer Corp.	787	Sylvania Miniature Lighting	793
SPECO Div.	784	Stancor/Hamilton	784	Steward, D. M., Mfg. Co.	787	Symbex Corp.	793
Spectrol Elctrns.	784	Standard Energy	784	Strobe, Inc.	788	Symbicon	793
Spectronics Corp.	784	Standard Power	785	Strongbox	788	Sym-Tek Sys., Inc.	793
Spectrum Control, Inc.	784	Koep Precision	720	Structured Design, Inc.	788	Symtron Corp.	793
Spectrum Technology, Inc.	784	Standex Elctrns.	786	Struthers-Dunn, Inc.	788	Syntest Corp.	793
Spellman High Voltage Elctrns.	784	Stanford Applied Engrg.	786	St-Semicon	788	Sytek, Inc.	793
Sperry, A. W., Instrs.	784	Stanley-Vidmar	786	Suckle Corp.	788	TAFA Inc.	793
Spiricon Inc.	784	Stantron, Div. of Wyco Metal Products	786	Sullins Elctrns. Corp.	788	TA Instr. Case Co.	793
Sprague Elec. Co.	784	Star Micronics, Inc.	786	Summit Elctrns., Inc.	788	Tansitor Elctrns.	794
Sprague-Goodman Elctrns., Inc.	784	Star-Tron Corp.	787	Superior Elec. Co.	789	Tapeswitch Corp. of America	794
Square D Co.	784	Statek Corp.	787	Superior Flux & Mfg. Co.	789	Tauber Elctrns., Inc.	794
SR Engineering Inc.	785	Static Inc.	787	Switchcraft, Inc.	789	Taurus Corp.	794
Staco Energy Prods. Co.	785	Staver Co., Inc.	787	Sylvania Control Devices	790	Taylor Electronics	794

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
T-Bar Incorporated	794	Technology Dynamics	795	Tempil Div.	799	THORN EMI Gencom Inc.	802
TDJ Co., Inc.	794	Techtrol Cyclonetics, Inc.	796	Temptronic	799	THORN EMI Technology Inc.	802
TDK Corporation of America	794	Tecknit (Eastern Facility)	796	Tencor Instruments	799	TII Electronics, Inc.	802
TEAC Corp. of America	794	Tecron Industrial Prods.	796	Tenney Engrg., Inc.	799	Timber-Top	802
TEC	794	Tedea USA	796	Ten-Tec	799	Timeplex, Inc.	802
TECA	794	Tektite Corp.	796	Test & Meas. Systems, Inc.	799	TOA Electronics, Inc.	802
Teccor Elctrns., Inc.	794	Tektronix, Inc.	784	Test Probes, Inc.	799	Todd Prods. Corp.	802
Tech Labs., Inc.	795	Telebyte Technology, Inc.	796	Tettex Instruments, Inc.	799	Todd Systems	802
Techmar Corp.	795	Telectro Sys.	796	Texmate, Inc.	800	Toko America Inc.	803
Technar Inc.	795	Teledyne Micronetics	797	Textool Products	800	Torad Coil Co., Inc.	803
Technic, Inc.	795	Tel Labs, Inc.	799	Therm-O-Disc, Inc.; Sub. Emerson Elec. Co.	801	Toroid Corp. of Maryland	803
Technical Research & Mfg., Inc.	795	Telonic Berkeley	799	Thermo Elec.	801	Torotel Prods., Inc.	803
Technipower, A Penril Co.	795	Telpar, Inc.	799	Thermometrics, Inc.	801	Torotron Corp.	803
Technitrol	795	Teltone	799	Thomas & Betts	801	Torwico Elctrns. Inc.	803
Techno-Components Corp.	795	Temescal	799	Thordarson Meissner	801	Tra-Con, Inc.	803

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
TRAK Microwave Corp.	803	Trio Labs.	805	TRW Motor Div.	808	Union Carbide Corporation	812
Transamerica Delaval/ Gems Sensors Div.	804	Trio Labs.	805	TRW Optoelectronics	809	Union Carbide Corporation	812
Trans American Transformer	804	Trio-Tech Intl.	805	TRW Resistive Products Div.	809	Union Carbide Corporation	812
Transco Prods.	804	Triplett Corp. — A Penril Co.	805	TRW RF Devices Div.	810	United Chemi-Con, Inc.	812
Transducers and Systems Inc.	804	Trompeter Electronics, Inc.	806	TSD Display	810	United Elec. Controls	812
Transducer Systems, Inc.	804	TRW	806	TS Products	810	United States Testing Co., Inc.	812
Transduktor Inc.	804	TRW	806	TTE, Inc.	810	United Technologies	812
Transformation Elctrns. Corp.	804	TRW Capacitor Div.	806	Tusonix, Inc.	810	UNITRACK Div.	812
Transistor Devices Inc.	804	TRW Connector	807	Tyton Corp.	810	Unitrode Corp.	815
Transmagnetics, Inc.	804	TRW Cylindrical Connector Div.	808	Ultronix, Inc.	811	Unitron Inc.	815
Triad Power Systems	804	TRW Electronic Components Grp.	808	Ungar; Div. Eldon Inds., Inc.	811	Universal Electronics Inc.	815
Triad-Utrad	804	TRW Fiber Optic Prods., Connector Div.	808	Unibox	811	Universal Instrs. Corp.	815
Trim-Tronics, Inc.	805	TRW Inductive Products Div.	808	Unicorp	811	Universal Voltronics	815
Trio Labs.	805	TRW LSI Products	808	Unimax Switch Corp.	811	University Sound	815
Trio Labs.	805	TRW Microwave	808	Union Carbide Corporation	812	UPSystems, Inc.	815

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
U.S. Digital	815	Velonex	817	VirTis Co.	819	VTM Microwaves, Inc.	820
U.S. Toyo Fan Corp.	815	Vemaline Prods. Div.	817	Vishay Angstrohm	819	Wabash Relay & Elctrns.	820
UTE Microwave	815	Vent Rak	817	Vishay-Mann	819	Walker Scientific	821
UVP, Inc.	816	Venus Scientific, Inc.	817	Vishay Resistive Sys. Grp.	819	Wall-Able Manufacturing Corp.	821
Vaco Prods.	816	Vermont Precision Resistor	818	Vistar Corp.	819	Wall Inds.	821
Validyne Engrg. Corp.	816	Vernitech	818	Visual Communications Co.	819	Wamco, Inc.	821
Valley Electromagnetics Corp.	816	Vernitron Corp.	818	Visual Communications Co.	819	Warren-Knight Instr. Co.	821
Valpey-Fisher	816	Vernitron Piezoelectric Div.	818	Visual Communications Co.	819	Waters Mfg.	821
Vanguard Elctrns. Co.	816	Vibration Instrs. Co.	818	Visual Info. Institute	819	Wavetek Indiana, Inc.	821
Vann Instruments	816	Vibro-Meter Corp.	818	VIZ Test Equipment; Div. VIZ Mfg.	819	Wayne Kerr, Inc.	821
Varo Semiconductor, Inc.	816	Victoreen, Inc.	818	VLSI Technology, Inc.	820	Weco Electrical Connectors Inc.	821
Varta Batteries, Inc.	817	Video Automation Systems	818	Voltage Multipliers, Inc.	820	Weidmuller Terminations, Inc.	821
Vector Electronic Company	817	Viking Connectors Co.	818	Voltex	820	Weinschel Engrg.	821
Vectron Labs, Inc.	817	Viking Labs., Inc.	818	Votan	820	Wellman Thermal Sys.	821
Vega Precision Labs.	817	Virginia Plastics Co.	819	VRN International	820	Wells Elctrns., Inc.	821

LOGOFINDER DIRECTORY

Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.	Logo/Mfr.	P.No.
Wesco Electrical Co.	822	Wintek Corp.	823	Zax Corp.	824	Ziatech	824
Westinghouse Electric Corp.	822	Wilco Corp.	823	Zendex Corp.	824	Zippertubing	824
Weston Controls/Pots Div.	822	Xanadu Controls	823	Zenith Components & Sys. Grp.	824	ZI-TECH Instr. Corp.	824
Wilcoxon Resch.	823	Xico, Inc.	823	Zero Corp.	824	ZI-TECH Instr. Corp.	824
Wilmore Elctrns. Co., Inc.	823	Xsis Electronics, Inc.	823	Zeus Indl. Prods., Inc.	824	ZyMOS Corp.	824
Wiltron	823	Yellow Springs Instr.	824				

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C
CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J
JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K
kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L
LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P
PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

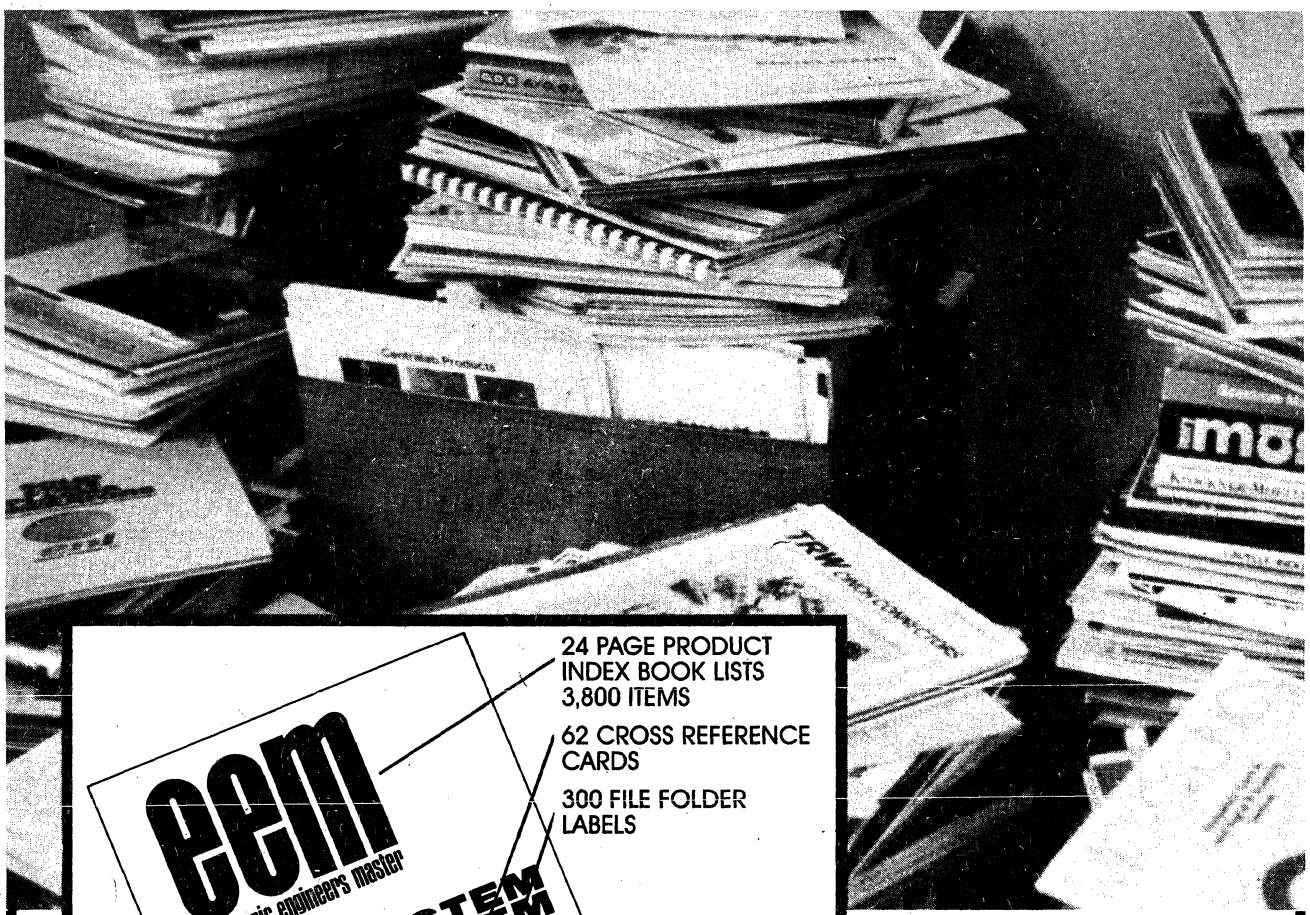
Y
YIG yttrium iron garnet

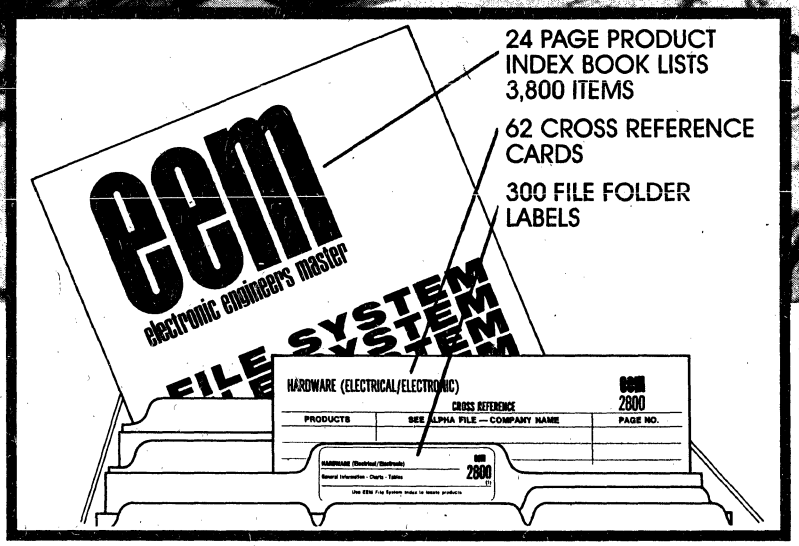
Z
ZIF zero insertion force

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844





24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS

62 CROSS REFERENCE CARDS

300 FILE FOLDER LABELS

ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

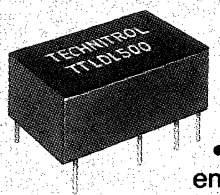
TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

Circuit timing.

Why adjust it when you can perfect it?



Let's say you've just designed the fastest, tightest digital circuit you've ever seen. But it needs a super delay line to tie into your overall scheme. Something special. Certainly high-performance.

You need Technitrol. For leading- or trailing-edge timing of any logic-based circuit.

• Only Technitrol can give you a selection of lumped-constant active delay lines with 5 ns to 2000 ns delay times that are ±1 ns or ±1% repeatable over −55° to +125°C, at rated voltage input ±10%. That's full voltage and temperature compensation!

(We aren't just telling you they perform this well—we'll put it on the part if you wish.)

• Our programmable delay lines, up to 100k ECL, give you a selection of up to 15 different delay times per module, differing by as little as 500 ps.

• Technitrol chip-carrier delay modules enable tighter board stacking and the use of vapor-phase reflow technology.

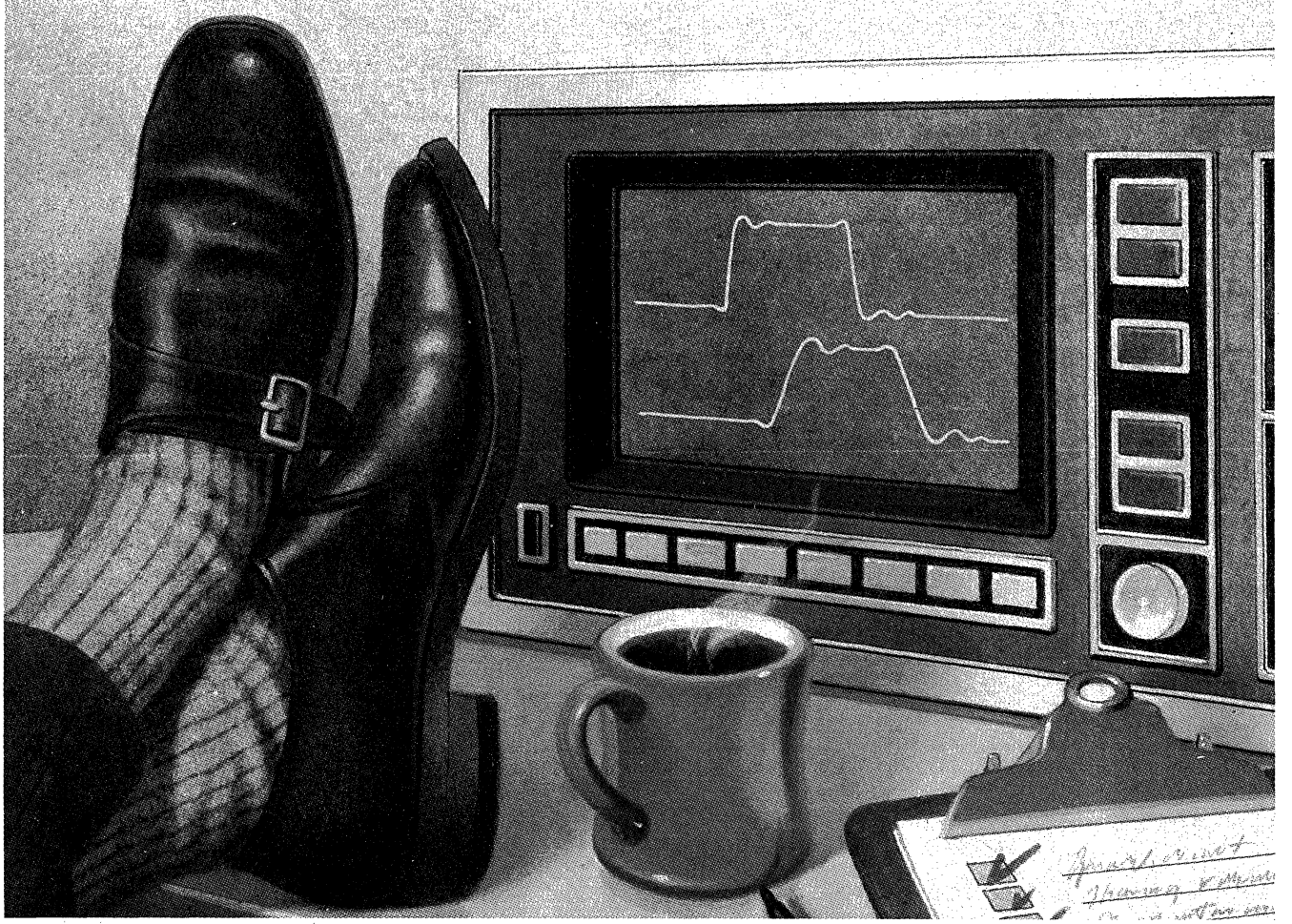
If you're really serious about quality and performance, you'll appreciate our meticulously balanced designs that produce consistent lows and highs for both positive- and negative-going logic signals. And our low failure rates are unheard of elsewhere. Who else can give you all this?

Technitrol, Inc.

1952 E. Allegheny Ave.
Philadelphia, PA 19134 USA
215-426-9105 • Telex 834245

You'll find the same performance and reliability in all of our military- and commercial-grade products. Our toughest customers demand this. You should, too.

active and passive delay lines • pulse transformers • Manchester encoder/decoders • data bus couplers • pulse-width regulators • high voltage, Scott T, and ferroresonant transformers



eem selection guide — qualified products lists-2440

"Qualified Products Lists" are issued periodically by the U.S. Government as a guide for the procurement of electronic components by government contractors. Each list contains every separately designated part that has qualified under the latest Mil. Specification for its class and the name(s) of the Manufacturer(s) of each.

EEM is publishing the names of those North American companies that are qualified producers of one or more products in each of the lists that apply to a selected group of electronic products normally cataloged in these pages. Addresses for these companies will be found in the EEM yellow pages.

For complete QPLs and update information write or call:

Naval Publications and
Forms Center
5801 Tabor Avenue
Philadelphia, PA 19120
(215) 697-3321

MIL-A6752 **FSC 6625**
Ammeters, Voltmeters, and Loadmeters; DC

Bach-Simpson Ltd.
General Electric Co.,
Cincinnati, OH
Hickok Electrical Inst. Co.
Ideal Precision Meter Co.
International Instruments Div.,
Sigma Instruments

MIL-B-81757 **FSC 6140**
Batteries and Cells, Storage Nickel-Cadmium

General Electric Co.,
Gainesville, FL
Marathon Battery Co.
Rebling Plastics Co.
SAFT America, Inc.

MIL-B-23071 **FSC 4140**
Blowers, Miniature, for cooling electronic equipment (10 to 500 CFM)

Eastern Air Devices, Inc.
EG&G Rotron, Inc.
IMC Magnetics Corp.,
Westbury, NY
TRW Motor Div.

MIL-B-5423 **FSC 5930**
Boots, Dust and Water Seal (for toggle and pushbutton switches and rotary-actuated parts)

APM Hexseal Division
Multi-Flex Seals, Inc.

MIL-C-19978 **FSC 5910**
Capacitors, Fixed, Plastic (or Paper-Plastic), Dielectric (Hermetically sealed in metal, ceramic, or glass cases)

Chicago Condenser Corp.
Sprague Electric Co.
Stone City Products Co.
TRW Capacitor Div.
West-Cap Arizona

MIL-C-915 **FSC 6145**
Cable and Cord, Electrical

Anaconda-Ericsson, Inc.,
Continental Wire & Cable
BIW Cable Systems, Inc.
Brand-Rex Company
Carol Cable Co. West
Cerro Wire & Cable Co.
Chester Cable Corp.
Collyer Insulated Wire Co.
Consolidated Products Corp.
General Cable Corp.
ITT Surprenant Div.
Marine Industrial Cable Corp.
Mohawk Wire & Cable Corp.
Monroe Wire & Cable Corp.
The Okonite Co.
Phalo Corp.
Pirelli Cable Corp.
Plastoid Corporation
Rome Cable Corporation
Times Wire & Cable Co.
Vector Cable Co.

MIL-C-7974 **FSC 5935**
Cable Assemblies and Attachable Plugs, external electrical power, aircraft

Anderson Power Products
Burton Electrical Engineering
FKC Engineering Co.
General Cable Co.,
Cornish Products Div.

MIL-C-17 **FSC 6145**
Cables, Radio Frequency: Flexible & Semirigid

Belden Electronic Wire & Cable
Cablewave Systems, Inc.
Champlain Cable Corp.
ITT Surprenant
Phalo Corp.
Plastoid Corp.
Precision Tube Co., Inc.
Saxton Products, Inc.
Storm Products Co.
Teledyne Thermatics
Tensolite Co.
Thermax Wire Corp.
Times Fiber Communications, Inc.
Uniform Tubes, Inc.

MIL-C-22442 **FSC 5965**
Cable Assembly, Aircraft Audio

Astrocom Electronics, Inc.
Hiltronics Corp.
Telephonics

MIL-C-13777 **FSC 6145**
Cable, Special Purpose

BIW Cable Systems, Inc.
Brand-Rex Company
Rome Cable Corp.
ITT Surprenant

MIL-C-55681 **FSC 5910**
Capacitors, Chip, Multiple Layer, Unencapsulated, Ceramic Dielectric

American Technical Ceramics
AVX Ceramics Corp.
Monolithic Components Corp
Republic Electronics Corp.
San Fernando Electric Mfg. Co.
Sprague Electric Co.
Union Carbide Corp., Greenville, SC
Unitrode Corp.
U.S. Microtek Components
Vitramon Inc.

MIL-C-83439 **FSC 5910**
Capacitors, Fixed, Feedthrough, EMI Suppression, (AC, DC, and AC-DC, Hermetically Sealed in Metal Cases)

Murata Erie, Canada
Sprague Electric Co.

MIL-C-27287 **FSC 5910**
Capacitors, Fixed, Plastic Dielectric, DC (Nonmetallic Cases)

Mepco/Electra Inc., Columbia, SC
Midwec Corp.
San Fernando Electric Mfg. Co.
TRW Capacitor Div.

MIL-C-55514 **FSC 5910**
Capacitors, Fixed, Plastic (or Metallized Plastic) Dielectric, in Nonmetal Cases

Electronic Concepts, Inc.
Sprague Electric Co.
Union Carbide Corp., Greenville, SC

MIL-C-39022 **FSC 5910**
Capacitors, Fixed, Metallized, Paper-Plastic Film, or Plastic Film Dielectric, DC and AC (Hermetically Sealed in Metal Cases)

Acushnet Capacitor Co., Inc.
Alissa Manufacturing Co.
Components Research Co., Inc.
Sprague Electric Co.
TRW Capacitors
Union Carbide Corp., Greenville, SC
West-Cap Arizona

MIL-C-39018 **FSC 5910**
Capacitors, Fixed, Electrolytic (Aluminum Oxide)

Cornell-Dubilier Electronics,
Sanford, NC

Mepco/Electra, Inc., Columbia, SC
Sangamo Capacitor Div.
Sprague Electric Co.

MIL-C-39003 FSC 5910
Capacitors, Fixed, Electrolytic, Tantalum, Solid-Electrolyted

Acushnet Electronics Co.
Mallory Capacitor Co.
Mepco/Electra, Inc.,
West Palm Beach, FL
Sprague Electric Co.
Union Carbide Corp., Greenville, SC

MIL-C-3965 FSC 5910
Capacitors, Fixed, Electrolytic, (Nonsolid Electrolyte), Tantalum

Cornell-Dubilier Electronics,
Sanford, NC
Hunter-Stanley Electronics, Inc.
Mallory Capacitor Co.
Mepco/Electra, Inc.,
West Palm Beach, FL
Mepco/Electra, Inc., Columbia, SC
Sprague Electric Co.
Tansitor Electronics, Inc.

MIL-C-19978 FSC 5910
Capacitors, Fixed, Plastic (or Paper-Plastic), Dielectric (Hermetically sealed in Metal, Ceramic, or Glass Cases)

Chicago Condenser Corp.
Sprague Electric Co.
Stone City Products Co.
TRW Capacitor Div.
West-Cap Arizona

MIL-C-11272 FSC 5910
Capacitors, Fixed, Glass-Dielectric

American Technical Ceramics Div.
Corning Glass Works, Raleigh, NC
Republic Electronics Corp.
Vitramon Inc.

MIL-C-11015 FSC 5910
Capacitors, Fixed, Ceramic-Dielectric (General Purpose)

Automation Components Inc.
AVX Ceramics Corp.
Centralab, Los Angeles, CA
Cera-Mite Corp.
Corning Glass Works, Raleigh, NC
Republic Electronics Corp.
San Fernando Electric Mfg. Co.
Sprague Electric Co.
Tusonix, Inc.
Union Carbide Corp., Greenville, SC
Vitramon, Inc.

MIL-C-123 FSC 5910
Capacitors, Fixed, Ceramic Dielectric, (Temperature Stable & General Purpose)

San Fernando Electric Mfg. Co.

MIL-C-62 FSC 5910
Capacitors, Fixed, Electrolytic (DC, Aluminum, Dry Electrolyte, Polarized)

Sprague Electric Co.

MIL-C-5 FSC 5910
Capacitors, Fixed, Mica-Dielectric

Acushnet Capacitor Co., Inc.
ADI Electronics, Inc.
Cornell-Dubilier Electronics,
New Bedford, MA
Sangamo Capacitor Co.
Silvered Electronic Mica Co., Inc.
(SEMCO)
Soshin Electric Ltd.
(Distr. by Multi Products Intl.)

MIL-C-23269 FSC 5910
Capacitors, Fixed, Glass Dielectric

Corning Glass Works, Raleigh, NC
Vitramon, Inc.

MIL-C-14409 FSC 5910
Capacitors, Variable, (Piston-Type, Tubular Trimmer)

Johanson Mfg. Corp.
Murata Erie, Erie, PA
Sprague-Goodman Electronics, Inc.
Voltronics Corp.

MIL-C-81 FSC 5910
Capacitors, Variable, Ceramic Dielectric

Tusonix, Inc.

MIL-C-7079 FSC 5925
Circuit Breakers, Non Trip-Free

Potter & Brumfield Div.,
AMF Inc., Gainesville, GA

MIL-C-55629 FSC 5925
Circuit Breakers, Magnetic, Unsealed or Panel Seal, Trip Free

Airpax Corp., Cambridge, MD
Heinemann Electric Co.,
Lawrenceville, NJ

MIL-C-15306 FSC 5950
Coils, Fixed and Variable, Radio Frequency

Cambridge Thermionic Corp.
Dale Electronics, Inc.,
Columbus Div.
Delevan, Div. of
American Precision Inds. Inc.
Jeffers Electronics, Inc.
Nytronics Components Group Inc.
Piconics, Inc.
Torotel Products, Inc.
TRW Inductive Products Div.
Vanguard Electronic Co.,
Inglewood, CA
West-Cap Arizona

MIL-C-22992 FSC 5935
Connectors, Electrical Waterproof, Quick Disconnect, Heavy Duty Type & Accessories

Amphenol, Broadview, IL
Bendix Corp.
Electrical Components Div.
Burndy/Berco
ITT Cannon Electric

MIL-C-21097 FSC 5935
Connectors, Electrical, Printed Wiring Board

AMP Incorporated
Amphenol, Broadview, IL
EDAC, Incorporated
Elco Corp., Connector Div.
TRW Connector Div.,
Elk Grove Village, IL
Winchester Electronic Div.,
Litton Industries

MIL-C-24308 FSC 5935
Connectors, Electric Rectangular, Miniature Polarized Shell, Rack Panel

ADI Electronics, Inc.
AMP, Inc.
General Connector Corp.
ITT Cannon Electric,
Fountain Valley, CA
Matrix Science Corp.
Positronic Industries, Inc.
Souriau, Inc., Valencia, CA
TRW Connectors Div.,
Elk Grove Village, IL

MIL-C-81703 FSC 5935
Connectors, Electric, Circular, Miniature, Rack & Panel or Push-Pull Coupling

Deutsch Elec., Component Div.
Sealtron, Inc.

MIL-C-25516 FSC 5935
Connector, Electrical, Miniature

TRW Electronic Components,
Minneapolis, MN

MIL-C-26500 FSC 5935
Connectors, General Purpose, Electrical, Miniature, Circular

Amphenol, Broadview, IL
Glenair, Inc.
Hermetic Seal Corp.
Pyle-National Co.
TRW Connectors, Minneapolis, MN

MIL-C-28748 FSC 5935
Connectors, Electrical, Rectangular, Rack & Panel, Solder Type & Crimp Type Contacts

Continental Connector Corp.
Dale Electronics, Inc.,
Columbus, NE
Hughes Aircraft Co., Connecting
Devices Div., Irvine, CA
Positronic Industries, Inc.

U.S. Components, Inc.
Winchester Electronics, Div. Litton Industries, Inc.

MIL-C-28804 FSC 5935
Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew

Hughes Aircraft Co., Connecting Device Div., Irvine, CA

MIL-C-3912 FSC 5935
Connectors, Coaxial, Radio Frequency

AMP, Inc.
Amphenol RF Operations, Danbury, CT
Automatic Connector, Inc.
Bendix Corp., Electrical Components Div.
Cablewave Miniature Products
Delta Electronics Mfg. Corp.
ITT Cannon Electric, Phoenix, AZ
Kings Electronics Co., Inc.
OMNI Spectra, Inc., Microwave Connector Div.
Sealectro Corp.
Solitron/Microwave
Specialty Connector Co.

MIL-D-3954 FSC 5985
Dummy Load, Electrical, Waveguide

Struthers Electronics Corp.

MIL-E-1 FSC 5960
Electron Tubes

Amperex Electronic Corp., Hicksville Div.
Beam Tube Corp.
Cetron Electronics
EG & G, Inc., Electro-Optics Div.
GEC Technology Corp.
General Atronics Corp.
General Electric Co., Microwave Tube Operation
General Electric Co., MIDPS
ITT Electron Tube Div.
Litton Industries, Electron Tube Div., Williamsport, PA
LND, Inc.
Machlett Labs., Inc.
Microwave Assoc., Inc., Burlington, MA
M. U. Incorporated
National Electronics, Inc.
OMNI-Wave Electronics Corp.
Philips ECG, Inc., Altoona, PA
Raytheon Co., Quincy, MA
Raytheon, Waltham, MA
RCA Corp., Lancaster, PA
TGM Detectors, Inc.
Thomas Electronics, Inc.
Thomson-CSF Comps. Corp., Dover, NJ
Varian Assoc., Palo Alto, CA
Varian Canada, Inc., Georgetown, Ont.
Varo Electron Devices, Inc.
Watkins-Johnson Co., Stewart Div.
Western Electric Co., Inc.
Westinghouse Electric Corp., Electronic Tube Div.

MIL-F-15733 FSC 5915
Filters, Radio Interference

Captor Corp.
Centre Engineering, Inc.
Fil-Coil Co., Inc.
Murata Erie, Canada
RFI Corporation
San Fernando Electric Mfg. Co.
Spectrum Control, Inc.
Sprague Electric Co. Filter Div., North Adams, MA

MIL-F-18327 FSC 5915
Filters: High Pass, Low Pass, Band Suppression, & Dual Functioning

ADC Products
Conolog Corp.
OPT Industries, Inc.
TRW Inductive Products Div.

MIL-F-23419 FSC 5920
Fuses, Instrument Type

Bussmann Mfg. Div., McGraw-Edison Co.
Littelfuse, Inc.

MIL-I-1361 FSC 6625
Instrument Auxiliaries, Electrical Measuring: Shunts, Resistors, & Transformers

Brown Boveri Electric, Inc., West Columbia, SC
Electromagnetic Industries, Inc.

MIL-I-27273 FSC 6130
Inverter, Power, Static

Hamilton Standard Div., United Technologies Corp.
Magnetika, Inc.

MIL-J-641 FSC 5935
Jacks, Telephone

ADC Products
Kings Electronics Co., Inc.
Switchcraft, Inc.

MIL-L-3661 FSC 6210, 6250
Lampholders, Indicator Lights, Indicator-Light Housings, & Indicator Light Lenses

Cutler Hammer Grp., Eaton Corp., Aerospace Controls/Systems Div.
Dialight
General Instrument Corp., Lamp Div.
Littelfuse, Inc.
Oak Switch Systems

MIL-M-10304 FSC 6625
Meters, Electrical Indicating, Panel Type, Ruggedized

A & M Instrument, Inc.
Bach-Simpson, Ltd.
Ideal Precision Meter Co., Inc.
International Instruments
Phaostron Instrument & Electronic Co.
Simpson Electric Co.
Triplett Corp.

MIL-0-55310 FSC 5955
Oscillators, Crystal

McCoy Electronics Co.
Oscillatek Corp.
Q-TECH Corp.
Spectrum Technology, Inc.
Vectron Labs., Inc.
Xsis Electronics, Inc.

MIL-P-26517 FSC 6130
Power Supply, Transformer-Rectifier, Aircraft

Wagner Electric Corp., Tung-Sol Div.
Westinghouse Electric Corp., Aerospace Electrical Div.

MIL-R-28803 FSC 6240
Readouts, Segmented

Master Specialties

MIL-R-19648 FSC 5945
Relays, Time Delay, Thermal

Warren Communications

MIL-R-83726 FSC 5945
Relays, Time Delay, Electric & Electronic

Deutsch Relays, Inc.
Hi-G Co., Inc., Windsor Locks, CT
Leach Corp., Control Products Div.
Struthers-Dunn, Inc.
Tempo Instrument, Plainview, NY

MIL-R-83407 FSC 5945
Relays, Reed (Mercury Wetted)

Struthers-Dunn, Inc.

MIL-R-39016 FSC 5945
Relays, Electromagnetic

Branson Corp.
Communications Instruments, Inc.
Deutsch Relays, Inc.
Electronic Specialty Div.
GENICOM Corp. (General Electric Co.), Waynesboro, VA
Gould, Inc., Allied Control Div., Plantsville, CT
Hi-G Co., Inc., Windsor Locks, CT
Teledyne Relays

MIL-R-28750 FSC 5945
Relays, Solid State

Hi-G Co., Inc., Windsor Locks, CT
Teledyne Relays

MIL-R-94 FSC 5905
Resistors, Variable, Composition

Allen-Bradley Co.
Clarostat Mfg. Co., Inc.

Precision Electronic Components, (1971), Ltd.

MIL-R-26
Resistors, Fixed, Wire-Wound (Power Type)

CAL-R, Inc.
Dale Electronics, Inc., Columbus, NE
E-Systems, Inc., Memcor, Div.
Ohmite Mfg. Co.
Pacific Resistor Co.
RCL Electronics, Inc.
Shallcross, Inc.
TEL-Labs, Inc.
Tepro of Florida, Inc.
Ultronix, Inc.
Ward Leonard Electric Co.

MIL-R-22 FSC 5905
Resistors, Variable (Wirewound, Power Type)

E-Systems, Inc., Memcor Div.
Ohmite Mfg. Co.

MIL-R-55342 FSC 5905
Resistors, Fixed, Film, Chip

Dale Electronics, Inc., Columbus, NE
Mepco/Electra, Inc., Morristown, NJ
Mini-Systems, Inc.
State of the Art, Inc.

MIL-R-83401 FSC 5905
Resistor Networks, Fixed Film

Allen-Bradley Co.
Dale Electronics, Inc., Columbus, NE
California Micro Devices, Inc.
KDI Pyrofilm Corp.
Mepco/Electra, Inc., Morristown, NJ
Sprague Electric Co.
Techno-Comps. Corp.
TRW Resistors
Vishay Resistive Systems

MIL-R-39008 FSC 5905
Resistors, Fixed, Composition (Insulated)

Allen-Bradley Co.

MIL-S-22432/9 FSC 6105
Servomotor, Type 18SM4c

Tachtronic Instruments, Inc.

MIL-S-12883 FSC 5935
Sockets & Accessories for Plug-in Electronic Components

Augat, Inc.
Deutsch Relays, Inc.
Eby Company

MIL-S-3928 FSC 5985
Switches (Coaxial), RF Transmission Line

Amphenol, RF Operations
Transco Products, Inc.

MIL-S-6807 FSC 5930
Switch, Rotary, Selector

Electro Switch Corp.

MIL-S-8805 FSC 5930
Switches & Switch Assemblies, Sensitive & Push (Snap Action)

Eaton Corp. Aerospace Controls/ Systems Div.
Haydon Switch & Instrument, Inc.
Licon Div.
Master Specialties Co.
Micro Switch
Nexus
Otto Engineering
Saint Switch, Inc.
Stacoswitch
Texas Instruments, Inc., Matls. & Controls Grp.
Unimax Switch Corp.
VIZ Mfg. Co., Inc.

MIL-S-9395 FSC 5930
Switches, Pressure, (Absolute, Gauge & Differential)

Consolidated Controls Corp.
Electro-National Corp.
Hydra-Electric Co.
Scott Aviation
Sigma-Netics, Inc.

MIL-S-22885 FSC 5930
Switch, Pushbutton, Illuminated

Aerospace Optics, Inc.
APM Hexseal Div.
Eaton Corp., Aerospace/ Commercial Controls Div.
Jay-El Products, Inc.
Korry Mfg. Co.
Licon Div.
Master Dynamics Corp.
Master Specialties Co.
Micro Switch
Precision Molded Products
Stacoswitch
Unimax Switch Corp.

MIL-S-22710 FSC 5930
Switches, Rotary (Printed Circuit), (Thumbwheel, Inline, & Pushbutton)

Digitran Co.
EECO, Inc.
Janco Corp.

MIL-T-23648 FSC 5905
Thermistor, (Thermally Sensitive, Resistor) Insulated

Ametick, Inc, Rodan Div.
Quality Thermister, Inc.
Unitrode Corp.
Victory Engineering Corp.

MIL-T-27 FSC 5950
Transformers & Inductors (Audio, Power, & High-Power Pulse)

ADC Products
Adec, Inc.
AEL-EMTECH Corp., Lansdale, PA
AMI/Coast Magnetics
Berkshire Transformer Corp.
Beta Transformer Technology Corp.
B.G. Laboratories, Inc.
Dytek Laboratories, Inc.
Electronic Transformer Corp.
Epsey Mfg. & Electronics Corp.
Fernwood Transformer Co.
Freed Transformer Co., Inc.
Hadley, Robert M., Co., Inc.
Microtran Co., Inc.
Midland-Ross Corp., Grimes Div.
OPT Industries, Inc.
Pico Electronics, Inc.
Sigmapower, Inc.
Titan Transformer Co.
Torwico Electronics, Inc.
Transformer Design, Inc.
TRW Inductive Products
Vanguard Electronics Co., Inc.
Zenith Transformer Co., Inc.

MIL-T-27535 FSC 5950
Transformer, Power, Isolation, Series Circuit

Amerace Corp., Elastimold Div.
Crouse Hinds/Sepco Corp.

MIL-T-21038 FSC 5950
Transformers, Pulse, Low Power

Epsey Mfg. & Electronics Corp.
JB Electronic Transformers Inc.
TRW Inductive Products

MIL-V-9999 FSC 6625
Voltmeters, Electronic

Hewlett-Packard Co., Loveland, CO
Ballantine Laboratories

MIL-W-16878 FSC 6145
Wire, Electric, Polyvinyl Chloride Insulated

Brim Electronics
Daburn Electronics & Cable
Judd Wire
National Wire & Cable

MIL-W-5086 FSC 6145
Wire, Electric, Polyvinyl Chloride Insulated, Copper of Copper Alloy

Barcel Wire & Cable Corp.
Independent Cable, Inc.
ITT Surprenant Div.
Philadelphia Insulated Wire Co.
Plastoid Corp.
Prestolite Wire Div.
Teledyne Thermatics

MIL-W-81381 FSC 6145
Wire, Electric, Polymide-Insulated, Copper or Copper Alloy

Barcel Wire & Cable Corp.
Champlain Cable Corp.
Independent Cable Corp.
Teledyne Thermatics, Inc.
Tensolite Co.
Thermax Wire Corp.

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide ..... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

Mepco//Electra
A NORTH AMERICAN PHILIPS COMPANY

Reliability across the board™

STANDARD RESISTOR MIL SPECIFICATION APPROVALS

RESISTORS:	RL standard military: 2% and 5% metal film resistor —RL07 (¼ watt) and RL20 (½ watt) —temperature coefficient: ±100 ppm/°C	MIL-R-22684
	RN standard military: 0.1% to 1% metal film resistor —RN50, RN55, RN60, RN65 styles	MIL-R-10509
	RLR established reliability: 1% and 2% metal film resistor —RLR05, RLR07 and RLR20 —temperature coefficient: ±100 ppm/°C —failure rate S (.001%)	MIL-R-39017
	RNC established reliability: 0.1% to 1% metal film resistor —RNC50, RNC55, RNC60, RNC65 —resistance tolerance: ±0.1%, 0.5%, 1.0% —failure rate: S (.001%) —temperature coefficient: K (±100 ppm/°C), H (±50 ppm/°C), J (±25 ppm/°C) —non-hermetic seal	MIL-R-55182
	RNR established reliability: 0.1% to 1% metal film resistor —RNR55, RNR60, RNR65, RNR70 —resistance tolerance: ±0.1%, 0.5%, 1.0% —failure rate: S (.001%) —temperature coefficient: C (±50 ppm/°C), E (±25 ppm/°C) —hermetic seal	MIL-R-55182
NETWORKS:	Single-In-Line (S.I.P.'s) —RZ040, RZ050, and RZ060 (High Profile); RZ070, RZ080, RZ090 (Low Profile) —resistance tolerance: ±1.0%, 2.0%, 5.0% —temperature coefficient: ±100 ppm and ±300 ppm/°C —resistance range: 10 ohm — 1M —6 pin, 8 pin, and 10 pin	MIL-R-83401/04/05/06/07/08/09
	Flat Packs —RZ030 —resistance tolerance: ±1.0%, 2.0%, 5.0% —temperature coefficient: ±100 ppm and ±300 ppm/°C —resistance range: 100 ohm — 100K —14 pin	MIL-R-83401/03
SMD® RESISTORS:	Established reliability (chip) resistor —RM1005, RM1505, RM0705 —resistance tolerance: ±1%, 5%, 10% —temperature coefficient: K (±100 ppm/°C), M (±300 ppm/°C) —resistance range: 1 ohm — 1M	MIL-R-55342
TRIMMER RESISTORS:	RJ24/RJR24 cermet trimmer —multiturn, ⅜" square —resistance range: 10 ohm — 5M —resistance tolerance: ±10% —temperature coefficient: ±100 ppm/°C (standard) ±50 ppm/°C (RJR) available RJ24—approved to Failure Rate P RJR24—approved to Failure Rate R	MIL-R-22097/MIL-R-39035
	RJ26/RJR26 cermet trimmer —multiturn, ¼" square —resistance range: 10 ohm — 5M —resistance tolerance: ±10% —temperature coefficient: ±100 ppm/°C (standard) ±50 ppm/°C (RJR) available RJ26—approved to Failure Rate P RJR26—approved to Failure Rate R	MIL-R-22097/MIL-R-39035
	RJ50 cermet trimmer —single turn, ¼" diameter round —resistance range: 10 ohm — 5M —resistance tolerance: ±10% (5% available) —temperature coefficient: ±100 ppm/°C (standard)	MIL-R-22097

Mepco//Electra
A NORTH AMERICAN PHILIPS COMPANY

Reliability across the board™

STANDARD CAPACITOR MIL SPECIFICATION APPROVALS

ALUMINUM ELECTROLYTIC: Computer Grade (screw terminal type)
MIL-C-39018/04: CU71 (M/E Style 3126)

TANTALUM:

Wet Slug		MIL-C-3965
CL14/CL16	hermetic seal, screw mount, cylindrical case	
CL17/CL18	hermetic seal, stud mount, cylindrical case	
CL55	hermetic seal, rectangular module	
CL64/CL65	elastomer seal, axial lead, tubular case	
CL66/CL67	hermetic seal, axial lead, tubular case	
Wet Slug, established reliability		MIL-C-39006
CLR10	extended range, axial lead, tubular case	
CLR14	extended range, cylindrical case, solder lug terminal	
CLR17	extended range, cylindrical case, solder lug terminal	
CLR65-8000 Series	glass-to-tantalum hermetic seal, axial lead, tubular case	
CLR79	hermetic seal, non-silver case, axial lead, tubular case	
Wet Foil		MIL-C-3965
CL20/CL21	polar, etched foil, tubular case, axial lead	
CL22/CL23	non-polar, etched foil, tubular case, axial lead	
CL30/CL31	polar, plain foil, tubular case, axial lead	
CL32/CL33	non-polar, plain foil, tubular case, axial lead	
CL51	polar, plain foil, KSR, hermetic rectangular module	
CL52	non-polar, plain foil, KSR, hermetic rectangular module	
CL53	polar, etched foil, KSR, hermetic rectangular module	
CL54	non-polar, etched foil, KSR, hermetic rectangular module	
CL70/CL71	polar, high etched foil, tubular case, axial lead	
CL72/CL73	non-polar, high etched foil, tubular case, axial lead	
Wet Foil, established reliability		MIL-C-39006
CLR25	polar, etched foil, hermetic and non-hermetic, axial lead	
CLR27	non-polar, etched foil, hermetic and non-hermetic, axial lead	
CLR35	polar, plain foil, hermetic and non-hermetic, axial lead	
CLR37	non-polar, plain foil, hermetic and non-hermetic, axial lead	
CLR71	polar, high etched foil, hermetic and non-hermetic, axial lead	
CLR73	non-polar, high etched foil, hermetic and non-hermetic, axial lead	
Solid Slug		MIL-C-26655
CS12/CS13	hermetic seal, axial lead, tubular case	
Solid Slug		MIL-C-49137
CX05	polar, molded, non-hermetic, axial lead	
Solid Slug, established reliability		MIL-C-39003
CSR09	polar, miniature, hermetic seal, axial lead, tubular case	
CSR13	polar, hermetic seal, axial lead, tubular case	
CSR21	polar, high frequency, hermetic, tubular case, axial lead	
CSR23	polar, extended range, hermetic seal, axial lead, tubular case	
CSR33	polar, extended range, hermetic seal, for low impedance application	
CSR91	non-polar, hermetic seal, axial lead, tubular case	
Solid Chip, established reliability		MIL-C-55365
CWR06	polar hybrid tantalum chip	

For information on Mepco/Electra's RESISTORS/CAPACITORS/POTENTIOMETERS, A•1124-1126, A•1890-1891 and A•2029.

Technitrol Mil-Spec delay lines, bus couplers, and transformers. They perform to spec.

Technitrol military-grade components do what they're supposed to — meet the specifications required, are tested for full compliance, and are shipped with our outstanding reputation behind them. Compare our randomly picked samples with others. You'll see how Technitrol stacks up.

Active delay modules and passive delay lines

- Ultra-stable delay modules for TTL, Schottky TTL, FAST, and low-power Schottky TTL circuits. ±1% repeatability over −55 to +125°C at rated voltage input ±10%. Such outstanding stability available only from Technitrol.
- 5 to 500 ns delays.
- Several high-performance TTL and ECL modules with −55 to +125°C temperature range.
- Programmable modules available.
- Chip-carrier, surface-mount, and flat-pack.
- High-performance passive delay lines.

Mil-Std-1553 data-bus interface transformers

- Meet Mil-Std-1553B.
- Meet MAC Air specifications A3818, A5690, A5232, and A4905.
- Surface-mount and flat-pack available.
- Wide selection of standard models.
- Custom designs.

Mil-Std-1553 data-bus couplers

- Single- and dual-stub-terminal models.
- Single- and dual-bus-terminal models.
- Use of our Mil-Std-1553 interface transformers within the couplers provides a large choice of coupling characteristics.

MIL-T-21038 pulse transformers

- Grades 5 or 7, Class S, life expectancy X.
- Surface-mount and flat-pack available.
- Wide selection of standard models.
- Custom designs.

MIL-T-27 transformers, Grades 4, 5, and 6

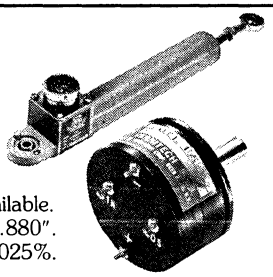
- Scott T.
- High-voltage.
- High-voltage pulse.
- 400 Hz.
- Voltage-regulating/ferroresonant.
- Custom, to your specifications.

Technitrol, Inc.

1952 East Allegheny Avenue
Philadelphia, PA 19134 USA
Telephone (215) 426-9105
Telex 834245

Technitrol products: Manchester encoder/decoders • pulse transformers • data bus couplers • pulse-width regulators • delay lines including digital, fixed-constant-distributed, fixed-lumped-constant, programmable, and trimmer types • transformers including audio, autotransformer, chopper, constant-voltage, dc-to-dc-conversion, decade, differential, discriminator, driver, ferroresonant, filament, 400 Hz, high-voltage, input, instrument, interstage, inverter, isolation, magnetic-amplifier, matching, microminiature, microphone, mixing, modulation, output, plate, power, pc-mounting, pulse, rf, rectifier, reference, Scott T, servo, synchro-control, telephone-coupling, toroidal, transistor, voltage-dividing, voltage-regulating, voltage-stabilizing, wideband, MIL-audio, MIL-power, MIL-rf, and MIL-pulse types • saturable reactors • filter reactors • square-wave oscillators • magnetic amplifiers • coils including foil-wound, high-Q/low frequency, toroidal, and transformer types.

POTENTIOMETERS



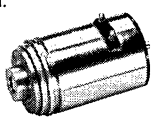
employing Vernitech's unique conductive film and precious metal wipers...respond to wiper motions as small as .000005".

Rotary Single Turn
Linear, non-linear, sine/cosine available.
Sizes 0.5", L 0.5" to Dia 5.0", L 1.880".
Linearity or conformity ±2% to 0.025%.
Resistance range 1KΩ to −250KΩ.

Rotary Multi-Turn
10 to 100 turns available.
Sizes Dia 0.5", L 1.5" to Dia 2.0", L 2.625".
Linearity or conformity ±0.5% to 0.015%.
Resistance range 1KΩ to 500KΩ.

Linear Motion
Electrical stroke lengths 1" to 60".
Linearity or conformity ±0.2% to 0.01%.
Resistance range 250Ω/in to 250KΩ/in.

CLUTCHES AND BRAKES
(electromagnetic)



hundreds of models and sizes available from stock.

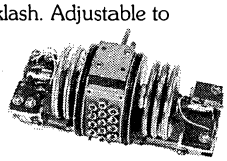
Precision Instrument Type
Sizes 5, 8, 11, 13, 15, and 18.
Standard length and wafer types. Spring and magnetic.
Meet MIL-E-5272C. Zero backlash.
Torque 5 to 150 oz. in. Response time 5 to 142 ms.

Industrial Types — open frame
Sizes 8, 12, 17, 22, 26. Torque to 75 in. lb.
Response time 6-30 ms at rated voltage.

Industrial Types — enclosed frame
Hybrid or special units designed for particular applications when MIL-SPECS and close tolerances are not essential, but where having a complete "self-contained" unit is desirable: cassette tape decks, analog devices actuators, etc.

Fail Safe
Braking action occurs 10 ms after coil is de-energized or power fails. Sizes 8, 17, 30, and 45.
Torque up to 50 in. lb. Zero backlash. Adjustable to compensate for wear.

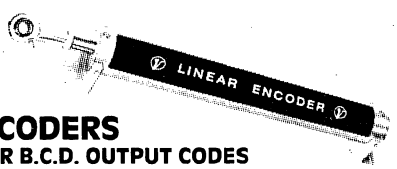
PRESSURE TRANSDUCERS
potentiometer type,



featuring infinite resolution, long life, and high reliability through the use of conductive film resistance elements, multiple wipers, and direct coupling of pressure sensing element to potentiometer wipers.

Pressure ranges from 0.1 to 10,000 psi in gage, absolute and differential types.

Linearity to ±0.3%. Air speed, altitude and low cost types available.



LINEAR ENCODERS
BINARY, GRAY OR B.C.D. OUTPUT CODES
1", 2", 4", 8", 12", 24", 36" and 48" STROKE LENGTHS
RESOLUTIONS TO 12 BITS.

VERNITECH

MOTORS

Over 1500 Standard Designs or Custom Designed to your requirements.

Synchronous — for laser scanning
Sizes 5, 8, 11, 15, 18, 20, 25, 35.
Speeds 100 to 48,000 rpm.
5 through 1600 Hz. 2, 4, 8, 12 poles.

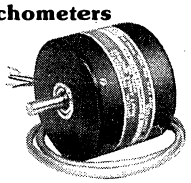
Servo
Viscous damped — sizes 8, 10, 11, 15, 18.
Speeds 3000 to 10,000 rpm.
Inertially damped — sizes 8, 11, 15, 18.
Speeds 3000 to 9500 rpm.

Stepper
Sizes 5, 8, 11, 15. Stepping angles 7.5°, 15°, 45°, 90°.
Stepping rates 100, 110, 125, 130, 175, 180, 225, 240, 260, 400, 725, 800, 1000 pps.

Precision Motor Generators Sizes 8, 10, 11, 15, 18, 23.

Integrating and Computer Motor Tachometers
Sizes 8, 10, 11, 15, 18, 23.

SHAFT ANGLE ENCODERS



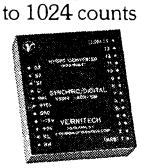
featuring precision chrome on glass discs for highest accuracy.

Optical Incremental
VOE 005 — Dia. 0.500", 0.510" L. To 256 pulses (modular)
VOE 05 — Dia. 0.500", 0.820" L. To 256 pulses
VOE 11 — Dia. 1.062", L. 1.80". To 1024 pulses
VOE 015 — Dia. 1.510", L. 0.88". To 1024 pulses (modular)
VOE M15 "Dial Coder" — panel mounted, 1.500" dia., L. 1.08" 127-256 pulses
VOE 023 — Dia. 2.25", L. 80". To 1250 pulses (modular)
VOE 23 — Dia. 2.250", L. 1.875". To 1250 pulses (available sealed)
VOE L23 "Thrift-Line" Dia. 2.250" L. 1.875". To 600 pulses
VOE 25 — Dia. 2.500", L. 2.500". To 3000 pulses (available sealed)

Optical Absolute
VOE 23: Binary, Gray or BCD to 512 counts per turn. Counting speed: 3000 rpm.
VOE 30: Single or multi-turn; Binary, Gray or BCD. To 1024 counts per turn. Max count (2^{19}) in 512 turns. Counting Speed: 30KHz.

Contacting Absolute
Sizes 11, 18, 23, & 31. Binary, Gray, and BCD. Single or multi-turn. Max count (2^{19}) in 2048 turns. 64 to 1024 counts per turn. Operating speed 200 rpm max.

SYNCHRO CONVERTER MODULES



Tracking Synchro-to-Digital and Resolver-to-Digital Converters
Economy Series VSD/VRD. Precision Series VSDH/VRDH
Compact, solid state, high performance converters employing type 11 servo loops for lag free tracking at rates to 3600°/sec. Resolution 10 bits, 12 bits, or 14 bits.

Digital-to-Synchro and Digital-to-Resolver Converters Series VDS/VDR:Accept shaft angle data in digital form for conversion to analog at accuracies up to ±4'.

Tracking Synchro-to-Linear DC Converter Module
Series VSDCH/VRDCH:Accept 3-wire synchro or 4-wire resolver input data, convert it to DC analog voltage proportional to synchro angle of input. Accuracy ±6' (typ.).

Tracking Angle Position Indicator
VNST-104: Tracking Synchro-to-Digital Converter, can also be used as a control element. Four decade 0.8" red LED display. Display accuracy ±6' arc (typical). Tracking rate 3600°/sec max. Parallel binary or BDC output. Self contained line operated power supply.

Custom designs available to your specifications.

VERNITECH, a division of Vernitron Corp., 300 Marcus Blvd., Deer Park, NY 11729 • 516-586-5100 • TWX 510-227-6089

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C
CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J
JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K
kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L
LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P
PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

Viking Labs/Honeywell
440 BERNARDO AVE.
MOUNTAIN VIEW, CA 94043
(415) 969-5500

HIGH RELIABILITY COMPONENT TESTING

All component testing done at Viking Labs/Honeywell is based on and performed in accordance with the applicable military specifications: 100% screening tests per MIL-STD-202, MIL-STD-750, and MIL-STD-883; and Qualification testing per the details of the MIL-STD's in accordance with MIL-S-19500 and MIL-M-38510 and NASA specifications.

BURN-IN SERVICES

Specializing in screening discrete semiconductors, Viking Labs/Honeywell has a myriad of transistor burn-in positions available of the common base configuration as well as for axial lead devices for both ambient and HTRB burn-in.

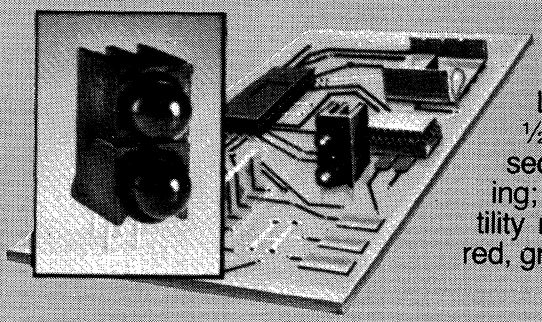
- 28 chambers are available for burn-in. Of these, six are configured for Dynamic burn-in (two of which are nitrogen purged) and 20 for Static burn-in. All burn-in systems are configured for continuous operation up to 150° C or higher.
- 12 multipurpose temperature chambers are available for specialized accelerated temperature tests.
- More than 200,000 burn-in positions are available to accommodate diverse available integrated circuits.

ELECTRICAL TESTING

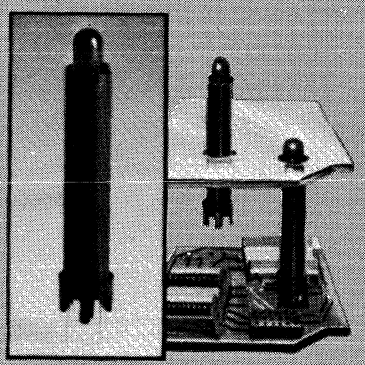
- The EATON IMPACT II (for active discretes), driven by a PDP-11/34, performs all standard transistor and diode tests, including leakage current, breakdown voltage, saturation voltage and current gain
- The LORLIN SERIES 5 Test System (for linear IC's), driven by a PDP-11/34, is supported by 128K of memory for total linear circuit testing
- The FAIRCHILD SENTRY VII General Purpose LSI Test System (for digital IC's) is configured with one high speed 60 pin test lead, one high voltage 60 pin test head, PPM, ETM, 128K of memory, hard disc and full data reduction and analysis capability.
  - The SEMICONDUCTOR TEST SOLUTION (STS), Model RPM 21 - an off line test program system - supports the SENTRY VII and allows our engineers to do much of their own programming and editing work prior to testing.
- More than 10 bench test systems

PHYSICAL TESTING

- THERMOTRON BUBBLE TESTER for gross leak seal testing
- VARIAN 925 HELIUM MASS SPECTROMETER for fine leak testing
- CINCINNATI SUB-ZERO LIQUID-TO-LIQUID THERMAL SHOCK SYSTEM for all package types
- B&W TESTER WITH EMI CAGE for Particle Impact Noise Detection (PIND) testing
- Four BLUE M WSP-109B automatic temperature cycling chambers. All systems are capable of -71° C to 200° C cycling and have programmable dwell time at each temperature



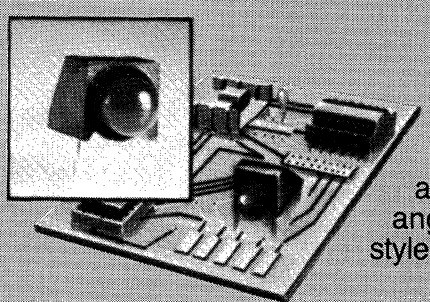
New Piggy-Back Series
Innovative, compact design puts two LEDs in the space of one. they're only ½ in. high, by ¼ in. wide. Snap-fit holds secure right through final board processing; leads spaced 0.1 in. apart. For versatility mix them in any color combination—red, green, or yellow.



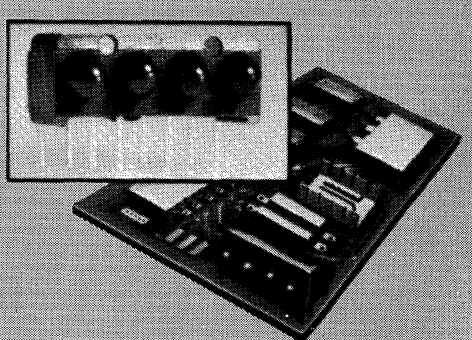
1-in. Tall 5311 Series
This Super-Brite LED allows more space between panel and PC Board—simplifies and speeds your production. Precise positioning with secure fit; long leads connect directly to the board. Works equally well with lenses. Maximum visibility for pilot lights, logic, function and fault indicators.

IDI SAVES YOU MONEY ACROSS THE BOARD

IDI now offers you more cost-cutting, assembly-time saving advantages. Packaged LEDs for through-the-panel and PC board mounting in a full range of highly economical styles. All available right off the shelf.



Economical "E" Series
Cost-efficient board telltale indicators, ideal for trouble shooting and service. T-1 3/4 bare LEDs provide typical 2mcd output at 20mA current. For fast mounting at right angles, use our black nylon economy block style.



Compact, Quad-Block 5360F Series
Space-saving, fast, direct mounting. Less than ¾" long, sits only ¼" high. Solid-state; combines 4 T-1 LEDs, at right angles to assembly leads. Wide-angle red, yellow, green or combination available. Nylon housing with molded polarity indications; built-in standoffs.

IDI has lots of creative solutions to LED packaging. Ask for our catalog and engineering guide or call direct for assistance. Start saving time, space and money today.

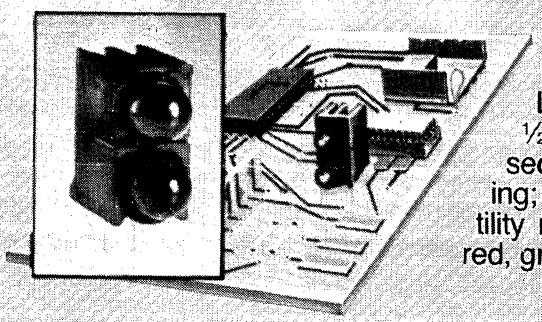
Industrial Devices, Inc.
Edgewater, N.J. 07020
(201) 224-4700

INDICATOR LIGHTS

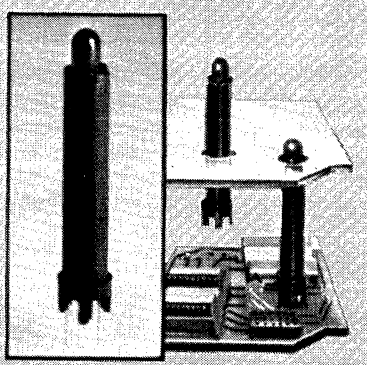
Manufacturer	Incandescent	LED	Neon	Fluorescent	Accessories/Hardware: Sockets/Holders/Clips	Accessories/Hardware: Caps & Lenses	Accessories/Hardware: Panel Mount	Accessories/Hardware: PC Mount	Features: Relampable Assemblies	Features: Rectangular	Features: Waterproof
Arcolectric			B•1018			•	•			•	
	B•1019	B•1019			•		•				
	B•1020					•	•		•	•	
Bulbtronics	B•1021		B•1021	B•1021							
Cord Electronics	B•1023		B•1023	B•1023							
Dialight		B•1032					•	•	•		
		B•1033			•	•	•	•	•	•	
		B•1034			•	•	•	•	•	•	
		B•1035			•	•	•	•	•	•	
	B•1036	B•1036	B•1036		•	•	•	•	•	•	
	B•1037		B•1037		•	•	•	•	•		
Dio-Rey		B•1046					•		•		
Gilway	B•1053				•		•	•	•		
	B•1054	B•1054					•	•	•		
IDEC Systems & Controls		B•1056			•	•	•		•		
Industrial Devices		B•1057					•				
		B•1058					•				
		B•1059					•	•			
		B•1060-B•1063						•			
		B•1064			•	•		•			
		B•1065			•	•				•	
		B•1066 B•1067									
			B•1068								
	B•1069-B•1077		B•1069-B•1077		•	•		•	•	•	
Industrial Electronic Engineers	B•1078	B•1078			•	•	•				
Inter-Market	B•1082	B•1082	B•1082			•	•				
Ledtronics, Inc.		B•1083									
Leecraft		B•1085					•	•			
	B•1086	B•1086	B•1086				•				
	B•1087				•						
Littelfuse	B•1088	B•1088	B•1088		•	•	•		•	•	
Oshino	B•1090						•	•			
Refac		B•1091									
Shelly Assocs.	B•1093	B•1093	B•1093				•				
Shogyo	B•1094										
	B•1095										
	B•1096		B•1096	B•1096							
Sloan	B•1098-B•1101	B•1098-B•1101	B•1098-B•1101		•	•	•		•		
Sorenson	B•1102	B•1102	B•1102				•				
	B•1103	B•1103	B•1103								
Sylvania/GTE			B•1109				•	•			
			B•1110			•	•		•		
			B•1111		•	•					
Visual Communications	B•1113				B•1113-B•1115	B•1113-B•1115	•			•	

DISPLAYS

Manufacturer	Single Character	Multicharacter	Multiline	Height			Segmented	Dot Matrix	Graphics	Light Type						Custom Design	Panels, Back, Edge Lighted
				½ in. or less	>½ in. <1 in.	1 in. or larger				Electromagnetic	Incandescent	LED	LCD	Plasma/Planar Gas Discharge	Vacuum Fluorescent		
Canyon		•		•	•		B•1022					•		•		•	
Cherry Electrical Products		•	•	•	•		B•1024	B•1024						•		•	
Dale		•	•	•		•	B•1025	B•1025						•			
		•		•			B•1026	B•1026						•			
		•	•	•				B•1027						•			
Densitron		•	•	•	•	•	B•1029	B•1029	B•1029	•				•			
		•		•				B•1030							•		
		•	•	•	•	•	B•1031	B•1031	B•1031				•				
Dialight	•	•		•	•		B•1038					•					
Dio-Rey		•				•	B•1040	B•1040				•					
		•				•	B•1042	B•1042				•					
		•				•	B•1044					•				•	
									B•1046		•	•				•	B•1046
Excel Technology		•		•	•	•	B•1050-B•1053						•				
Industrial Electronic Engineers		•		•	•	•	B•1078				•	•	•				
		•	•	•	•		B•1078	B•1079					•	•	•		
Infodex																B•1080 CRT	
NES, Inc.		•				•	B•1089				•	•	•				
Refac							B•1091	B•1091			•	•	•				
Seiko Instruments		•	•	•	•	•		B•1092	B•1092				•			•	
Shelly Assocs.		•					B•1093					•	•				B•1093
Staver	•					•	B•1105-B•1107	B•1105-B•1107		•							
VL Electronics	•	•	•	•	•	•	B•1117	B•1117	B•1117				•				



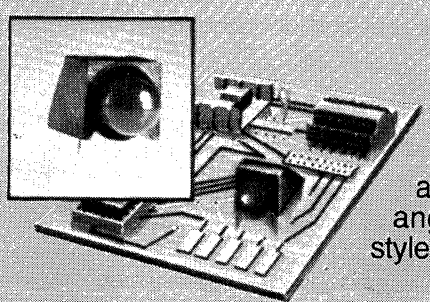
New Piggy-Back Series
Innovative, compact design puts two LEDs in the space of one. they're only ½ in. high, by ¼ in. wide. Snap-fit holds secure right through final board processing; leads spaced 0.1 in. apart. For versatility mix them in any color combination—red, green, or yellow.



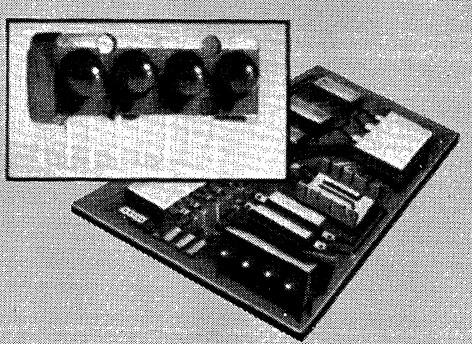
1-in. Tall 5311 Series
This Super-Brite LED allows more space between panel and PC Board—simplifies and speeds your production. Precise positioning with secure fit; long leads connect directly to the board. Works equally well with lenses. Maximum visibility for pilot lights, logic, function and fault indicators.

IDI SAVES YOU MONEY ACROSS THE BOARD

IDI now offers you more cost-cutting, assembly-time saving advantages. Packaged LEDs for through-the-panel and PC board mounting in a full range of highly economical styles. All available right off the shelf.



Economical "E" Series
Cost-efficient board telltale indicators, ideal for trouble shooting and service. T-1 3/4 bare LEDs provide typical 2mcd output at 20mA current. For fast mounting at right angles, use our black nylon economy block style.



Compact, Quad-Block 5360F Series
Space-saving, fast, direct mounting. Less than ¾" long, sits only ¼" high. Solid-state; combines 4 T-1 LEDs, at right angles to assembly leads. Wide-angle red, yellow, green or combination available. Nylon housing with molded polarity indications; built-in standoffs.

IDI has lots of creative solutions to LED packaging. Ask for our catalog and engineering guide or call direct for assistance. Start saving time, space and money today.

Industrial Devices, Inc.
Edgewater, N.J. 07020
(201) 224-4700

ARCOLECTRIC CORPORATION

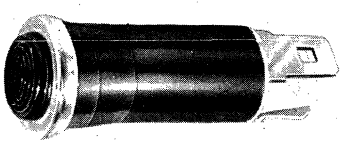
NEON INDICATOR LIGHTS

UL FILE E78783/C.S.A. FILE LR47253

All indicators have built in resistors for 100/125 volt operation. Polycarbonate transparent lenses; amber, clear, green and red. Wire leads or tab style terminals available on most styles. U.L., C.S.A. and international electrical approvals available on most models. All dimensions are in millimeters. 250V and 380V types can be ordered.

VDE APPROVED VERSIONS AVAILABLE

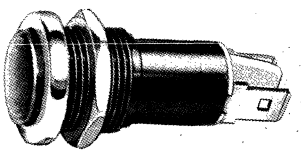
Model NL67C 12.7 MTG.



Panel Thk. 1.1
Overall Size
15.9 x 43.2

NL67WL
WIRE LEADS

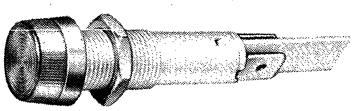
Model NL69C 17.5 MTG.



Panel Thk. 10.0
Overall Size
20.0 x 43.2

NL69WL
WIRE LEADS

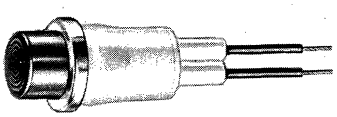
Model NL177C 12.7 MTG.



Panel Thk. 12.5
Overall Size
14.6 x 50.8

NL177WL
WIRE LEADS

Model NL193WL 12.7 MTG.



Panel Thk. 1.1
Overall Size
15.8 x 37.5

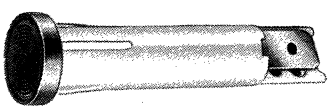
NL193C
6.3 TAB

Model NL244 7.1 MTG.
Model NL244C 8.0 MTG.
(NL244C SUPPLIED WITH CHROME BEZEL)

Panel Thk. 6.3
Overall Size
7.4 x 26.7

WIRE LEADS
ONLY

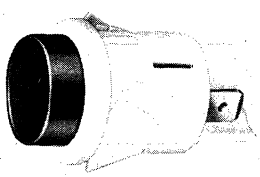
Model NL273C 9.0 MTG.



Panel Thk. 2.0
Overall Size
12.2 x 46.5

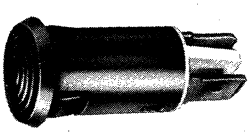
NL273WL
WIRE LEADS

Model NLC7030 25.2 MTG.



Panel Thk. 5mm
Overall Size
28.0 x 38.6

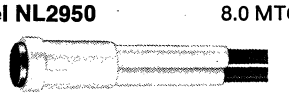
Model NL589C 12.7 MTG.



Panel Thk. 1.14
Overall Size
15.9 x 35.3

NL589WL
WIRE LEADS

Model NL2950 8.0 MTG.

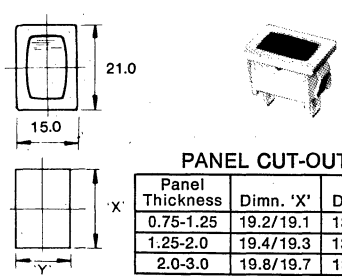


Model 2951

Panel Thk. 1.16
Overall Size
9.0 x 36.5

Panel Thk. 1.16
Overall Size
9.8 x 41.1

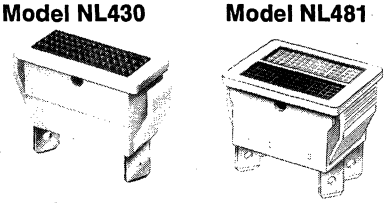
Model NL8430



PANEL CUT-OUT B

Panel Thickness	Dimn. 'X'	Dimn. 'Y'
0.75-1.25	19.2/19.1	13.0/12.9
1.25-2.0	19.4/19.3	13.0/12.9
2.0-3.0	19.8/19.7	13.0/12.9

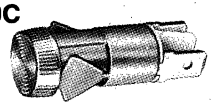
Model NL430 **Model NL481**



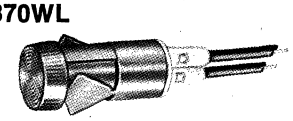
Panel Thk. 2.5
430A 12.2 x 27.2 MTG.
430M 11.0 x 30.0 MTG.
430Q 11.5 x 28.2 MTG.
430R 14.0 x 28.5 MTG.

Panel Thk. 3.3
22.3 x 27.2 MTG.

Model NL2870C



Model NL2870WL



Panel thickness
.75 - 2.0

Panel cut-out
12.7mm

SEE OTHER "EEM" PAGES B•1496-1501 FOR SWITCH PRODUCTS.

9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 19-4645

ARCOLECTRIC CORPORATION

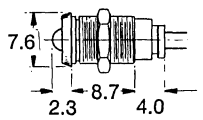
LED LAMPS COMPLETE WITH HOLDERS

Dimensions in mm

ORDER EXAMPLE

LED specs listed below

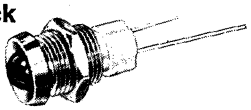
43V

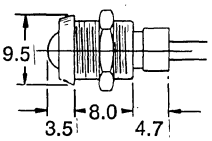


Chrome plated brass.
Nylon insert.
6.3mm dia. mtg. hole.
Max. panel thickness
6.3mm

LH43V1301
LH43V1401
LH43V1503

48 Chrome
48B Black

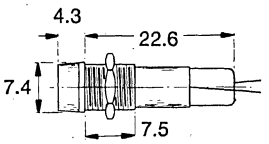




Chrome plated brass.
Nylon insert.
0.8mm dia. mtg. hole.
Max. panel thickness
5.5mm

LH483300
LH483400
LH483502
LH483601
LH483651
LH483681

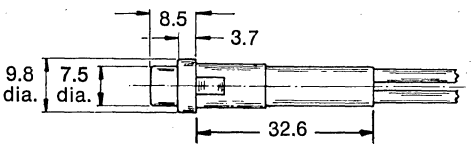
246C



Nylon body with
chrome bezel.
8.0mm dia. mtg. hole.
Max. panel thickness
6.3mm

LH246C1301
LH246C1401
LH246C1503

2951



Supplied with 5″ insulated lead

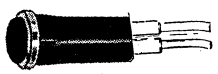
LH2951 Snap-in mtg. 8.0
Panel thickness min. 0.8,
max. 1.6 Chrome bezel.
Can be ordered with LED types
3300 thru 3681.

FL SERIES INDICATOR LIGHTS

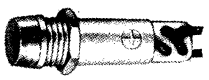
Built in filament lamps. Normally supplied with 5″ insulated leads. Polycarbonate transparent lenses: A = amber, B = blue, C = clear, G = green, R = red. Tab terminals available on some models. VOLTAGES: 6V, 12V and 28V.

FL40 6.3 MTG.

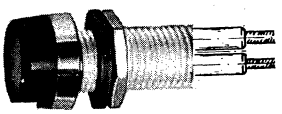
FL67 12.7 MTG.



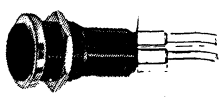
FL244, 244C 7.1 MTG. 8.0 MTG.



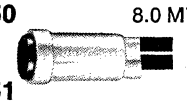
FL177 12.7 MTG.



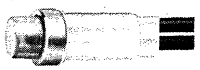
FL69 17.5 MTG.



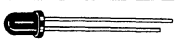
FL2950 8.0 MTG.



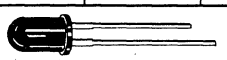
FL2951



LED LAMPS ONLY



T.1 Size		Forward Voltage	Power Diss.	Lum. Intensity	View Angle
1303	Red	2.2 25MA	135MW	2.5MCD	60°
1401	Yellow	2.2 20MA	85MW	3.0MCD	60°
1503	Green	2.3 25MA	135MW	5.0MCD	60°



1.1¾ Size		Forward Voltage	Power Diss.	Lum. Intensity	View Angle
3300	Red	2.2 25MA	135MW	3.5MCD	90°
3400	Yellow	2.2 20MW	85MW	4.0MCD	90°
3502	Green	2.3 25MA	135MW	6.0MCD	75°

INTEGRAL CURRENT LIMITING RESISTOR
Requires no External Current Limiter with 12 Volt Supply

T.1¾ Size		Operating Voltage	Typ. MCD	Viewing Angle
3601	Red	12V 13mA	4.0	65°
3651	Yellow	12V 13mA	4.0	75°
3681	Green	12V 13mA	4.0	75°

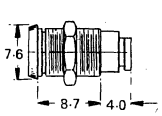
For 28 volt DC add series 1100 OHM ½ watt resistor for models 3601, 3651, 3681.

* LED's to be used with D.C. Power Source.

LED HOLDERS ONLY

LH43V

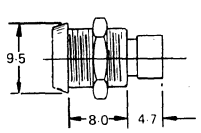
For T.1 Size



Chrome plated brass.
Nylon insert.
6.3mm dia. mtg. hole.
Max. panel thickness
6.3mm.

LH48 Chrome
LH 48B Black

For 1.1¾ Size



Chrome plated brass.
Nylon insert.
8.0mm dia. mtg. hole.
Max. panel thickness
5.5mm.

SEE OTHER "EEM" PAGES B•1496-1501 FOR SWITCH PRODUCTS.

9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 19-4645

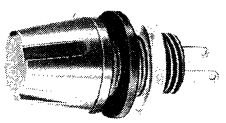
ARCOLECTRIC CORPORATION

PANEL LAMP ASSEMBLIES

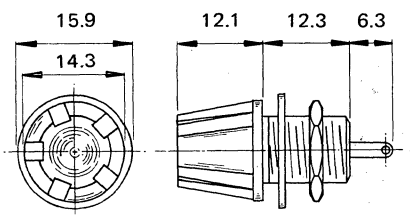
Polycarbonate lenses: transparent red, amber, green, blue or clear.
All items can be supplied without lamps or with lamps installed.

Dimensions in mm

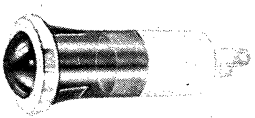
Model LH60 9.53 MTG.



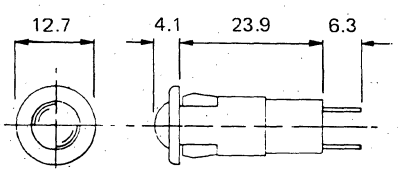
Midget
Screw Base
LES-6 Volt
LES-12 Volt
LES-28 Volt



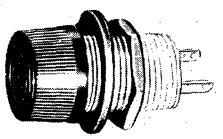
Model LH61 9.53 MTG.



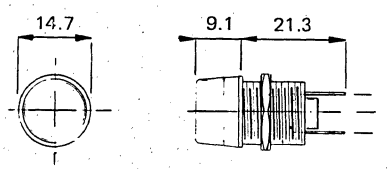
Midget
Screw Base
LES-6 Volt
LES-12 Volt
LES-28 Volt



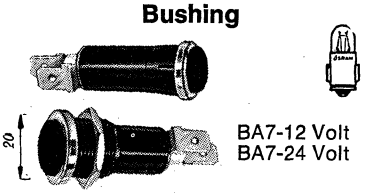
Model LHM62 12.7 MTG.



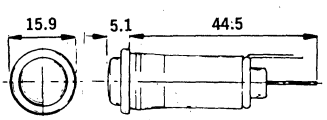
Single
Contact
Midget
Flanged
381-6 Volt
382-14 Volt
387-28 Volt



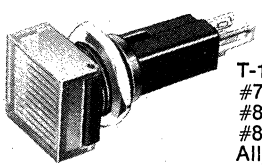
Model LH67 Snap In 12.7 MTG.
Model LH69 Threaded Bushing 17.5 MTG.



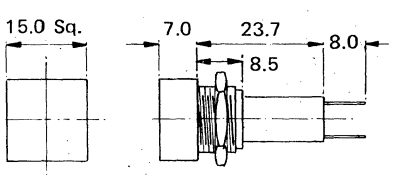
BA7-12 Volt
BA7-24 Volt



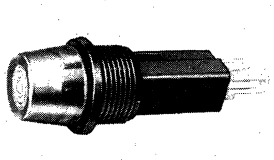
Model LH115 12.7 MTG.

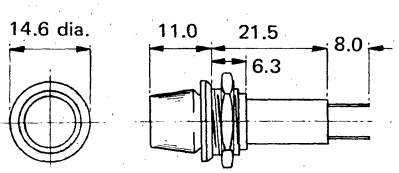


T-1¾ (6mm)
#73 12 Volt
#84 6.3 Volt
#85 28 Volt
All glass,
wedge shape
bulb

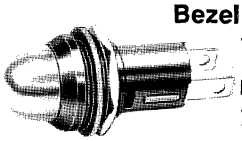


Model LH116 12.7 MTG.

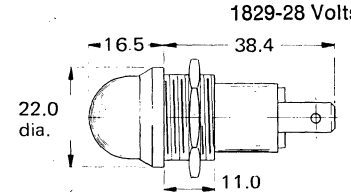




Model LH138 Black Bezel 19.0 MTG.
Model LH138C Chrome Bezel

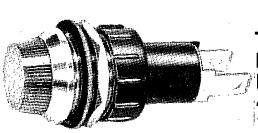


T-3¼ Bulb
Miniature
Bayonet Base
47-6 Volts
1891-14 Volts
1829-28 Volts

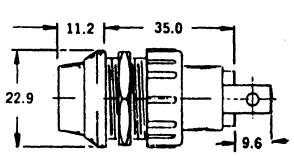


For flat lens version contact factory.

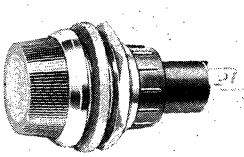
Model LH392 19.0 MTG.



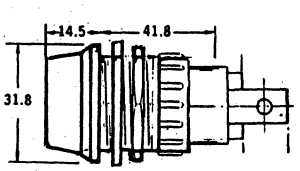
T-3¼ Bulb
Miniature
Bayonet Base
47-6 Volts
1891-14 Volts
1829-28 Volts



Model LH692 25.4 MTG.

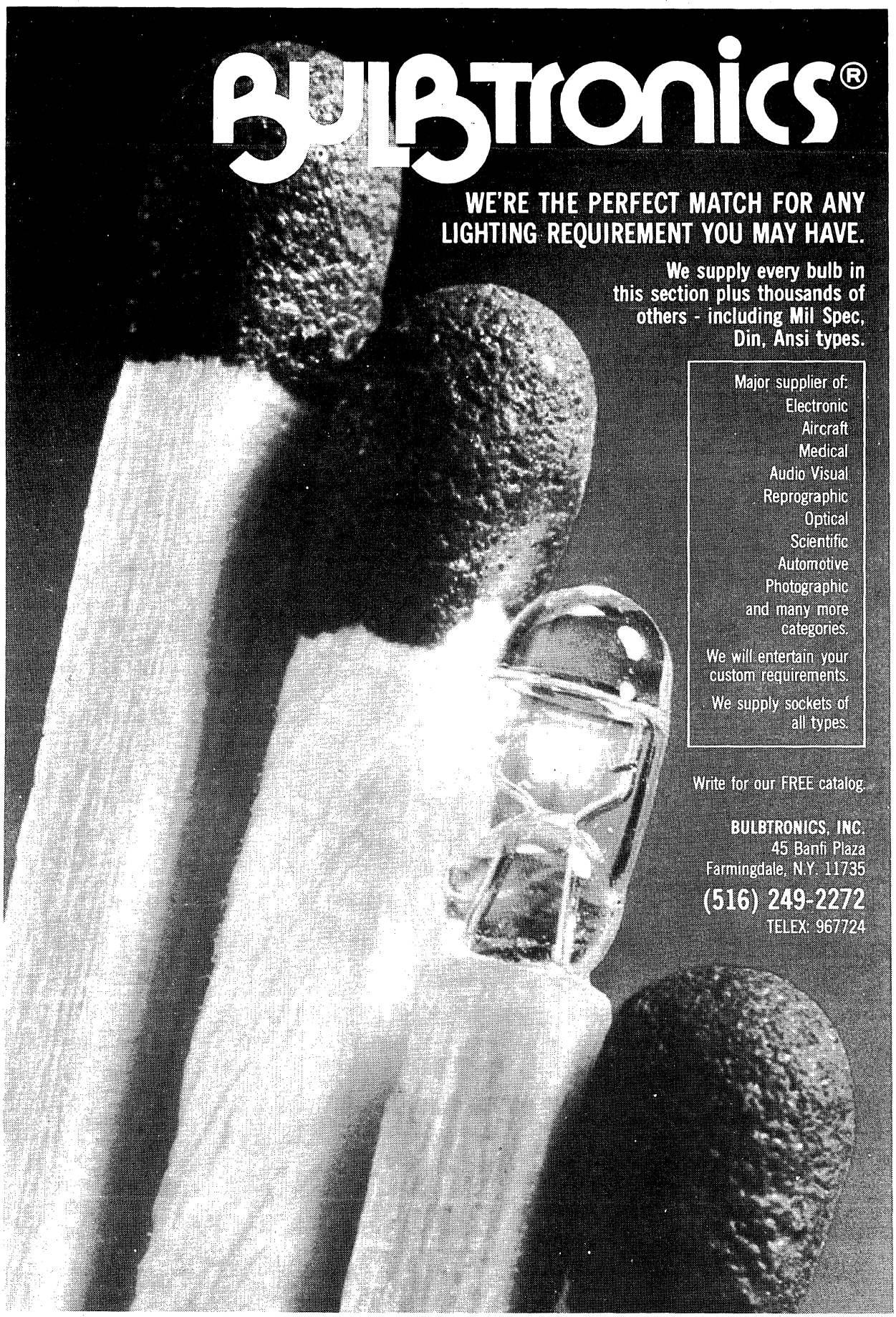


T-3¼ Bulb
Miniature
Bayonet Base
47-6 Volts
1891-14 Volts
1829-28 Volts



SEE OTHER "EEM" PAGES B•1496-1501 FOR SWITCH PRODUCTS.

9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 19-4645


BULBTRONICS®
WE'RE THE PERFECT MATCH FOR ANY LIGHTING REQUIREMENT YOU MAY HAVE.
We supply every bulb in this section plus thousands of others - including Mil Spec, Din, Ansi types.
Major supplier of:
Electronic
Aircraft
Medical
Audio Visual
Reprographic
Optical
Scientific
Automotive
Photographic
and many more categories.
We will entertain your custom requirements.
We supply sockets of all types.
Write for our FREE catalog.
BULBTRONICS, INC.
45 Banfi Plaza
Farmingdale, N.Y. 11735
(516) 249-2272
TELEX: 967724

CANYON electronics

READOUT ASSEMBLIES

MINI-PAK DISPLAY ASSEMBLIES

The MINI-PAK® series are gas discharge or LED readout modules, specifically designed for use on low-to-medium volume industrial or commercial instruments. The display and associated electronic drive are packaged in a black thermoplastic case available in two styles; a rear panel mount and a front panel mount. The modules are available in 1½-, 2-, 2½ and 3-digit configuration that can be mounted individually or stacked horizontally to form any number of digits. The MINI-PAK® series are designed for direct interface compatibility with TTL or LSI integrated circuits with 4 line output information in the 8-4-2-1 BCD code format.

GAS DISCHARGE SERIES CE-1000/CE-2000

The MINI-PAK® series CE-1000/CE-2000 include a 0.55" high character gas discharge display and the BCD to seven segments Decoder/Driver. The interface terminals are brought out to 14 pin dual-in-line header or socket. All components are soldered to the P.C. Board.

GAS DISCHARGE SERIES CE-3000/CE-4000

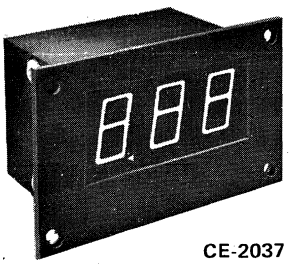
The MINI-PAK® series CE-3000/CE-4000 include a 0.55" high character gas discharge display and socket mounted BCD to seven segments Decoder/Driver. The interface terminals are brought out to wire wrap pins. The gas discharge display can be very easily and efficiently replaced, thereby, minimizing down time.

LED SERIES CE-5000/CE-6000

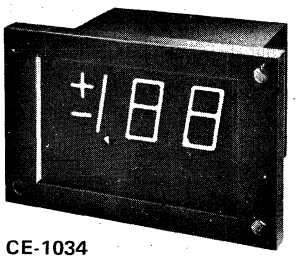
The MINI-PAK® series CE-5000/CE-6000 include a socket mounted 0.43", 0.625" or 0.8" character high LED display, a socket mounted BCD to seven segments Decoder/Driver and current limitting resistors, whenever applicable. The interface terminals are brought out to wire wrap pins. The series is available with or without latch or in 5 mA, 15 mA or 20 mA per segment.

FOR CUSTOM MADE ASSEMBLIES, LARGER CHARACTERS OR OTHER REQUIREMENTS, CONSULT FACTORY

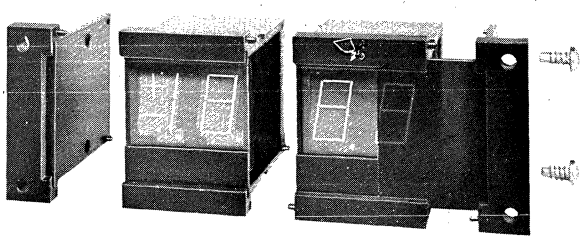
DOUBLES YOUR OPTION TO YOUR PANEL DESIGN WITH THE MINI-PAK® LED AND GAS DISCHARGE DISPLAYS.



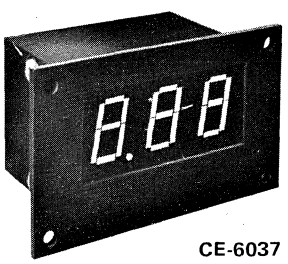
CE-2037



CE-1034



INSTALLATION DRAWING

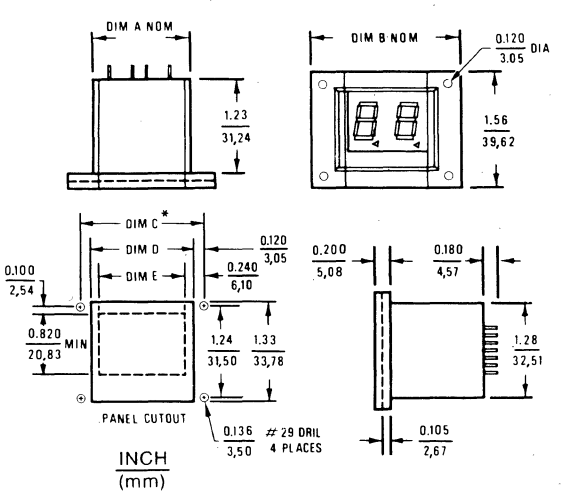


CE-6037

CE-5034

MECHANICAL SPECIFICATIONS

NO DIGITS	BEZEL WIDTH DIM. B NOM.		PANEL CUTOUT † DIM. D		PANEL CUTOUT †† DIM. E	
2	1.94	49,28	1.38	35,1	1.14	28,96
3	2.48	62,99	1.92	48,8	1.68	42,68
4	3.04	77,22	2.48	63,0	2.24	56,90
5	3.58	90,93	3.02	76,70	2.78	70,62
▲ 6	4.12	104,65	3.56	90,42	3.32	84,33
7	4.68	118,87	4.12	104,7	3.88	98,56
▲ 8	5.22	132,59	4.66	118,4	4.42	112,27



▲ Assumes maximum 3 digits modules per assembly.

† D Dimension applies to CE-1000/3000/5000 series.

†† E Dimension applies to CE-2000/4000/6000 series.

CANYON ELECTRONICS 2001 W. North Lane, Phoenix, Arizona 85021 (602) 944-4421

CORD ELECTRONICS
INCORPORATED (Formerly the OEM Division of MURA)
177 Cantiague Rock Road, Westbury, N.Y. 11590 U.S.A.
Phone: (516) 935-3640 • Tlx: 4758020 • Fax: (516) 935-0780

INCANDESCENT, NEON AND FLUORESCENT LAMPS

This page summarizes the many sub-miniature and miniature incandescent lamps, neons and fluorescent tubes available from CORD. For fast reference, we have shown the size and voltage ranges that are available for each of the different standard lamp bases. Please call or write us for our complete catalog.

WIRE TERMINAL

Size	Voltage
T-¾	1½ - 5V
T-1	1¼ - 28V
T-1¼	1.3 - 28V
T-1¾	1.35 - 48
T-2	4 - 120V
TL-¾	
TL-1	

MIDGET FLANGED

T-¾	1½ - 5V
T-1	1¼ - 28
T-1¼	1.3 - 28
T-1¾	1.35 - 48
TL-¾	5V
TL-1	1.5 & 5V

BI-PIN

T-¾	1½ - 5V
T-1	1¼ - 28V
T-1¼	1.3 - 28V
T-1¾	1.35 - 28V
TL-¾	5V
TL-1	1.5 & 5V

SCREW BASE

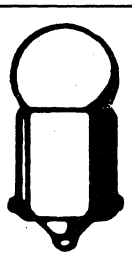
T-1¼	1.3 - 28V
T-1¾	1.35 - 28V
T-3¼	2 - 28V
GTL-3	1.2 - 2.33V
G-2	7-14 - 28V
G-3½	1.25 - 14.4V

WEDGE BASE

T-1¾	6.3 - 28V
T-3¼	6.3 - 28V

SLIDE BASE

T-2	4 - 120V



S/C BAYONET

T-3¼	2 - 55V
G-3½	6.3 - 18
G-4½	6.5 - 14
G-6	7 - 28
S-8	5 - 28

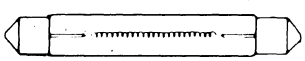
D/C BAYONET

Size	Voltage
G-6	7 - 28
S-8	5 - 28

STD. VOLTAGE LAMPS

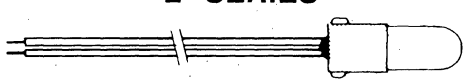
CANDELABRA	S-6	115 - 250V
	T-4½	115V
	C-7	115V
	T-6	115V
	T-7	115V
	T-8	115V
D.C. BAYONET	S-6	115V - 250V
	C-7	115V
	T-7	115V

FUSE LAMP



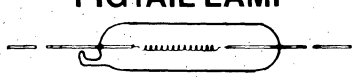
6 and 12 volt in lengths of 1.3" and 1.7"

"L" SERIES



2 thru 28 volts
Standard with 6" UL insulated leads.
Plastic lens caps in a variety of colors are available as well.

PIGTAIL LAMP



6 and 12 volt in lengths of 0.68" and 1.05"

NEON LAMPS:

A wide selection of neon lamps with wire terminal, midget flange, telephone slide, bayonet and candelabra bases are available.

MINIATURE FLUORESCENT:

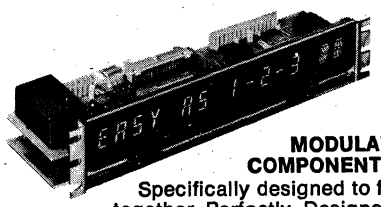
Available in sizes T5 to T8, from 4 to 50 watts in daylight, coolwhite, black light and black light blue. U shaped and "tight-U" are also available.

CHERRY Displays

TECHNICAL INFORMATION

- 100,000 hour display life. • Wide viewing angle.
- Baud rates from 300 to 9600 selectable on back panel.
- RS232C, RS422, 20 ma loop, or TTL parallel interface operation.
- End of Line Modes — left entry with automatic carriage return; writeover carriage return, horizontal scroll.
- Self-test mode: ASCII character set scrolled across panel.
- Environmental Operating Range: 0-70°C, 5-95% relative humidity (non-condensing).
- Designed to meet NEMA Pub. ICS 2-230 standard for EMI noise immunity (showering arc transients).
- Metal enclosure wth sealed bezel compatible with NEMA 12 standards.
- 115/220 VAC • Full address capability

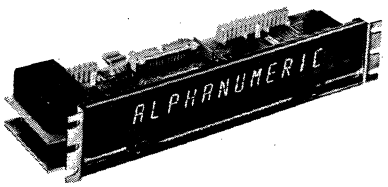
ALPHANUMERIC DISPLAY SYSTEMS



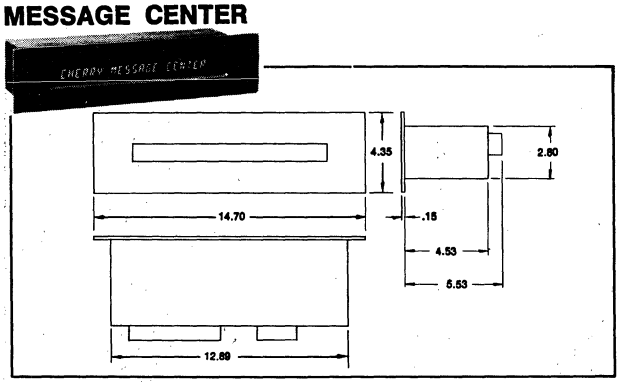
MODULAR COMPONENTS
Specifically designed to fit together. Perfectly. Designed so you can use each module alone . . . or put them all together.

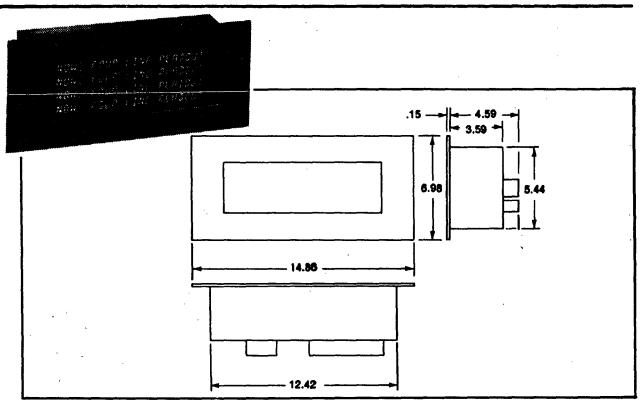
24 CHARACTER ALPHANUMERIC DISPLAY MODULE
A totally self-contained system. Complete microprocessor controlled circuitry includes drivers, character generator, refresh memory and provides all standard functions.

Result	Characteristics
W424-1051 . . . requires 12 VDC only and accepts parallel or serial input — serial in either RS232 or 20 ma current loop. Selectable baud rates.	Receives only, in parallel or serial.
W424-1053 . . . requires 12 VDC only and accepts parallel or serial input (RS232 or 20 ma current loop.) Selectable baud rates. Fully interactive with half and full duplex operation capability.	Receives in parallel or serial. Sends in serial only.
W424-1058 . . . requires 12 VDC only and accepts binary input, 6 bits and strobe.	Will output a total of 64 messages, each being as long as 32 bytes. User can program his own message EPROM (2716). Requires no ASCII code or serial input.



MESSAGE CENTER





- 24 Characters • Alphanumeric
- Receives serial or parallel ASCII output.
- Microprocessor Controlled

W424-105B — It displays up to 24 character messages in large half-inch bright orange neon 14 segment characters.

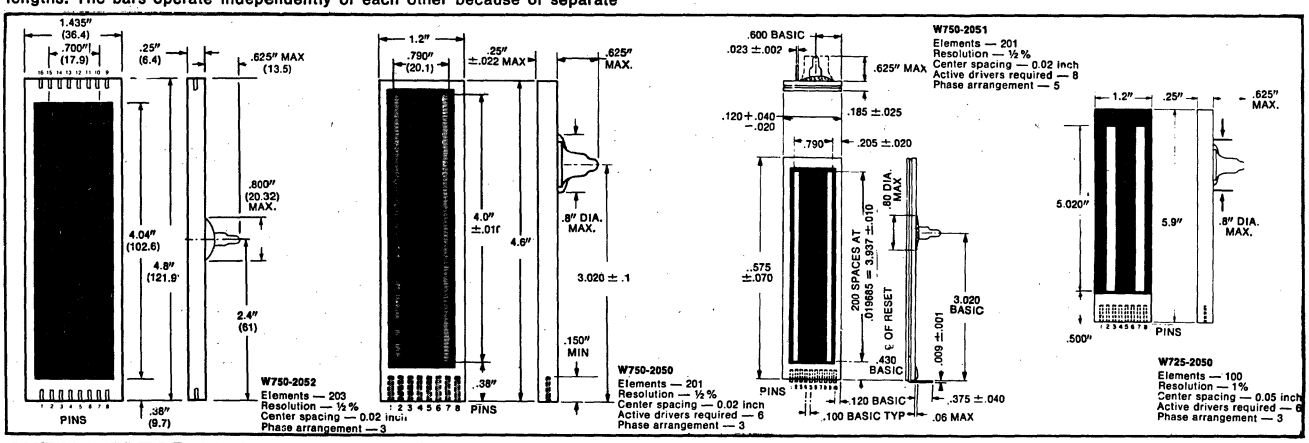
W424-105D — It can display up to 256 messages that have been stored in a nonvolatile, battery backed CMOS RAM.

W424-4040 — On a 4-line by 24 character display, the W424-4040 can show any of the 256 messages stored in the battery backed CMOS RAM memory. Each message may be up to 32 characters in length.

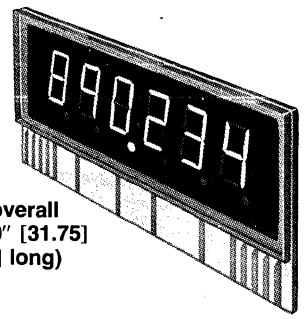
GAS DISCHARGE BAR GRAPH DISPLAY

The single wide bar graph is 10 inches long and is viewable at 50 feet. The elements are bussed together in a 5-phase arrangement for high brightness and provide for a flicker-free continuous appearing display.

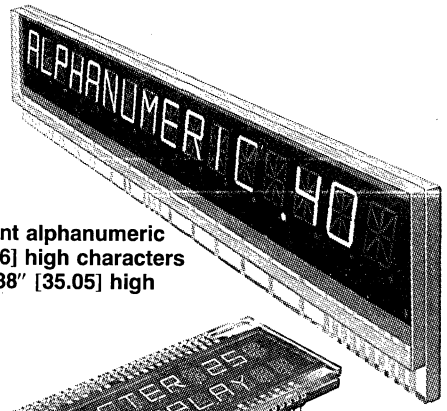
Two separate graphs give continuous glow on precisely controlled bar lengths. The bars operate independently of each other because of separate connections. Each bar graph can be viewed from both directions at once, or from either direction. Two separate pieces of information can be viewed in each bar as long as the total elements do not exceed 201. Cathodes in each bar are bussed together in a 3-phase arrangement.



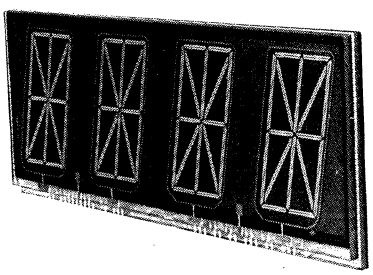
FLAT PANEL DISPLAYS
GAS DISCHARGE TYPE



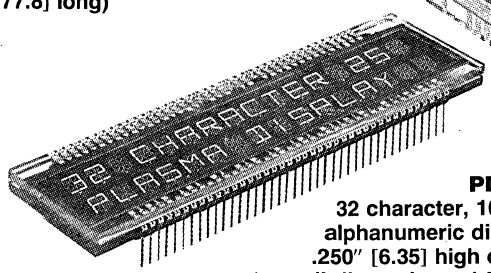
PD-06D040
Six character, seven segment digital display with .400″ [10.16] high characters (overall dimensions: 1.250″ [31.75] high x 3.00″ [76.2] long)



PD-16A040
16 character, 16 segment alphanumeric display with .400″ [10.16] high characters (overall dimensions: 1.38″ [35.05] high x 7.00″ [177.8] long)



PD-04A200
Four character, 16 segment alphanumeric display with 2″ [50.8] high characters. Designed for end stacking (overall dimensions: 2.85″ ±.04″ [72.39 ± 1.02] high x 7.2″ ± .04″ [182.88 ± 1.02] long)



PD-32A025
32 character, 16 segment alphanumeric display with .250″ [6.35] high characters (overall dimensions: 1.56″ [39.62] wide x 5.00″ [127.00] long)

BASIC FEATURES

Bright, Uniform Characters provide a major advantage...particularly when the display is to be viewed at a distance.

Easily Driven— Uncomplicated drive circuits minimize overall cost. Dale can provide the "intelligence" including drive circuits required for various display packages.

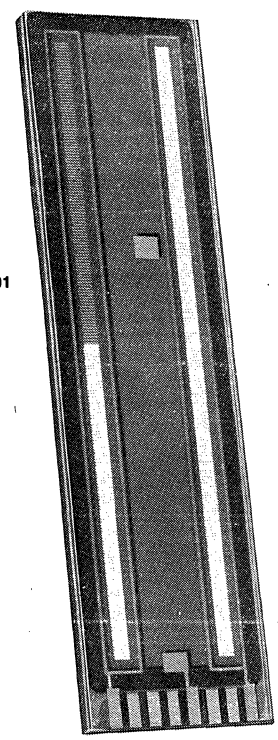
Easily Customized — The special and/or personalized informative formats you wish to present can be provided at reasonable cost.

Aesthetically Superior — Soft neon glow provides exceptional contrast and reduces segmented appearance of characters.

DUAL LINEAR BAR GRAPH DISPLAYS

TYPES PBG-12201, PBG-12203, PBG-12205, PBG-16101

Dale dual linear bar graphs are flat panel plasma indicators each displaying two separate bar graphs. Depending on the model, they contain 101, 201 or 203 elements with resolution of ½% and 1%. At normal viewing distances, their glow blends into a continuous but precisely controlled bar length. The unique scanning technique minimizes the number of drives required.



Model 12201

APPLICATIONS

- Process Control
- Depth Indicators
- Panel Meters
- Level Indicators
- Analog Indicators

FEATURES

	PBG-12201	PBG-12203	PBG-12205	PBG-16101
Resolution	1/2%	1/2%	1/2%	1%
Segment Length	.100″	.150″	.100″	.100″
Segment Width	.011″	.010″	.011″	.020″
Segment Spacing	.020″	.020″	.020″	.050″
Active Drives Required	6	12	8	6
Light Output	35 fl	30 fl	70 fl	60 fl
Viewing Angle	120°			
Color	Neon Orange			

For complete information, write or phone
DALE ELECTRONICS, INC., 2064 12th Avenue, Columbus, Nebraska 68601 • Phone 402-564-3131

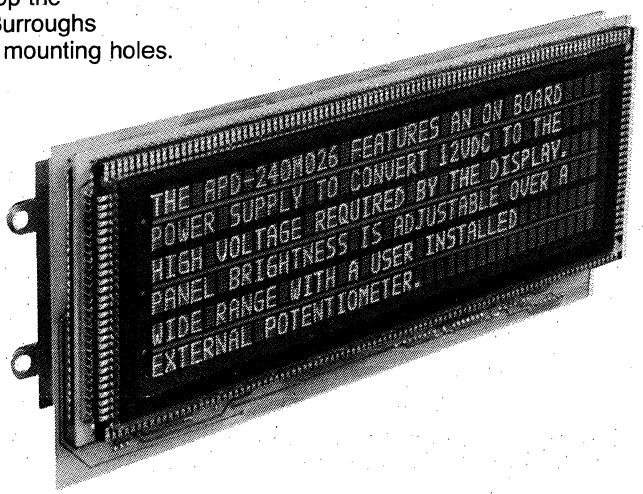
DALE®

PLASMA PANEL DISPLAY MODULES

TYPE APD-240M026

240 character display with drive electronics

The APD-240M026 display module displays up to 240 alphanumeric 5 x 7 dot matrix characters arranged in 6 lines of 40 characters each. The module includes drive electronics and a DC to DC converter to develop the necessary panel voltage. Data interface is equivalent to the Burroughs SII-0640-PD2 as are character dimensions, viewing area and mounting holes.



FEATURES

- 240 (6x40) alphanumeric characters (5x7 dot matrix)
- .14W x .26H character size
- Data interface compatible with Burroughs SII-0640-PD2
- Controller Board available similar to Burroughs SII-0640-200
- Wide viewing angle (150°)
- Low input voltage (+5 and +12)
- Compact size
- Dimmable with external potentiometer

SPECIFICATIONS

OPTICAL

Viewing area: 2.26″ [57.40] W x 8.33″ [211.66] L

Number of Characters: 240

Character Size: .14″ [3.56] W x .26″ [6.60] H

Dot Size: .020″ [.51] Dia.

Dot Pitch, Vertical: .040″ [1.016]

Dot Pitch, Horizontal: .030″ [.762]

Character Spacing: 2 blank columns of dots between successive characters

Scanning Rate: 75 Hz

Brightness: 30 foot lamberts

Color: neon orange

Viewing Angle: 150° cone

Panel Dimming: fixed or variable from nominal to less than 50% of nominal

ENVIRONMENTAL

Operating Temperature: 0°C to 50°C

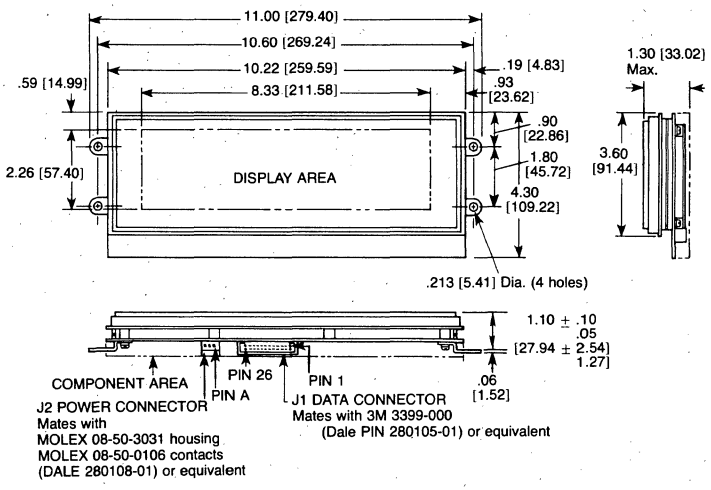
Storage Temperature: −20°C to 70°C

Relative Humidity: 10-90% non-condensing

Mechanical Shock: 50G½ Sine Wave, 11 ms duration, 5 shocks in each of 6 directions

Vibration: .018″ displacement amplitude from 10 to 50 Hz, 2G acceleration from 50 to 2000 Hz logarithmic sweep rate. 30 min. duration along each side of the 3 major axes.

[Numbers in brackets indicate millimeters.]



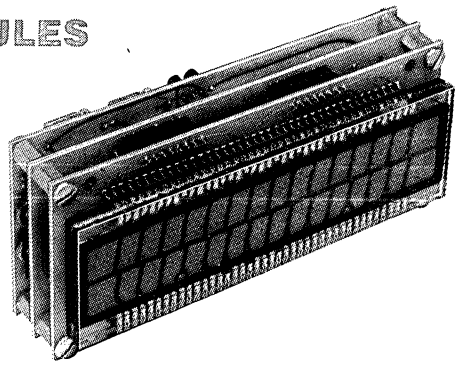
ELECTRICAL

	MIN.	TYP.	MAX.	UNITS
Logic Supply Voltage	+4.75	5.0	+5.25	V
Logic Supply Current	200	210	230	mA
Panel Supply Voltage	11.4	12.0	12.6	V
Panel Supply Current	.85	1.0	1.2	A

NOTE: SII-0640-PD2 and SII-0640-200 are registered trademarks of the Burroughs Corp.

For complete information, write or phone
DALE ELECTRONICS, INC., 2064 12th Avenue, Columbus, Nebraska 68601 • Phone 402-564-3131

DALE® PLASMA PANEL DISPLAY MODULES



TYPE APD-32A025

The Dale APD-32A025 microprocessor based display system gives the superior aesthetics of a plasma display without the need to design the drive electronics, interface circuitry and voltage converter, and in a package that conserves valuable front panel area.

FEATURES

- 32 alphanumeric characters
- 64 ASCII character set
- Refresh memory
- 8 bit, three state, bi-directional data base
- Decodes and debounces up to 64 key keyboards
- Operates from single 5V power supply
- User enabled blinking, cursor/display
- Cursor addressable or auto incremented/decremented
- Scroll (left or right)
- Compact size
- Neon orange (filterable from red to yellow)
- 60 ft./lamberts light output (typical)
- Standby (low power) mode

MAXIMUM RATINGS

Operating Temperature: 0°C to +55°C
Storage Temperature: −55°C to +70°C
Voltage on any Pin vs. Ground: −0.5V to +7V
Power Dissipation: 5W

SPECIFICATIONS

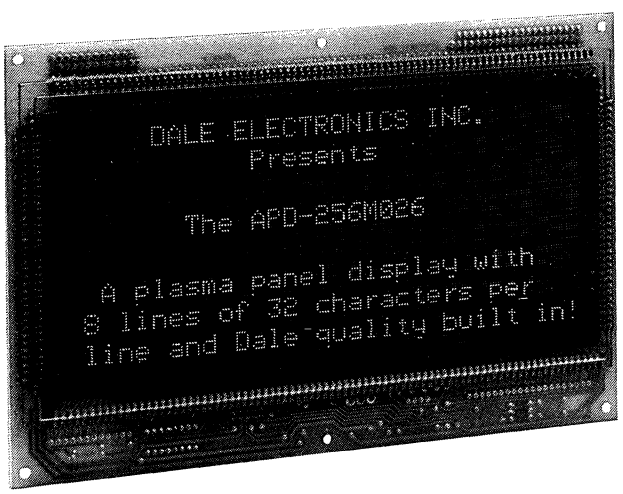
Character Design: 14 segment starburst
Character Set: ASCII (upper case)
Character Height: .25 inches
Viewing Area: 4.45″ x .7″
Viewing Angle: 130°
Dimensions: 5.25″L x 2.35″H x 2.35″D
Supply Voltage: +5V ±5%
Supply Current: 750mA (typical)

MATING CONNECTORS

Power: Molex P/N08-50-0106 (terminals) 09-50-3031 (housing) or equivalent
Data: 3M P/N 3399-000 or equivalent

TYPE APD-256M026

The APD-256M026 display module displays up to 256 alphanumeric 5 x 7 dot matrix characters arranged in 8 lines of 32 characters each. The module includes drive electronics and is easily interfaced to CRT controllers.



FEATURES

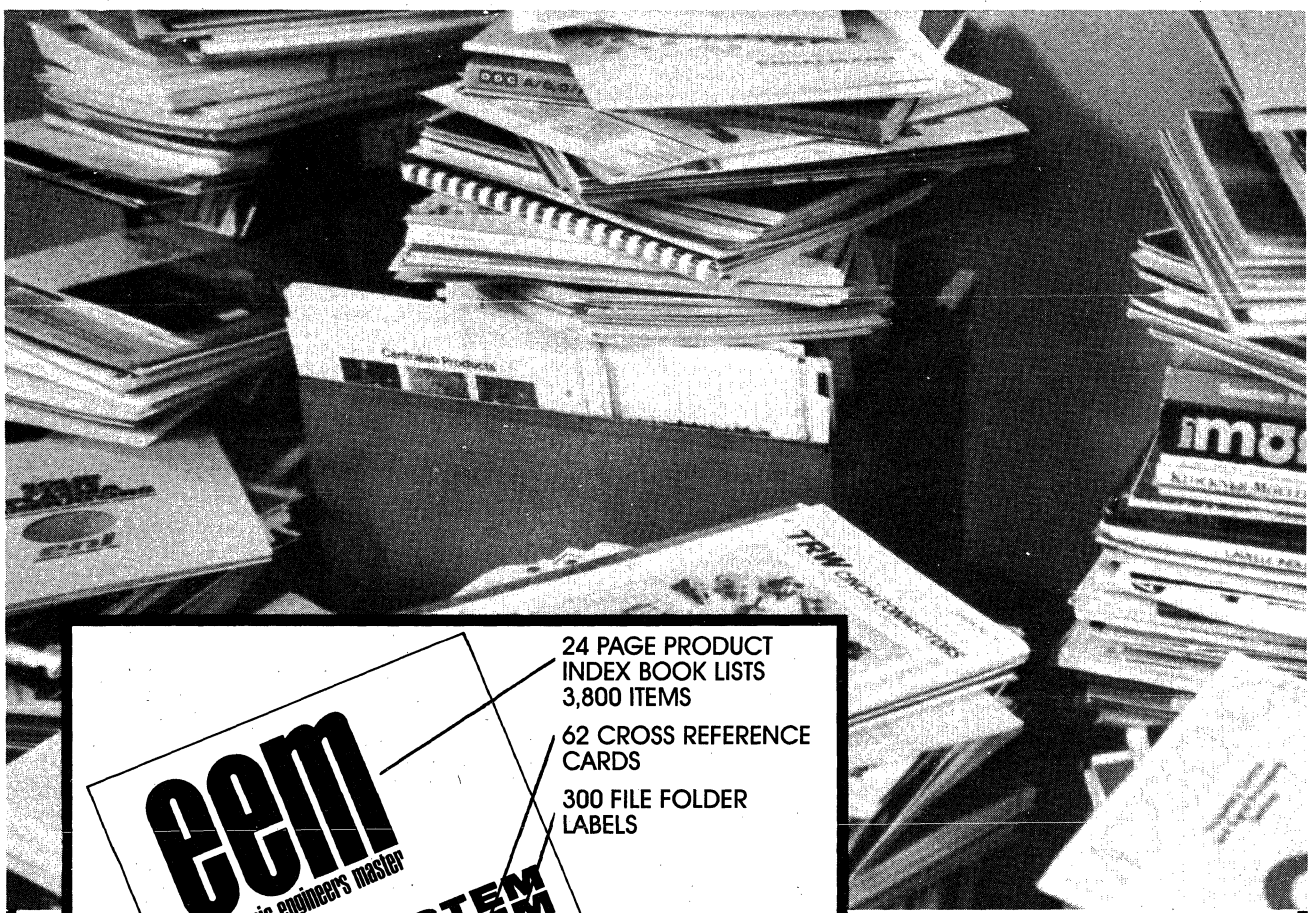
- 256 (8x32) alphanumeric characters (5x7 dot matrix plus underbar)
- .18 W x .26H character size
- High brightness (100 ft./lamberts typical)
- Controller Board available with parallel and RS232 inputs
- Wide viewing angle (150°)
- Easily interfaced
- Compact size

SPECIFICATIONS

OPTICAL

Viewing area: 3.30″ [83.82] W x 7.62″ [193.55] L
Number of Characters: 256
Character Size: .18″ [4.57] W x .26″ [6.60] H
Dot Size: .020″ [.51] Dia.
Dot Pitch: .040″ [1.016]
Character Spacing: .060″ [1.52]
Scanning Rate: 70-80 Hz
Brightness: 100 ft./lamberts
Colors: neon orange
Viewing Angle: 150° cone

For complete information, write or phone
DALE ELECTRONICS, INC., 2064 12th Avenue, Columbus, Nebraska 68601 • Phone 402-564-3131



ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

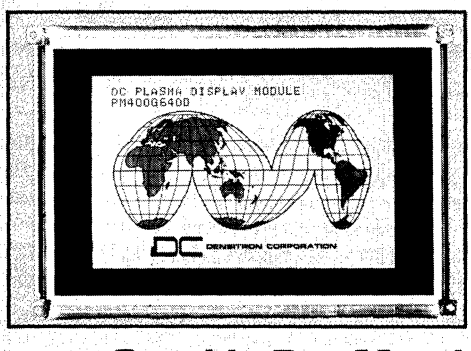
The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

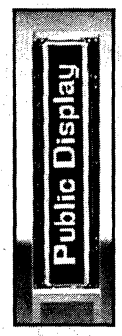
Don't waste any more time. Get organized now!

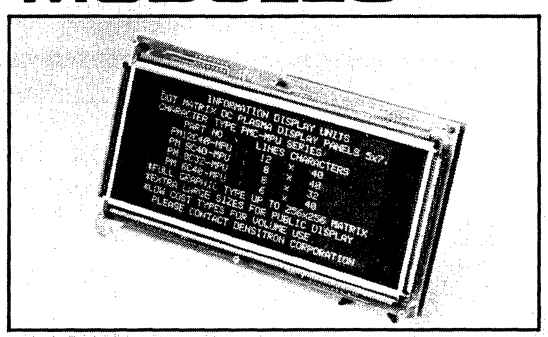
EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

VISUAL DISPLAYS from DENSITRON!

PLASMA DISPLAY MODULES







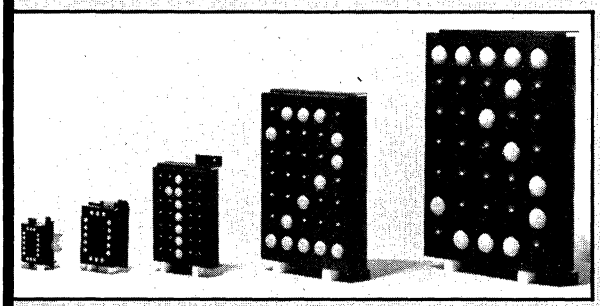
Graphic Dot Matrix

- Pixels: 16x101, 16x135, 64x192, 64x256, 96x240, 128x256, 200x640, 400x640
- With drivers and controllers
- Bright neon orange color

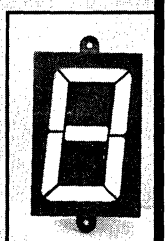
Alphanumeric Dot Matrix

- Lines/Characters: 1x16, 1x22, 2x16, 4x16, 6x40, 8x32, 8x40, 12x40
- With drivers and controllers
- Bright neon orange color

ELECTRO-MAGNETIC DISPLAYS



- Seven-segment electro-magnetic display units
- No power required after setting
- Very long life
- Choice of segment colors
- Available with decoder/drivers



For public information displays requiring large character heights

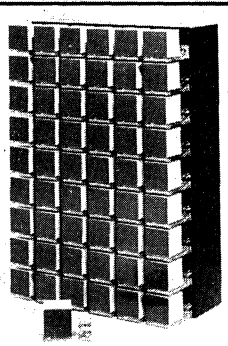
- Types: dot matrix, segmented, message plate and 4 color cubes

Model	Digit Height	Model	Digit Height
SS-0	40mm	SS-3	165mm
SS-1	70mm	SS-4	230mm
SS-2	103mm	SS-5	300mm

Multi-Color Display Units — New Item!

Four color cubic electro-magnetic display bits and units ■ your choice of 4 colors in one bit ■ very colorful message signs are possible to outdo your competition ■ available in either bit or matrix form ■ the matrixes are X-Y stackable.

Model	Size	Model	Size
C25-1	25mm sq. bit	C25-64	8 x 8 matrix
C40-1	40mm sq. bit	C40-64	8 x 8 matrix

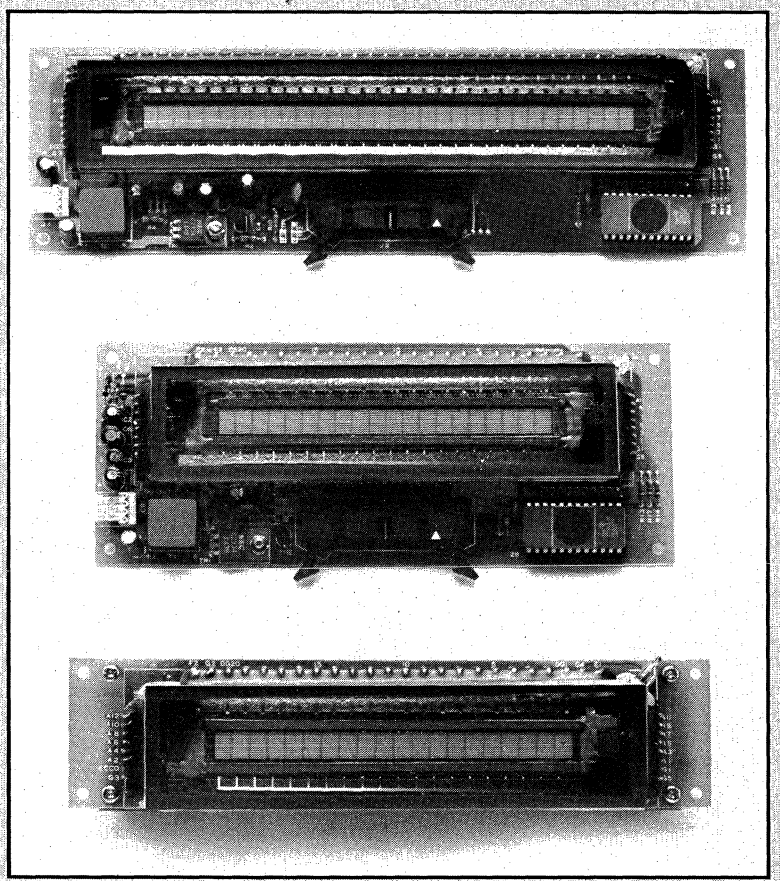


DENSITRON CORPORATION
Information Device Division

20775 Western Avenue
Torrance, California 90501
Phone: (213) 618-9647
FAX: G2/G3: 213-618-1658
Telex I I: 910-349-6200

VISUAL DISPLAYS

VACUUM FLUORESCENT DISPLAY MODULES



Sizes: 1x20 and 1x32 in .35" character heights
1x40 and 2x40 in .31" character heights
Mechanical: Single board for minimum depth or dual board for minimum panel space
Data Interface: 8-bit parallel and RS232C serial; self-test feature included
Temperature Range: operating: −20 to +85°C
storage: −55 to +85°C
Power Supply: single +5VDC

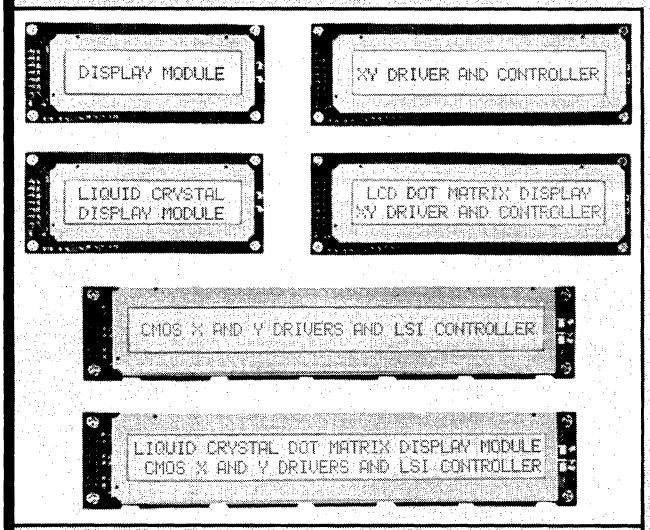
DENSITRON CORPORATION
Daini-Hasegawa Bldg., 4/F, 1-12-4, Hamamatsucho, Minato-ku, Tokyo 105 Japan Cable: "DENTROROSE" Tokyo
Phone: (03) 437-3721 Facsimile: (03) 434-0427 Telex: J26914 DENSITRO J

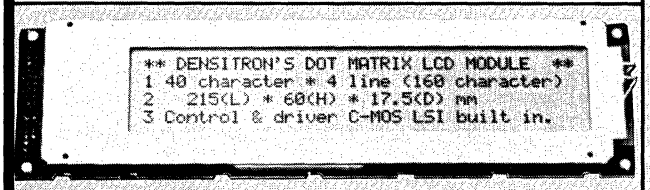
DENSITRON CORPORATION OF AMERICA
INFORMATION DEVICE DIVISION 20775 S. Western Avenue, Torrance, Calif. 90501 U.S.A.
Phone: (213) 618-9647 Facsimile: (213) 618-1658 Telex: 910-349-6200 DENSITRON TRNC

DENSITRON EUROPE LTD.
50 London Road, Sevenoaks, Kent TN13 1AS
Phone: (0732) 455522 Telex: 957134 DENSI G

from DENSITRON!

LCD MODULES





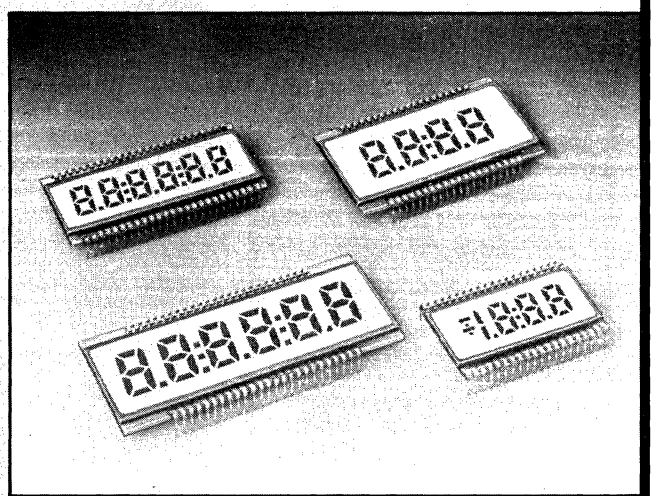
ALPHANUMERIC DOT MATRIX

- Integral E-L backlight (standard)
- Operating Temperature: −20 to +70°C or 0 to +50°C
- Built-in CMOS RAM and ROM
- Wide viewing angle (top or bottom)
- Sizes: 1x8, 1x16, 1x20, 1x24, 1x40, 1x80, 2x8, 2x16, 2x20, 2x24, 2x40, 2x80, 3x40, 4x16, 4x20, 4x40, 4x80, 8x20, 8x40, 8x80, 16x40, 16x80, 25x80

NOW AVAILABLE IN LARGE CHARACTERS

- .5" - 1x16, 1x20, 1x24, 1x40, 2x40, 4x20, 4x40
- .33" - 2x16, 2x20, 2x24

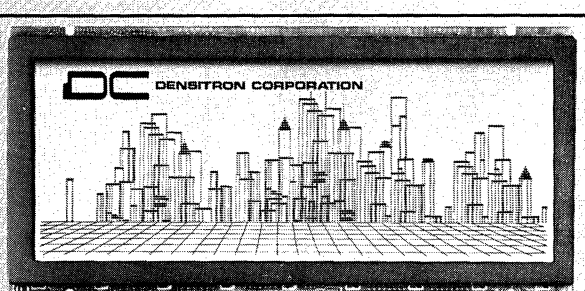
NEW LIGHTED DOT VERSION WITH DARK BACKGROUND (LOOKS LIKE VFD)



SEGMENTED NUMERIC

Package Type: DIL pins or rubber connector
Standard Sizes: 2, 3½, 4, 5, 6 and 8 digits in .5, .7 and 1.0" heights
Operating Temperature: −20 to +60°C (Commercial)
−30 to +85°C (Industrial)

- Negative guest-host (dichroic) type available — white characters on a dark background
- Integral E-L and LED backlights
- Reflective, transflective or transmissive polarizers



GRAPHIC DOT MATRIX

- Drivers only type configuration (CMOS)
- Separate 8-bit input controller (RAM & ROM)
- Thin package
- Pixels: 32x120, 64x120, 64x240, 64x320, 64x480, 128x128, 128x256, 200x640

DIALIGHT LED CIRCUIT BOARD INDICATORS MEET YOUR NEEDS.

Dialight originated the idea of packaging LEDs for easy mounting on PC boards almost 15 years ago. So it's no wonder we now have the industry's widest selection.

Choose single-element LEDs in a wide range of voltages (with or without current-limiting resistors) or QUAD-LED® four-element arrays. We offer standard and high-efficiency LEDs, as well as new super bright models that are 4 times brighter than ordinary LEDs but operate on a fraction of the power.

We have just the right color for your application, too. Red, green, yellow or red/green bicolor. The combinations are virtually limitless. That's why your search for the perfect LED circuit board indicator should begin and end with the company that started it all and has been lighting the way ever since. Dialight.

STANDARD

PART NUMBER	DIFFUSED LED COLOR	TYPICAL FORWARD VOLTAGE †	TYPICAL FORWARD CURRENT†	TYPICAL LUMINOUS INTENSITY	FIGURE NUMBER
547-2001	Red	1.6V @ 20mA	■	3.0mcd @ 20mA	
547-2002	Red	—	20mA @ 3.6V	3.0mcd @ 3.6V	
547-2007	Red	—	3.0mA @ 5.0V	0.6mcd @ 5.0V	
547-2003	Red	—	6.0mA @ 5.0V	1.2mcd @ 5.0V	
547-2004	Red	—	16mA @ 5.0V	2.0mcd @ 5.0V	
547-2005	Red	—	14mA @ 10.0V	1.8mcd @ 10.0V	1
547-2006	Red	—	10mA @ 14.0V	1.3mcd @ 14.0V	
547-2008	Red	—	3.0mA @ 24.0V	0.4mcd @ 24.0V	
547-2301	Green	2.4V @ 20mA	■	1.0mcd @ 20mA	
547-2303	Green	—	4.7mA @ 5.0V	0.5mcd @ 20mA	
547-2401	Yellow	2.2V @ 20mA	■	2.0mcd @ 20mA	
547-2403	Yellow	—	4.7mA @ 5.0V	0.6mcd @ 20mA	
550-0204	Green	2.3V @ 20mA	■	3.2mcd @ 20mA	
550-0304	Yellow	3.2V @ 20mA	■	3.2mcd @ 20mA	
550-0404	Red	1.7V @ 20mA	■	2.0mcd @ 20mA	
550-0504**	Red	—	15mA @ 5.0V	2.0mcd @ 5.0V	
550-0604π	Red	—	15mA @ 12.0V	2.0mcd @ 12.0V	2
550-0704**	Green	—	15mA @ 5.0V	2.0mcd @ 5.0V	
550-0804**	Yellow	—	15mA @ 5.0V	2.0mcd @ 5.0V	
550-3004▲	Red/Green	2.3V @ 10mA (Red)	■	1.8mcd @ 10mA (Red)	
		2.3V @ 10mA (Green)	■	1.8mcd @ 10mA (Green)	
550-0205	Green	2.3V @ 20mA	■	3.2mcd @ 20mA	
550-0305	Yellow	2.3V @ 20mA	■	3.2mcd @ 20mA	
550-0405	Red	1.7V @ 20mA	■	2.0mcd @ 20mA	
550-0505**	Red	—	15mA @ 5.0V	2.0mcd @ 5.0V	
550-0605π	Red	—	15mA @ 12.0V	2.0mcd @ 12.0V	3
550-0705**	Green	—	15mA @ 5.0V	2.0mcd @ 5.0V	
550-0805**	Yellow	—	15mA @ 5.0V	2.0mcd @ 5.0V	
550-3005▲	Red/Green	2.3V @ 10mA (Red)	■	1.8mcd @ 10mA (Red)	
		2.3V @ 10mA (Green)	■	1.8mcd @ 10mA (Green)	
550-0206	Green	2.3V @ 20mA	■	3.2mcd @ 20mA	
550-0306	Yellow	2.3V @ 20mA	■	3.2mcd @ 20mA	
550-0406	Red	1.7V @ 20mA	■	2.0mcd @ 20mA	
550-0506**	Red	—	15mA @ 5.0V	2.0mcd @ 5.0V	
550-0606π	Red	—	15mA @ 12.0V	2.0mcd @ 12.0V	4
550-0706**	Green	—	15mA @ 5.0V	2.0mcd @ 5.0V	
550-0806**	Yellow	—	15mA @ 5.0V	2.0mcd @ 5.0V	
550-3006▲	Red/Green	2.3V @ 10mA (Red)	■	1.8mcd @ 10mA (Red)	
		2.3V @ 10mA (Green)	■	1.8mcd @ 10mA (Green)	
550-0204-004*	Green	2.3V @ 20mA	■	3.2mcd @ 20mA	
550-0304-004*	Yellow	2.3V @ 20mA	■	3.2mcd @ 20mA	
550-0404-004*	Red	1.7V @ 20mA	■	2.0mcd @ 20mA	
550-0205-004*	Green	2.3V @ 20mA	■	3.2mcd @ 20mA	
550-0305-004*	Yellow	2.3V @ 20mA	■	3.2mcd @ 20mA	
550-0405-004*	Red	1.7V @ 20mA	■	2.0mcd @ 20mA	5
550-0206-004*	Green	2.3V @ 20mA	■	3.2mcd @ 20mA	
550-0306-004*	Yellow	2.3V @ 20mA	■	3.2mcd @ 20mA	
550-0406-004*	Red	1.7V @ 20mA	■	2.0mcd @ 20mA	
550-3006-004*▲	Red/Green	2.3V @ 10mA (Red)	■	1.8mcd @ 10mA (Red)	
		2.3V @ 10mA (Green)	■	1.8mcd @ 10mA (Green)	
551-0205	Green	2.4V @ 20mA	■	2.0mcd @ 20mA	
551-0305	Yellow	2.2V @ 10mA	■	2.5mcd @ 10mA	6
551-0405	Red	1.6V @ 20mA	■	2.0mcd @ 20mA	
551-0505**	Red	5V	16mA @ 5.0V	0.8mcd @ V_f=5.0V	
555-2001	Red	1.6V @ 20mA	■	3.0mcd @ 20mA	
555-2002	Red	—	20mA @ 3.6V	3.0mcd @ 3.6V	
555-2007	Red	—	3.0mA @ 5.0V	0.6mcd @ 5.0V	
555-2003	Red	—	6.0mA @ 5.0V	1.2mcd @ 5.0V	
555-2004	Red	—	16mA @ 5.0V	2.0mcd @ 5.0V	
555-2005	Red	—	14mA @ 10.0V	1.8mcd @ 10.0V	7
555-2006	Red	—	10mA @ 14.0V	1.3mcd @ 14.0V	
555-2008	Red	—	3.0mA @ 24.0V	0.4mcd @ 24.0V	
555-2301	Green	2.4V @ 20mA	■	1.0mcd @ 20mA	
555-2303	Green	—	4.7mA @ 5.0V	0.5mcd @ 5.0V	
555-2401	Yellow	2.2V @ 20mA	■	2.0mcd @ 20mA	
555-2403	Yellow	—	4.7mA @ 5.0V	0.6mcd @ 5.0V	
555-3001		1.6V @ 20mA	■	3.0mcd @ 20mA	
555-3002		—	20mA @ 3.6V	3.0mcd @ 3.6V	
555-3007		—	3.0mA @ 5.0V	0.6mcd @ 5.0V	
555-3003	Red	—	6.0mA @ 5.0V	1.2mcd @ 5.0V	8
555-3004		—	16mA @ 5.0V	2.0mcd @ 5.0V	
555-3005		—	14mA @ 10.0V	1.8mcd @ 10.0V	
555-3006		—	10mA @ 14.0V	1.3mcd @ 14.0V	
555-3008		—	3.0mA @ 24.0V	0.4mcd @ 24.0V	

STANDARD

PART NUMBER	DIFFUSED LED COLOR	TYPICAL FORWARD VOLTAGE †	TYPICAL FORWARD CURRENT†	TYPICAL LUMINOUS INTENSITY	FIGURE NUMBER
555-4001*	Red	1.6 @ 20mA	■	3.0mcd @ 20mA	
555-4003*	Red	—	6mA @ 5.0V	1.2mcd @ 5.0V	
555-4007*	Red	—	3mA @ 5.0V	0.6mcd @ 5.0V	
555-4301*	Green	2.4V @ 20mA	■	1.0mcd @ 20mA	9
555-4303*	Green	—	4.7mA @ 5.0V	0.5mcd @ 5.0V	
555-4401*	Yellow	2.2V @ 20mA	■	2.0mcd @ 20mA	
555-4403*	Yellow	—	4.7mA @ 5.0V	0.6mcd @ 5.0V	
561-0101-050	Red	1.9V @ 5.0mA	■	3.0mcd @ 10mA	
561-0101-060	Red	1.9V @ 5.0mA	■	3.0mcd @ 10mA	
561-0101-070	Red	1.9V @ 5.0mA	■	3.0mcd @ 10mA	10
561-0101-080	Red	1.9V @ 5.0mA	■	3.0mcd @ 10mA	
561-0101-090	Red	1.9V @ 5.0mA	■	3.0mcd @ 10mA	
561-0101-100	Red	1.9V @ 5.0mA	■	3.0mcd @ 10mA	

HIGH EFFICIENCY Current Limiting Required

PART NUMBER	DIFFUSED LED COLOR	TYPICAL FORWARD VOLTAGE †	TYPICAL FORWARD CURRENT†	TYPICAL LUMINOUS INTENSITY	FIGURE NUMBER
550-2204	Green	2.2V @ 20mA		3.0mcd @ 20mA	
550-2304	Yellow	2.2V @ 10mA		3.0mcd @ 10mA	2
550-2404	Red	2.2V @ 10mA		4.0mcd @ 10mA	
550-2205	Green	2.2V @ 20mA		3.0mcd @ 20mA	
550-2305	Yellow	2.2V @ 10mA		3.0mcd @ 10mA	3
550-2405	Red	2.2V @ 10mA		4.0mcd @ 10mA	
550-2206	Green	2.2V @ 20mA		3.0mcd @ 20mA	
550-2306	Yellow	2.2V @ 10mA		3.0mcd @ 10mA	4
550-2406	Red	2.2V @ 10mA		4.0mcd @ 10mA	
550-2204-004	Green	2.2V @ 20mA		3.0mcd @ 20mA	
550-2304-004	Yellow	2.2V @ 10mA		3.0mcd @ 10mA	
550-2404-004	Red	2.2V @ 10mA		4.0mcd @ 10mA	
550-2205-004	Green	2.2V @ 20mA		3.0mcd @ 20mA	
550-2305-004	Yellow	2.2V @ 10mA		3.0mcd @ 10mA	5
550-2405-004	Red	2.2V @ 10mA		4.0mcd @ 10mA	
550-2206-004	Green	2.2V @ 20mA		3.0mcd @ 20mA	
550-2306-004	Yellow	2.2V @ 10mA		3.0mcd @ 10mA	
550-2406-004	Red	2.2V @ 10mA		4.0mcd @ 10mA	
561-2101-050	Red	2.2V @ 10mA		4.0mcd @ 10mA	
561-2101-060	Red	2.2V @ 10mA		4.0mcd @ 10mA	
561-2101-070	Red	2.2V @ 10mA		4.0mcd @ 10mA	
561-2101-080	Red	2.2V @ 10mA		4.0mcd @ 10mA	
561-2101-090	Red	2.2V @ 10mA		4.0mcd @ 10mA	
561-2101-100	Red	2.2V @ 10mA		4.0mcd @ 10mA	
561-2201-050	Green	2.2V @ 20mA		6.0mcd @ 20mA	
561-2201-060	Green	2.2V @ 20mA		6.0mcd @ 20mA	
561-2201-070	Green	2.2V @ 20mA		6.0mcd @ 20mA	
561-2201-080	Green	2.2V @ 20mA		6.0mcd @ 20mA	
561-2201-090	Green	2.2V @ 20mA		6.0mcd @ 20mA	
561-2201-100	Green	2.2V @ 20mA		6.0mcd @ 20mA	
561-2301-050	Yellow	2.2V @ 10mA		3.0mcd @ 10mA	
561-2301-060	Yellow	2.2V @ 10mA		3.0mcd @ 10mA	
561-2301-070	Yellow	2.2V @ 10mA		3.0mcd @ 10mA	
561-2301-080	Yellow	2.2V @ 10mA		3.0mcd @ 10mA	
561-2301-090	Yellow	2.2V @ 10mA		3.0mcd @ 10mA	
561-2301-100	Yellow	2.2V @ 10mA		3.0mcd @ 10mA	10
561-2401-050	Red □	2.2V @ 10mA		24.0mcd @ 10mA	
561-2401-060	Red □	2.2V @ 10mA		24.0mcd @ 10mA	
561-2401-070	Red □	2.2V @ 10mA		24.0mcd @ 10mA	
561-2401-080	Red □	2.2V @ 10mA		24.0mcd @ 10mA	
561-2401-090	Red □	2.2V @ 10mA		24.0mcd @ 10mA	
561-2401-100	Red □	2.2V @ 10mA		24.0mcd @ 10mA	
561-2501-050	Green □	2.2V @ 20mA		25.0mcd @ 20mA	
561-2501-060	Green □	2.2V @ 20mA		25.0mcd @ 20mA	
561-2501-070	Green □	2.2V @ 20mA		25.0mcd @ 20mA	
561-2501-080	Green □	2.2V @ 20mA		25.0mcd @ 20mA	
561-2501-090	Green □	2.2V @ 20mA		25.0mcd @ 20mA	
561-2501-100	Green □	2.2V @ 20mA		25.0mcd @ 20mA	
561-2601-050	Yellow □	2.2V @ 10mA		16.0mcd @ 10mA	
561-2601-060	Yellow □	2.2V @ 10mA		16.0mcd @ 10mA	
561-2601-070	Yellow □	2.2V @ 10mA		16.0mcd @ 10mA	
561-2601-080	Yellow □	2.2V @ 10mA		16.0mcd @ 10mA	
561-2601-090	Yellow □	2.2V @ 10mA		16.0mcd @ 10mA	
561-2601-100	Yellow □	2.2V @ 10mA		16.0mcd @ 10mA	

† Typical Forward Current is specified for indicators with integral current limiting resistors; typical Forward Voltage is specified for indicators without integral current limiter. * LED array, Specifications are "per LED". ** With integral resistor for 5V operation.
π With integral resistor for 5V operation. ▲ Bicolor LED. ■ Current limiting required. • Other configurations available. Consult factory.

FIGURE 1

FIGURE 2

FIGURE 3

FIGURE 4

TYPICAL ILLUSTRATION

FIGURE 5•

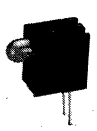


FIGURE 6

FIGURE 7

FIGURE 8

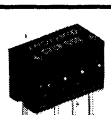


FIGURE 9

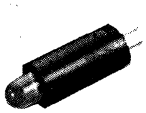
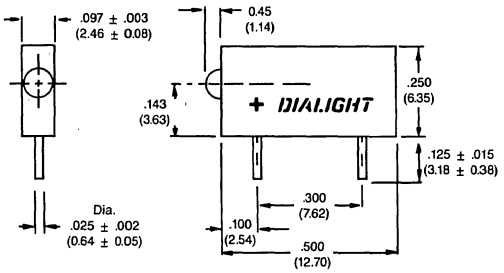


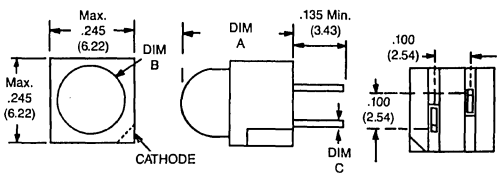
FIGURE 10

FIGURE 1



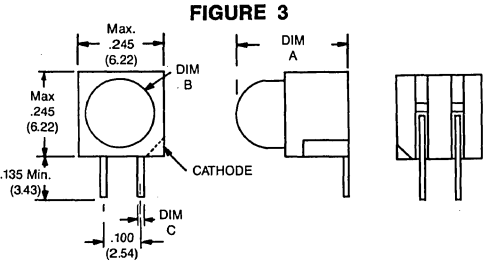
• DECIMALS ± .010 (±0.25)

FIGURE 2



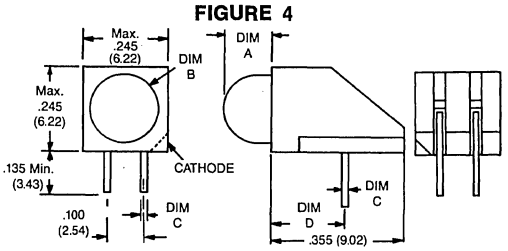
Dimensions	Standard	High Efficiency	550-0504 550-0604
A Max.	.380 (9.65)	.38	.37 (11.10)
B Dia.	.185 (4.70)	.185	.185 (4.70)
C	.020 (0.51)	.020	.025 (0.64)

FIGURE 3



Dimensions	Standard	High Efficiency	550-0505 550-0605
A Max.	.380 (9.65)	.38	.37 (11.10)
B Dia.	.185 (4.70)	.185	.185 (4.70)
C	.020 (0.51)	.020	.025 (0.64)

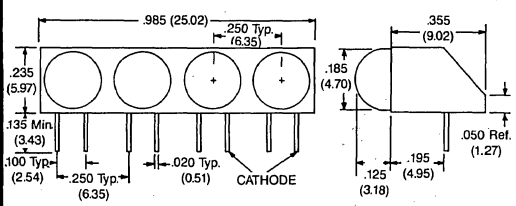
FIGURE 4



Dimensions	Standard	High Efficiency	550-0504 550-0604
A	.125 (3.18)	.183	.187 (4.75)
B Dia.	.185 (4.70)	.185	.185 (4.70)
C	.020 (0.51)	.020	.025 (0.64)
D	.200 (5.08)	.203	.210 (5.33)

FIGURE 5•

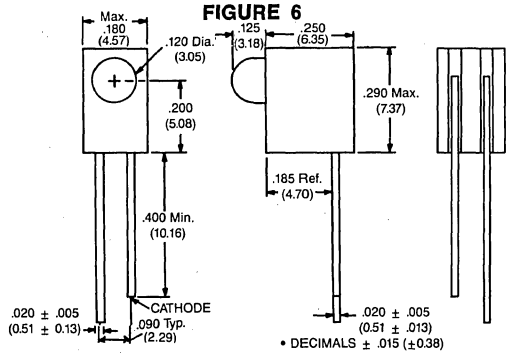
QUAD-LED®



THE CATHODE, AS MARKED, IS THE RED CATHODE FOR THE RED/GREEN BICOLOR LED.

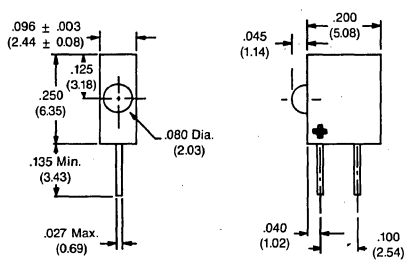
• DECIMALS ± .015 (±0.38)

FIGURE 6



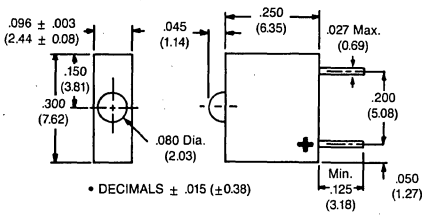
• DECIMALS ± .015 (±0.38)

FIGURE 7



• DECIMALS ± .015 (±0.38)

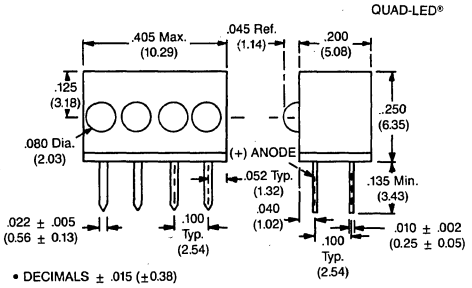
FIGURE 8



• DECIMALS ± .015 (±0.38)

FIGURE 9

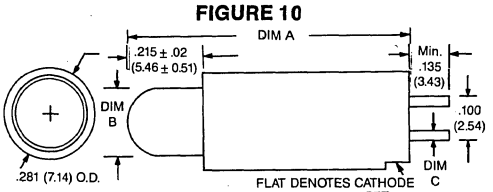
QUAD-LED®



• DECIMALS ± .015 (±0.38)

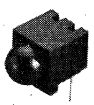
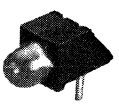
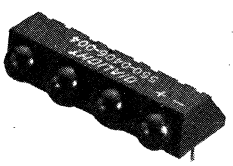
U.S. Pat. No. 4,206,493

FIGURE 10



DIMENSIONS	STANDARD & HIGH EFFICIENCY
Dimension A + .010 (0.25) − .031 (0.79)	
561XXXX050	0.500 (12.70)
561XXXX060	0.600 (15.24)
561XXXX070	0.700 (17.78)
561XXXX080	0.800 (20.32)
561XXXX090	0.900 (22.86)
561XXXX100	1.000 (25.40)
Dimension B	0.200 (5.08)
Dimension C	0.020 (0.51)

SUPER BRIGHT Current Limiting Required

PART NUMBER	LED COLOR Diffused (D) Water Clear (W.C.)	TYPICAL FORWARD VOLTAGE	TYPICAL LUMINOUS INTENSITY	FIGURE NUMBER
550-5104	Red (D)	1.7V @ 20mA	30mcd @ 30mA	FIGURE 2
550-5204	Green (D)	2.1V @ 20mA	12mcd @ 20mA	
550-5304	Yellow (D)	2.1V @ 20mA	45mcd @ 20mA	
550-5404	Amber (D)	2.2V @ 20mA	24mcd @ 20mA	
550-5504	Red (W.C.)	1.7V @ 20mA	160mcd @ 20mA	
550-5604	Green (W.C.)	2.1V @ 20mA	80mcd @ 20mA	
550-5704	Yellow (W.C.)	2.1V @ 20mA	160mcd @ 20mA	
550-5804	Amber (W.C.)	2.2V @ 20mA	90mcd @ 20mA	
550-5105	Red (D)	1.7V @ 20mA	30mcd @ 20mA	 FIGURE 3
550-5205	Green (D)	2.1V @ 20mA	12mcd @ 20mA	
550-5305	Yellow (D)	2.1V @ 20mA	45mcd @ 20mA	
550-5405	Amber (D)	2.2V @ 20mA	24mcd @ 20mA	
550-5505	Red (W.C.)	1.7V @ 20mA	160mcd @ 20mA	
550-5605	Green (W.C.)	2.1V @ 20mA	80mcd @ 20mA	
550-5705	Yellow (W.C.)	2.1V @ 20mA	160mcd @ 20mA	
550-5805	Amber (W.C.)	2.2V @ 20mA	90mcd @ 20mA	
550-5106	Red (D)	1.7V @ 20mA	30mcd @ 20mA	 FIGURE 4
550-5206	Green (D)	2.1V @ 20mA	12mcd @ 20mA	
550-5306	Yellow (D)	2.1V @ 20mA	45mcd @ 20mA	
550-5406	Amber (D)	2.2V @ 20mA	24mcd @ 20mA	
550-5506	Red (W.C.)	1.7V @ 20mA	160mcd @ 20mA	
550-5606	Green (W.C.)	2.1V @ 20mA	80mcd @ 20mA	
550-5706	Yellow (W.C.)	2.1V @ 20mA	160mcd @ 20mA	
550-5806	Amber (W.C.)	2.2V @ 20mA	90mcd @ 20mA	
550-5104-004*	Red (D)	1.7V @ 20mA	30mcd @ 20mA	 FIGURE 5• TYPICAL ILLUSTRATION
550-5204-004*	Green (D)	2.1V @ 20mA	12mcd @ 20mA	
550-5304-004*	Yellow (D)	2.1V @ 20mA	45mcd @ 20mA	
550-5404-004*	Amber (D)	2.2V @ 20mA	24mcd @ 20mA	
550-5504-004*	Red (W.C.)	1.7V @ 20mA	160mcd @ 20mA	
550-5604-004*	Green (W.C.)	2.1V @ 20mA	80mcd @ 20mA	
550-5704-004*	Yellow (W.C.)	2.1V @ 20mA	160mcd @ 20mA	
550-5804-004*	Amber (W.C.)	2.2V @ 20mA	90mcd @ 20mA	
550-5105-004*	Red (D)	1.7V @ 20mA	30mcd @ 20mA	
550-5205-004*	Green (D)	2.1V @ 20mA	12mcd @ 20mA	
550-5305-004*	Yellow (D)	2.1V @ 20mA	45mcd @ 20mA	
550-5405-004*	Amber (D)	2.2V @ 20mA	24mcd @ 20mA	
550-5505-004*	Red (W.C.)	1.7V @ 20mA	160mcd @ 20mA	
550-5605-004*	Green (W.C.)	2.1V @ 20mA	80mcd @ 20mA	
550-5705-004*	Yellow (W.C.)	2.1V @ 20mA	160mcd @ 20mA	
550-5805-004*	Amber (W.C.)	2.2V @ 20mA	90mcd @ 20mA	
550-5106-004*	Red (D)	1.7V @ 20mA	30mcd @ 20mA	
550-5206-004*	Green (D)	2.1V @ 20mA	12mcd @ 20mA	
550-5306-004*	Yellow (D)	2.1V @ 20mA	45mcd @ 20mA	
550-5406-004*	Amber (D)	2.2V @ 20mA	24mcd @ 20mA	
550-5506-004*	Red (W.C.)	1.7V @ 20mA	160mcd @ 20mA	
550-5606-004*	Green (W.C.)	2.1V @ 20mA	80mcd @ 20mA	
550-5706-004*	Yellow (W.C.)	2.1V @ 20mA	160mcd @ 20mA	
550-5806-004*	Amber (W.C.)	2.2V @ 20mA	90mcd @ 20mA	

* LED array, Specifications are "per LED".
• Other configurations available. Consult factory.

FIGURE 2

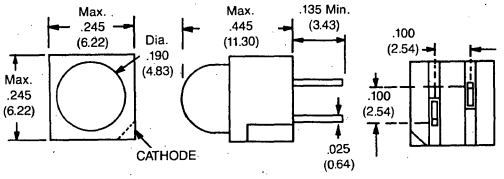


FIGURE 3

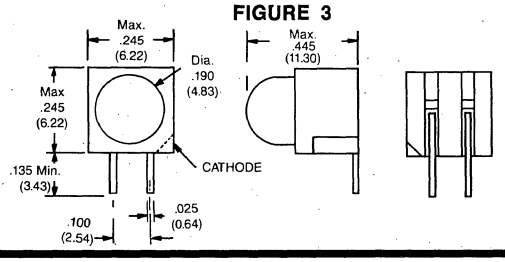


FIGURE 4

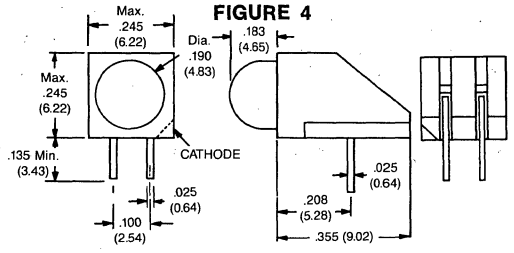
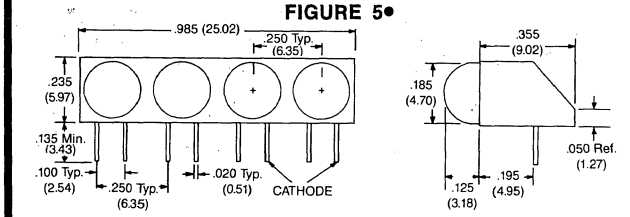


FIGURE 5•



THE CATHODE, AS MARKED, IS THE RED CATHODE FOR THE RED/GREEN BICOLOR LED.

• DECIMALS ± .015 (±0.38)

SUPER BRIGHT Current Limiting Required

PART NUMBER	LED COLOR Diffused (D) Water Clear (W.C.)	TYPICAL FORWARD VOLTAGE	TYPICAL LUMINOUS INTENSITY	FIGURE NUMBER
561-5101-050	Red (D)	1.7V @ 20mA	30mcd @ 20mA	
561-5101-060	Red (D)	1.7V @ 20mA	30mcd @ 20mA	
561-5101-070	Red (D)	1.7V @ 20mA	30mcd @ 20mA	
561-5101-080	Red (D)	1.7V @ 20mA	30mcd @ 20mA	
561-5101-090	Red (D)	1.7V @ 20mA	30mcd @ 20mA	
561-5101-100	Red (D)	1.7V @ 20mA	30mcd @ 20mA	
561-5201-050	Green (D)	2.1V @ 20mA	12mcd @ 20mA	
561-5201-060	Green (D)	2.1V @ 20mA	12mcd @ 20mA	
561-5201-070	Green (D)	2.1V @ 20mA	12mcd @ 20mA	
561-5201-080	Green (D)	2.1V @ 20mA	12mcd @ 20mA	
561-5201-090	Green (D)	2.1V @ 20mA	12mcd @ 20mA	
561-5201-100	Green (D)	2.1V @ 20mA	12mcd @ 20mA	
561-5301-050	Yellow (D)	2.1V @ 20mA	45mcd @ 20mA	
561-5301-060	Yellow (D)	2.1V @ 20mA	45mcd @ 20mA	
561-5301-070	Yellow (D)	2.1V @ 20mA	45mcd @ 20mA	
561-5301-080	Yellow (D)	2.1V @ 20mA	45mcd @ 20mA	
561-5301-090	Yellow (D)	2.1V @ 20mA	45mcd @ 20mA	
561-5301-100	Yellow (D)	2.1V @ 20mA	45mcd @ 20mA	
561-5401-050	Amber (D)	2.2V @ 20mA	24mcd @ 20mA	
561-5401-060	Amber (D)	2.2V @ 20mA	24mcd @ 20mA	
561-5401-070	Amber (D)	2.2V @ 20mA	24mcd @ 20mA	
561-5401-080	Amber (D)	2.2V @ 20mA	24mcd @ 20mA	
561-5401-090	Amber (D)	2.2V @ 20mA	24mcd @ 20mA	
561-5401-100	Amber (D)	2.2V @ 20mA	24mcd @ 20mA	
561-5501-050	Red (W.C.)	1.7V @ 20mA	160mcd @ 20mA	
561-5501-060	Red (W.C.)	1.7V @ 20mA	160mcd @ 20mA	
561-5501-070	Red (W.C.)	1.7V @ 20mA	160mcd @ 20mA	
561-5501-080	Red (W.C.)	1.7V @ 20mA	160mcd @ 20mA	
561-5501-090	Red (W.C.)	1.7V @ 20mA	160mcd @ 20mA	
561-5501-100	Red (W.C.)	1.7V @ 20mA	160mcd @ 20mA	
561-5601-050	Green (W.C.)	2.1V @ 20mA	80mcd @ 20mA	
561-5601-060	Green (W.C.)	2.1V @ 20mA	80mcd @ 20mA	
561-5601-070	Green (W.C.)	2.1V @ 20mA	80mcd @ 20mA	
561-5601-080	Green (W.C.)	2.1V @ 20mA	80mcd @ 20mA	
561-5601-090	Green (W.C.)	2.1V @ 20mA	80mcd @ 20mA	
561-5601-100	Green (W.C.)	2.1V @ 20mA	80mcd @ 20mA	
561-5701-050	Yellow (W.C.)	2.1V @ 20mA	160mcd @ 20mA	
561-5701-060	Yellow (W.C.)	2.1V @ 20mA	160mcd @ 20mA	
561-5701-070	Yellow (W.C.)	2.1V @ 20mA	160mcd @ 20mA	
561-5701-080	Yellow (W.C.)	2.1V @ 20mA	160mcd @ 20mA	
561-5701-090	Yellow (W.C.)	2.1V @ 20mA	160mcd @ 20mA	
561-5701-100	Yellow (W.C.)	2.1V @ 20mA	160mcd @ 20mA	
561-5801-050	Amber (W.C.)	2.2V @ 20mA	90mcd @ 20mA	
561-5801-060	Amber (W.C.)	2.2V @ 20mA	90mcd @ 20mA	
561-5801-070	Amber (W.C.)	2.2V @ 20mA	90mcd @ 20mA	
561-5801-080	Amber (W.C.)	2.2V @ 20mA	90mcd @ 20mA	
561-5801-090	Amber (W.C.)	2.2V @ 20mA	90mcd @ 20mA	
561-5801-100	Amber (W.C.)	2.2V @ 20mA	90mcd @ 20mA	

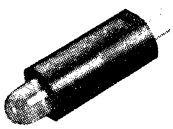
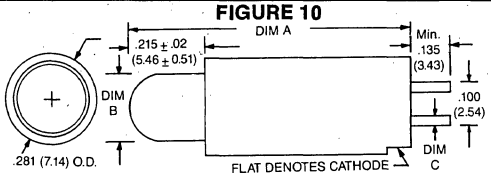


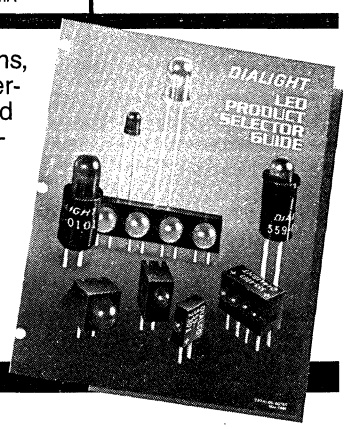
FIGURE 10

FIGURE 10



DIMENSIONS	SUPER BRIGHT
Dimension A + .010 (0.25) − .031 (0.79)	
561XXXX050	0.500 (12.70)
561XXXX060	0.600 (15.24)
561XXXX070	0.700 (17.78)
561XXXX080	0.800 (20.32)
561XXXX090	0.900 (22.86)
561XXXX100	1.000 (25.40)
Dimension B	0.197 (5.00)
Dimension C	0.025 (0.64)

For complete specifications, mounting diagrams, ordering information, etc., send for our free LED product catalog. Dialight, 203 Harrison Place, Brooklyn, NY 11237-1587. Or call (718) 497-7600.



DIALIGHT LED CIRCUIT BOARD INDICATORS

A North American Philips Company

DIALIGHT INDICATOR LIGHTS MEET YOUR NEEDS.

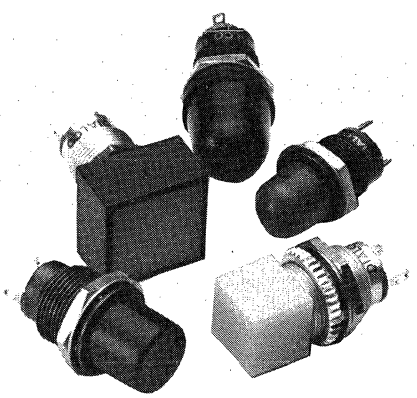
Whatever your application calls for in indicator lights, Dialight has your number. Over 1,500,000 to be exact. That's how many different types of indicator lights we offer. One is bound to meet your specs and needs perfectly.

Take our ultraminiature incandescents with plug-in cartridges for example. They come in enough colors to simplify even the most complex front panels. And they make changing lamps a snap. Dialight LEDs, on the other hand, have a service life of over 100,000 hours. We also offer indicators with built-in RFI/EMI shields, open types, as well as watertight, oil-tight and press-to-test models. You'll also be happy to know that all our indicator lights meet or exceed military specs.

ULTRAMINIATURE LED, INCANDESCENT OR NEON INDICATORS—DATALITES®

Replaceable plug-in cartridges for 1.35-125V operation. U.L. listed and CSA approved. Indicators mount in 9/32″, 3/8″ and 3/4″ (twin lamp) clearance holes. Meet or exceed MIL-L-3661. Available with red, green, amber, blue, white translucent, light yellow or colorless lenses. Wide range of lens shapes. Custom legends.

SUBMINIATURE INCANDESCENT OR NEON INDICATORS

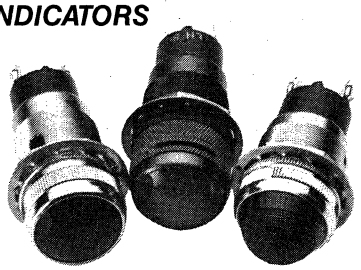


Meet or exceed MIL-L-3661. U.L. listed and CSA approved. Mount in 15/32″, 1/2″ or 17/32″ clearance holes. Incandescent for 1.35 to 28V; neon has built-in current-limiting resistor. Choice of cylindrical, faceted, convex, flat, square and round lens shapes. Custom legends.

MINIATURE INCANDESCENT OR NEON INDICATORS

U.L. listed and CSA approved. Meet or exceed MIL-L-3661. Mount in 9/16″ and 11/16″ clearance holes. Voltages range from 2 to 120V. Available in red, green, amber, blue, white, yellow or colorless lenses. Full range of finishes.

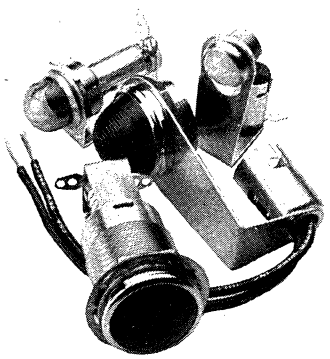
LARGE INCANDESCENT OR NEON INDICATORS



DIALIGHT INDICATOR LIGHTS MEET YOUR NEEDS.

Mount in 1″ clearance hole. U.L. listed and CSA approved. Meet or exceed MIL-L-3661. Incandescent for 2 to 250V; neon has built-in current-limiting resistor. Screw-on or friction-fit lens caps. Bayonet lock caps also available. Mechanical dimmer caps or light shield lens cap available on some models. Choice of flat, convex, torpedo, large torpedo, faceted, torpedo faceted or dome lens shapes.

OPEN TYPE INDICATORS

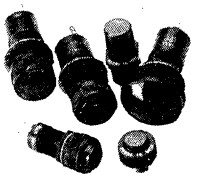


Mount in 7/16″, 11/16″ or 1″ clearance holes. 2 to 250V models available depending upon series. Tamper-proof construction is available. Choice of flat, convex, faceted, stove-pipe or cylindrical lens shapes.

OIL-TIGHT INDICATORS

U.L. listed and CSA approved. Three retained elastomer seals of inert material, consisting of a gasket and two "O" rings, make these indicator lights resistant to permeation by oil, water, dust or fumes. Thus, assuring high reliability in harsh environments. Subminiature and miniature incandescent and neon lamps mount in 15/32″ and 11/16″ clearance holes. Large incandescent and neon lamps mount in 1″ or 1-3/16″ clearance holes. Available in red, green, yellow, blue, white translucent, light yellow and clear colorless. Positive or negative film discs with words, numerals or letters may be ordered for use with some models. Wide range of voltages and specifications available.

PRESS-TO-TEST INDICATORS

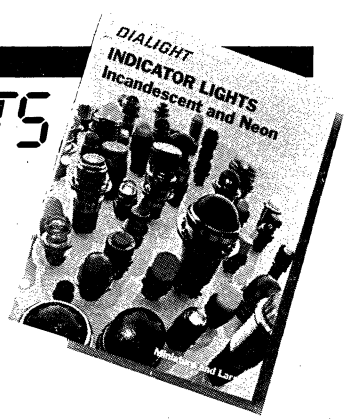


Positive safety factors are provided by patented built-in Press-To-Test indicators. Lamps can be checked instantly and accurately without removing them from their assembly. 4-terminal assemblies are available with all indicators and are particularly useful for remote applications. Subminiature, miniature and large Press-To-Test indicators are available for mounting in 15/32″, 5/8″ and 1″ clearance holes respectively. Choice of red, green, yellow, blue, white translucent, light yellow and clear colorless lens colors. Patented shutter-dimming device available on most models. Hot-stamped or engraved legend can be supplied on flat lenses. Meet or exceed MIL-L-7961B and MIL-L-3661. QPL approval.

For complete specifications, mounting diagrams, ordering information, etc., send for our free product catalogs. Dialight, 203 Harrison Place, Brooklyn, NY 11237-1587. Or call (718) 497-7600.

DIALIGHT INDICATOR LIGHTS

A North American Philips Company



DIALIGHT LED READOUT DISPLAYS MEET YOUR NEEDS.

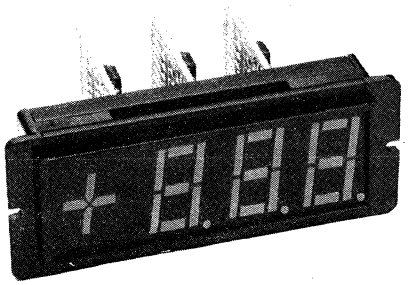
Dialight offers three basic types of LED readout displays: complete assemblies, modules and bezel kits, and discrete readouts. All are excellent choices where power is a limiting factor and IC compatibility, ultra reliability and packaging density are prime requirements.

Readouts come in a variety of sizes, ranging from .270″ to .600″ in character height. Available styles include: 7 segment, hexadecimal, alphanumeric and custom symbols.

Typical viewing distance, in normal ambient, ranges from 10 to 25 feet, with brightness a current variable. Special Dialight filters provide excellent character enhancement, permitting use in higher illumination environments (excluding direct sunlight).

Because Dialight readout displays are virtually immune to shock and vibration, they're particularly valuable in rugged applications. Their solid-state construction offers life measured in years.

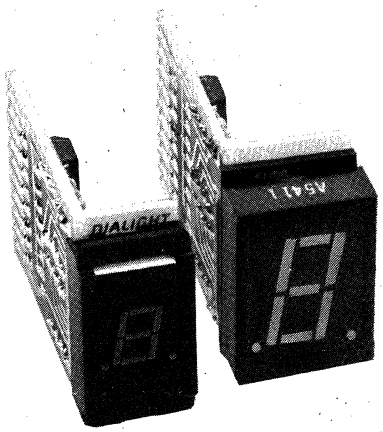
COMPLETE LED ASSEMBLIES



Complete assemblies significantly reduce the design time and cost normally associated with mounting and driving displays. They come complete with readouts and drivers mounted to PC boards in a bezel, making panel mounting easy. They also require only a 5 or 12 VDC power supply and BCD inputs. And they can be wired directly or by using edge-card connectors.

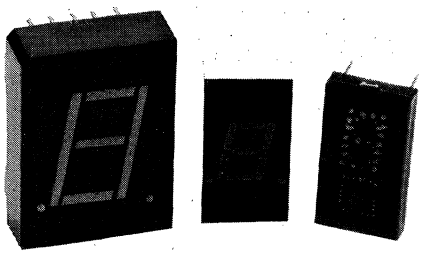
Attractive and bright, these LED readouts have non-glare windows to further enhance visibility. Each assembly is available with anywhere from one to 20 digits or status indicators. Character size ranges from .270″ to .600″ in height. To further increase design flexibility, drive circuitry is available with optional latch or counter. Also available with hexadecimal decoder with latch and CMOS decoder with latch. In addition, polarity indicators are an option. And optional spacers or specialty status symbols can be accommodated for custom assemblies.

LED MODULES



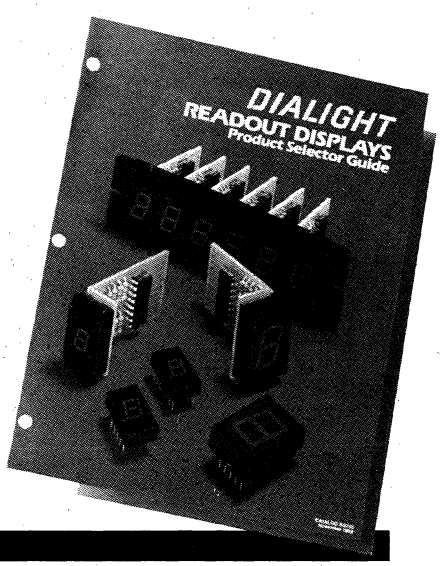
The same modules used in Dialight complete assemblies can be ordered separately, along with easily assembled bezel kits. This allows users to make their own custom displays with a minimum of parts, money and effort. Modules are also available in panel mount types for use without a bezel.

DISCRETE LED READOUTS



Discrete readouts are available in .270″, .300″ and .600″ character heights. Choose from seven segment, hexadecimal with integral drive circuitry and alphanumeric styles. Each readout offers high brightness with a wide viewing angle. Standoffs also allow for easy flux removal from PC boards after wave soldering.

For complete specifications, mounting diagrams, ordering information, etc., send for our free product catalog. Dialight, 203 Harrison Place, Brooklyn NY 11237-1587. Or call (718) 497-7600.



DIALIGHT LED READOUT DISPLAYS

A North American Philips Company

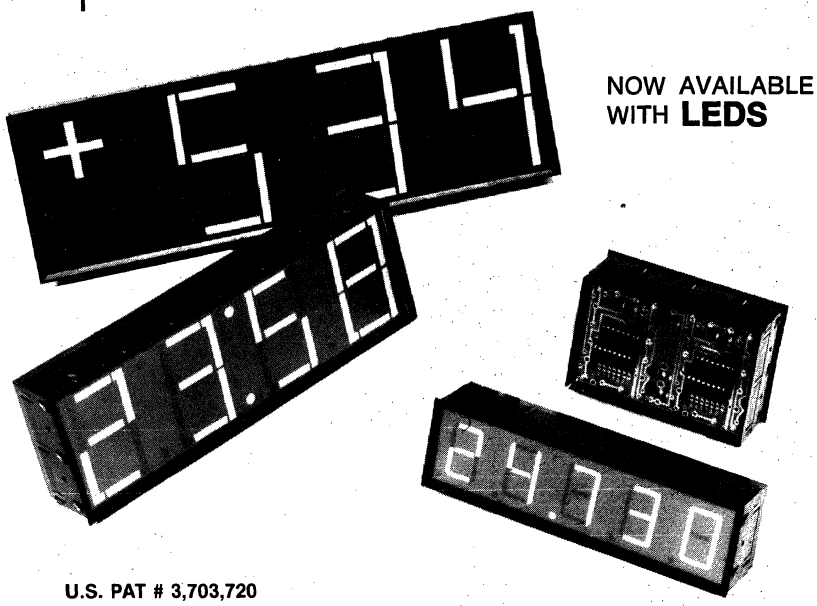
EEM PRODUCT SELECTION GUIDES

Use the EEM Product Selection Guides. There are 34 Guides in this edition of EEM. See page 2 (A•2, B•2, C•2, D•2) of each volume to locate the Product Selection Guides that pertain to your needs.

DIO-REY

THE LIGHTED DISPLAY DIVISION OF
INFO-LITE CORPORATION

LARGE CHARACTER DIGITAL DISPLAYS



NOW AVAILABLE WITH **LEDS**

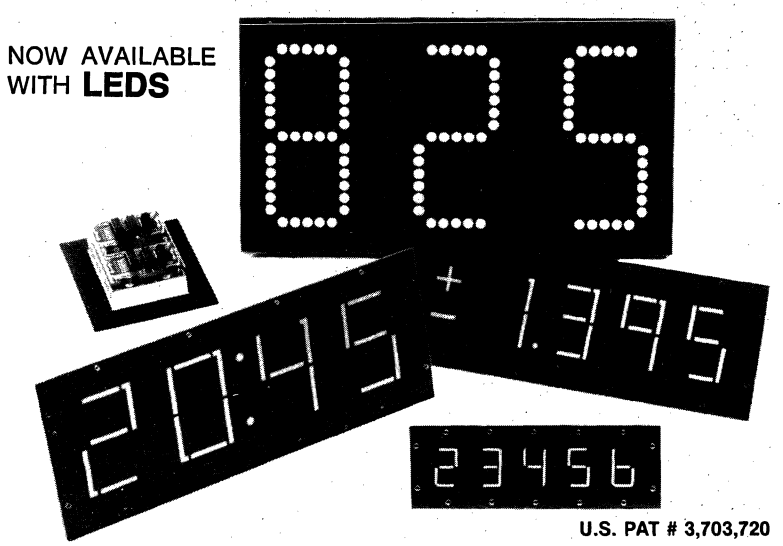
U.S. PAT # 3,703,720

DESIGNER SERIES

SERIES	DIGIT HT.	VIEW'G DIST.
68131	1.0 IN.	30 FT.
68132	2.0 IN.	60 FT.
68133	2.7 IN.	80 FT.

FEATURES

- Supplied in attractive, 1 to 8 digit assemblies
- Ready to install into rectangular panel cutout
- Assembly includes bezel & anti-glare "Black-Out" front panel
- Six standard, integral color filters, including High-Efficiency Red
- Low power: 0.8 W/1" digit; 1.6 W/2" & 2.7 digit (w/ HER filter)
- TTL or CMOS logic boards are part of assembly — Memory opt'l
- ± sign, colons, fixed or floating decimal are standard options
- Serviced from front without tools
- All wear parts (lamps and logic) socket mounted



NOW AVAILABLE WITH **LEDS**

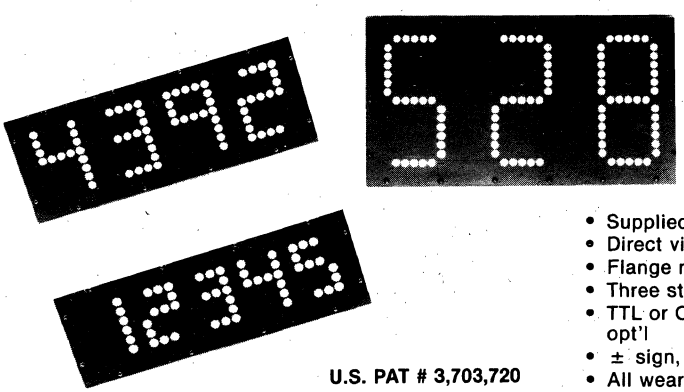
U.S. PAT # 3,703,720

INDUSTRIAL SERIES

SERIES	DIGIT HT.	VIEW'G DIST.
68231	1.0 IN.	30 FT.
68232	2.0 IN.	60 FT.
68233	2.7 IN.	80 FT.
68236	5.5 IN.	150 FT.

FEATURES

- Supplied in 1 to 8 digit assemblies w/anti-glare front panel
- Flange mounting w/gasket for NEMA environments
- TTL or CMOS drive logic boards are part of assembly — Memory opt'l
- Six standard, integral color filters, including High-Efficiency Red
- ± sign, colons, fixed or floating decimal are standard options
- All wear parts (lamps and logic) socket mounted



U.S. PAT # 3,703,720

OUTDOOR SERIES

SERIES	DIGIT HT.	VIEW'G DIST.
68332	2.0 IN.	60 FT.
68333	2.7 IN.	80 FT.
68336	5.5 IN.	150 FT.

FEATURES

- Supplied in 1 to 8 digit assemblies w/anti-glare front panel
- Direct viewed filaments for sunlight or stage light applications
- Flange mounting w/gasket for NEMA environments
- Three standard, integral color filters, including High-Efficiency Red
- TTL or CMOS drive logic boards are part of assembly — Memory opt'l
- ± sign, colons, fixed or floating decimal are standard options
- All wear parts (lamps and logic) socket mounted

DIO-REY • Div. of INFO-LITE • 422 Cliff Street • Fairview, NJ 07022 • (201) 941-4455 • "LINKS BETWEEN MAN AND MACHINE"

DIO-REY

THE LIGHTED DISPLAY DIVISION OF
INFO-LITE CORPORATION

SPECIFYING INFORMATION

GENERATING PART NUMBERS

68X 3X – XX – X X – X – X – X

SERIES
DESIGNER 1
INDUSTRIAL 2
OUTDOOR 3

DIGIT HT.
1″ 1
2″ 2
3″ 3
5½″ 6

LOGIC CODE (SEE TABLE 1)

NO. OF DIGITS

DISPLAY FORMAT
88 . . . . . 8 A
8.8. . . . . .8 B
±88 . . . . . 8 C
±8.8. . . . . .8 D
88:88:88 or 88:88 E
88 . . . . . 80 F
OTHER F'MATS (4) X

LAMP CODE (SEE TABLE 2)

COLOR FILTER
1 WHITE
2 RED
3 AMBER
4 YELLOW (3)
5 GREEN (3)
6 BLUE (3)

GASKET (1)
O NONE
F FRONT FLANGE MT'G (2)
R REAR FLANGE MT'G

NOTES:
(1) Gasket not available on Designer Series.
(2) Not available on 68X31 (1″) & 68X36 (5½″) Series.
(3) Not available on 68X36 (5½″) & Outdoor Series.
(4) If the unit in the example had a single decimal to the left of the least significant digit, it would be called out as: #68132-D1-3X-C-2-0; ± 88.8 format.

EXAMPLE: A Designer Series with 2″ digits; TTL, BCD to 7-Bar decoder-drivers without leading zero blanking; 3 digits, ± sign and floating decimal point (± 8.8.8 format); 5 volt, #345 lamps and red color filter (High Efficiency Red is mated with the #345 lamps) would have part #68132-D1-3D-C-2-0.

LAMP & DRIVE LOGIC OPTIONS

TABLE 1

VARIABLE	LOGIC CODE DASH NO.														
	-D1	-D2	-M1	-M2	-M3	-M4	-M5	-M6	-M7	-M8	-C1	-C2	-C3	-C4	-00
W/O Lead'g Zero Blank'g	●														W/O LOGIC
W/Lead'g Zero Blank'g		●													
1 Latch Per Digit			●	●	●	●									
1 Latch Per Display							●	●	●	●					
Latch Inactive											●	●	●	●	
Blanking User Driven					●	●			●	●			●	●	
Blanking Inactive			●	●			●	●			●	●			
Test User Driven				●		●		●		●		●		●	
Test Inactive			●		●		●		●		●		●		
Logic Type	TTL		CMOS w/ Latch Memory								CMOS				

DISPLAY	0	1	2	3	4	5	6	7	8	9	*	*	*	*	*	
BINARY INPUTS 8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
1 = High 4	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
0 = Low 2	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

DRIVE LOGIC NOTES

The 68X32 & 68X33 Series use SN7448 (TTL) or 4511B (CMOS), BCD to 7 Bar decoders which drive ULN2003A, 7 channel darlington drivers.

The 68X36 Series employs the same decoders and drivers as the 68X32 & 68X33 Series. For added reliability, these are arranged in a dual-parallel circuit with each decoder-driver powering half of the lamps that light each segment.

As with all CMOS devices, options with user driven inputs must be switched high or low during operation.

The logic supply current for TTL options is 55ma, typ., per digit except for the 68X36 Series and the 68X31 Series with J lamps where 110ma per digit is required.

* *With CMOS logic options, the display will blank if the BCD input is greater than 9.*

TABLE 2

LAMP TYPE	LAMP CODE	G.E. NO.	VOLTS (2)	Ma PER LAMP	MAX. AMPS/DIGIT (3) 68131 68231	68132 68232	68332	68133 68233	68333	68236 68336	AVG. LIFE (K HRS)
INCAN-DESANT	C (1)	345	5	33	.231	.462		.462		1.287	50 (5)
	J	377	5	60	.420	.840		.840		2.340	10 (5)
	K (4)	394	12	39	.273	.546	.702	.546	.975	1.521	10 (5)
	L (1)	344	12	15	.105	.210		.210		.585	10 (5)
RED LED	M5	—	5-6	30-40	.252	.504		.504		.756	100+
	M12	—	12-14	15-20	.126	.252		.252		.378	100+

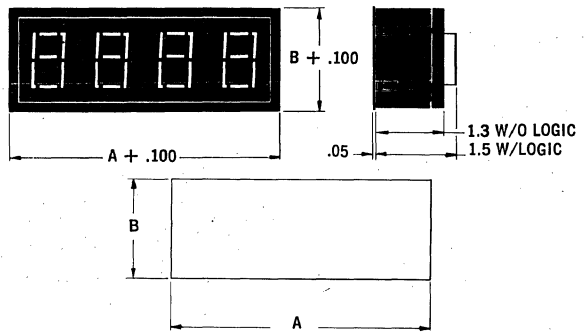
NOTES:
(1) Use with High Efficiency Red only.
(2) Input DC volts to lamp drivers.
(3) With figure 8 displayed.
(4) Use with all 6833X Outdoor Series.
(5) Reducing voltage by 6% doubles life.

DIO-REY • Div. of INFO-LITE • 422 Cliff Street • Fairview, NJ 07022 • (201) 941-4455 • "LINKS BETWEEN MAN AND MACHINE"

DIO-REY
THE LIGHTED DISPLAY DIVISION OF
INFO-LITE CORPORATION

MOUNTING INFORMATION

6813X DESIGNER SERIES

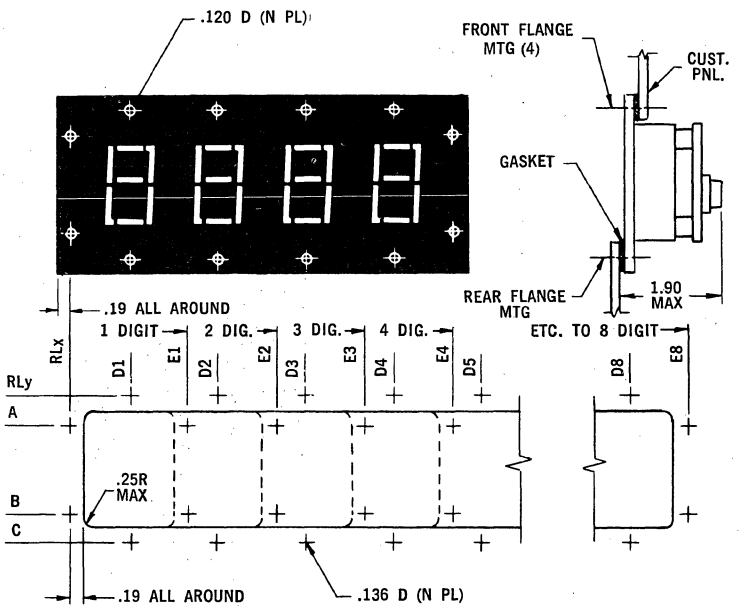


CUTOUT DIMENSIONS
ALL TOLERANCES +.015, −.000

No. of Digits In Assy*	Series 82131 B=1.630	Series 82132 B=2.380	Series 82133 B=3.130
	A	A	A
1	1.253	1.629	2.010
2	2.381	3.511	4.650
3	3.509	5.393	7.290
4	4.637	7.275	9.930
5	5.765	9.157	12.570
6	6.893	11.039	15.210
7	8.021	12.921	17.850
8	9.149	14.803	20.490

* ± sign equals one digit

6823X INDUSTRIAL SERIES & 6833X OUTDOOR SERIES



NOTES:

(1) Segments on all OUTDOOR Series are dot type. See photos.

(2) Two dimensions for a given Dim. Code indicate 2 mounting hole locations.

(3) ± sign equals one digit.

(4) Front Flange Mtg available on 2″ & 3″ models only — consult factory if this is required on 1″ or 5½″ models.

CUTOUT DIMENSIONS *ALL DIMENSIONS OFF RLX & RLY*

DIM. CODE (2)	SERIES 68231	68232 & 68332	68233 & 68333	68236 & 68336
A	.375	.750	.750	1.125
				3.375
B	1.500	2.625	3.375	5.625
C	1.875	3.375	4.125	6.750
D1	.750	1.500	1.500	.750
				3.000
D2	1.875	3.375	4.125	5.250
				7.500
D3	3.000	5.250	6.750	9.750
				12.000
D4	4.125	7.125	9.375	14.250
				16.500
D5	5.250	9.000	12.000	18.750
				21.000
D6	6.375	10.875	14.625	23.250
				25.500
D7	7.500	12.750	17.250	27.750
				30.000
D8	8.625	14.625	19.875	32.250
				34.500
E1	1.500	2.625	3.000	3.750
E2	2.625	4.500	5.625	8.250
E3	3.750	6.375	8.250	12.750
E4	4.875	8.250	10.875	17.250
E5	6.000	10.125	13.500	21.750
E6	7.125	12.000	16.125	26.250
E7	8.250	13.875	18.750	30.750
E8	9.375	15.750	21.375	35.250

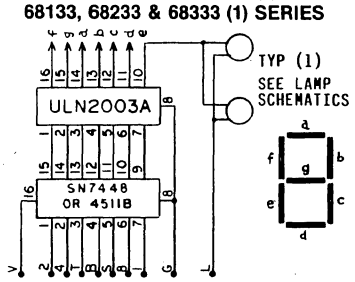
NO. OF DIGITS	N (Qty. of Mtg. Holes)			
1	6	6	6	10
2	8	8	8	14
3	10	10	10	18
4	12	12	12	22
5	14	14	14	26
6	16	16	16	30
7	18	18	18	34
8	20	20	20	38

DIO-REY
THE LIGHTED DISPLAY DIVISION OF INFO-LITE CORPORATION

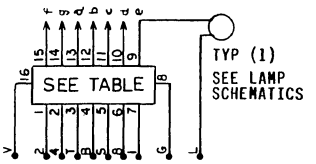
NUMERIC SCHEMATICS
ALPHA NUMERICS

DRIVE LOGIC SCHEMATICS

68132, 68232, 68332 (1)
68133, 68233 & 68333 (1) SERIES

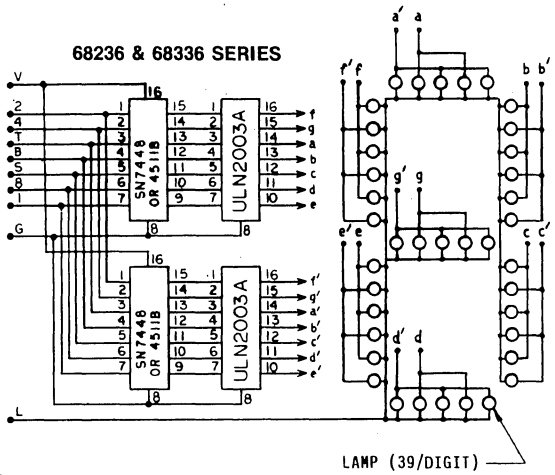


68131 & 68231 SERIES



LOGIC CODE	LAMP CODE	DECODER DRIVER
DX	C,K.L	SN7447A
DX	J	PB7447A
CX & MX	L	4511B
CX & MX	C,K	PB4511B

68236 & 68336 SERIES



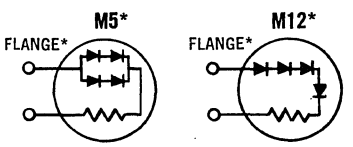
NOTES:
(1) **68332 Series** have 3 lamps in segments b, c, e & f. **68333 Series** have 3 lamps in segments a, d & g; 4 lamps in segments b, c, e & f.
(2) The T and/or B inputs are strapped high for CMOS logic options calling for inactive test or blanking.
(3) The S input is strapped low for CMOS logic options without memory (latch inactive).
(4) For ± sign: BCD 2 = +; BCD 1 = −
(5) Fixed decimal points and colons are strapped ON. Floating decimal points are user driven thru terminal D.
(6) In the -D2 logic option calling for leading zero blanking, the S terminal of the most significant digit is strapped low and the B terminal is connected to the S terminal of the next least significant digit (LSD). This B to S connection is repeated on all the following digits except on the LSD of the display assembly (right-most digit) which is set up not to blank leading zeros.

DRIVE LOGIC TERMINAL DESIGNATIONS

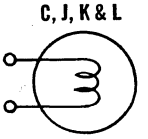
TERMINAL CODE		— FUNCTION — TTL (1) (68X3X-DX Series)	CMOS (3) (8) (68X3X-CX & -MX Series)
1, 2, 4 & 8		BCD INPUTS	BCD INPUTS
B	...	BLANKING INPUT (2)	BLANKING INPUT (4) (6)
D		DECIMAL POINT	DECIMAL POINT
G	...	GROUND	GROUND
L		LAMP POS. COMM	LAMP COMM (5)
S	...	NONE	LATCH (4)
T		LAMP TEST (6)	LAMP TEST (4) (6)
V	...	LOGIC POS	LOGIC POS.

NOTES:
(1) See electrical characteristics of SN7447A or SN7448 for details.
(2) Not available if leading zero suppression is specified.
(3) See electrical characteristics of 4511B for details.
(4) Strapped inactive (hi or lo) if function is not called for when purchasing.
(5) Positive for all series EXCEPT 68X31-CX & 68X31-MX where lamp common is negative.
(6) If active, only one connection required to operate (all terminals are common).
(7) Regulated power supplies are recommended for lamps & logic.
(8) For CMOS Logic options, handle display at a conductive work station until it is wired into the system.

LAMP SCHEMATICS



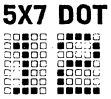
C, J, K & L



All lamps are T1¾, midget flange base. See Table 2, Lamp & Drive Logic Options, on previous page for further details.
*ZMX should be specified for 68X31 Series W/ CMOS Logic (cathode to flange).

ALPHANUMERICS — 0.7", 2.0" & 4.0"

5X7 DOT MATRIX



84040 SERIES, 0.7" LED
Features an on-board, 7 bit, TTL latch, character generator & LED drive circuitry, as well as a four level brightness control & lamp test. It will display a 96 character ASCII repetoire. Power is 5 volt at 200ma max. Available in orange & green with 500ucd brightness. Micro-processor buss compatible & can interface with Dio-Rey's 820 Series ASCII Serial Receivers (up to 16 characters can be driven by one 820 receiver)*. The characters may be stacked horizontally on .7" centers. Loading data: The desired data and chip enable should be present & stable during a write pulse. No sync is necessary & character will continue to be displayed until replaced with another. Multi-character units supplied (16 character Std.).
*See SYSTEM INTERFACES on following page.

84042 SERIES, 2.0" LED & 84044 SERIES, 4.0" LED
Complete multi-character units (18 character units are Std.) can be supplied to meet a wide variety of applications. They can be supplied in NEMA or Designer enclosures. Alternately, the hardware can be supplied bare, ready for user mounting. Included in the unit: Serial ASCII current loop receiver (300 to 1200 baud); Character generator and display driver; Optional display controller which allows various modes of display including direct copy, horizontal scroll, vertical scroll, etc.; All required DC power supplies. Multiple units may be driven off a single data loop with each unit being addressable. Up to 1756 characters can be stored in the memory.— For further information or applications engineering assistance, please contact us or your area representative.

14 SEGMENT

84045 SERIES, 5.4" LED
Multi-character units are available for industrial and commercial applications. Features superbright, 20mcd segments; Serial ASCII input at RS232 or current loop levels, or 6 bit parallel ASCII inputs at TTL levels; Displays 64 character ASCII subset; Supplied with all required DC power supplies, in NEMA or Designer enclosures; Input power is 115/230 VAC; Available with high efficiency red, green or yellow segments; Multiple units may be driven off a single data loop; Up to 65 location addresses per data loop; Input data rates from 110 to 9600 baud; 8 character and 16 character standard units.—For further information or applications engineering assistance, please contact us or your area representative.

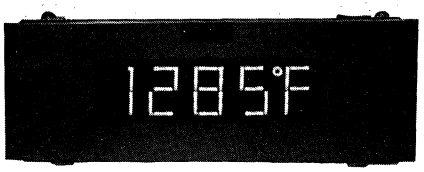
DIO-REY • Div. of INFO-LITE • 422 Cliff Street • Fairview, NJ 07022 • (201) 941-4455 • "LINKS BETWEEN MAN AND MACHINE"

DIO-REY

THE LIGHTED DISPLAY DIVISION OF INFO-LITE CORPORATION

DIGITAL INSTRUMENTS AND SYSTEMS

SERIAL INTERFACE DISPLAYS, DIGITAL METERS, COUNTERS, CLOCKS & TIMERS



GENERAL:

Dio-Rey standard instruments integrate a wide range of display interfaces and power supplies. Whether it be a 6 digit, 5½" high display w/serial interface in a NEMA 12 box or a 2" 4 digit clock in a designer enclosure, Dio-Rey has the unit.

FEATURES

- Large, easy to read LED displays for high reliability (1", 2", 3" and 5½")
- Available in rugged Industrial or attractive Designer packages
- Designed for long, trouble-free service
- Suitable for a wide variety of applications
- Serial interface is EIA RS232 or current loop compatible
- Analog to digital interfaces are voltage, current, temperature, load-cell and tachometer compatible
- Counters, clocks and timers in most popular configurations are available
- Powered from 110/220V, 50/60 Hz
- All wear and calibration components easily accessible

SPECIFICATIONS

- For Displays, see previous pages.
- For Interfaces, see next page.
- For Enclosures, see below
- Termination: barrier terminal block

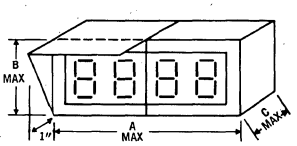
APPLICATIONS

- Analog to digital converters
- Clocks
- Bidirectional counters
- Coil winding counters
- Decade counters
- Event counters
- Pulse counters
- AC/DC ammeters
- AMP-HR meters
- Decibel indicating meters
- Fluid flow meters
- Volt meters
- Ohm meters
- Temperature meters
- Watt meters
- Timers
- Special indicators

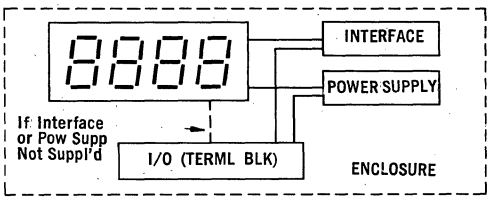
ENCLOSURE SIZE

Dimension Code		Dash Number (Number of Digits)*						
		-1X	-2X	-3X	-4X	-5X	-6X	-7X
A	82231				8	12¼	12¼	12¼
	82232			12¼	12¼	18¼	18¼	18¼
	82233	12¼	12¼	12¼	24¼	24¼	24¼	24¼
	82236	16¼	16¼	16¼	24¼	24¼	36¼	36¼
B	82231				6	6¼	6¼	6¼
	82232			6¼	6¼	6¼	6¼	6¼
	82233	6¼	6¼	6¼	12¼	12¼	12¼	12¼
	82236	14¼	14¼	14¼	12¼	12¼	12¼	12¼
C	82231				6	6	6	6
	82232			6	6	6	6	6
	82233	6	6	6	12	12	12	12
	82236	8	8	8	12	12	12	12

* ± sign counts as one digit, ie: -2C (±88 Format), uses a -3X enclosure.



BLOCK DIAGRAM

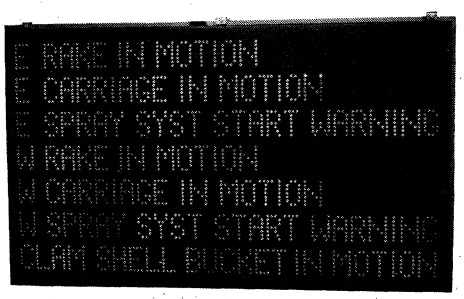


823 SERIES CLOCK & TIMERS

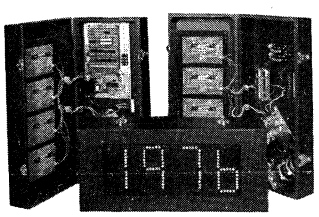
Standard Clock Interfaces are supplied in 4 or 6 digit, 12 or 24 hour formats. Calendar and decimal formats are available. Fast and Slow set inputs are standard; hold is optional.(1) As with the timers, All have BCD outputs compatible with Dio-Rey's Numeric Readouts. Timer interfaces that are available include count up, count down, both with preset options. Switch operation at a specified time optional.

(1) 50/60 Hz and crystal oscillation time bases are optional as are master/slave systems.

Part Number	Interface Code	Description
823-1	—61	4/6 Digit, 12 Hr Clock
823-2	—62	4/6 Digit, 24 Hr Clock
823-3	—63	Up Timer
823-4	—64	Down Timer

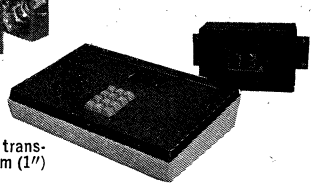


SPECIAL NUMERIC & ALPHA NUMERIC DISPLAY SYSTEMS

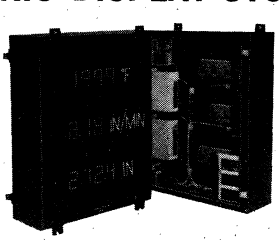


Laddle Wt meter (5½")

Two sided 5½" high digital thermometer



Keyboard entry, serial ASCII transmission remote display system (1")



Laddle temp/cast feed/cast length digital instrument unit for metal slab casting plant (3")

Dio-Rey has supplied a wide variety of display systems and custom displays to meet the special needs of our customers. These include:

- High noise immunity logic interfaces
- Keyboard & thumbwheel entry for remote displays
- Large character speed/length displays
- Digital Wt meters
- Visual annunciator systems

If you have a special requirement for lighted displays, please call us for applications engineering assistance. — We will be happy to help you.

DIO-REY • Div. of INFO-LITE • 422 Cliff Street • Fairview, NJ 07022 • (201) 941-4455 • "LINKS BETWEEN MAN AND MACHINE"

DIO-REY

THE LIGHTED DISPLAY DIVISION OF
INFO-LITE CORPORATION

SYSTEM INTERFACES
POWER SUPPLIES

GENERAL

DIO-REY has developed a wide variety of standard system interfaces for its numeric/alphanumeric readouts and lighted indicator/annunciators. These are the result of over 12 years experience in serving a broad spectrum of industries including instrumentation process control, communications, metals, chemicals, data processing, agriculture, security, office equipment, petroleum, auto, aerospace, textile, packaging, paper, transportation, governmental agencies and military.

These products may also be used in systems which do not require displays. In addition, custom interface electronics, designed to perform outside the specifications or capabilities of our standard units are available. Contact our sales department for technical application assistance.

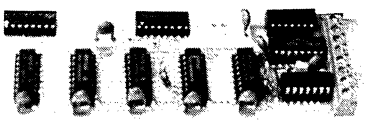
821 SERIES ANALOG TO DIGITAL CONVERTERS

The DIO-REY 821 Series are bipolar A/D's with up to 4¾ digit output capacity • BCD output ranges are: ±1999, ±3999, ±19999 and ±3999.

All features state-of-the-art technology at competitive cost • Input impedance >100 mΩ • Common mode rejection is 110 dB for DC; 90 dB for AC • Accuracy is ±0.05%, ±1 count • Auto zero and zero offset available • Ranging and zero adjustments conveniently located • 5 VDC and 110/220, 47-500 Hz input, depending on model • −10°C to +65°C; 0-90% RH non-condensing operating environment • ½" LED display available • 100 K hr MTBF.

Part Number	Interface Code	Range	Input Power	
			5 VDC	110/220 VAC
821-1	—21	±1.999V	•	
821-2	—22	±199.9V	•	
821-3	—23	±20.0 mA		•
821-4	—24	±20.00 mA		•
821-5	—25	4.0-20.0 mA		•
821-6	—26	4.00-20.00 mA		•
821-7	—27	10.0-50.0 mA		•
821-8	—28	10.00-50.00 mA		•
821-9	—29	±1.999 mV		•
821-10	—30	±1999 mV		•
821-11	—31	±3.999 mV		•
821-12	—32	±3999 mV		•

822 SERIES DECADE COUNTERS

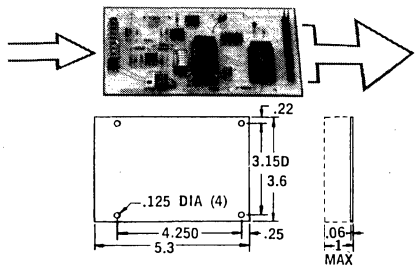


This series of counters includes Up, Down, Bi-Directional and Presetable (or combinations of these) units. All have T²L BCD outputs, compatible with DIO-REY displays. (1)Reset count and power (5 VDC) are brought in via a terminal block. Outputs terminate through a header.

(1) Contact debounce circuitry is supplied for mechanical switch count pulses. Decoupling capacitors are used for noise immunity.

Part Number	Interface Code	Description
822-4-1	—41	4 Decade, Up Counter
822-4-2	—42	4 Decade, Down Counter
822-4-3	—43	4 Decade, Up-Down Counter
822-4-4	—44	4 Decade, Preset Up Counter
822-4-5	—45	4 Decade, Preset Down Counter
822-4-6	—46	4 Decade, Preset Up-Down Counter

820 SERIES SERIAL ASCII INTERFACES



The DIO-REY 820 Series Serial to Parallel and Parallel to Serial Converters are microprocessor based and are primarily intended for driving remote display decoders.

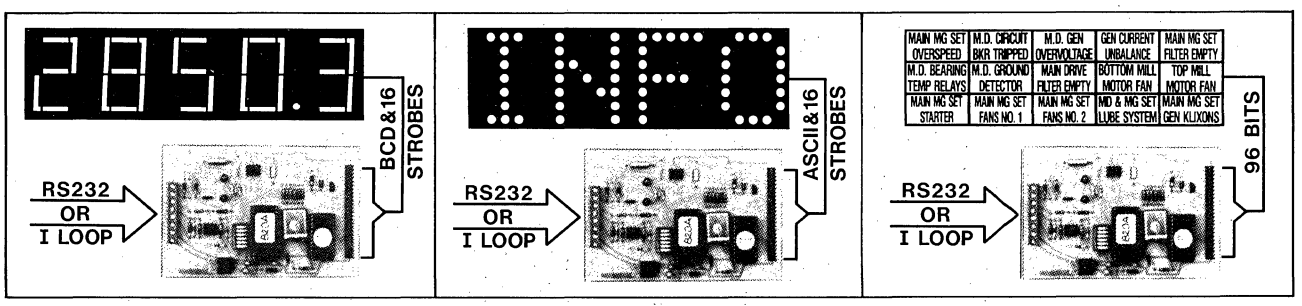
The input to the 820 Receiver is a Serial ASCII coded data stream at either RS232 or current loop levels. The 820 Receiver automatically adapts itself to incoming data rates over the range of 110 to 1200 baud. In addition it features a six position DIP switch which allows selective addressing of up to 64 separate receivers on one data link. The output of the receiver is six bits of data and sixteen strobe lines. The receiver, therefore, can drive either sixteen numeric or alphanumeric displays per receiver or up to 96 points in an annunciator system.

The 820A Transmitter accepts parallel, 7-bit ASCII (monocase) and converts it into a serial data format (RS232 or current loop) compatible with the receiver. Alternately, an array of sixteen, 6-bit registers may be sequentially inputed to the 820B Transmitter and converted to the same serial output, for annunciator systems.

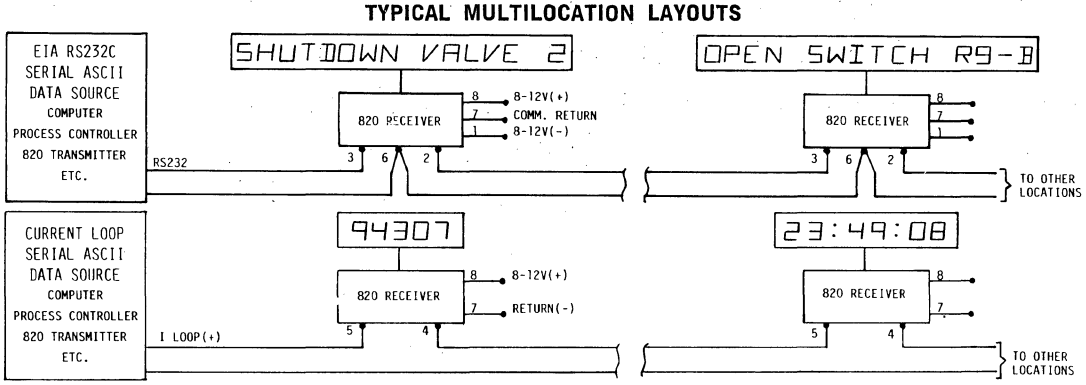
Part Number	Interface Code	Description	Transmission Mode
820-1	—11	Serial ASCII Data Receiver	EIA RS232
820-2	—12	(Serial to Parallel Converter)	Current Loop
820X-3	*	Serial ASCII Data Transmitter	EIA RS232
820X-4	*	(Parallel to Serial Converter)	Current Loop

* Not used for display.

SERIAL ASC11 RECEIVERS & TRANSMITTERS
FOR REMOTE DISPLAYS. CONTROLS & TELEMETRY



TYPICAL MULTILOCATION LAYOUTS

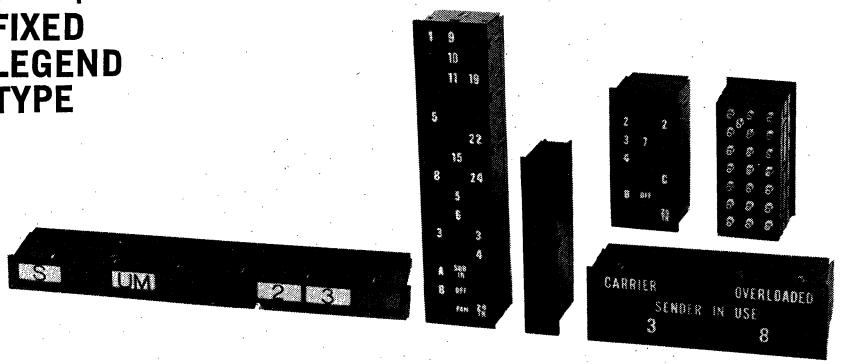


DIO-REY

THE LIGHTED DISPLAY DIVISION OF INFO-LITE CORPORATION

LIGHTED INDICATORS AND ANNUNCIATORS

FIXED LEGEND TYPE



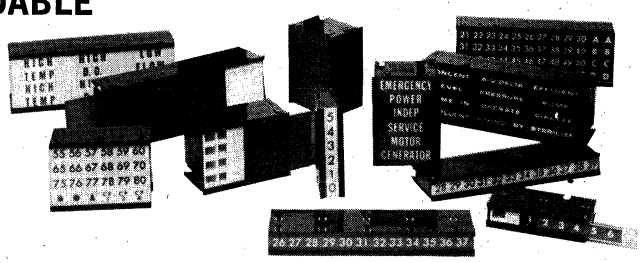
U.S. PAT #3,703,720

Series	Indicator Module Size	Series	Indicator Module Size
68811	3/8" x 3/8"	68822	3/4" x 3/4"
68812	3/8" x 3/4"	68823	3/4" x 1 1/8"
68813	3/8" x 1 1/8"	68824	3/4" x 1 1/2"
68814	3/8" x 1 1/2"	Special	Any size on 3/8" Grid

Any group of messages/symbols can be displayed in any combination of colors

- Construction is modular
- Front panel graphics are back lighted using LEDS — STD MFB T1¾ lamps also available
- Units are supplied in an attractive package with bezel and "Black-Out" front panel, ready to snap into rectangular panel cutout
- Lamp common reduces installation time
- Serviced from the front
- Lamp drivers and special logic available
- Standard MFB T1¾ lamps also available

RELEGENDABLE TYPE

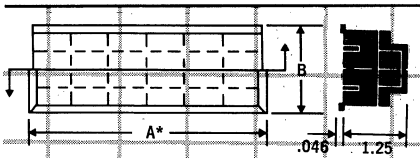


U.S. PAT #3,703,720

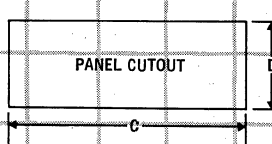
Series	82911	82912	82914
Indicator Module Size	3/8" x 3/8"	3/8" x 3/4"	3/8" x 1 1/2"

For applications where the legend or graphics must be able to be changed

- Same features as the FIXED LEGEND TYPE
- Can be supplied with photographic film legend
- Relegendable from front
- Six standard color filters
- Twenty-three standard units with from 2 to 48 indicator modules
- Special assemblies available



LONG SIDES HAVE BEZELS, SHORT SIDES HAVE NO BEZELS (ON RELEGENDABLE ONLY).



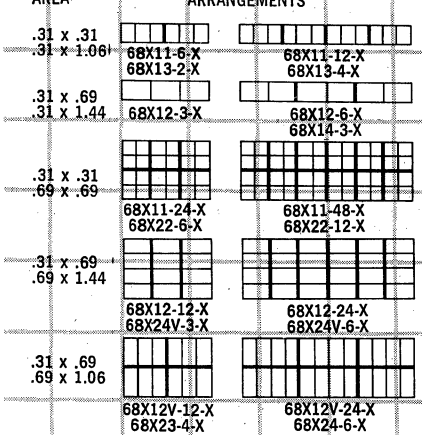
Basic Part Number	A*	B	C +.015 −.000	D +.015 −.000
68X11-6-X, 68X13-2-X, 68X12-3-X		.590	2.380	.500
68X11-24-X, 68X22-6-X	**2.375**	1.720	2.380	1.630
68X12-12-X, 68X24V-3-X	2.465	1.720	2.380	1.630
68X12V-12-X, 68X23-4-X		1.720	2.380	1.630
68X14V-6-X		1.720	2.380	1.630
68X11-12-X, 68X13-4-X, 68X12-6-X, 68X14-3-X		.590	4.630	.500
6811-48-X, 68X22-12-X	**4.625**	1.720	4.630	1.630
68X12-24-X, 68X24V-6-X	4.715	1.720	4.630	1.630
68X12V-24-X, 68X24-6-X		1.720	4.630	1.630
68X14-12-X		1.720	4.630	1.630
68X14V-12-X		1.720	4.630	1.630

* Bold type indicates dims. for relegendables (829XX-XX-X)

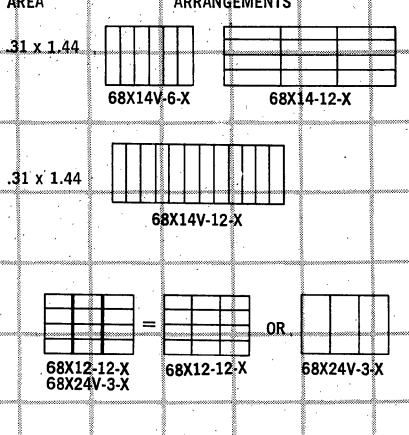
LAYOUT SHEET FOR DIO-REY 82000 SERIES LIGHTED INDICATORS

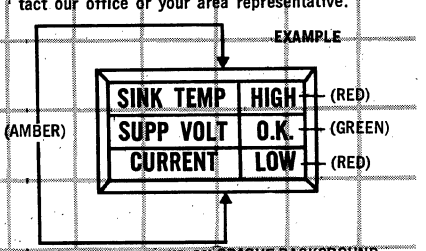
Units which combine two or more of the standard module sizes can be supplied in attractive, integrated assemblies. To determine the assembly that will meet your requirements, just follow these steps: 1 — List the information (Words, Numbers, Letters, Symbols, etc.) to be displayed and then lay it out on a 3/8" square grid. (A vellum or onion-skin overlay on the grid pattern printed on this sheet may be helpful for this purpose.) 2 — Choose lighted legend or lighted background for displayed information. 3 — Select the module sizes that will meet your display requirements and block them in on the layout. If you need a larger lighted area than is available from a single module, combine modules. 4 — Add a 1/8" bezel around the light module layout to obtain the overall appearance of the display unit. 5 — Choose the color(s) for the lighted areas. 6—Choose a LED/lamp, considering Power Available, and Ambient Light Intensity from Table 2, Page B•1041. At this point, or if applications engineering assistance is required earlier, contact our office or your area representative.

LIGHT AREA — STANDARD LIGHT CELL ARRANGEMENTS



LIGHT AREA — STANDARD LIGHT CELL ARRANGEMENTS





SPECIFYING PART NUMBERS

82X XX - XX - X

FIXED LEGEND 8
RELEGENDABLE 9

OPTIONS, LED/LAMP SEE TABLE 2, Page B•1041

INDICATOR MODULE SIZE

.375 x .375	11
.375 x .750	12
.375 x 1.125	13
.375 x 1.500	14
.750 x .750	22
.750 x 1.125	23
.750 x 1.500	24

NUMBER OF LIGHTED INDICATOR MODULES (SEE DETAILS ABOVE FOR ARRANGEMENT)

DIO-REY • Div. of INFO-LITE • 422 Cliff Street • Fairview, NJ 07022 • (201) 941-4455 • "LINKS BETWEEN MAN AND MACHINE"

SMART FORCE™ INVERTERS

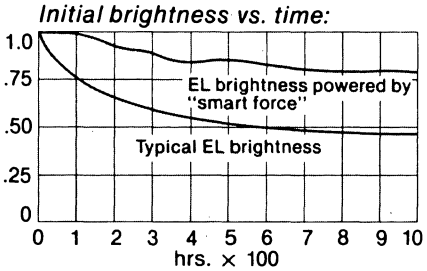
for electroluminescent lamps

From Endicott Research Group, Inc.!

ERG Smart Force™ DC-AC Inverters compensate for the aging characteristics (brightness loss over time) of electroluminescent (EL) phosphors to improve EL lamp life! (See "Initial brightness vs. Time" graph below.) Automatically adapt their own voltage and frequency over the course of EL lamp life to deliver near constant power output.

Applications:
• Backlight LCDs, membrane switches, dead front panels, legends *and* decorative trim; • Discharge latent images in copy machines; • Power emergency signage, exit signs, POP displays, novelty lighting, etc., from Low DC Voltages!

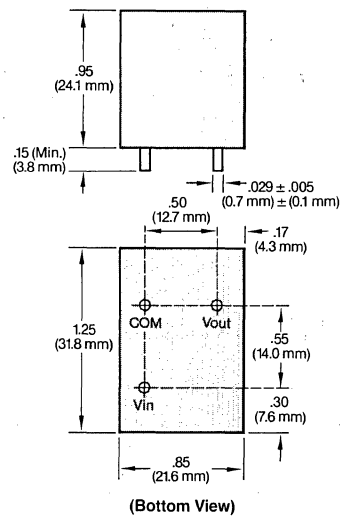
Initial brightness vs. time:



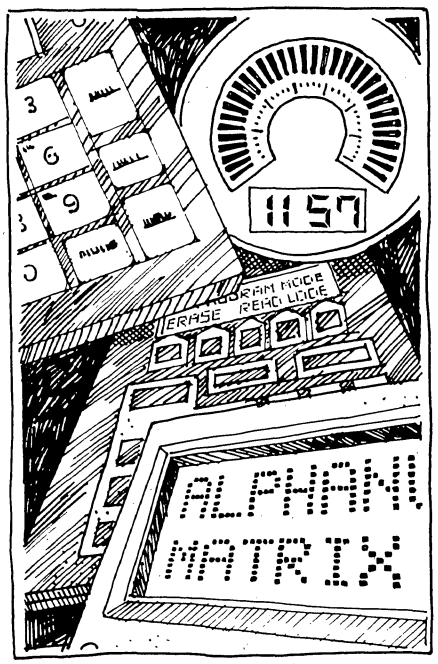
Luminescent Systems #20014-2 EL lamp (16 IN²) and ERG E613 - E0003 inverter (V IN = 12V).

Features:

- **Smart Force™**
- **Small size**
- **PC Board mount**
- **Encapsulated**
- **Custom designs**



(Bottom View)



General Specifications:

Input: 3, 5, 6, 9, 12, 15, 18, 24, 28 VDC (your choice)
Output: 60 - 130V RMS @ 400 - 700 Hz. nom.
Package: Nylon, epoxy filled
Mounting: PCB Mount standard
Size: 1.25″ x .85″ x .95″ high
Temp. Range:
Operating: -25°C to +85°C
Storage: -40°C to +100°C
Weight: 30 gms. (Approx.)

E600 SERIES

From $8.70 ea.
(Qty. 1 - 9)

Our E600 Series Inverter has met the economy and reliability needs of the auto industry. Now we can tailor EL power to your needs! To help us determine what inverter suits your application, let us know: 1) input voltage; 2) lamp surface area to be excited; 3) brightness level desired (low, medium, high); 4) lamp operating life; 5) type and brand of EL phosphors; 6) number of EL segments, and 7) application.

Use our E600 Inverters to power JKL Micro-Lume mini-fluorescent lamps, including Model #BF659-01! ***Call factory for free circuit diagram and other product data!***

LPS SERIES INVERTERS

From $7.80 ea.
(Qty. 1 - 9)

...TAKE THE GUESSWORK OUT OF MATCHING EL LAMPS AND DRIVERS!

Looking at EL Lamps as lossy, light-emitting capacitors (LECs), LPS Inverters are designed to power conventional foil-construction lamps of a given area to specified brightness level (low, medium, high). As a result, it is now possible for the engineer to specify and purchase a standard Smart Force Inverter for applications incorporating lamps from virtually all "foil" lamp manufacturers.

The LPS is a clearly specified DC-AC Inverter with a wide tolerance to both input voltage swings and loading. LPS units are designed to power up to approximately 20 square inches of foil-type EL lamp from a wide variety of commonly available low DC-voltage inputs.

Free Data Packet contains LPS Series specifications & EL Source List to help you source EL Lamps, LCDs, membrane switches, etc. Call today!

Also see our ad in EEM, Sec. 4000, Power Supplies DC.

To expedite smaller orders (up to $250) we welcome credit card purchases. VISA MasterCard

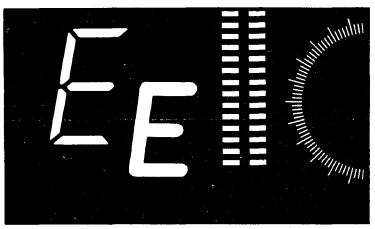
Endicott Research Group, Inc.
2601 Wayne Street, P.O. Box 269, Endicott, NY 13760
® 607-754-9187 TWX510-252-0155

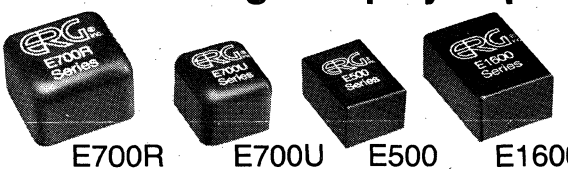
Specifications subject to change without notice.

© Copyright 1985 Endicott Research Group, Inc.

Power your displays —

DC-DC converters for Gas Discharge Displays up to 25W

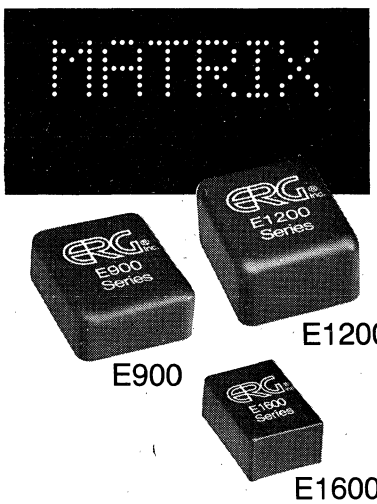




E700R E700U E500 E1600

Made in U.S.A.

Convert low DC line voltage to the higher voltage levels required to activate multi-segment plasma gas discharge displays (including bar graphs). ERG Converters eliminate need for 200–250V DC line.



E1200

E900

E1600

General Specifications

ERG Converter Series	Input	Output†	Size	Weight	Package
E700U	5,9,12,15 V DC standard (to 48 available)	Up to 3W unregulated (e.g. 200 V DC @ 15 ma)	1.1" (27.94 mm) × 1.2" (30.48 mm) × .91" (23.11 mm) max. high	30 gms.	Plastic
E700R (Regulated)	5,9,12,15 V DC standard (to 48 available)	Up to 3W regulated (e.g. 200 V DC @ 15 ma)	1.43" (36.32 mm) × 1.5" (38.10 mm) × 1.03" (26.16 mm) max. high	40 gms.	Plastic
E500*	5,9,12,15 V DC standard (to 48 available)	Up to 3W unregulated (e.g. 200 V DC @ 15 ma)	1.00" (25.40 mm) × 1.38" (35.05 mm) × 0.70" (17.78 mm) high	20 gms.	Plastic
E1600	5,9,12,15 V DC standard (to 48 available)	Up to 6W unregulated (e.g. 250 V DC @ 24 ma)	1.30" (33.02 mm) × 1.88" (47.75 mm) × 0.82" (20.83 mm) high	44 gms.	Plastic
E900	5,12,15 V DC standard (to 48 available)	Up to 12W total, with single or dual outputs, unregulated; (e.g. Single: 250V DC @ 30 ma Dual: 250V DC @ 30 ma and −16V DC @ up to 200 ma to power the drive electronics in many applications using the Burroughs SELF-SCAN® or IEE® ARGUS displays)	2" (50.80 mm) × 2.5" (63.50 mm) × .98" (24.9 mm) high	122 gms.	Aluminum
E1200	12,15 V DC standard (others to your spec)	Up to 25W unregulated (e.g. 250V DC @ 100 ma)	2" (50.80 mm) × 2.5" (63.50 mm) × 1.19" (30.23 mm) high	185 gms.	Aluminum

*For high-volume requirements, E500 delivers same performance as E700 at significantly lower unit cost!
Mounting: P.C. board standard
Encapsulation: All ERG converters are fully encapsulated
Isolation (in/out): 600V RMS (60 Hz. breakdown for 1 min.) standard
Temperature: 0–70° C. standard. Wider ranges available. 85° C. case max. 25° C. temp. rise typical for E1200
†Output power may be derated up to 50%, dependent on output voltage, output current and temperature.

Match our converter to your display

Use this handy chart to find the right ERG converter for your gas discharge display application. Remember, this is just a guideline. Consult the factory if your application requires a series or part number other than shown below! Ask about our expanded Cross Reference Index for gas discharge displays.

All converters below are 12V DC input; other input voltages available.

Mfr.	Mfr.'s Part #	ERG Part #	Mfr.	Mfr.'s Part #	ERG Part #
BABCOCK	SP-101	E712-215U	CHERRY	W-750-2052	E1612-1.835S
BABCOCK	HB-332	E712-215U	CHERRY	WO7-1007	E1612-1.835S
BABCOCK	DP-0216-C1	E1612-1.8532S	DALE	PD-06D040	E512-215U
BABCOCK	DP-16G101-C1	E912-1.8545S	DALE	PD-16A040	E512-215U
BABCOCK	DP-0840-C1	E1212-1.85130	DALE	PD-32A025	E512-215U
BURROUGHS	SSD1000-0030/39	E912-2.540S	DALE	APD-32A025	E1612-2.520S
BURROUGHS	SII0120A0030/39	E1212-2.5100	FUJITSU	FPN060DRUD	E1212-1.510S
BURROUGHS	SII0140A-0030/39	E1612-2.520S	FUJITSU	FPC4012NRPL	E912-1.5560S
BURROUGHS	SII-1240PD	E1212-2.5100	FUJITSU	FPN020DRUD	E1612-1.535S
BURROUGHS	BG16101-2	E712-2.512U	IEE	MAXI 32(16X2) (O)	E1612-1.535S
BURROUGHS	BAF06770	E712-215U	IEE	MAXI 128(32X4) (O)	E1212-1.5100
CHERRY	W416-1051	E1612-1.835S	IEE	MINI 480(40X12) (O)	E1212-1.3185
CHERRY	W420-1052	E1612-1.835S	PCPC	RU-32-8RD10(32X8)	E1212-2.5100
CHERRY	W424-1053	E1612-1.835S	PCPC	PC1705-25664DC	E1212-1.85130
CHERRY	W416-1054	E1612-1.835S	THOMSON	TH 7606	E1212-1.00160
CHERRY	W420-1055	E1612-1.835S		NEEDS BOTH	E1212-1.00160
CHERRY	W424-1058	E1612-1.835S	THORN EMI	P157/03-MI	E912-2.732S

All specifications subject to change without notice.

Tell us about your display power needs

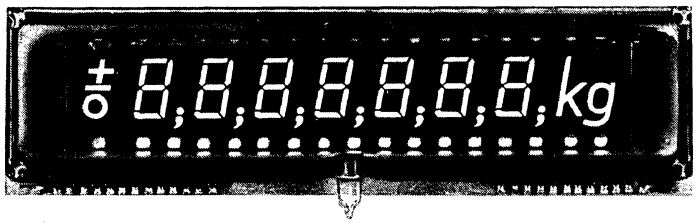
- **Custom Designs**
- **Variations for multi-segment, bar graph and dot matrix gas discharge and vacuum fluorescent displays**
- **Inputs from 5V DC to 48V DC (your choice)**
- **Outputs from 5V DC to 1,500V DC (your choice)**
- **Single and dual outputs (up to 25W total)**
- **Regulated and unregulated**
- **Center tap (± voltages)**

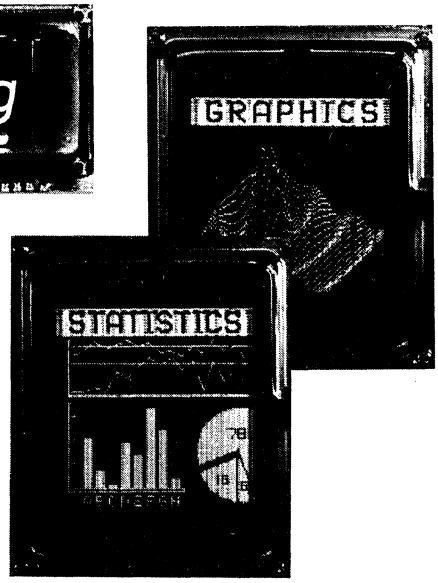
ERG®

© Copyright 1985
Endicott Research Group, Inc.

from low DC voltage

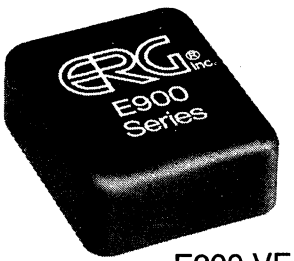
DC-DC converters for Vacuum Fluorescent Displays up to 12W





Made in U.S.A.

E700 VF



E900 VF

No need for "special" multiple output power supplies. ERG converters produce both anode and filament voltages for VF displays up to 12W. Compatible with all major VF display makes. Mount on your PC board as needed, where needed.

General Specifications

ERG Converter Series	Input	Output*	Size	Weight	Package
E700 VF	5,12V DC (other inputs available upon request)	DC Anode voltage and Center tap (AC) filament voltage at combined currents to yield up to 3W max.	1.1" (27.94 mm) × 1.2" (30.48 mm) × .91" (23.11 mm) max. high	30 gms.	Plastic
E900 VF	5,12V DC (other inputs available upon request)	Up to 12W max. (to 7.5W max. with 5V DC input)	2" (50.80 mm) × 2.5" (63.50 mm) × .98" (24.9 mm) high	122 gms.	Aluminum

Mounting: P.C. board standard
Encapsulation: All ERG converters are fully encapsulated
Isolation (in/out): 300V RMS (60 Hz. breakdown for 1 min.) standard
Temperature: 0–70° C. standard. Wider ranges available. 85° C. case max.
*Output power may be derated up to 50%, dependent on output voltage, output current and temperature.

Match our converter to your display

Use this handy chart to find the right ERG converter for your VF display application. Remember, this is just a guideline. Consult the factory if your application requires a series or part number other than shown below! Ask about our expanded Cross Reference Index for vacuum fluorescent displays.

All converters below are 12V DC input; other input voltages available.

Mfr.	Mfr.'s Part #	ERG Part #	Mfr.	Mfr.'s Part #	ERG Part #
TECHNA	CL-128X212	E912-.6509V4.7	NEC	FIP16B13R	E712-.47V7.2
TECHNA	GH-256X256	E912-.8006V6.0	NORITAKE	DC40125A	E912-.60100V7.6
TECHNA	CLD401	E712-.85V7.2	NORITAKE	DM256X64A	E912-.8060V7.2
TECHNA	CLD-321	E712-.73V2.8	NORITAKE	DM128X128C	E912-.8060V4.0
TECHNA	CLD-204	E912-.8550V8.0	NORITAKE	DM80X80C	E912-.7040V4.3
TECHNA	GH-512X256	E912-1.006V11.4	NORITAKE	DM64X64B	E912-.7448V4.3
FUTABA	16-SY-O3Z	E712-.24V5.8	NORITAKE	DC440066A	E912-.6080V8.8
FUTABA	5-LY-O1ZL	E712-.26V3.0	NORITAKE	DC440046A	E912-.6060V9.2
FUTABA	16-MY-O1ZL	E712-.31V6.2	NORITAKE	DC40026B2	E912-.5540V9.0
FUTABA	32-SD-41Z	E712-.32V7.3	NORITAKE	DC409A2	E712-.55V9.7
FUTABA	14-LD-O1Z	E712-.31V6.5	NORITAKE	DC209A2	E712-.35V6.5
NEC	FIP32B5X	E712-.45V6.8	NORITAKE	DC205A2	E712-.42V5.7
NEC	FIP32A9X	E712-.45V6.5	NORITAKE	DC169A2A	E712-.42V4.8
NEC	FIP40A5X	E712-.45V8.9	NORITAKE	FG206A2	E712-.35V6
NEC	FIP80A5X	E712-.45V9.0	NORITAKE	FG166A2	E712-.35V5.3

All specifications subject to change without notice.

Ask about our quadruple output DC-DC converters, capable of powering two dissimilar vacuum fluorescent displays!

Also see our ad in EEM Sec. 4000, Power Supplies DC.

VISA MasterCard

To expedite smaller orders (up to $250) we welcome credit card purchases.

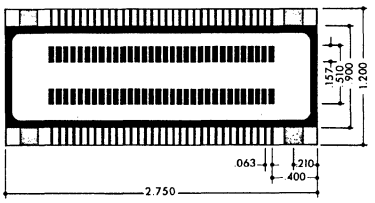
© Copyright 1985 Endicott Research Group, Inc.

Endicott Research Group, Inc.
2601 Wayne Street P.O. Box 269 Endicott, NY 13760
® 607-754-9187 TWX510-252-0155

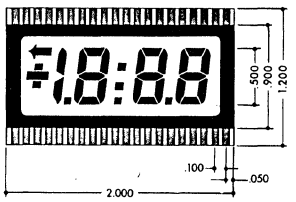
EXCEL
Technology International Corp.

EXCELIX LCD

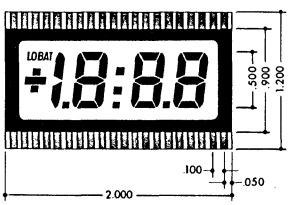
0520 d = N/A



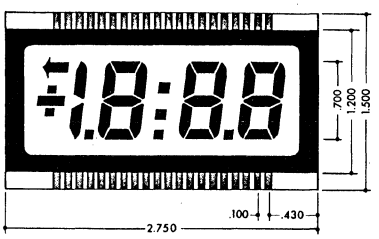
3551 d = 1.25

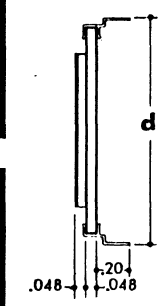


3555 d = 1.25

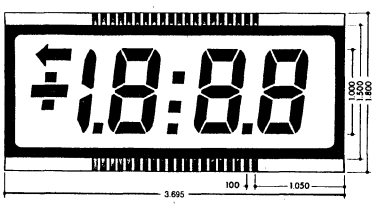


3751 d = 1.55

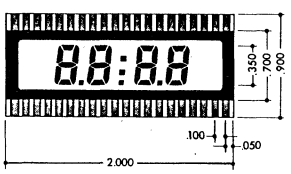




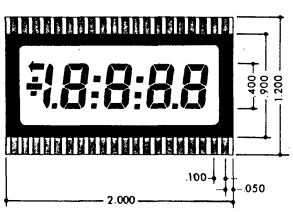
31051 d = 1.85



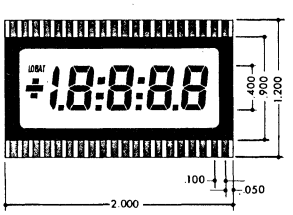
4320 d = .95



4451 d = 1.25



4455 d = 1.25



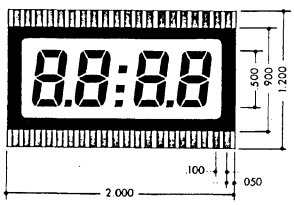
TEL. (201) 874-4747 • TWX 9103339588, EXCELTECH UD
DEPT. EM, 5-4 STRYKER LANE, HILLSBOROUGH IND. PK., BELLE MEAD, NJ 08502

EXCEL

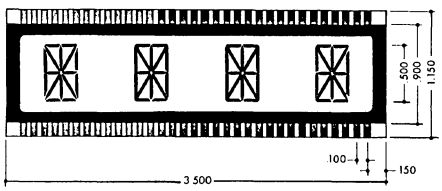
EXCELIX LCD

Technology International Corp.

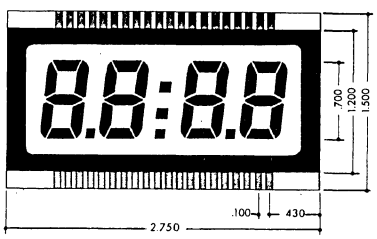
4500 d = 1.25



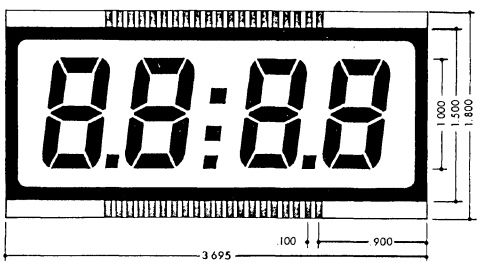
4540 d = 1.20

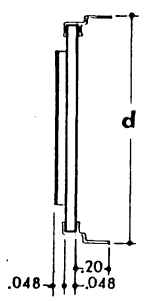


4700 d = 1.55

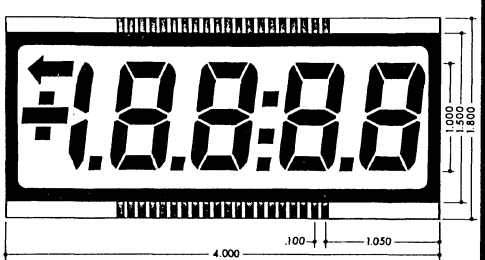


41000 d = 1.85

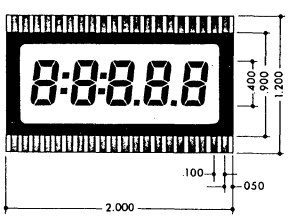




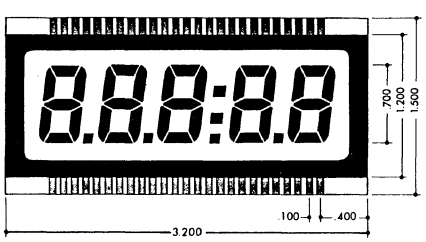
41051 d = 1.85



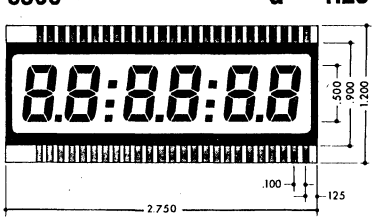
5400 d = 1.55



5700 d = 1.55



6500 d = 1.25

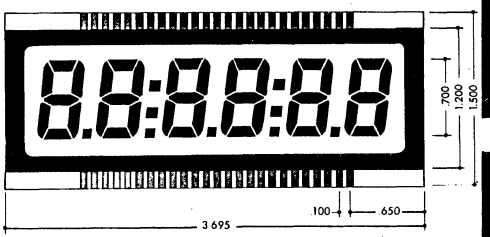


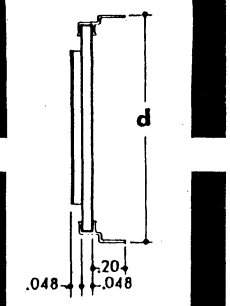
TEL. (201) 874-4747 • TWX 9103339588, EXCELTECH UD
DEPT. EM, 5-4 STRYKER LANE, HILLSBOROUGH IND. PK., BELLE MEAD, NJ 08502

EXCEL Technology International Corp.

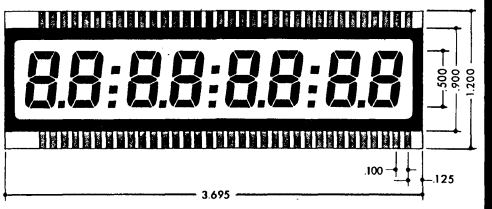
EXCELIX LCD

6700 **d = 1.55**





8500 **d = 1.25**



PERFORMANCE SPECIFICATIONS

PARAMETER	UNITS	MIN.	TYP.	MAX.
Operating Voltage	V	3	5	10
Operating Frequency	Hz	30	60	120
Current*	μA		3	10
Capacitance*	pf		3,000	
DC Resistance*	MΩ	20		
Allowable DC Offset	mV			50
Response Times (25°C)				
Rise to 90% ON	ms		30	50
Decay to 10% OFF	ms		50	100
Contrast Ratio			20:1	
Viewing Angle (at 5V)			±75°	
Operating Temp. Range	°C	−30		85
Storage Temp. Range	°C	−30		85
Estimated Life	hrs.		50,000	

* All Segments ON.
Specifications are for 3½ digit 0.5″DH LCDs.

ORDERING INFORMATION

EXCELIX□□□□-□□□-□

Excelix Part Number

OPTICAL MODES:
- **R** Reflective
- **T** Transmissive
- **S** Transflective
- **O** No Polarizer

PRINTING MODES:
- **P** Positive Printing (dark segments on light background)
- **N** Negative Printing (light segments on dark background)
- **O** No Polarizer

DEVIATION:
- **0** Standard, Epoxied Pins 0.100″ center-to-center
- **1** Snap on Terminal 0.100″ center-to-center
- **2** No Pins Conductive Pads Up
- **3** No Pins Conductive Pads Down

POLARIZERS:
- **H** Standard
- **Q** High Humidity
- **O** No Polarizer

* Q-type polarizer is less bright than H-type.

We are ever expanding our standard Excelix LCD products. If you need displays that are not listed in this catalog, call us. They may have already been our standard products.

We can tailor our standard products to meet your particular needs. We also provide services for custom designed displays, from concept, artwork, prototype, all the way up to volume production. Our Engineering Department will be happy to discuss with you and help you with your specific applications.

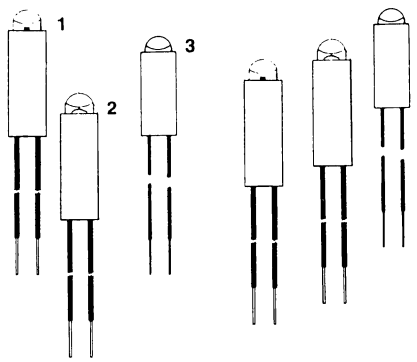
For your display needs, please contact our local sales representative or Excel Technology International directly.

TEL. (201) 874-4747 • TWX 9103339588, EXCELTECH UD
DEPT. EM, 5-4 STRYKER LANE, HILLSBOROUGH IND. PK., BELLE MEAD, NJ 08502

Gilway Technical Lamp
165 New Boston St., Woburn, MA 01801 USA 617/935-4442

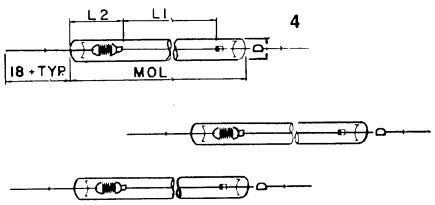
Lens-End Lamps

Lamp No.	Volts	Amps	Lux	Color Temp. (°Kelvin)	Hours	Filament	Diameter	Figure
L1005	2.5	.350	1,550	2,170	30,000	C-6	6.35	1
L1005A	2.5	.350	1,550	2,170	30,000	C-6	6.35	3
L1026A	2.5	.350	2,000	2,250	10,000	C-2R	6.35	3
L1023	2.5	.350	2,100	2,240	15,000	C-6	6.35	1
L1006	3.5	.450	1,600	2,230	50,000	C-6	6.35	1
L1024	3.5	.560	3,800	2,490	5,000	C-6	6.35	1
L1024A	3.5	.560	3,800	2,490	5,000	C-6	6.35	1
L1021	3.5	.600	12,000	2,930	100	C-6	6.35	1
L1007	5.0	.160	800	2,300	20,000	C-2R	6.35	2
L1025	5.0	.240	1,200	2,450	10,000	C-2R	6.35	2



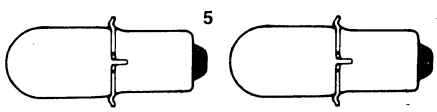
Line Filament Lamps

Lamp No.	Volts	Amps	Watts	Hours	Filament	Length, L_1	L_2	MOL	Diameter	Figure
L9050	3.0	.370	1.10	2,000	S-8	16±1	9±.5	36	3.5	4
L9001	4.5	.370	1.65	2,000	S-8	23±1	9±.5	43	3.5	4
L9013	6.0	.370	2.22	2,000	S-8	30±1	9±.5	50	3.5	4
L9003	12.0	.300	3.60	1,000	S-8	75±1	9±.5	92	3.5	4
L9014	12.0	.370	4.45	2,000	S-8	60±1	9±.5	77	3.5	4
L9028	12.0	.725	8.70	1,500	S-8	100±1	9±.5	121	3.5	4



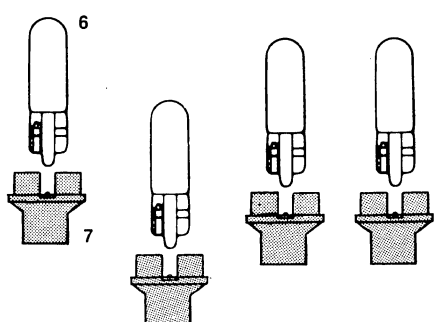
Flashlight Krypton Hi-Beams

Lamp No.	Volts	Amps	M.S.C.P.	Hours	Filament	Base	Figure
K-2	2.38	1.000	1.6	35	C-2R	S.C. Miniature Flanged	5
K-3	3.57	.890	3.2	15	C-2R	S.C. Miniature Flanged	5
K-13	4.75	.750	4.4	15	C-2R	S.C. Miniature Flanged	5
K-12	5.95	.840	6.0	15	C-2R	S.C. Miniature Flanged	5



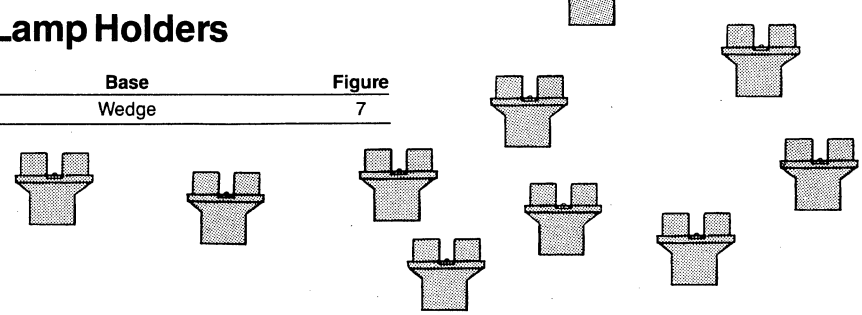
T-5mm (T-1 ¾) Wedge Base Lamps

Lamp No.	Volts	Amps	M.S.C.P.	Hours	Filament	Base	Figure
86	6.3	.200	.40	50,000	C-2F	Wedge	6
2100	6.3	.040	.40	10,000	C-2V	Wedge	6
73	14.0	.080	.30	25,000	C-2F	Wedge	6
74	14.0	.100	.70	500	C-2F	Wedge	6
17	28.0	.065	.65	5,000	C-2F	Wedge	6



T-5mm (T-1 ¾) Wedge Base Lamp Holders

Holder No.	Lamp Type	Base	Figure
H710	T-5mm	Wedge	7



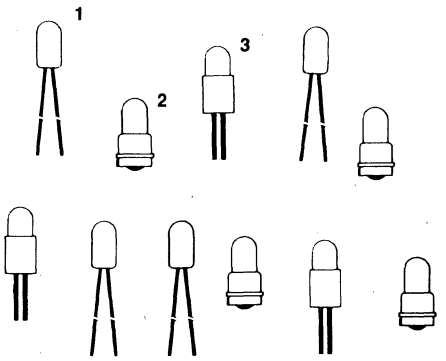
For more specifications, call 617/935-4442 and request our long form catalogue.

(Telex 287617 GWAY UR)

Gilway Technical Lamp
165 New Boston St., Woburn, MA 01801 USA 617/935-4442

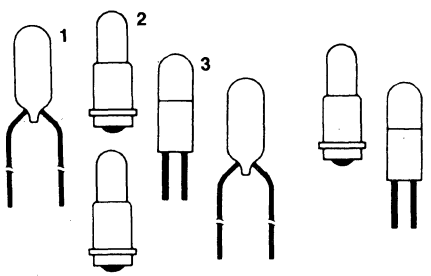
T-1 Subminiature Lamps

Volts	Amps	M.S.C.P.	Hours	Wire 1	Flanged 2	Bi-Pin 3
5.0	.060	.05	100,000	683	685	7683
5.0	.060	.15	5,000	6150	6180	7265
5.0	.075	.09	25,000	713	714	7714
5.0	.080	.16	3,000	7211	7235	7266
5.0	.115	.15	40,000	715	718	7715
5.0	.115	.20	5,000	7213	7236	7267
5.0	.125	.22	5,000	7216	7239	7268
10.0	.027	.10	10,000	7218	7240	8095
12.0	.060	.15	16,000	7219	32	8097
14.0	.065	.15	16,000	8111	8112	8098
18.0	.026	.15	16,000	7220	7241	8099
28.0	.024	.15	16,000	6838	6839	7839



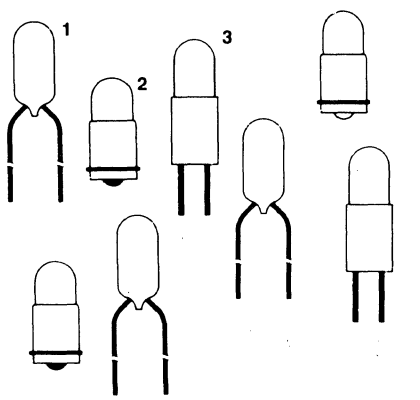
T-1 ¼ Subminiature Lamps

2.5	.40	.55	30	8655	8656	7307
3.0	.19	.25	350	324	8637	7637
5.0	.06	.05	100,000	583	3585	7583
5.0	.115	.15	40,000	515	3518	7515
6.0	.06	.13	3,000	2114	8541	7309
6.0	.20	.63	1,000	634	8628	7628
6.3	.20	.55	5,000	8610	8551	7310
14.0	.08	.50	1,000	8640	8646	7646
28.0	.04	.32	1,000	8627	8632	7632



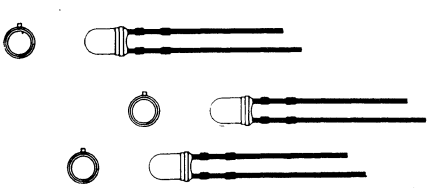
T-1 ¾ Subminiature Lamps

6.3	.20	.40	50,000	2181	381	7381
6.3	.20	.55	3,000	2112	349	7349
10.0	.014	.002	10,000	1869	344	7344
10.0	.04	.08	5,000	2107	367	7367
12.0	.04	.12	10,000	2174	394	7394
14.0	.08	.30	50,000	2182	382	7382
14.0	.08	.50	750	1705	330	7330
14.0	.100	.50	10,000	2162	8918	7373
18.0	.04	.15	10,000	2102	370	7370
22.0	.04	.30	2,000	8425	459	7459
28.0	.04	.20	50,000	2185	385	7374
28.0	.04	.30	25,000	2187	387	7387
28.0	.04	.34	7,000	1764	327	7327
28.0	.065	.65	5,000	8361	7341	7376



T-1 Visible LEDs (Very Bright)

			Luminous Intensity at 20mA			Forward Voltage at 20mA		Peak Wave Length
	LED No.	Lens	Minimum	Typical	Viewing Angle	Typical	Maximum	at 20mA
RED	E100	Clear	90mcd	200mcd	40°	2.1V	3.0V	650nm
ORANGE	E102	Clear	90mcd	200mcd	40°	2.1V	3.0V	610nm
YELLOW	E104	Clear	90mcd	200mcd	40°	2.2V	3.0V	585nm
GREEN	E106	Clear	90mcd	200mcd	40°	2.2V	30V	563nm



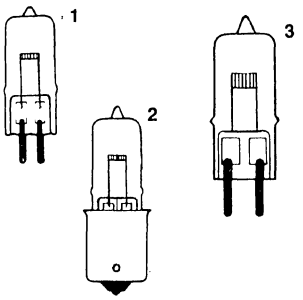
For more specifications, call 617/935-4442 and request our long form catalogue.

(Telex 287617 GWAY UR)

Gilway Technical Lamp
165 New Boston St., Woburn, MA 01801 USA 617/935-4442

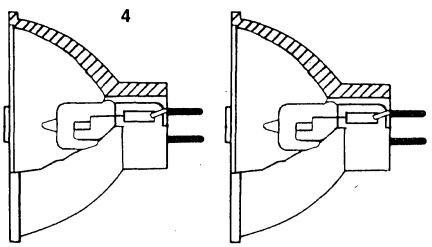
Halogen Lamps

Lamp No.	Volts	Watts	Lumens	Color Temp. (°Kelvin)	Hours	MD	MOL	LCL	Base	Filament	Figure
L6401	4	4	105	3,000	2,000	9.0	36.5	15.5	Ba9s	C-6	2
L7387	6	10	200	3,200	100	9.0	30.0	19.5	G-4	C-6	1
L6402	6	10	150	2,900	2,000	9.0	30.0	19.5	G-4	C-6	1
L7388	6	20	400	3,200	100	9.0	30.0	19.5	G-4	C-6	1
L6394	6	20	320	2,900	2,000	9.0	30.0	19.5	G-4	C-6	1
L7401	12	20	420	3,200	250	9.0	30.0	19.5	G-4	C-6	1
L6404	12	20	320	2,900	2,000	9.0	30.0	19.5	G-4	C-6	1
L6403	12	20	320	2,900	2,000	9.0	36.5	15.5	Ba9s	C-6	2
L6389	12	50	850	3,000	2,000	11.0	44	30	GY6.35	C-Bar-6	3
L6390	12	100	2,100	3,000	2,000	11.0	44	30	GY6.35	C-Bar-6	3
L6405	24	150	4,700	3,400	70	13.5	50	30	G6.35	C-Bar-6	3
L6406	24	150	4,350	3,300	200	13.5	50	30	G6.35	C-Bar-6	3



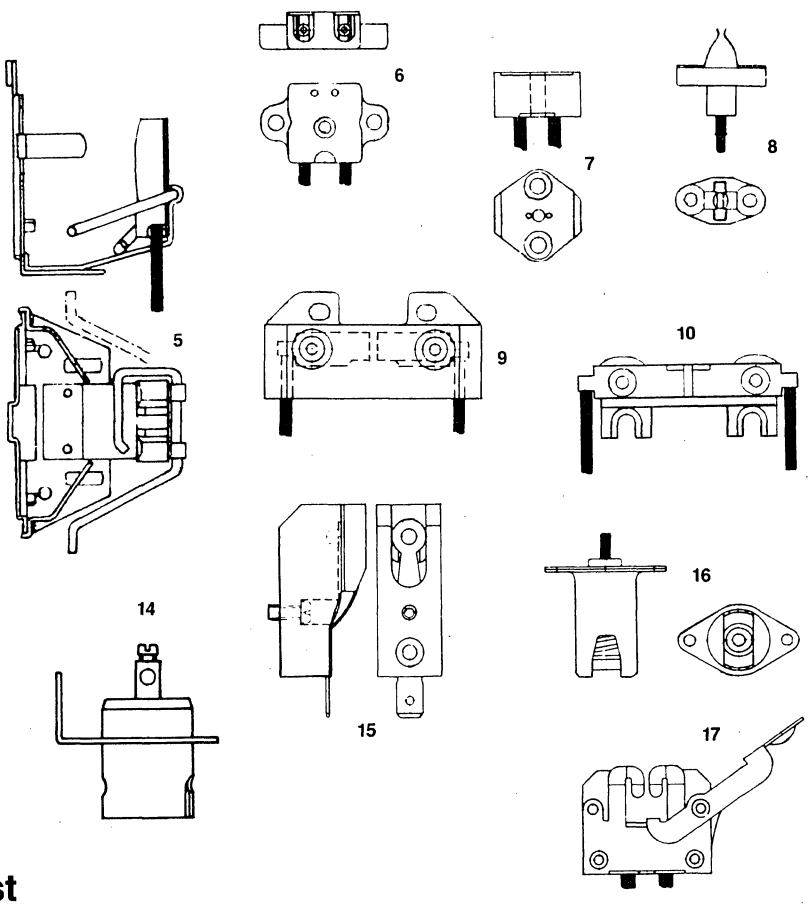
Dichroic Reflector Halogen Lamps

Lamp No.	Volts	Watts	Color Temp. (°Kelvin)	Hours	MD	MOL	Base	Figure
L6400	12	55	3,000	750	49.7	42	GZ6.35	4
L6408	12	75	3,000	1,500	49.7	42	GZ6.36	4



Halogen Lamp Holders

Holder No.	Halogen Lamp Base Type		Figure
H705	GZ6.35	Reflector	5
H706	GX5.3	Reflector	5
H992	G-4	Bi-Pin	6
H991	G-4	Bi-Pin	7
H997	G-4	Bi-Pin	8
H910	G6.35	Bi-Pin	9
H902	G6.35	Bi-Pin	10
H990	GY6.35	Bi-Pin	11
H912	GY6.35	Bi-Pin	12
H879	W4x9d	Wedge	13
H2572	B15d	Bayonet	14
H9431	R7s	Linear	15
H942	R7s	Linear	16
H9971	GY9.5	Bi-Pin	17



For more specifications, call 617/935-4442 and request our long form catalogue.

(Telex 287617 GWAY UR)

LED ILLUMINATED MINIATURE PILOT LIGHT SERIES

SPECIFICATIONS (COMMON)

RATINGS

Input Type	Full Voltage Type		
Operational Voltage	6V DC	12V DC	24V DC
Current	36mA*	18mA	18mA**
Illumination Color (Code)	Red (R), Green (G), Amber (A), Yellow (Y), White (W)		

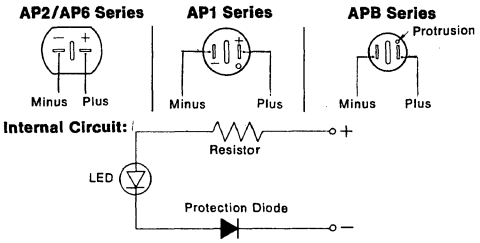
* AP8 & AP1 series: 18mA ** AP8 & AP1 series: 12mA

GENERAL SPECIFICATIONS

Operating Temperature: −20°C to +40°C
Operating Humidity: 45 to 85% RH
Insulation Resistance: Between live and dead parts: 100 MΩ minimum (500V DC megger)
Dielectric Strength: Between live and dead parts: 2,000V, 1 minute
Reverse Withstand Voltage: 200V
Wire-Wrap Terminal (except AP8):
Applicable wire: AWG 24
Tin-coated annealed copper wire: ϕ0.5 mm
Stripping length of wire insulator: 37 mm
Required number of turns: Approx. 6
Weight (approx.): AP8: 2.3g; AP1: 2.5g; AP2: 4.5g; AP6: 7.5g
Degree of Protection: IP65 (AP8 IP40)

INSTRUCTIONS

1. Apply DC power to the correct terminals.

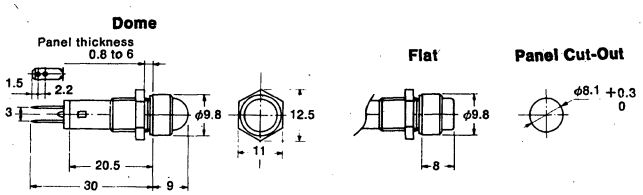


2. Marking is available on flat lens units of the AP1, AP2 and AP6 series. Be aware of the orientation of the marking plate when engraving. The AP8 series is not available for marking.

ORDERING INFORMATION

- When ordering, specify the Type No.
- Locking ring wrenches are available; Type MT-003 for AP1, Type MT-002 for AP2, and Type MT-001 for AP6 series optionally.

AP8 SERIES ϕ8
DIMENSIONS & PANEL CUT-OUT

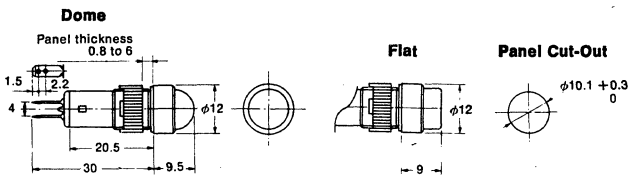


All dimensions in mm.

Operational Voltage		Terminal Style: Solder
Dome	6V DC	AP8M266 — *
	12V DC	AP8M211 — *
	24V DC	AP8M222 — *
Flat	6V DC	AP8M166 — *
	12V DC	AP8M111 — *
	24V DC	AP8M122 — *

* Illumination Color (Code): Red (R), Green (G), Amber (A), Yellow (Y), White (W).

AP1 SERIES ϕ10
DIMENSIONS & PANEL CUT-OUT

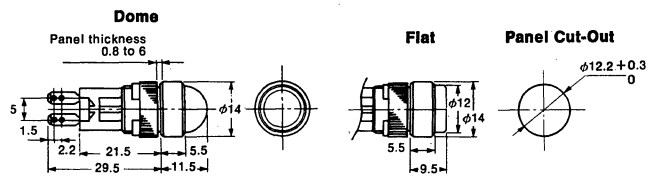


All dimensions in mm.

Operational Voltage		Terminal Style: Solder	Terminal Style: Wire-Wrap
Dome	6V DC	AP1M266 — *	AP1M266W — *
	12V DC	AP1M211 — *	AP1M211W — *
	24V DC	AP1M222 — *	AP1M222W — *
Flat	6V DC	AP1M166 — *	AP1M166W — *
	12V DC	AP1M111 — *	AP1M111W — *
	24V DC	AP1M122 — *	AP1M122W — *

* Illumination Color (Code): Red (R), Green (G), Amber (A), Yellow (Y), White (W).

AP2 SERIES ϕ12
DIMENSIONS & PANEL CUT-OUT

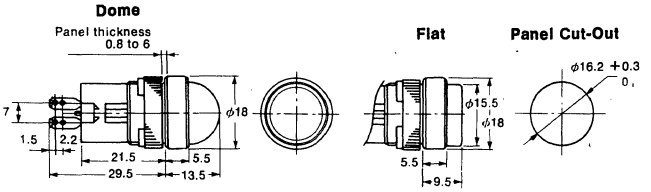


All dimensions in mm.

Operational Voltage		Terminal Style: Solder	Terminal Style: Wire-Wrap
Dome	6V DC	AP2M266 — *	AP2M266W — *
	12V DC	AP2M211 — *	AP2M211W — *
	24V DC	AP2M222 — *	AP2M222W — *
Flat	6V DC	AP2M166 — *	AP2M166W — *
	12V DC	AP2M111 — *	AP2M111W — *
	24V DC	AP2M122 — *	AP2M122W — *

* Illumination Color (Code): Red (R), Green (G), Amber (A), Yellow (Y), White (W).

AP6 SERIES ϕ16
DIMENSIONS & PANEL CUT-OUT



All dimensions in mm.

Operational Voltage		Terminal Style: Solder	Terminal Style: Wire-Wrap
Dome	6V DC	AP6M266 — *	AP6M266W — *
	12V DC	AP6M211 — *	AP6M211W — *
	24V DC	AP6M222 — *	AP6M222W — *
Flat	6V DC	AP6M166 — *	AP6M166W — *
	12V DC	AP6M111 — *	AP6M111W — *
	24V DC	AP6M122 — *	AP6M122W — *

* Illumination Color (Code): Red (R), Green (G), Amber (A), Yellow (Y), White (W).

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

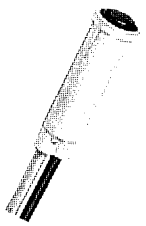
Panel Mounted LEDs

IDI panel mounted LED assemblies feature quick snap-fit panel mounting, wide angle visibility, and attractive appearance. While most assemblies incorporate ultra high intensity **SUPER-BRITE** LEDs, we also offer our Dual Color (Red/Green) LED in a panel mounted assembly (Model 5100H1/5). IDI LED assemblies are an economical way to enhance your front panel's appearance.

FEATURES

- Quick snap-fit panel mounting
- Attractive appearance
- **SUPER-BRITE** or Dual Color LEDs

SERIES 3990A 7/32" DIA.



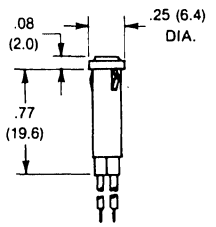
Mounting: Will snap-fit into .217/.221 (5.51/5.61) dia. hole in panels .031/.062 (.79/1.58) thick

Wire Leads: No. 24 AWG., 4.4/4.8 (112/ 122.9) long, stripped .43/.57 (10.9/14.5)

Anode (+): Red lead

Housing: White nylon

MODEL NO.	COLOR	INCORPORATES LED*
3990A1	Red	4303F1
3990A5	Green	4303F5
3990A7	Yellow	4303F7



SERIES 5100H, 5102H 1/4" DIA.

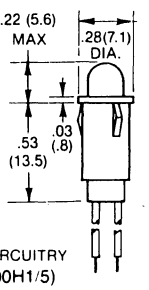
Mounting: Will snap-fit in .249/.254 (6.33/6.45) dia. hole in panels .031/.062 (.79/1.58) thick

Wire Leads: No. 24 AWG. 4.4/4.8 (111.8/121.9) long

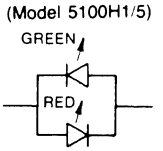
Anode (+): Red lead (Model 5100H1/5) Yellow lead anode for red light — blue lead anode for green light

Housing: Black nylon

MODEL NO.	COLOR	INCORPO-RATES LED*
5100H1	Red	4304H1
5100H5	Green	4304H5
5100H7	Yellow	4304H7
5100H1/5	Red/Green	4301H1/5
5100H1LC	Red	4300H1LC
5100H7LC	Yellow	4300H7LC
5102H1-5V	Red	4302H1-5V
5102H3-5V	Amber	4302H3-5V
5102H5-5V	Green	4302H5-5V



INTERNAL CIRCUITRY
(Model 5100H1/5)



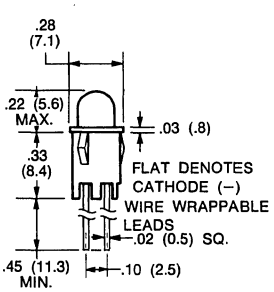
SERIES 5101H 1/4" DIA.

Mounting: Will snap-fit in .249/.254 (6.33/6.45) dia. hole in panels .031/.062 (.79/1.58) thick

Terminals: .02 (0.5) Sq.

Housing: Black nylon

MODEL NO.	COLOR	INCORPO-RATES LED*
5101H1	Red	4304H1
5101H5	Green	4304H5
5101H7	Yellow	4304H7



SERIES 5110F 5/32" DIA.

Mounting: Will snap-fit in .155/.158 (3.94/4.01) dia. hole in panels .031/.062 (.79/1.58) thick†

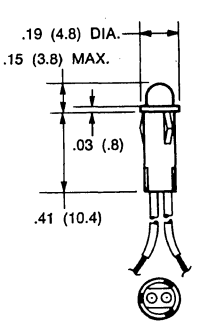
Wire Leads: No. 26 AWG., 4.4/4.8 (112/ 122) long, stripped .18/.32 (4.6/8.1)

Anode (+): Red lead

Housing: Black nylon

† We recommend using an installation tool to press against flange of housing rather than LED.

MODEL NO.	COLOR	INCORPO-RATES LED*
5110F1	Red	4303F1
5110F5	Green	4303F5
5110F7	Yellow	4303F7
5110F1LC	Red	4300F1LC
5110F7LC	Yellow	4300F7LC



* SEE PAGE 10 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

Panel Mounted LEDs

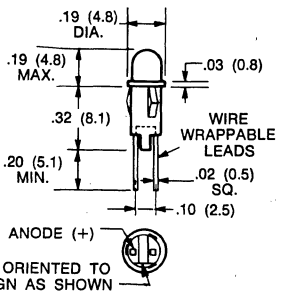
SERIES 5111F 5/32" DIA.

Mounting: Will snap-fit in .155/.158 (3.94/4.01) dia. hole in panels .031/.062 (.79/1.58) thick†

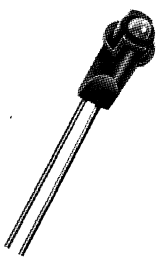
Terminals: .02 (0.5) Sq.

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5111F1	Red	4303F1
5111F5	Green	4303F5
5111F7	Yellow	4303F7



SERIES 5120F

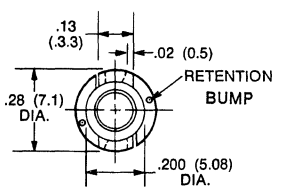


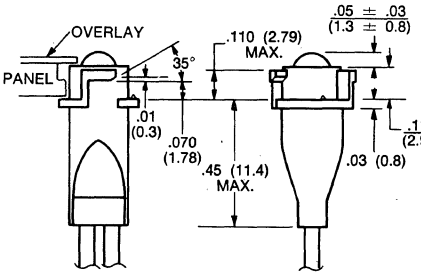
Mounting: Rear twist in to mounting hole specified.

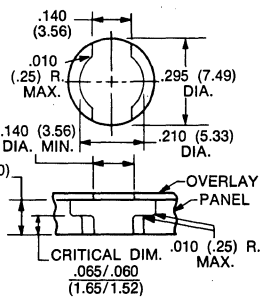
Wire Leads: Plastic leads (105°C). One red, one white, red is anode. 4.4/4.8 (112/122) long. No. 26 AWG. Stripped .43/.57 (10.9/14.5).

Housing: Black nylon

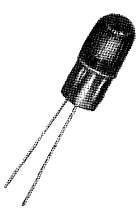
MODEL NO.	COLOR	INCORPORATES LED*
5120F1	Red	4303F1
5120F5	Green	4303F5
5120F7	Yellow	4303F7







SERIES 5200F 3/16" DIA.



SUB-MINIATURE **SUPER-BRITE** LED ASSEMBLIES

Sub-miniature LED assemblies feature:

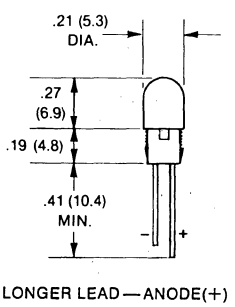
- quick push-in panel mounting
- attractive appearance
- wide angle visibility
- high-intensity light output
- state-of-the-art construction (GaAsP on GaP for red and yellow, GaP for green)

These assemblies offer the superior performance of **SUPER-BRITE** LEDs in a package that is economical to buy and install.

Mounting: Will snap-fit into .187/.192 (4.75/4.87) dia. hole in panels .020/.097 (.51/2.46) thick

Lens: Polycarbonate

MODEL NO.	COLOR	INCORPORATES LED*
5200F1	Red	4303F1
5200F5	Green	4303F5
5200F7	Yellow	4303F7



SERIES 5210F 3/16" DIA.

This is an insulated lead version of the 5200F Series Sub-miniature **SUPER-BRITE** LED assembly that offers superior performance in a package that is economical to buy and install. This series gives protection against static discharge.

Mounting: Will snap-fit into .187/.192 (4.75/4.87) dia. hole in panel .020/.097 (.51/2.46) thick.

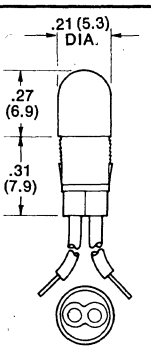
Wire Leads: No. 26 AWG., 4.4/4.8 (111.8/ 121.9) long, stripped: .18/.32 (4.6/8.1).

Anode (+): Red lead

Lens: Polycarbonate

Housing: Polycarbonate

MODEL NO.	COLOR	INCORPORATES LED*
5210F1	Red	4303F1
5210F5	Green	4303F5
5210F7	Yellow	4303F7



* SEE PAGE 10 FOR LED RATINGS

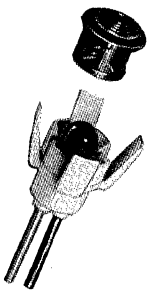
ALL DIMENSIONS ARE IN INCHES (MM).

CALL FOR OUR COMPLETE CATALOG

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

Panel Mounted LEDs

SERIES 5400A 5/16" DIA.



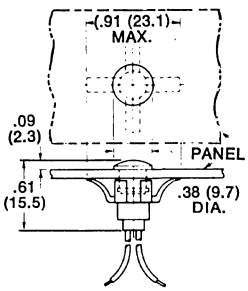
A unique design, the 5400 Series is a two-piece unit consisting of a lens and the housing-LED assembly. Simple, fast installation provided by placing the lens into mounting hole from the panel front and snapping the housing assembly onto the lens from the rear. Allows pre-wiring into the circuit and testing before installation. Has low-profile, damage-resistant lens offering static discharge protection and wide-angle viewing.

Mounting: Will snap-fit into .312/.317 (7.93/8.05) dia. hole in panel .020/.098 (0.51/2.49) thick.

Wire Leads: No. 24 AWG., 4.4/4.8 (111.8/121.9) long, stripped: .43/.57 (10.9/14.5)

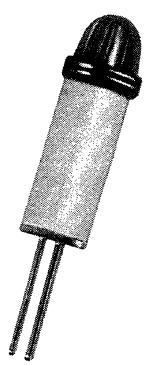
Anode (+): Red lead
Lens: Polycarbonate
Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES SUPER-BRITE LED*	INCLUDES LENS MODEL NO.
5400A1	Red	4305H1	4741
5400A5	Green	4305H5	4745
5400A7	Yellow	4305H7	4747



Note: To install, insert lens into panel and press firmly to snap LED assembly onto rear of lens.

SERIES 5500Y 9/32" DIA.



Miniature **SUPER-BRITE** LED assemblies offer attractive appearance, wide-angle viewing, electrostatic discharge protection, wire-wrap terminals. Available in plain LED and 5V resistor-included versions.

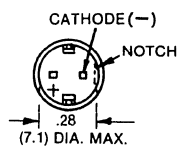
Mounting Hole: .29 (7.4) min. dia. for front-of-panel mounting use push-on speednut SN2212 or tubular mounting clip SN1220 (see page 21). Order mounting hardware separately.

Terminals: .025 (.64) square tinned brass pins

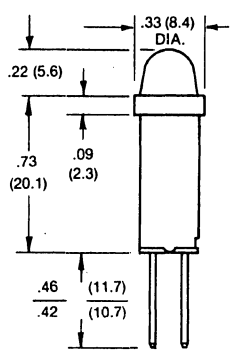
Lens: Polycarbonate

Bezel: Black oxide finished brass

Housing: White nylon



MODEL NO.	COLOR	INCORPORATES LED*
5500Y1	Red	4304H1
5500Y5	Green	4304H5
5500Y7	Yellow	4304H7
5502Y1-5V	Red	4302H1-5V
5502Y3-5V	Amber	4302H3-5V
5502Y5-5V	Green	4302H5-5V



PC Board Mounted LEDs

IDI printed circuit board mounted LED assemblies feature press-in mounting for accurate location on the board. These assemblies utilize **SUPER-BRITE** LEDs with state-of-the-art construction (GaAsP on GaP for red and yellow, GaP on GaP for green). They are easy to mount and have a high contrast ratio. The design of IDI board mounted LED assemblies includes a board standoff to prevent flux entrapment and permit easy washing.

FEATURES

- Attractive
- Economical
- Easy to Mount
- **SUPER-BRITE** LEDs

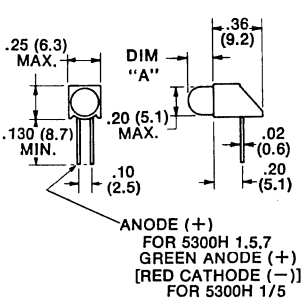
SERIES 5300E, 5300H, 5302H

BOARD MOUNTED LED BLOCKS

- Easy to mount
- High contrast ratio
- High-intensity light output
- Includes board standoff to prevent flux entrapment — permit easy washing
- TTL compatible — requires no external current-limiting resistors (Series 5302H-5V only)

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*	DIM "A"
5300E1	Red	4300E1NF	.13(3.3)
5300E5	Green	4300E5NF	.13(3.3)
5300E7	Yellow	4300E7NF	.13(3.3)
5300H1	Red	4304H1	.19(4.3)
5300H5	Green	4304H5	.19(4.3)
5300H7	Yellow	4304H7	.19(4.3)
5300H1/5	Red/Green	4301H1/5	.21(5.3)
5302H1-5V	Red	4302H1-5V	.21(5.3)
5302H3-5V	Amber	4302H3-5V	.21(5.3)
5302H5-5V	Green	4302H5-5V	.21(5.3)
5300H1LC	Red	4300H1LC	.21(5.3)
5300H7LC	Yellow	4300H7LC	.21(5.3)



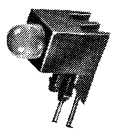
* SEE PAGE 10 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

PC Board Mounted LEDs

SERIES 5390E, 5390H, 5392H



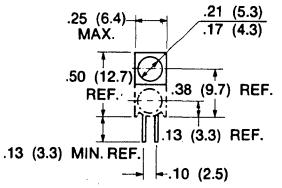
MINIATURE **SUPER-BRITE** LED ASSEMBLIES

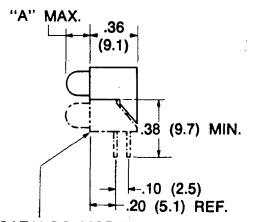
For use in connection with 5300E and H series board mounted LED blocks (see page 21)

- Easy installation — slide onto 5300 series blocks, must be pre-assembled before mounting on PC board
- Allow 2 LEDs in the same board area required for a single LED
- High contrast ratio, high-intensity light output

Housing: Black nylon

NOTE: 5390 SERIES PIGGY-BACK BLOCK SLIDES ONTO 5300H BLOCK, MUST BE PRE-ASSEMBLED BEFORE MOUNTING ON PC BOARD

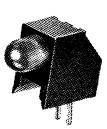




MODEL NO.	COLOR	INCORPORATES LED*	DIM. "A"
5390E1	Red	4300E1NF	.13 (3.3)
5390E5	Green	4300E5NF	.13 (3.3)
5390E7	Yellow	4300E7NF	.13 (3.3)
5390H1	Red	4304H1	.19 (4.8)
5390H5	Green	4304H5	.19 (4.8)
5390H7	Yellow	4304H7	.19 (4.8)
5392H1-5V	Red 5V	4302H1-5V	.21 (5.3)
5392H3-5V	Amber 5V	4302H3-5V	.21 (5.3)
5392H5-5V	Green 5V	4302H5-5V	.21 (5.3)
5390H1LC	Red	4300H1LC	.21 (5.3)
5390H7LC	Yellow	4300H7LC	.21 (5.3)

SERIES 5306H

NEW!

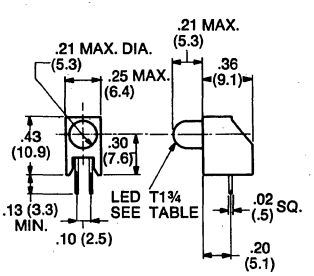


BLACK MOUNTED LED BLOCKS

- Easy to mount
- High intensity light output
- Includes board standoff to prevent flux entrapment — permit easy washing

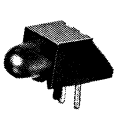
Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5306H1	Red	4304H1
5306H5	Green	4304H5
5306H7	Yellow	4304H7



SERIES 5307H

NEW!



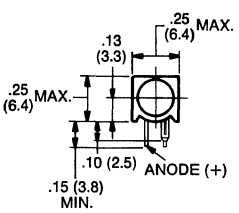
BOARD MOUNTED LED BLOCKS

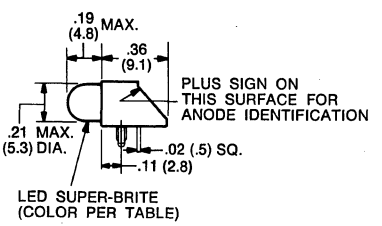
- Press-in mounting for accurate location on printed circuit board
- High intensity light output
- Includes board standoff to prevent flux entrapment — permit easy washing

Mounting: See page 21 for mounting hole

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5307H1	Red	4304H1
5307H5	Green	4304H5
5307H7	Yellow	4304H7





* SEE PAGE 10 FOR LED RATINGS ALL DIMENSIONS ARE IN INCHES (MM).

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

PC Board Mounted LEDs

SERIES 5310F, 5312F

5310F

5312F

SUB-MINIATURE **SUPER-BRITE** LED ASSEMBLIES

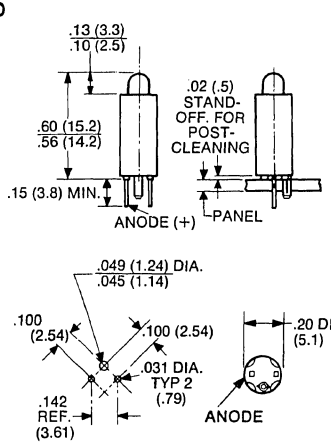
- Press-in mounting for accurate location on printed circuit board
- High -intensity light output

Ideal for use where LEDs must align with opening in a cover or panel.

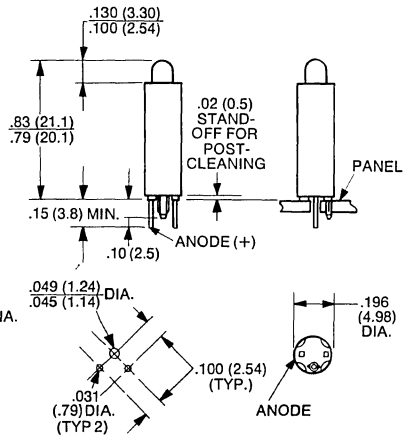
Housing: Black nylon

MODEL NO.	COLOR	INCOR-PORATES LED*	DIM "A"
5310F1	Red	4303F1	.60(15.2)
5310F5	Green	4303F5	.60(15.2)
5310F7	Yellow	4303F7	.60(15.2)
5312F1	Red	4303F1	.83(21.1)
5312F5	Green	4303F5	.83(21.1)
5312F7	Yellow	4303F7	.83(21.1)

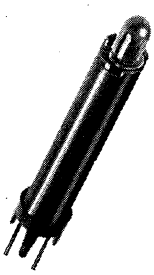
5310F



5312F



SERIES 5311F



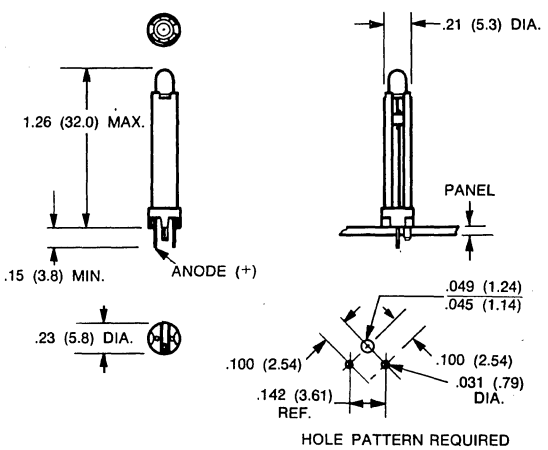
SUB-MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- Press-in mounting for accurate location on printed circuit board
- High -intensity light output

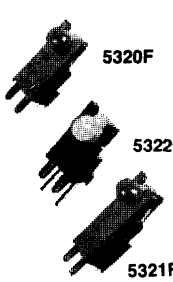
Ideal for use where LEDs must align with opening in a cover panel.

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5311F1	Red	4303F1
5311F5	Green	4303F5
5311F7	Yellow	4303F7



SERIES 5320F, 5321F, 5322F



5320F

5322F

5321F

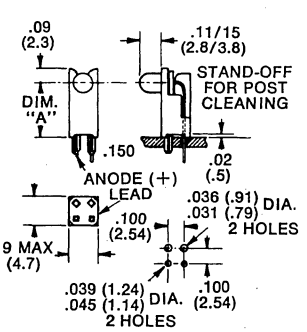
SUB-MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- 3 different board heights available
- Easy press-in mounting for precise positioning on printed circuit board
- T-1 size high intensity LEDs (GaAsP on GaP for red and yellow, GaP on GaP for green)

Ideal for use when the LED must line up with a panel opening or to provide uniform height for a row of LEDs.

Housing: Black nylon

MODEL NO.	COLOR	INCOR-PORATES LED*	DIM. "A"
5320F1	Red	4303F1	.35 (8.9)
5320F5	Green	4303F5	.35 (8.9)
5320F7	Yellow	4303F7	.35 (8.9)
5321F1	Red	4303F1	.45 (11.4)
5321F5	Green	4303F5	.45 (11.4)
5321F7	Yellow	4303F7	.45 (11.4)
5322F1	Red	4303F1	.25 (6.4)
5322F5	Green	4303F5	.25 (6.4)
5322F7	Yellow	4303F7	.25 (6.4)



* SEE PAGE 10 FOR LED RATINGS

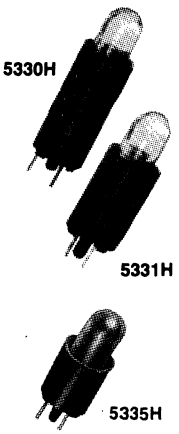
ALL DIMENSIONS ARE IN INCHES (MM).

CALL FOR OUR COMPLETE CATALOG

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

PC Board Mounted LEDs

SERIES 5330H, 5331H, 5335H



MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- T-1¾ size wide viewing angle (SERIES 5330H) or intense beam (SERIES 5331H) LEDs
- Easy press-in mounting for precise positioning on printed circuit board
- Includes board stand-off to prevent flux entrapment — permit easy washing

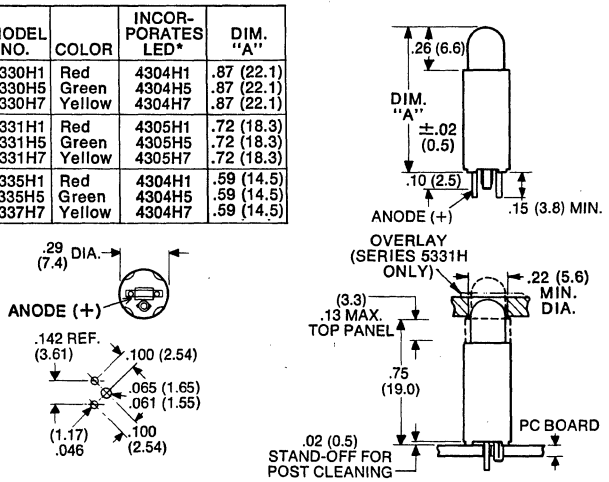
Height matches popular rocker and toggle switches

—use SERIES 5330H to fit panel hole openings

—use SERIES 5331H to line up behind panel overlays

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*	DIM. "A"
5330H1	Red	4304H1	.87 (22.1)
5330H5	Green	4304H5	.87 (22.1)
5330H7	Yellow	4304H7	.87 (22.1)
5331H1	Red	4305H1	.72 (18.3)
5331H5	Green	4305H5	.72 (18.3)
5331H7	Yellow	4305H7	.72 (18.3)
5335H1	Red	4304H1	.59 (14.5)
5335H5	Green	4304H5	.59 (14.5)
5337H7	Yellow	4304H7	.59 (14.5)



SERIES 5332H

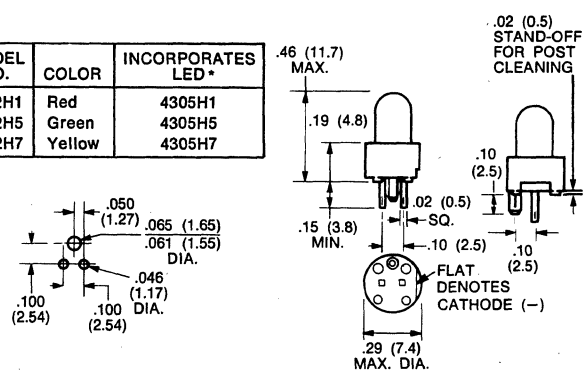
MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- T-1¾ size intense beam LEDs
- Easy press-in mounting for precise positioning on printed circuit board
- Includes board stand-off to prevent flux entrapment — permit easy washing

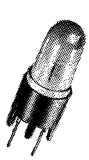
Low height makes this unit ideal for use on a board behind panel overlays where a precisely located illuminated spot is required.

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5332H1	Red	4305H1
5332H5	Green	4305H5
5332H7	Yellow	4305H7



SERIES 5340H

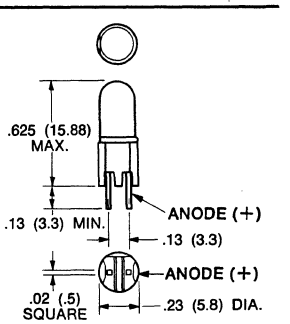


MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- T-1¾ size wide viewing angle LEDs
- Includes board stand-off, features .13 centers

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5340H1	Red	4304H1
5340H5	Green	4304H5
5340H7	Yellow	4304H7



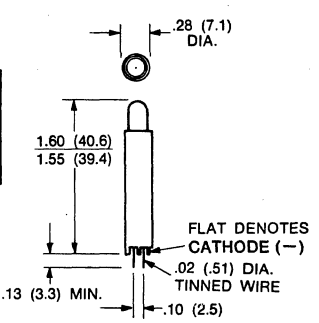
SERIES 5341H

MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- LED is fully insulated, fully supported high above the board
- Economical to buy and install
- T-1¾ size wide viewing angle LEDs

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5341H1	Red	4304H1
5341H5	Green	4304H5
5341H7	Yellow	4304H7



* SEE PAGE 10 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

PC Board Mounted LEDs

SERIES 5350T, 5370T

5350T

SUB-MINIATURE **SUPER-BRITE** LED ASSEMBLIES

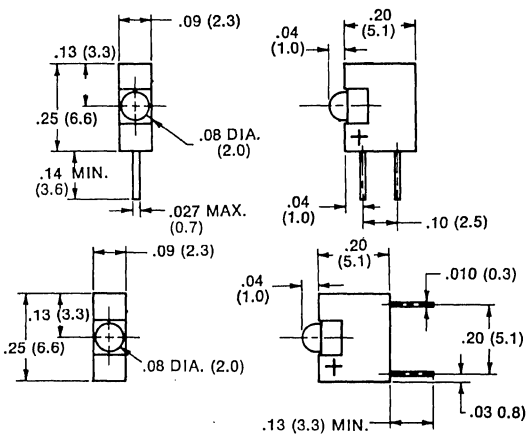
- Small size enables these to be stacked on 0.100" centers
- High-intensity light output

Ideal for use where LEDs must align with opening in a cover panel.

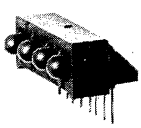
Housing: Black nylon

5370T

MODEL NO.	MODEL NO.	LENS COLOR	INCORPORATES LED*
5350T1	5370T1	Red	4307T1
5350T5	5370T5	Green	4307T5
5350T7	5370T7	Yellow	4307T7
5352T1-5V	5372T1-5V	Red	4302T1-5V
5350T1LC	5370T1LC	Red	4300T1LC
5350T7LC	5370T7LC	Yellow	4300T7LC



SERIES 5360F

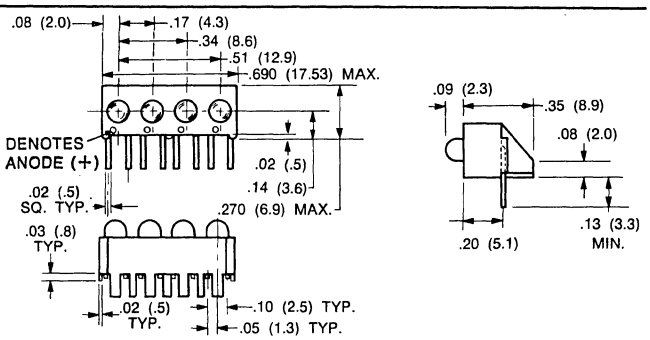


SUB-MINIATURE **BRITE** LED ASSEMBLIES

- Quad assembly permits economical purchase, easy mounting of 4 LEDs
- Includes board stand-off to prevent flux entrapment — permit easy washing

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES 4 LEDS
5360F1	Red	4300F1



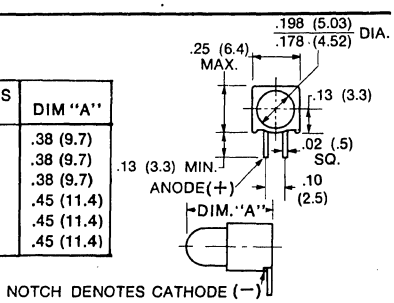
SERIES 5380E, 5380H

MINIATURE **SUPER-BRITE** LED ASSEMBLIES

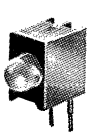
- Easy to mount
- High contrast raised shell
- Includes board stand-off to prevent flux entrapment — permit easy washing
- Takes minimum board space

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*	DIM "A"
5380E1	Red	4300E1NF	.38 (9.7)
5380E5	Green	4300E5NF	.38 (9.7)
5380E7	Yellow	4300E7NF	.38 (9.7)
5380H1	Red	4304H1	.45 (11.4)
5380H5	Green	4304H5	.45 (11.4)
5380H7	Yellow	4304H7	.45 (11.4)



SERIES 5600F

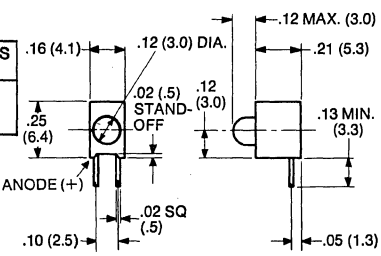


SUB MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- Easy to mount
- Includes board standoff to prevent flux entrapment — permit easy washing
- T-1 size high intensity LEDs (GaAsP on GaP for red and yellow, GaP on GaP for green)

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5600F1	Red	4303F1
5600F5	Green	4303F5
5600F7	Yellow	4303F7



* SEE PAGE 10 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

CALL FOR OUR COMPLETE CATALOG

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

PC Board Mounted LEDs

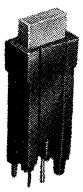
SERIES 5610R, 5620R

RECTANGULAR BOARD MOUNTED **SUPER BRITE** LED ASSEMBLIES

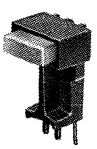
- Press-in mounting for accurate location on printed circuit board
- High-intensity light output spread uniformly over entire front surface
- State-of-the-art construction (GaAsP on GaP for red and yellow, GaP on GaP for green)

MODEL NO.	COLOR	INCORPORATES LED*
5610R1	Red	4306R1
5610R5	Green	4306R5
5610R7	Yellow	4306R7
5620R1	Red	4306R1
5620R5	Green	4306R5
5620R7	Yellow	4306R7

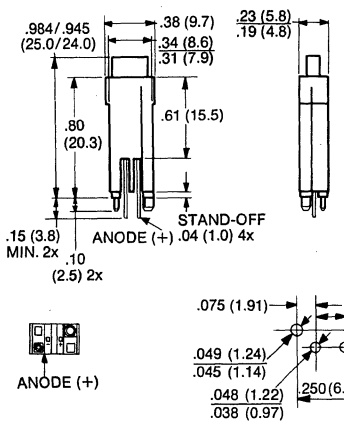
5610R



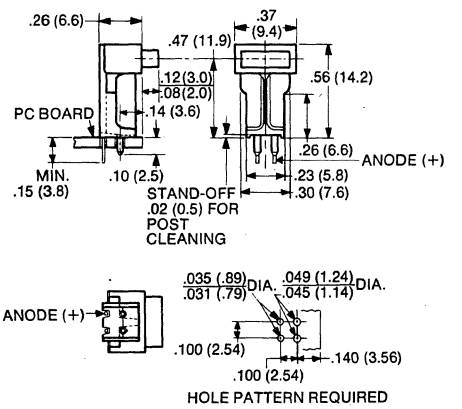
5620R



5610R



5620R



SERIES 5640E, 5640H

NEW!

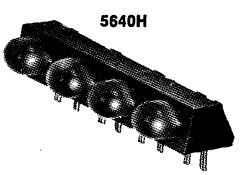
MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- Quad assembly permits economical purchase, easy mounting of 4 LEDs
- Includes board standoff to prevent flux entrapment — permit easy washing

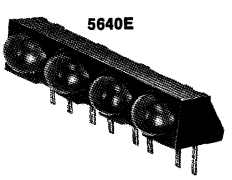
Mounting: See page 21 for mounting hole
Housing: Black nylon

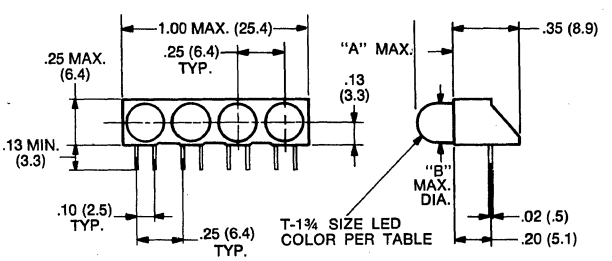
MODEL NO.	COLOR	INCORPORATES LED*	DIM "A"	DIM "B"
5640E1	Red	4300E1NF	.13 (3.3)	.21 (5.3)
5640E5	Green	4300E5NF	.13 (3.3)	.21 (5.3)
5640E7	Yellow	4300E7NF	.13 (3.3)	.21 (5.3)
5640H1	Red	4304H1	.19 (4.8)	.20 (5.0)
5640H5	Green	4304H5	.19 (4.8)	.20 (5.0)
5640H7	Yellow	4304H7	.19 (4.8)	.20 (5.0)

5640H



5640E





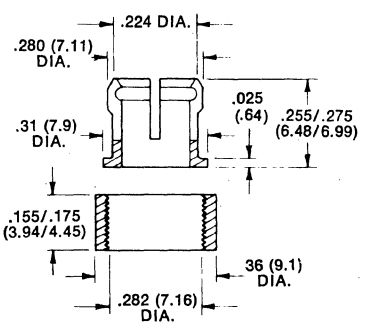
LED Clip and Lenses

MODELS 4304MC, ¼" DIA.

LED MOUNTING CLIP FOR T-1¾ SIZE LEDS

This attractive and economical mounting clip installs quickly and provides secure mounting for LEDs. Order Model 4304MC two-piece mounting clip for T-1¾ high dome LEDs such as 4301H, 4304H, or 4305H Series.

Material: Black polypropylene
Mounting Hole: .250 (6.35) min. dia. in panels up to .125 (3.18) thick.



* SEE PAGE 10 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

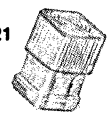
CALL FOR OUR COMPLETE CATALOG

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

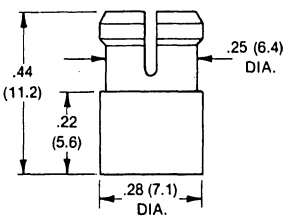
LED Clip and Lenses

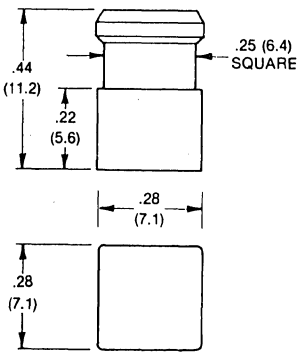
SERIES 4311, 4321 ¼" DIA., ¼" SQ.

4311


4321

MODEL NO. ROUND	MODEL NO. SQUARE	LENS COLOR
4311	4321	Red
4312	4322	Clear
4315	4325	Green
4317	4327	Yellow





ROUND & SQUARE LED LENSES FOR T-1¾ LEDS

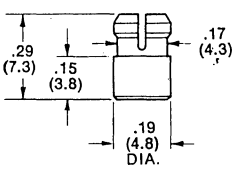
These lenses provide quick and economical panel mounting, plus electrostatic discharge protection, for T-1¾ high dome LEDs. Molded in Fresnel rings spread light evenly, provide wide viewing angle viewing (up to 180°) and bright attractive appearance. Use 4311 or 4321 red lenses with 4305H1 LEDs, 4315 or 4325 green lenses with 4305H5 LEDs, 4317 or 4327 yellow lenses with 4305H7 LEDs. Clear lenses, 4312 or 4322, may be used with 4301H1/5 red/green LED.

Mounting: Snap round lenses into .248/.252 (6.30/6.40) dia. hole, square lenses into .248/.252 (6.30/6.40) square hole in panels .06/.13 (1.5/3.3) thick. Square lenses may also be gang mounted in slotted hole. .248/.252 (6.30/6.40) wide. .280 (7.00) times number of lenses minus .030 (.76) long.

Material: Cellulose acetate butyrate

SERIES 4331 11/64" DIA.

MODEL NO. ROUND	LENS COLOR
4331	Red
4335	Green
4337	Yellow



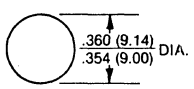
ROUND LED LENS FOR T-1 LEDS

This is a smaller version of the 4311 series lenses and is designed for T-1 LEDs rather than T-1¾ LEDs. The plastic lens provides protection against electrostatic discharge.

Mounting: Snap round lens into .170/.174 (4.32/4.42) dia. hole in panels .03-.06 (.8-1.5) thick.

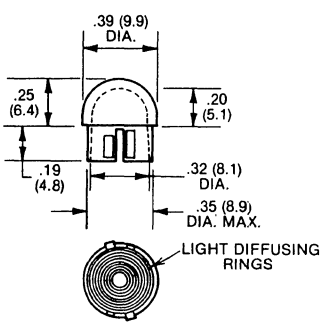
Material: Cellulose acetate butyrate

SERIES 4341 23/64" (9mm) DIA.



MOUNTING HOLE:
UNIT WILL SNAP INTO
.03-.08 (.76-2.03) THICK PANEL

MODEL NO.	LENS COLOR
4341	Red
4342	Clear
4343	Amber
4344	White
4345	Green
4346	Blue
4347	Yellow



ROUND PANEL LENSES FOR T-1¾ PC BOARD MOUNTED LEDS

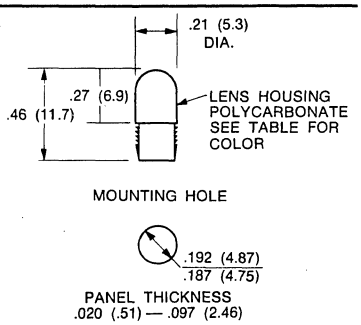
Attractive snap-in panel lenses provide wide-angle viewing plus mechanical security and electrostatic discharge protection. Generous clearance and "forgiving" optics speed product assembly. Ideal for use with narrow beam LEDs, such as 4305H or 4308H series — or use with incandescent lamps.

Mounting: Snap into .354/.360 (9.00/9.14) dia hole in panels .03-.08 (.76-2.03) thick.

Material: Polycarbonate

SERIES 4350 3/16" DIA.

MODEL NO.	LENS COLOR
4351	Red
4352	Clear
4353	Amber
4354	White
4355	Green
4356	Blue
4357	Yellow



ROUND PANEL LENS FOR T-1 LEDs

Attractive snap-in panel lenses provide wide-angle viewing plus mechanical security and electrostatic discharge protection. Ideal for use with T-1 LEDs such as 4303F series.

Mounting: Snap into .187/.192 (4.75/4.87) dia. hole in panels .020/.097 (.51/2.46) thick.

Material: Polycarbonate

ALL DIMENSIONS ARE IN INCHES (MM).

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

Bare LEDs

A wide variety of top-quality LEDs in a variety of sizes and package styles.

- All IDI LEDs provide bright, unmistakable indication **SUPER-BRITE** LEDs are GaAsP on GaP for red and yellow, **EXTRA-SUPER-BRITE** (series) are ultra bright LEDs utilizing GaA1As construction for red, GaAsP on GaP for amber, and high-efficiency GaP for yellow and green.
- New "LC" LEDs are high efficiency types available in red and yellow, require only 2 mA, ideal for battery-operated devices and limited-current power supplies.
- −5V LEDs have a current-limiting resistor on the chip, are TTL compatible — require no external current-limiting resistors.
- IDI LEDs are available as components, and also in a variety of panel-mounted and printed circuit-board mounted assemblies.

SPECIFICATIONS

* OUTPUT COLOR	* DIFFUSED, NON DIFFUSED	* PACKAGE COLOR	VIEWING ANGLE	MIN. LUM. INTENSITY AT RATED CURRENT	TYP. LUM. INTENSITY AT RATED CURRENT	RATED CURRENT	FORWARD VOLTAGE TYP.	FORWARD VOLTAGE MAX.	CONTINUOUS FORWARD CURRENT, MAX.	PEAK FORWARD CURRENT @ 1 μS-300 PPS.	REVERSE BREAKDOWN VOLTAGE (MIN.)	PEAK WAVELENGTH	POWER: DISSIPATION MAX. AT 25°C.	POWER: DERATE LINEARLY FROM 25°C.	CAPACITANCE @ V = 0	FORWARD CURRENT @ V_f = 5V TYP.	FORWARD CURRENT @ V_f = 5V MAX.	PHYSICAL DIMENSIONS	
	COLOR		DEG.	mcd	mcd	mA	V	V	mA	A	V	nm	nW	mW/C°	P.F.	mA	mA	FIG.	MODEL NO.
R	D	R	70	.5	2	20	1.7	2.2	30	1.0	5	660	105	1.14	25	—	—	B	4300E1NF
G	D	G	70	3.0	12	20	2.2	3.0	30	.09	5	567	105	1.14	20	—	—	B	4300E5NF
Y	D	Y	70	2.0	11	20	2.1	3.0	30	1.0	5	585	105	1.14	45	—	—	B	4300E7NF
R	D	R	125	0.5	1.0	20	1.6	2.0	50	1.0	3	655	100	—	100	—	—	F	4300F1
R	D	R	50	1.0	1.8	2	1.8	2.2	7	.007	5	635	27	—	4	—	—	F	4300F1LC
Y	D	Y	50	1.0	1.8	2	1.9	2.7	7	.007	5	583	24	—	4	—	—	F	4300F7LC
R	D	R	80	0.5	1.6	20	1.7	2.2	100	1.0	5	670	180	2.0	30	—	—	C	4300H1
R	D	R	50	1.2	2.0	2	1.8	2.2	7	.007	5	635	27	—	4	—	—	C	4300H1LC
Y	D	Y	50	1.2	1.8	2	1.9	2.7	7	.007	5	583	24	—	4	—	—	C	4300H7LC
R	D	R	80	.6	1.5	10	2.0	2.8	30	1	5	697	100	1.5	50	—	—	A	4300S1
R	D	R	70	0.4	0.8	2	1.8	2.2	7	.007	5	635	27	—	4	—	—	G	4300T1LC
Y	D	Y	70	0.4	0.8	2	1.9	2.7	7	.007	5	583	24	—	4	—	—	G	4300T7LC
R/G	D	CLR	—	R-0.6 G-0.6	R-1.8 G-1.8	10	2.2	2.8	25	.06	—	R-697 G-565	115	1.5	100	—	—	D	4301H1/5
R	D	R	60	0.8	1.5	13	5	7.5	20	—	3	655	—	—	—	13	20	F	4302F1-5V
R	D	R	90	1.5	4.0	10	5	7.5	15	—	5	635	—	—	—	10	15	C	4302H1-5V
A	D	A	90	1.5	4.0	10	5	7.5	15	—	5	583	—	—	—	10	15	C	4302H3-5V
G	D	G	90	1.5	4.0	12	5	7.5	15	—	5	565	—	—	—	12	15	C	4302H5-5V
R	D	R	80	1.0	2.4	9.6	5	6	13	—	5	635	—	—	—	9.6	13	G	4302T1-5V
R	D	R	90	1.5	2.5	10	2.0	3.0	30	1.0	5	635	120	—	45	—	—	F	4303F1
G	D	G	90	2.0	5.0	20	2.2	3.0	30	.09	5	562	120	—	20	—	—	F	4303F5
Y	D	Y	90	1.5	3.0	20	2.1	3.0	30	1.0	5	585	120	—	45	—	—	F	4303F7
R	D	R	65	3.0	10	20	2.0	3.0	35	1.0	5	635	120	1.14	45	—	—	C	4304H1
G	D	G	75	3.0	12	20	2.2	3.0	30	.09	5	562	120	—	20	—	—	C	4304H5
Y	D	Y	65	2.5	11	20	2.1	3.0	35	1.0	5	585	120	1.14	45	—	—	C	4304H7
R	D	R	50	2.0	4.0	10	2.0	3.0	35	1.0	5	630	105	1.14	45	—	—	A	4304S1
G	D	G	50	.5	3.0	10	2.2	3.0	30	.09	5	562	180	—	20	—	—	A	4304S5
Y	D	A	50	1.5	3.0	10	2.1	3.0	35	1.0	5	585	105	1.14	45	—	—	A	4304S7
R	N	R	28	17	40	20	2.0	3.0	35	1.0	5	635	120	—	45	—	—	C	4305H1
G	N	G	35	12	25	20	2.3	3.0	30	.09	5	562	120	—	20	—	—	C	4305H5
Y	N	Y	28	10	45	20	2.1	3.0	35	1.0	5	585	120	—	45	—	—	C	4305H7
R	D	R	100	2.5	5.0	25	2.1	3.0	30	.09	5	635	135	—	17	—	—	H	4306R1
G	D	G	100	1.5	2.5	25	2.3	3.0	30	.09	5	565	135	—	18	—	—	H	4306R5
Y	D	Y	100	3.0	5.0	20	2.2	3.0	20	.06	5	583	85	—	17	—	—	H	4306R7
R	D	R	80	1.0	3.0	10	2.2	3.0	30	.06	5	635	120	—	11	—	—	G	4307T1
G	D	G	70	1.0	3.0	10	2.3	3.0	30	.06	5	565	120	—	18	—	—	G	4307T5
Y	D	Y	90	1.0	3.0	10	2.2	3.0	20	.06	5	583	120	—	15	—	—	G	4307T7
R	N	CLR	20	80	160	20	1.7	2.0	50	.3	4	660	100	—	50	—	—	C	4308H1
A	N	CLR	20	60	90	20	2.2	2.5	50	.1	4	580	125	—	50	—	—	C	4308H3
G	N	CLR	20	50	80	20	2.1	2.5	50	.1	4	555	125	—	50	—	—	C	4308H5
Y	N	CLR	20	80	160	20	2.1	2.5	50	.1	4	570	125	—	40	—	—	C	4308H7

* COLOR CODE: A - AMBER, CLR - CLEAR, G - GREEN, R - RED, Y - YELLOW, D - DIFFUSED, N - NON-DIFFUSED

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

Bare LEDs

FIG. A

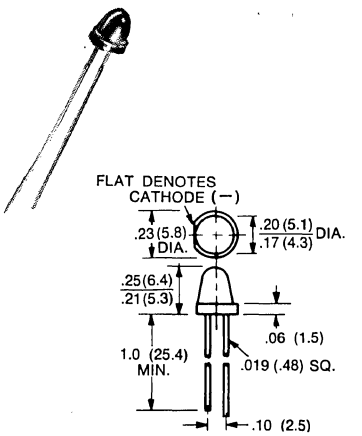


FIG. B

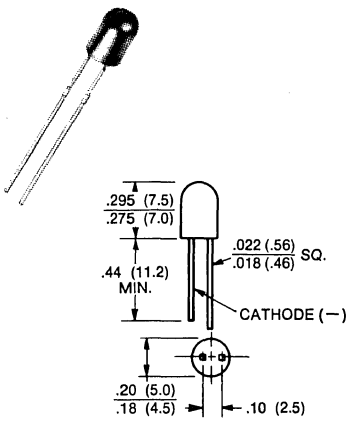


FIG. C

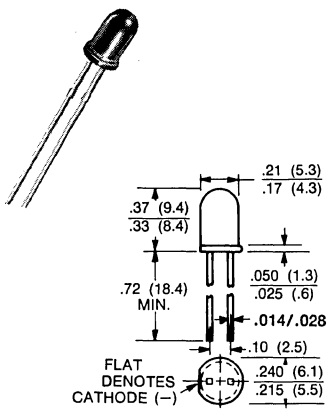


FIG. D

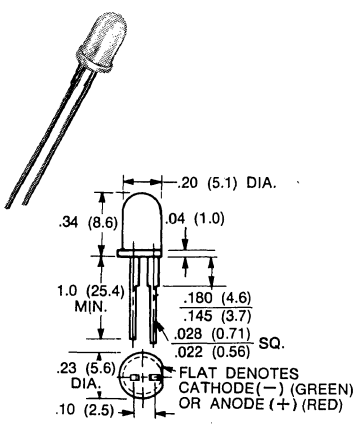


FIG. E

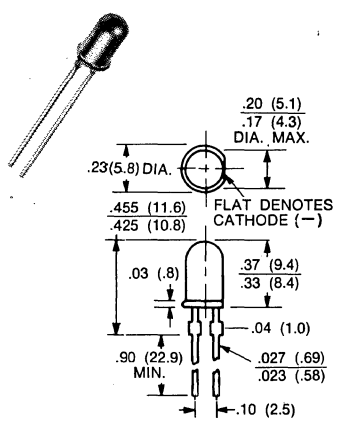


FIG. F

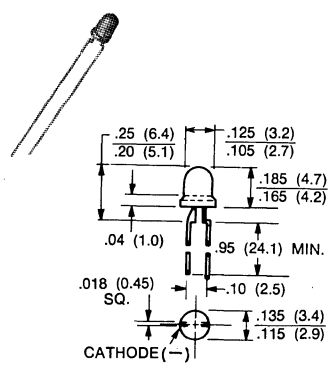


FIG. G

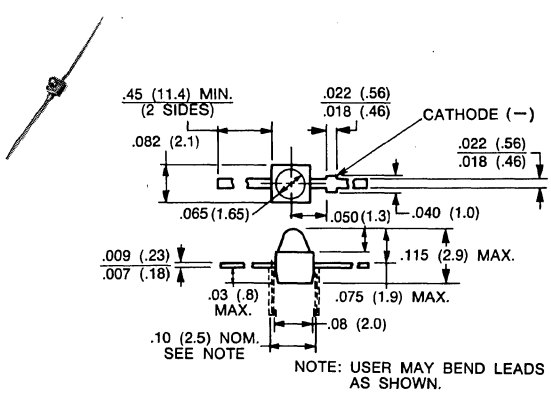
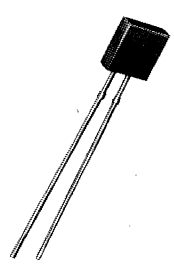


FIG. H



ALL DIMENSIONS ARE IN INCHES (MM).

CALL FOR OUR COMPLETE CATALOG

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

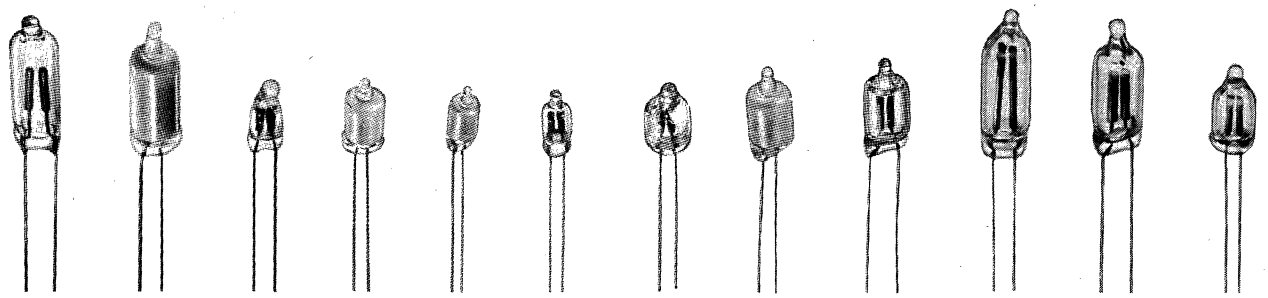
Neon Glow Lamps

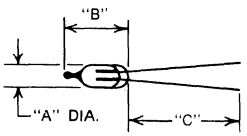
Neon lamps are ideal for line-voltage AC as well as for 90V and up DC applications. They are rugged and long-lived; properly specified neon lamps will outlast the equipment in which they are incorporated.

IDI 4900 series neon lamps have tinned leads, and are ideal for use on printed circuit boards. Unique sizes, colors, and voltage characteristics provide a wide range of options.

Plain glass lamps include both standard brightness and high brightness types, and include a unique high-current lamp for greater light output and a unique high brightness low voltage lamp. Green, blue, and amber lamps have a phospher coating on the inside of the glass envelope to convert the typical orange-red neon glow to other colors, and are available in both miniature and sub-miniature sizes.

A wide variety of complete panel-mounted neon indicator lights is listed in the "non-relampable" section of this catalog. Several PC Board-mounted neon assemblies are in development; please let us know if you have specific needs.





(SEE TABLE FOR DIM'S)

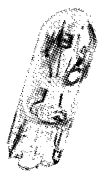
NOTES: 1. Leads are Tinned.
2. DC life is 60% of AC life.
3. All lamps must be ballasted.
4. All lamps may be used on higher voltages with appropriate value resistor in series.
5. Max. firing voltage when lamp is new, for high brightness lamps voltage increases as lamp ages.
6. Voltage measured across lamp at design current.

MODEL NO.	LAMP TYPE	CIRCUIT VOLTAGE (VAC)	MAX. FIRING VOLTAGE (NOTE 5) (VAC)	TYP. MAINTAINING VOLTAGE (NOTE 6) (VAC)	END OF LIFE FIRING VOLTAGE (VAC)	NOMINAL CURRENT (mA)	RECOMMENDED EXT. RESISTOR FOR SHOWN CIRCUIT VOLTAGE (NOTE 4) (OHMS)	AVERAGE USEFUL LIFE AT RATED CURRENT. (HRS) AC	COMMENTS	DIM'S. IN INCHES (MM) A MAX.	B MAX.	C
4915H5	—	95-120	95	40	—	0.7	100,000	10,000	Green Sub-Miniature	.16 (4.1)	.40 (10.2)	1.0 (25) MIN.
4915H6	—	95-120	95	40	—	0.7	100,000	10,000	Blue Sub-Miniature	.16 (4.1)	.40 (10.2)	1.0 (25) MIN.
4915H7	—	95-120	95	40	—	0.7	100,000	10,000	Orange Sub-Miniature	.16 (4.1)	.40 (10.2)	1.0 (25) MIN.
4916S1	2ML	85-125	65	40	—	0.3	150,000	25,000	Standard Brightness Sub-Miniature	.16 (4.1)	.43 (10.9)	1.0 (25) NOM.
4916H1	1MH	105-125	100	40	—	0.7	100,000	5,000	High Brightness Sub-Miniature	.16 (4.1)	.43 (10.9)	1.0 (25) NOM.
4920H5	—	95-120	95	40	—	0.8	91,000	10,000	Green Miniature	.20 (5.1)	.60 (15.2)	1.0 (25) NOM.
4920H6	—	95-120	95	40	—	0.8	91,000	10,000	Blue Miniature	.20 (5.1)	.60 (15.2)	1.0 (25) NOM.
4920H7	—	95-120	95	40	—	0.8	91,000	10,000	Orange Miniature	.20 (5.1)	.60 (15.2)	1.0 (25) NOM.
4921S1	A1B	75-125	65	40	—	0.3	220,000	25,000	Standard Brightness Miniature	.25 (6.4)	.50 (12.7)	1.0 (25) NOM.
4921H1	A1C	105-125	95	50	—	1.2	47,000	25,000	High Brightness Miniature	.25 (6.4)	.50 (12.7)	1.0 (25) NOM.
4924J1	—	100	55	40	75	1.5	33,000	10,000	Low Voltage High Brightness	.25 (6.4)	.60 (15.2)	1.0 (25) MIN.
4925S1	A9A	75-125	65	40	—	0.7	100,000	10,000	Standard Brightness	.25 (6.4)	.75 (19.1)	2.0 (51) NOM.
4925U1	—	105-125	85	45	95	5.0	8,200	15,000	High Current High Brightness	.25 (6.4)	.79 (20.1)	1.0 (25) MIN.
4925H1	C2A	105-125	95	65	—	1.9	30,000	25,000	High Brightness	.25 (6.4)	.75 (19.1)	2.0 (51) NOM.
4925H5	G2B	95-120	95	40	—	1.6	36,000	20,000	Green	.25 (6.4)	.75 (19.1)	1.0 (25) MIN.
4925H6	T2B	95-120	95	40	—	1.6	36,000	20,000	Blue	.25 (6.4)	.75 (19.1)	1.0 (25) MIN.
4925H7	—	95-120	95	40	—	1.6	36,000	20,000	Orange	.25 (6.4)	.75 (19.1)	1.0 (25) MIN.
4926H1	C6A	105-125	95	50	—	2.0	18,000	10,000	Long Electrode High Brightness	.25 (6.4)	1.0 (25)	1.0 (25) MIN.

CALL FOR OUR COMPLETE CATALOG

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

Tiny-Mite™



FEATURES

- Attractive
- Compact
- Easy lamp insertion and removal
- Economical

TINY-MITE indicator light assemblies and sockets feature a unique socket construction which holds the lamp securely, makes contact reliably, and will not loosen with vibration or shock, yet permits easy lamp removal and replacement.

TINY-MITE 4600 Series indicator light assemblies are extremely attractive, rugged, and reliable, yet utilize minimal panel space. TINY-MITE 4100 Series sub-miniature wedge-base lamp sockets are available in both lead and solder terminal versions, as well as in a printed circuit board version.

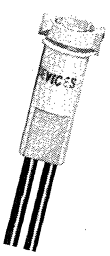
Sub-miniature wedge-base lamps evolved from the design originally developed for miniature (T-3-1/4) lamps. The ruggedness and reliability of wedge-base lamps has been proved by the annual use of hundreds of millions of units. Wedge-base design is economical because the base is formed from the glass of the bulb and lead-in wires. There are no separate parts or extra welded connections. There are 13 different types presently available with voltage ratings ranging from 2.5 volts to 28 volts.

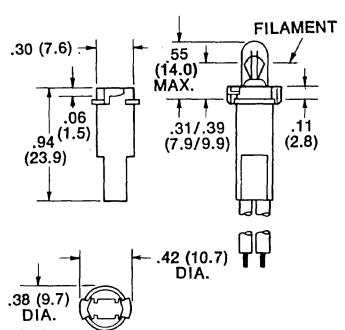
SUB-MINIATURE (T-1¾) WEDGE-BASE LAMPS

LAMP NO.	DESIGN VOLTAGE	DESIGN AMPS	CANDLE POWER (APPROX.)	RATED LIFE HOURS
11	2.5	.20	.20	1,000
56	5	.115	.15	20,000
79	6	.20	.60	1,000
84	6.3	.04	.03	20,000
16	6.3	.15	.34	5,000
86	6.3	.20	.40	20,000
18	14	.04	.13	5,000
73	14	.08	.30	15,000
37	14	.09	.50	1,500
74	14	.10	.70	500
70	14	.15	.15	100
85	28	.04	.30	7,000
17	28	.06	.65	5,000

MODEL 4100 5/16" DIA. — KEYED

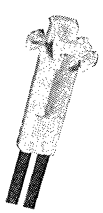
Mounting: For rear insertion in panels .06 (1.5) thick, see pg. 21 for mounting hole
Wire Leads: No. 22 AWG, 4.4/4.8 (111.8/121.9) long,stripped .43/.57 (10.9/14.5)
Housing: White nylon
Note: Available with other leads and/or terminals on special order

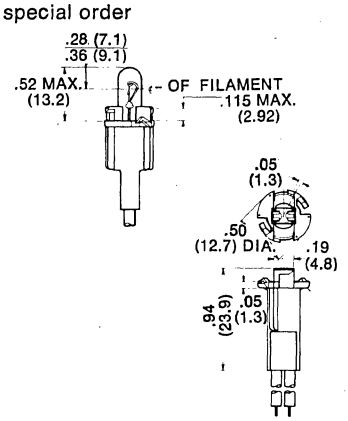




MODEL 4104

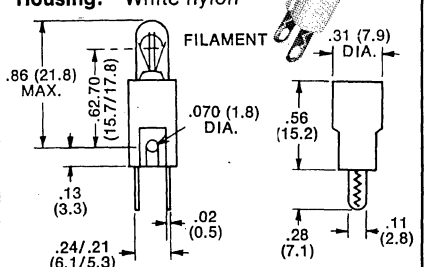
Mounting: For rear insertion in panels .06 (1.5) thick see pg. 21 for mounting hole
Wire Leads: No. 20 AWG, 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Housing: White nylon
Note: Available with other leads and/or terminals on special order





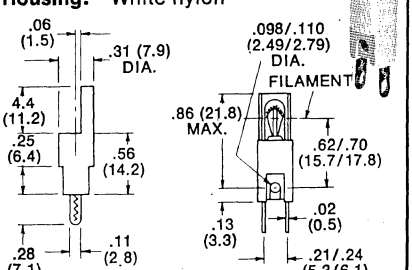
MODEL 4110

Mounting: Rivet mount
Terminals: Tinned brass
Housing: White nylon



MODEL 4111

Mounting: Rivet mount
Terminals: Tinned brass
Housing: White nylon

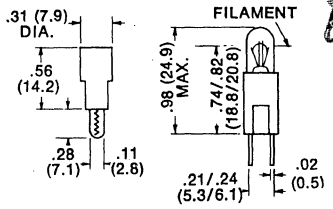


Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

Tiny-Mite™ Sub-Miniature Wedge-Base Lamp Sockets

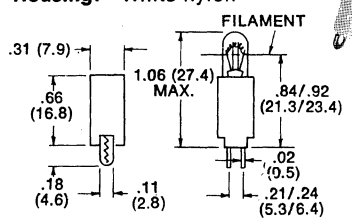
MODEL 4112

Terminals: Tinned brass
Housing: White nylon



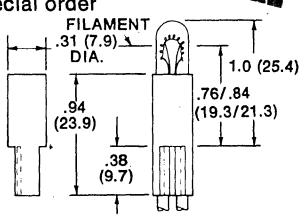
MODEL 4113

Terminals: Tinned brass
Housing: White nylon

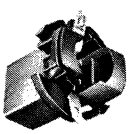


MODEL 4120

Mounting: Tab mount, see pg. 21 for mounting tab
Wire Leads: No. 22 AWG, 4.5 (114.3) long, stripped .5 (12.7)
Housing: White nylon
Note: Available with other leads and/or terminals on special order

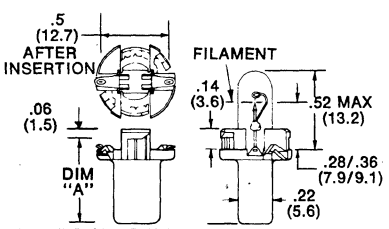


MODEL 4130, 4133, 4136

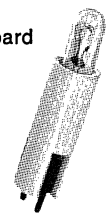


Mounting: Printed circuit board, see pg. 21 for mounting hole
Contacts: CA-725 alloy
Housing: Nylon (see table for color)

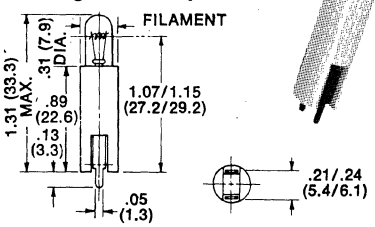
MODEL	DIM "A"	COLOR
4130	.55 (14.0)	Gray
4133	.51 (13.0)	Black
4136	.385 (9.8)	Black



MODEL 4140

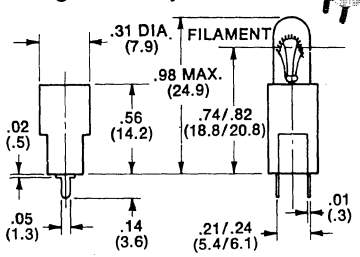


Mounting: Printed circuit board
Terminals: Tinned brass
Housing: White nylon



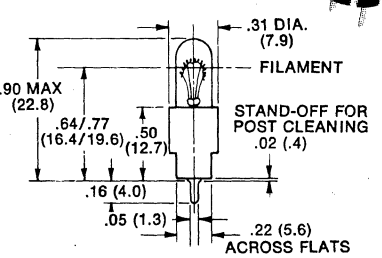
MODEL 4141

Mounting: Printed circuit board
Terminals: Tinned brass
Housing: White nylon



MODEL 4142, 4142WT

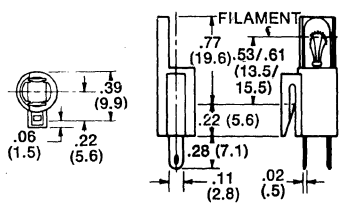
Mounting: Printed circuit board
Terminals: Tinned brass
Housing: Black nylon for 4142
White nylon for 4142WT



MODELS 4150, 4150R, 4150L

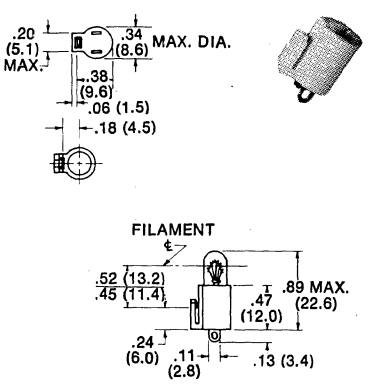
Mounting: Hook mount, see pg. 21 for optional mounting holes
Terminals: Tinned brass
Housing: White nylon

SOCKET NO.	LIGHT SHIELD
4150L	Left Hand (as shown)
4150R	Right Hand
4150	None

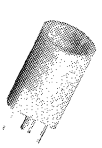


MODEL 4151

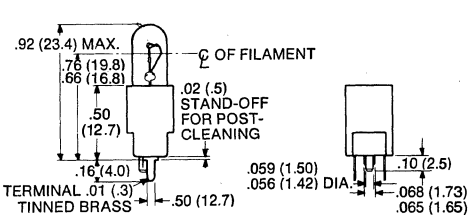
Mounting: Snap on edge or center, see pg. 21 for optional mounting holes
Terminals: Tinned brass
Housing: White nylon



MODEL 4144



Mounting: Press-in mounting for accurate location on printed circuit board
Terminals: Tinned brass
Housing: White nylon



ALL DIMENSIONS ARE IN INCHES (MM).

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

Non-Relampable Indicator Lights

IDI non-relampable, or unit-construction, indicator light assemblies are compact and attractive. They are essentially tamper-proof and have outstanding reliability due to the elimination of sockets and spring contacts. In addition, IDI non-relampable indicator light assemblies are extremely economical to buy and install.

Omni-Glow 1000 SERIES

GENERAL PURPOSE INDICATOR LIGHTS

- Available in five lens shapes and two body sizes.
- Neon models incorporate appropriate current-limiting resistors.
- A choice of wire leads or quick connect terminals.
- Lights can be easily mounted by either push-on speednut or snap-fit into a .500 (12.70) dia. hole.
- UL Recognized — CSA Approved.

Rugged and long-lived, OMNI-GLOW Indicator Lights usually outlast the product on which they are used. Conservatively rated, the neon lights will function in excess of 10,000 hours — and often much longer. Depending on usage, the incandescent models can also provide outstanding performance. Tamper-proof housing and elimination of sockets and spring contacts — along with intrinsically rugged shock-proof design — all combine to provide outstanding reliability.

OMNI-GLOW Indicator Lights are compact and economical. They take little space on your panel or behind it and make modest demands on your budget.

LAMP DATA TABLES

Neon Lamps (All High-Brightness)

LAMP NO.	INCORPORATED RESISTANCE (Ohms)		AVERAGE RATED LIFE (Hours)	
	125VAC	250V	125VAC	250V
C2A (NE-2H)	30k	100k	25,000	25,000
C6A	18k	—	10,000	—
G2B (Green)	39k	120k	25,000	25,000
T2B (Blue)	39k	120k	25,000	25,000

Incandescent Lamps (T-1¾)

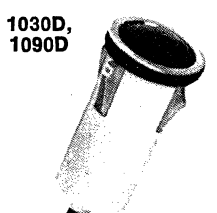
NOMINAL VOLTAGE	LAMP NO.	DESIGN VOLTAGE	DESIGN AMPS	MSCP (Approx.)	RATED LIFE (Hours)
6V	2112	6.3	.20	.55	20,000
12V	2162	14.0	.10	.50	10,000
28V	2187	28.0	.04	.30	7,000

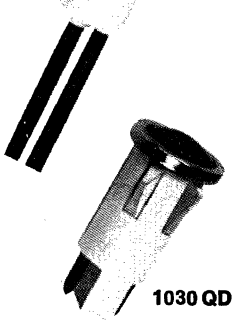
Note: To convert 125V models to 250V service, add a 47k series resistor for C6A lamps; add a 100k series resistor for NE-2H, G2B and T2B lamp.

* Incandescent lamp life ratings are based on static (vibration-free) conditions. Unit should be tested in your application to assure that it will perform satisfactorily.

SERIES 1030D, 1030QD, 1090D ½" DIA.

1030D, 1090D

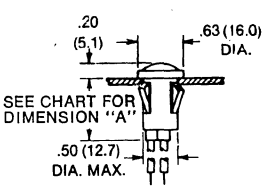




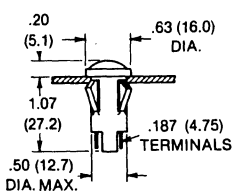
1030 QD

Mounting: Will snap-fit into .500/.505 (12.70/12.83) dia. hole in panels .020/.100 (.51/2.54) thick. Push-on speednut SN0461 (see page 21) also available. See page 21 for optional mounting hole

Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)



SERIES 1030D, 1090D



SERIES 1030QD

Terminals: Tinned brass **Bezel:** Chrome plated brass
Lens: Polycarbonate **Housing:** White nylon

LENS COLOR	NEON MODEL NO. 105-125VAC	NEON MODEL NO. 208-250V	INCANDESCENT MODEL NO. 6V	INCANDESCENT MODEL NO. 12V	INCANDESCENT MODEL NO. 28V	NEON MODEL NO. 105-125VAC	NEON MODEL NO. 208-250V
Red	1030D1	1031D1	1090D1-6V	1090D1-12V	1090D1-28V	1030QD1	1031QD1
Amber	1030D3	1031D3	1090D3-6V	1090D3-12V	1090D3-28V	1030QD3	1031QD3
White	1030D4	1031D4	1090D4-6V	1090D4-12V	1090D4-28V	1030QD4	1031QD4
Green	1032D5*	1033D5*	1090D5-6V	1090D5-12V	1090D5-28V	1032QD5*	1033QD5*
Lamp	C2A + Resistor		#2112	#2162	#2187	C2A + Resistor	
Lead Color	Black	One Black/One Red	White	Yellow	Purple	Quick Connect Terminals	
"A"	1.13 (28.7)	1.13 (28.7)	.91 (23.1)	.91 (23.1)	.91 (23.1)	—	—

* Incorporates G2B lamp and resistor

Underwriters Laboratories (UL) File No. E20325 — Canadian Standards Association (CSA) File No. 13346

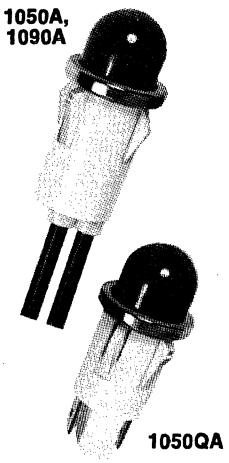
ALL DIMENSIONS ARE IN INCHES (MM).

CALL FOR OUR COMPLETE CATALOG

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

Omni-Glow 1000 SERIES

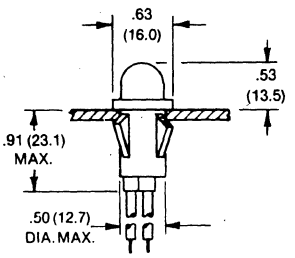
SERIES 1050A, 1050QA, 1090A ½" DIA.



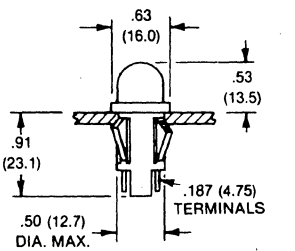
Mounting: Will snap-fit into .500/.505 (12.70/12.83) dia. hole in panels .020/.100 (.51/2.54) thick. Push-on speednut SN0461 (see pg. 21) also available. See page 21 for optional mounting hole.
Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Terminals: Tinned brass
Lens: Nylon on models 1050A1, 1050A3, 1050A4 — Polycarbonate on all other models
Bezel: Chrome plated brass
Housing: White nylon

	NEON		INCANDESCENT			NEON	
LENS COLOR	MODEL NO. 105-125 VAC	MODEL NO. 208-250 V	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V	MODEL NO. 105-125 VAC	MODEL NO. 208-250 V
Red	1050A1	1051A1	1090A1-6V	1090A1-12V	1090A1-28V	1050QA1	1051QA1
Clear	1050A2	1051A2	—	—	—	1050QA2	—
Amber	1050A3	1051A3	1090A3-6V	1090A3-12V	1090A3-28V	1050QA3	1051QA3
White	1050A4	1051A4	1090A4-6V	1090A4-12V	1090A4-28V	1050QA4	1051QA4
Green	1052A5*	1053A5*	1090A5-6V	1090A5-12V	1090A5-28V	1052QA5*	1053QA5*
Blue	1052A6†	1053A6†	1090A6-6V	1090A6-12V	1090A6-28V	1052QA6†	1053QA6†
Lamp	C2A + Resistor		#2112	#2162	#2187	C2A + Resistor	
Lead Color	Black	One Black One Red	White	Yellow	Purple	Quick Connect Terminals	

* Incorporates G2B lamp and resistor † Incorporates T2B lamp and resistor

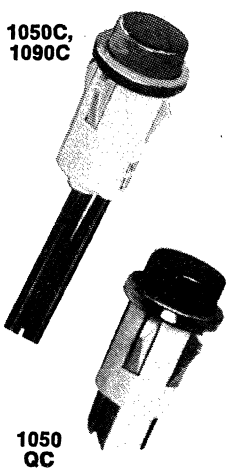


SERIES 1050A, 1090A



SERIES 1050QA

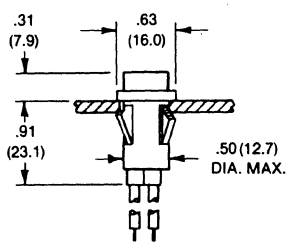
SERIES 1050C, 1050QC, 1090C ½" DIA.



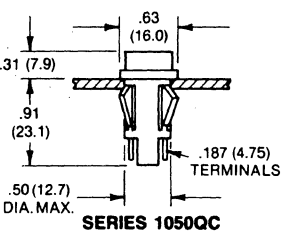
Mounting: Will snap-fit into .500/.505 (12.70/12.83) dia. hole in panels .020/.100 (.51/2.54) thick. Push-on speednut SN0461 (see pg. 21) also available. See page 21 for optional mounting hole.
Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Terminals: Tinned brass
Lens: Nylon on models 1050C1, 1050C3, 1050C4 — Polycarbonate on all other models
Bezel: Chrome plated brass
Housing: White nylon

	NEON		INCANDESCENT			NEON	
LENS COLOR	MODEL NO. 105-125 VAC	MODEL NO. 208-250 V	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V	MODEL NO. 105-125 VAC	MODEL NO. 208-250 V
Red	1050C1	1051C1	1090C1-6V	1090C1-12V	1090C1-28V	1050QC1	1051QC1
Clear	1050C2	1051C2	—	—	—	1050QC2	—
Amber	1050C3	1051C3	1090C3-6V	1090C3-12V	1090C3-28V	1050QC3	1051QC3
White	1050C4	1051C4	1090C4-6V	1090C4-12V	1090C4-28V	1050QC4	1051QC4
Green	1052C5*	1053C5*	1090C5-6V	1090C5-12V	1090C5-28V	1052QC5*	1053QC5*
Lamp	C2A + Resistor		#2112	#2162	#2187	C2A + Resistor	
Lead Color	Black	One Black One Red	White	Yellow	Purple	Quick Connect Terminals	

* Incorporates G2B lamp and resistor

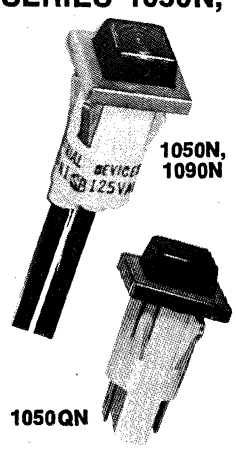


SERIES 1050C, 1090C



SERIES 1050QC

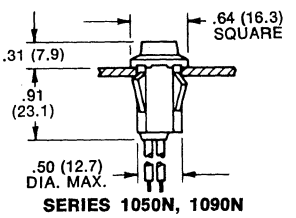
SERIES 1050N, 1050QN, 1090N ½" DIA.



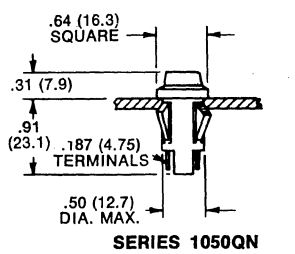
Mounting: Will snap-fit into .500/.505 (12.70/12.83) dia. hole in panels .020/.100 (.51/2.54) thick. Push-on speednut SN0461 (see pg. 21) also available. See page 21 for optional mounting hole.
Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Terminals: Tinned brass
Lens: Polycarbonate
Bezel: Chrome plated brass
Housing: White nylon

	NEON	INCANDESCENT			NEON
LENS COLOR	MODEL NO. 105-125VAC	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V	MODEL NO. 105-125VAC
Red	1050N1	1090N1-6V	1090N1-12V	1090N1-28V	1050QN1
Clear	1050N2	—	—	—	—
Amber	1050N3	1090N3-6V	1090N3-12V	1090N3-28V	1050QN3
White	1050N4	1090N4-6V	1090N4-12V	1090N4-28V	1050QN4
Green	1052N5*	1090N5-6V	1090N5-12V	1090N5-28V	1052QN5*
Lamp	C2A + Resistor	#2112	#2162	#2187	C2A + Resistor
Lead Color	Black	White	Yellow	Purple	Quick Connect Terminals

* Incorporates G2B lamp and resistor



SERIES 1050N, 1090N



SERIES 1050QN

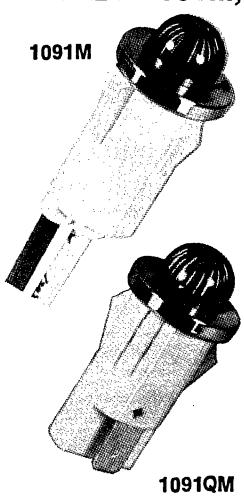
Underwriters Laboratories (UL) File No. E20325 Canadian Standards Association (CSA) File No. 13346

ALL DIMENSIONS ARE IN INCHES (MM).

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

Omni-Glow 1000 SERIES

SERIES 1091M, 1091QM ½" DIA.



Solid-State Indicator Lights Complete With Built-in Current-Limiting Resistor and Rectifier Diode

Mounting: Will snap-fit into .500/.505 (12.70/12.83) dia. hole in panels .020/.100 (.51/2.54) thick. Push-on speednut SN0461 also available. See catalog page 21.

Wire Leads: No. 22 AWG (105°C) lead color: red and white 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)

Terminals: Quick connect, tinned brass **Bezel:** Chrome plated brass

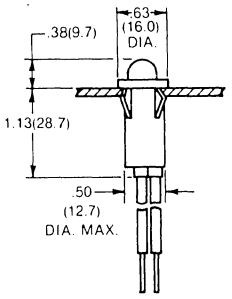
Lens: Polycarbonate **Anode (+):** Red lead **Housing:** White nylon

SOLID STATE						
LENS COLOR	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 24V	MODEL NO. 12V	MODEL NO. 24V	INCORPORATES LED*
Red	1091M1-6V	1091M1-12V	1091M1-24V	1091QM1-12V	1091QM1-24V	4304H1
Green	1091M5-6V	1091M5-12V	1091M5-24V	1091QM5-12V	1091QM5-24V	4304H5
Yellow	1091M7-6V	1091M7-12V	1091M7-24V	1091QM7-12V	1091QM7-24V	4304H7
Internal Resistor (ohms)	150	390	1000	390	1000	—

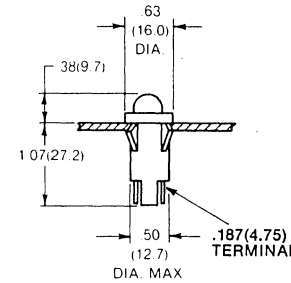
Note: Also incorporates 1N4004 (400 P.I.V.) rectifier diode.

VOLTAGE TABLE		
NOMINAL	VAC	VDC
6V	5 to 11	3.5 to 6.5
12V	10 to 20	6 to 13.5
24V	22 to 32	12 to 24

To Use 24V model:
Beyond 32 VAC add 30 ohms per volt
Beyond 24 VDC add 50 ohms per volt
Use ½W resistor up to 50V
1W resistor for 50V to 70V
2W resistor for 75V to 125V
Do not use beyond 125V



SERIES 1091M



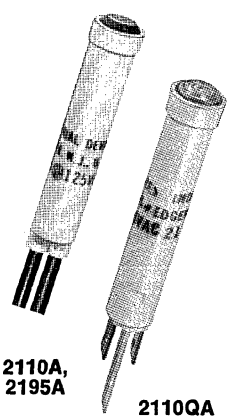
SERIES 1091QM

Glo-Dot 2100 SERIES

MINIATURE INDICATOR LIGHTS

GLO-DOT Indicator Lights are available in five body sizes and four lens shapes in a wide choice of colors. Conservatively rated, these rugged, long-lived units outlast the product in which they are installed. Tamper-proof housings, elimination sockets and spring contacts plus rugged shock-proof design combine to provide highest reliability.

SERIES 2110A, 2110QA, 2195A 5/16" DIA.



Mounting Hole: .31 (7.9) min. dia. Supplied with push-on speednut SN1287 (see page 21)

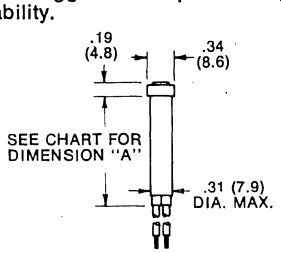
Wire Leads: No. 22 AWG (105°), 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)

Terminals: Tinned brass

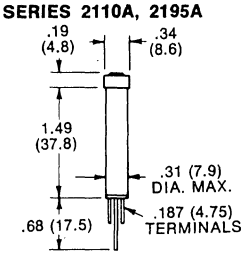
Lens: Polycarbonate **Housing:** White nylon

	NEON	INCANDESCENT			NEON
LENS COLOR	MODEL NO. 105-125VAC	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V	MODEL NO. 105-125VAC
Red	2110A1	2195A1-6V	2195A1-12V	2195A1-28V	2110QA1
Clear	2110A2	—	—	—	2110QA2
Amber	2110A3	2195A3-6V	2195A3-12V	2195A3-28V	2110QA3
White	2110A4	2195A4-6V	2195A4-12V	2195A4-28V	2110QA4
Green	2112A5*	2195A5-6V	2195A5-12V	2195A5-28V	2112QA5*
Blue	2112A6†	—	—	—	—
Lamp	C2A + Resistor	#2112	#2162	#2187	C2A + Resistor
Lead Color	Black	White	Yellow	Purple	Quick Connect Terminals
"A"	1.48 (37.6)	.74 (18.8)	.74 (18.8)	.74 (18.8)	—

* Incorporates G2B lamp and resistor † Incorporates T2B lamp and resistor



SERIES 2110A, 2195A



SERIES 2110QA

SERIES 2120A 5/16" DIA.

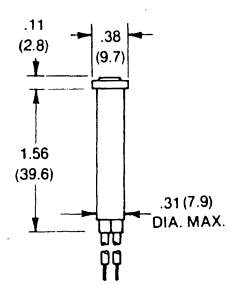
Mounting Hole: .31 (7.87) min. dia. Supplied with push-on speednut SN1287 (see page 21)

Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)

Lens: Polycarbonate

Housing: White nylon

	NEON
LENS COLOR	MODEL NO. 105-125VAC
Red	2120A1
Amber	2120A3
White	2120A4
Lamp	C2A + Resistor



Underwriters Laboratories (UL) File No. E20325 — Canadian Standards Association (CSA) File No. 13346

ALL DIMENSIONS ARE IN INCHES (MM).

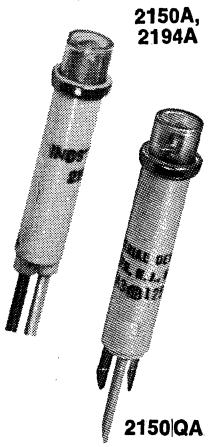
* SEE PAGE 9 FOR LED RATINGS

CALL FOR OUR COMPLETE CATALOG

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

Glo-Dot 2100 SERIES

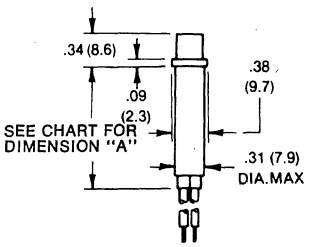
SERIES 2150A, 2150QA, 2194A 5/16" DIA.



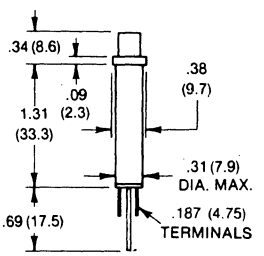
Mounting Hole: .31 (7.9) min. dia. Supplied with push-on speednut SN1287 (see page 21)
Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Terminals: Tinned brass
Lens: Polycarbonate
Bezel: Chrome plated brass
Housing: White nylon

LENS COLOR	NEON	INCANDESCENT			NEON
	MODEL NO. 105-125 VAC	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V	MODEL NO. 105-125 VAC
Red	2150A1	2194A1-6V	2194A1-12V	2194A1-28V	2150QA1
Clear	2150A2	—	—	—	—
Amber	2150A3	2194A3-6V	2194A3-12V	2194A3-28V	2150QA3
White	2150A4	2194A4-6V	2194A4-12V	2194A4-28V	2150QA4
Green	2152A5*	2194A5-6V	2194A5-12V	2194A5-28V	2152QA5*
Blue	2152A6†				
Lamp	C2A + Resistor	#2112	#2162	#2187	C2A + Resistor
Lead Color	Black	White	Yellow	Purple	Quick Connect Terminals
"A"	1.31 (33.3)	.83 (21.1)	.83 (21.1)	.83 (21.1)	—

* Incorporates G2B lamp and resistor † Incorporates T2B lamp and resistor

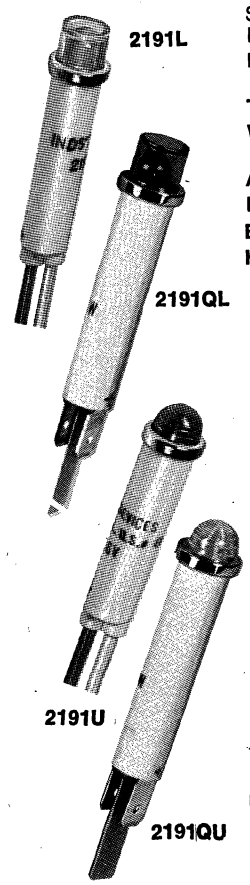


SERIES 2150A, 2194A



† SERIES 2150QA

SERIES 2191L, 2191QL, 2191U, 2191QU 5/16" DIA.



Solid-State Indicator Lights Complete With Built-in Current-Limiting Resistor and Rectifier Diode.
Mounting Hole: .31 (7.9) min. dia. Supplied with push-on speednut SN1287 (see page 21)
Terminals: Quick connect, tinned brass
Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Anode (+): Red lead
Lens: Polycarbonate
Bezel: Chrome plated brass
Housing: White nylon

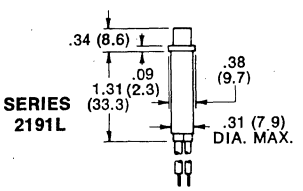
LENS COLOR	SOLID STATE					
	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 24V	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 24V
Red	2191L1-6V	2191L1-12V	2191L1-24V	2191U1-6V	2191U1-12V	2191U1-24V
Green	2191L5-6V	2191L5-12V	2191L5-24V	2191U5-6V	2191U5-12V	2191U5-24V
Yellow	2191L7-6V	2191L7-12V	2191L7-24V	2191U7-6V	2191U7-12V	2191U7-24V
Red	——	2191QL1-12V	2191QL1-24V	——	2191QU1-12V	2191QU1-24V
Green	——	2191QL5-12V	2191QL5-24V	——	2191QU5-12V	2191QU5-24V
Yellow	——	2191QL7-12V	2191QL7-24V	——	2191QU7-12V	2191QU7-24V
Internal Resistor (ohms)	150	390	1000	150	390	1000

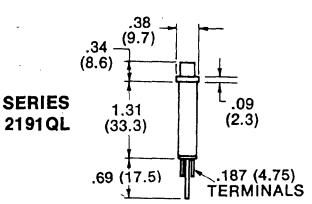
LENS COLOR	INCORPORATES LED*
Red	4304H1
Green	4304H5
Yellow	4304H7

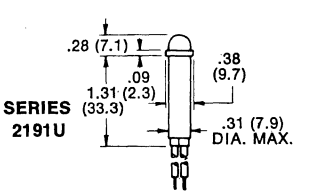
* Also incorporates 1N4004 (400 P.I.V.) rectifier diode.

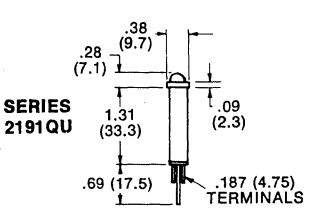
VOLTAGE TABLE		
NOMINAL	VAC	VDC
6V	5 to 11	3.5 to 6.5
12V	10 to 20	6 to 13.5
24V	22 to 32	12 to 24

To use 24V model:
Beyond 32 VAC add 30 ohms per volt. Beyond 24 VDC add 50 ohms per volt.
Use ½W resistor up to 50V, 1W resistor for 50V to 70V, 2W resistor for 75V to 125V.
Do not use beyond 125V.









* SEE PAGE 9 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

Underwriters Laboratories (UL) File No. E20325 — Canadian Standards Association (CSA) File No. 13346

CALL FOR OUR COMPLETE CATALOG

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

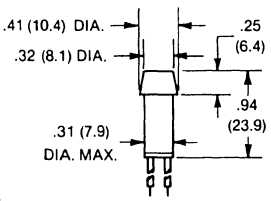
Glo-Dot 2900 SERIES

SERIES 2990D 5/16" DIA.

Low-cost GLO-DOT 2900 Series Indicator Lights offer a wide choice of colors in a one piece lens-body. Both push-on speednut and plug-button bezel mounting styles are available.

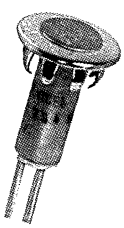
Mounting Hole: .31 (7.9) min.
Wire Leads: No. 24 AWG 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Lens: Polycarbonate
Bezel: Mirror finish chrome plated steel (Series 2990P)

INCANDESCENT			
LENS COLOR	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V
Red Amber White Green Blue	2990D1-6V 2990D3-6V 2990D4-6V 2990D5-6V 2990D6-6V	2990D1-12V 2990D3-12V 2990D4-12V 2990D5-12V 2990D6-12V	2990D1-28V 2990D3-28V 2990D4-28V 2990D5-28V 2990D6-28V
Lamp	#2112	#2162	#2187
Lead Color	White	Yellow	Purple
Mounting	Supplied with push-on speednut SN1287 (see page 21)		



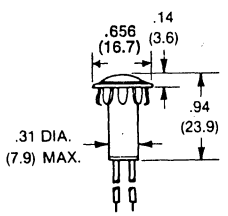
SERIES 2990D

SERIES 2990P 1/2" DIA.



Mounting Hole: .50 (12.7) min. dia.
Wire Leads: No. 24 AWG 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Lens: Polycarbonate
Bezel: Mirror finish chrome plated steel (Series 2990P)

INCANDESCENT			
LENS COLOR	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V
Red Amber White Green Blue	2990P1-6V 2990P3-6V 2990P4-6V 2990P5-6V 2990P6-6V	2990P1-12V 2990P3-12V 2990P4-12V 2990P5-12V 2990P6-12V	2990P1-28V 2990P3-28V 2990P4-28V 2990P5-28V 2990P6-28V
Lamp	#2112	#2162	#2187
Lead Color	White	Yellow	Purple
Mounting	Plug-button bezel		



SERIES 2990P

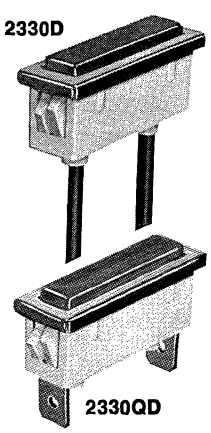
Line-O-Lite 2300 SERIES

RECTANGULAR INDICATOR LIGHTS

LINE-O-LITE rectangular neon indicator lights provide a perfect assembly for illuminating a message or high-lighting a function. Units are supplied complete with a built-in current-limiting resistor. Snapfit mounting reduces assembly time to a minimum. 2300 Series lights are available with a push-on speednut which adjusts to any panel thickness. Use 3600 Series lights to squeeze more illuminated legends into less panel space — or simply to complement your design. LINE-O-LITE Indicator Lights offer a desirable method of placing a bright, attention-getting bar of light on your product.

- UL Recognized — CSA Approved

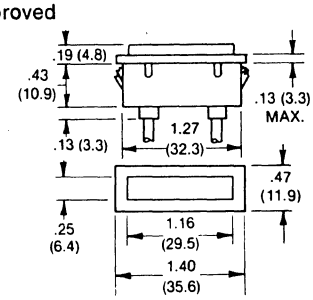
SERIES 2330D, 2330QD 1 9/32" x 13/32"



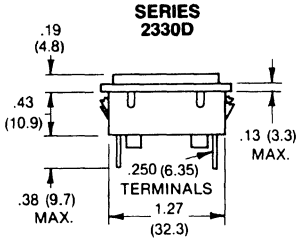
Mounting: Will snap-fit into .032/.100 (.81/.254) thick panel, use speednut for other panel thicknesses. Available with speednut SN1963 (see page 20). See page 21 for mounting hole dimensions
Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Terminals: Tinned brass
Lens: Polycarbonate
Bezel: Chrome plated brass

NEON			INCANDESCENT
	MODEL NO. 105-125 VAC		MODEL NO. 28V
LENS COLOR	WIRE LEADS	.250 TERMINALS	.250 TERMINALS
Red Amber White Green	2330D1 2330D3 2330D4 2332D5*	2330QD1 2330QD3 2330QD4 2332QD5*	2390QD1-28V 2390QD3-28V 2390QD4-28V 2390QD5-28V
Lamp	C6A + Resistor		#2187

* Incorporates G2B lamp and resistor



SERIES 2330D



SERIES 2330QD

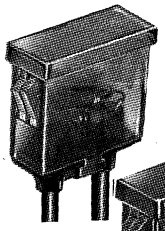
Underwriters Laboratories (UL) File No. E20325 — Canadian Standards Association (CSA) File No. 13346

ALL DIMENSIONS ARE IN INCHES (MM).

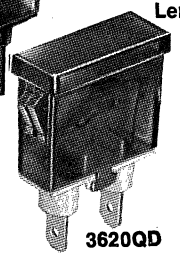
Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

Line-O-Lite 3600 SERIES

SERIES 3620D, 3620QD 5/16" x 55/64"



3620D



3620QD

Mounting: Will snap-fit into .020/.130 (0.51/3.30) thick panel. See page 21 for mounting hole dimensions

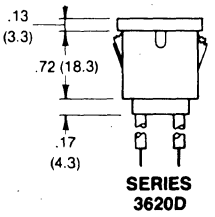
Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)

Terminals: Tinned brass

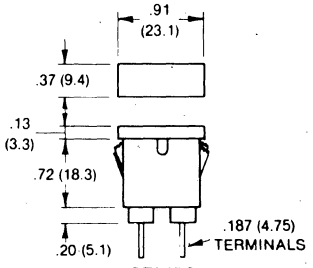
Lens: Polycarbonate

NEON		
MODEL NO. 105-125VAC		LENS COLOR
WIRE LEADS	.187 TERMINALS	
3620D1 3620D3 3620D4 3622D5*	3620QD1 3620QD3 3620QD4 3622QD5*	Red Amber White Green
C2A + Resistor		Lamp

* Incorporates G2B lamp and resistor



SERIES 3620D

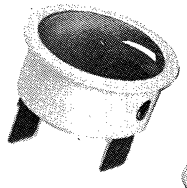


SERIES 3620QD

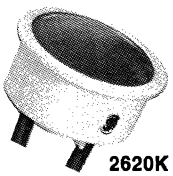
Omni-Glow 2600 SERIES

If you are looking for unmistakable indication, look at OMNI-GLOW 2600 Series Indicator Lights. These big lights are instant attention getters. A push-on speednut (included) provides secure mounting in any panel — and the mounting hole can be "D" shaped for keying. Economical to buy and install, these rugged, ultra-reliable indicator lights will enhance the appearance and performance of your product.

SERIES 2620K, 2620QK 7/8" DIA.



2620QK



2620K

Mounting: See page 21 for optional mounting holes. Supplied with push-on speednut SN2089 (see page 21)

Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)

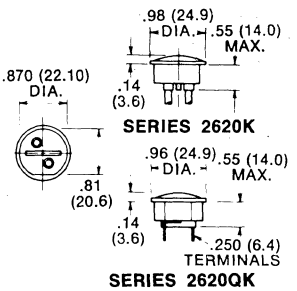
Terminals: Tinned brass

Lens: Polycarbonate

Housing: White nylon

NEON		
MODEL NO. 105-125VAC		
WIRE LEADS	.250 TERMINALS	LENS COLOR
2620K1 2620K3 2620K4 2622K5*	2620QK1 2620QK3 2620QK4 2622QK5*	Red Amber White Green
C2A + Resistor		Lamp

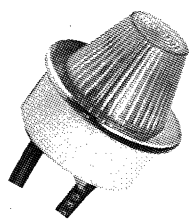
* Incorporates G2B lamp and resistor



SERIES 2620K

SERIES 2620QK

SERIES 2620T 7/8" DIA.



Mounting: See page 21 for optional mounting holes. Supplied with push-on speednut SN2089 (see page 21)

Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)

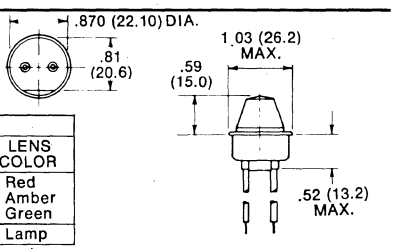
Lens: Polycarbonate

Bezel: Mirror finish chrome plated brass

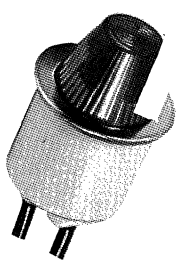
Housing: White nylon

NEON		
MODEL NO. 105-125VAC	MODEL NO. 208-250V	LENS COLOR
2620T1 2620T3 2622T5*	2621T1 2621T3 2623T5*	Red Amber Green
C2A + Resistor		Lamp

* Incorporates G2B lamp and resistor



SERIES 2650T 7/8" DIA. FLASHERS



These neon flashers incorporate a built-in flashing circuit to provide unmistakable indication even in high ambient light environments. Bulb is up into the lens and can be seen from any angle.

Mounting: See page 21 for optional mounting holes. Supplied with push-on speednut SN2089 (see page 21)

Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)

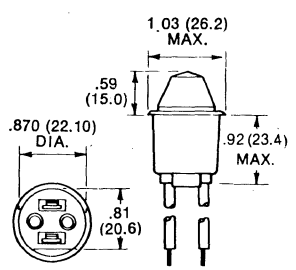
NEON	
MODEL NO. 105-125VAC	LENS COLOR
2650T1 2650T3	Red Amber
C2A + Resistor	Lamp

Note: Flashing rate 60 to 120 per minute

Lens: Polycarbonate

Bezel: Mirror finish chrome plated brass

Housing: White nylon



* SEE PAGE 9 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

Underwriters Laboratories (UL) File No. E20325 — Canadian Standards Association (CSA) File No. 13346

CALL FOR OUR COMPLETE CATALOG

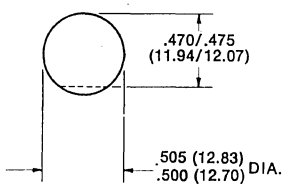
Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700 • TELEX: 127459

Mounting Information

MOUNTING HOLES

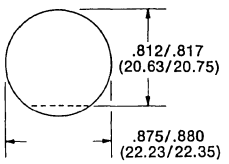
SERIES 1000. 3000

OPTIONAL ROUND OR FLAT

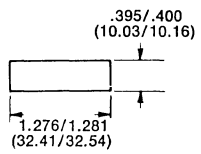


SERIES 2620K, 2620QK, 2620T, 2650T

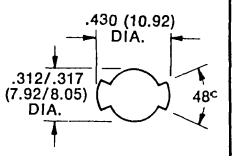
OPTIONAL ROUND OR FLAT



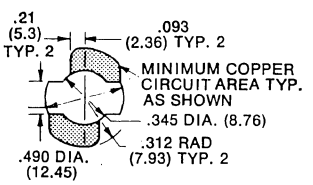
SERIES 2300



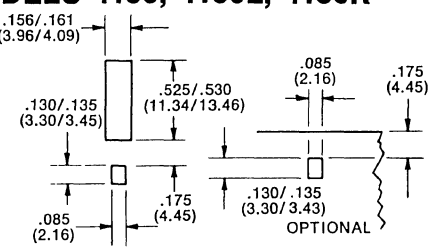
MODEL 4100



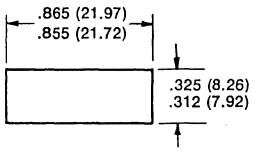
MODEL 4104, 4130, 4133, 4136



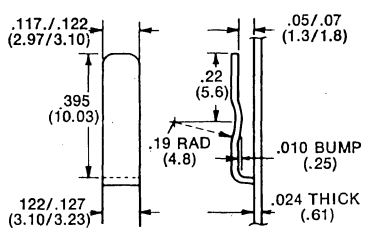
MODELS 4150, 4150L, 4150R



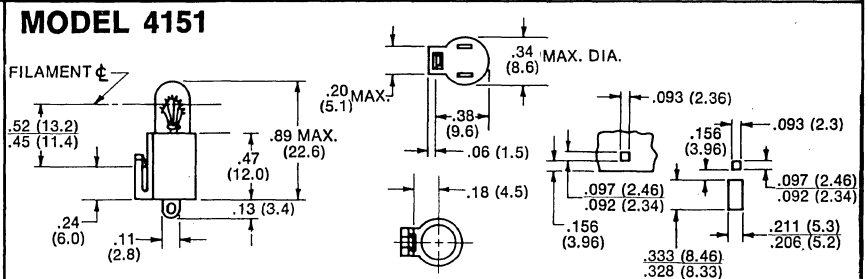
SERIES 3600



MODEL 4120

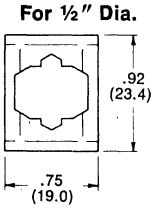


MODEL 4151

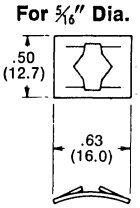


Speednuts

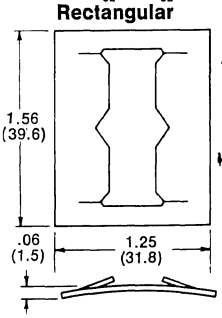
SN0461
For ½" Dia.



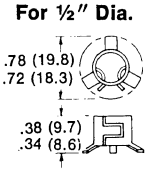
SN1287
For 5/16" Dia.



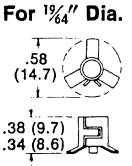
SN1963
For 1 9/32" x 13/32" Rectangular



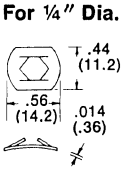
SN1336
For ½" Dia.



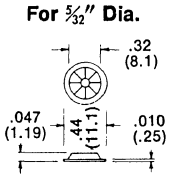
SN1220
For 19/64" Dia.



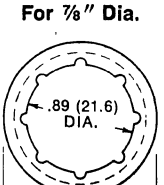
SN3678
For ¼" Dia.



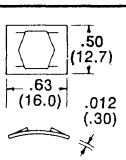
SN3775
For 5/32" Dia.



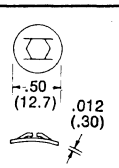
SN2089
For ⅞" Dia.



SN2212
For 19/64" Dia.



SN2763
For 7/32" Dia.



ALL DIMENSIONS ARE IN INCHES (MM).

$25 Buys You $65 Worth Of Bright Ideas From IDI

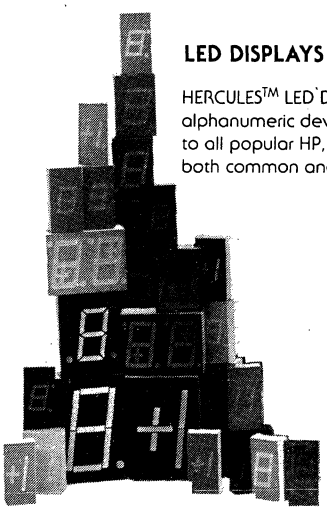
NEW EK-3 ENGINEER'S KIT IS AVAILABLE. Supplied in a handy compartmented plastic box full of $65 worth of IDI products you can use for building prototypes and to stimulate ideas for future projects. It costs us more than $25 for the samples, the box, and mailing it to you, but you can have EK-3 for a $25 check or money order along with the coupon. At this price don't ask us to bill you — check or money order with your order please. THE IDI ENGINEER'S KIT. Lots of big bright ideas in small packages.

ENGINEER'S KIT EK-3 28 LEDs and LED assemblies. 21 styles, 3 colors. Plain LEDs including Super-Brite and Extra-Super-Brite, panel-mounted LEDs, P.C. board-mounted LEDs, complete assemblies including current-limiting resistors and rectifier diodes.

In addition 9 sockets and relampable incandescent lamp assemblies, and 13 neon and incandescent non-relampable assemblies. In all over a dozen styles, 7 colors, 5 voltages, and 5 mounting hole sizes. Both wire lead and terminal types.

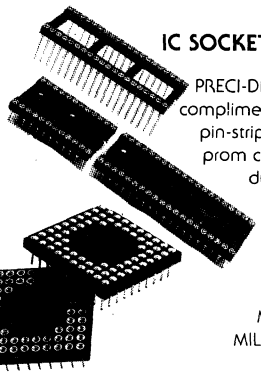
PLEASE SEND ME THE IDI EK-3 ENGINEER'S KIT. I enclose $25, check or money order.

IEE Component Products Division



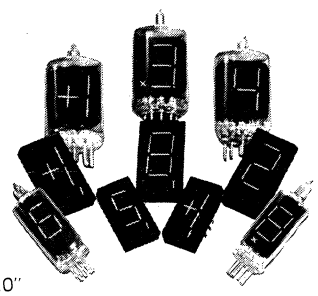
LED DISPLAYS

HERCULES™ LED Displays offer a complete assortment of numeric and alphanumeric devices ranging in size from .27" to 2.0". Equivalents to all popular HP, GI, TI, Fairchild, and Litronix displays are available in both common anode and common cathode configurations.



IC SOCKETS/CONNECTORS

PRECI-DIP™ features a full compliment of I.C. Sockets, pin-strips, pin-grid arrays, prom carriers, single and dual pin strips, and pin carriers using precision screw machine pins. Standard items exceed MIL-G-45204 and MIL-T-10727 ratings.

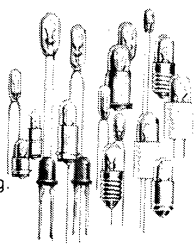


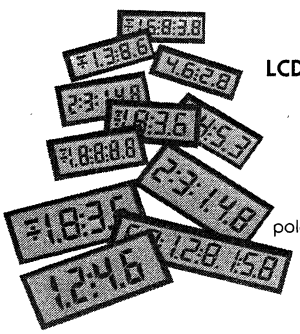
INCANDESCENT DISPLAYS

AURORA™ and APOLLO™ Displays are 7-segment digital displays available in .400", .472", .614" and 1.0" character heights. Models are offered with brightness levels suited to either indoor ambient lighting conditions or direct sunlight readable applications. The displays may be filtered to almost any desired display color, adding to their versatility. They operate at 5.0 volts, are multiplexible, TTL compatible and feature a ruggedized filament with extremely long life (more than 10 years on most models).

LED & INCANDESCENT LAMPS/INDICATORS

These high quality products are available in a broad range of styles, colors and industry standard sizes ranging from T-¾ (.094" Dia.) to T-2 (.250" Dia.). Various voltage and current ranges are available with complementary lens caps and other support hardware for panel mounting.





LCD DISPLAYS

POLARIS™ LCD Displays with permanently fixed DIL pins as standard, are available in a wide assortment of popular models with character heights of .35" to .70" and lengths of 3½ to 8 digits. Featured are reflective and transflective polarizers with commercial and high temperature/-humidity fluids for almost every environment.

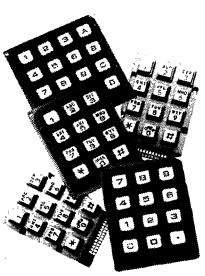
MINIATURE TOGGLE, ROCKER, LEVER AND PUSHBUTTON SWITCHES

The OTAX™ line of premium quality miniature toggle, rocker, lever and pushbutton switches feature molded-in terminals, fine silver contacts, gold flashed terminals, stainless steel frame design.

QUALITY KEYBOARDS

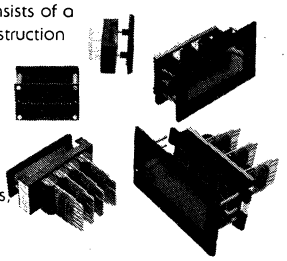
THRIFTSWITCH™ Keyboard products are offered in a variety of styles in 3x4 and 4x4 key formats. Both conductive silicone rubber and metal contact types with either rubber or double-shot molded keys are offered with all popular output codes.

The PCB's are gold-plated and every keyboard is supplied with an electrostatic shield to protect sensitive circuitry.



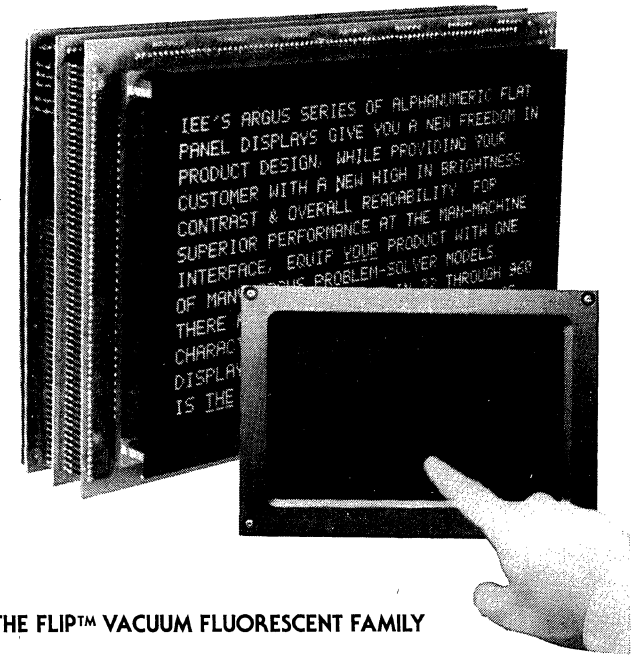
DISPLAY MOUNTING HARDWARE

ATLAS™ Mounting Hardware consists of a single piece, molded frame construction which accommodates LED, LCD and Incandescent displays in widths up to 8 digits. Each is fitted with a colored filter or clear viewing screen available in polarized and unpolarized materials. Mounting rails, sockets, and several decoder/driver assemblies have been made available to complement the individual display component.



IEE • 7740 Lemona Avenue, Van Nuys, CA 91405 • Telephone (818) 787-0311 • TLX: 4720556 IEE CPD

Industrial Products Division

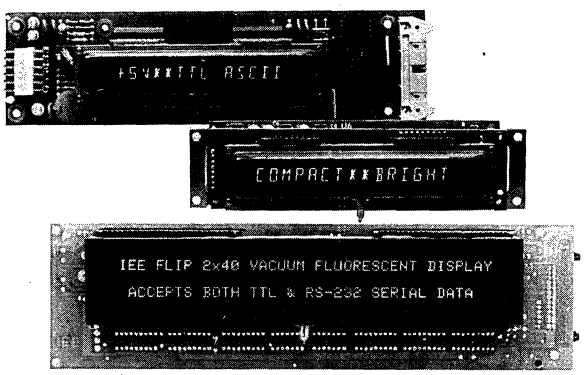


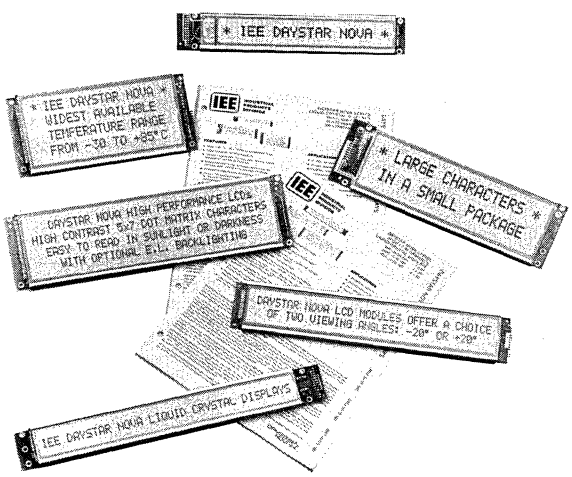
THE ARGUS™ GAS PLASMA FAMILY
PEP™ INTERACTIVE TOUCH DISPLAY

These compact DC plasma display modules, some with interactive capabilities, revolutionized the industry. They utilize neon-orange or green 5x7 dot matrix plasma panels and integrated electronics to produce bright, easy to read alphanumeric characters. Standard U.S. ASCII and several European ECMA font sets are available; optional custom programmed font sets can also be provided. Multiple lines (2, 4, 6, 8 & 12) of 16, 20, 32 and 40 characters per line are standard with character heights of .21, .26 and .33 inches. A simple TTL level ASCII interface scheme is utilized. Most models contain on-board control, memory, and refresh electronics, further simplifying the interface task. Data rates of 40,000 to 750,000 characters per second are possible depending on the model and interface method chosen. Careful attention has been paid to packaging design, resulting in very compact modules. ARGUS display life normally exceeds 30,000 hours, depending on application and environment. A wide range of accessories, including filters, power supplies, and serial data converters round out the current ARGUS Family. Low cost, "minimum logic" ARGUS MPX™ modules compatible with competitive product lines are also now available. The new ARGUS AIM™ full-logic modules use convenient 8-bit bus interfaces and require only low-voltage power supplies. On the drawing board now is a range of "full-dot" graphic models.

THE FLIP™ VACUUM FLUORESCENT FAMILY

These vacuum fluorescent display modules feature bright (100fL) blue-green characters filterable to blue, yellow, green or red. A wide variety of models use a 5x7 or 5x12 dot matrix format to display alphanumeric data along with European, scientific or custom characters. For low-cost applications 14-segment models are available, which display upper case characters. Single and multiple line displays are available with character heights ranging from .2" to .59". All FLIP modules operate on +5VDC only, and most are less than 1" deep. Each unit has a self-contained microprocessor and accepts both serial and parallel (8-bit bus) ASCII data. A number are drop-in replacements for competitive products and several are priced at under $100 in production quantities. Models available offer fields from 10 to 240 characters. The FLIP Family's latest additions are a line of extended temperature range models which operate from −40 to +85 °C (−40 to +185 °F). New models are frequently added to this growing and compatible line.





THE DAYSTAR NOVA™ LIQUID CRYSTAL FAMILY

Members of IEE's newest and fastest growing alphanumeric family, these low power, compact Liquid Crystal Display Modules are ideal for battery-operated portable equipment, especially when sunlight readability is a must. Models currently available range from one line of 16 characters to four lines of 40 characters. These ASCII modules interface easily to a 4 or 8-bit data bus; an RS-232 serial data converter card will be available shortly. Our new, unique-to-the-industry DAYSTAR NOVA line features extra-large (.33 inch to .5 inch) characters, a wide operating temperature range (−30 ° to +85 °C), and optional electroluminescent backlighting for night viewing. They operate on a single 5V power supply.

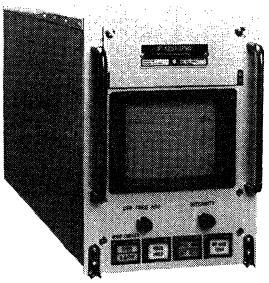
IEE • 7740 Lemona Avenue, Van Nuys, CA 91405 • Telephone (818) 787-0311 • TWX: 910-495-4586 IEE IPD VAN

INFODEX INCORPORATED

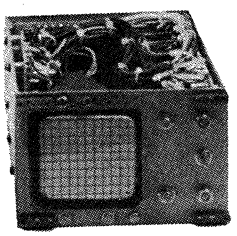
395 WEST MAIN STREET, WATERBURY, CT 06702 • (203) 757-9291

OEM CRT DISPLAYS See pg. D•1410, for Mil Spec.

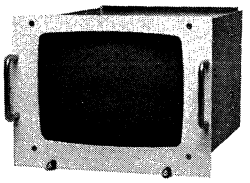
*** ALSO ASK ABOUT INFODEX'S NEW LINE OF MIL SPEC ELECTROLUMINESCENT FLAT PANEL DISPLAYS**



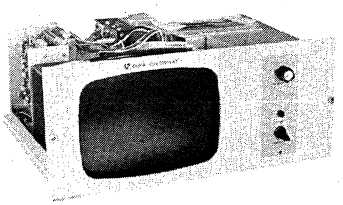
5″ waveform display for Airborne MIL-Spec application. Complete unit supplied ready for operation as shown.



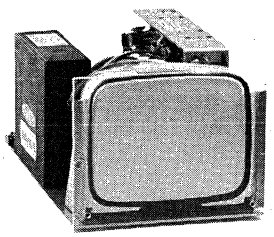
Model 7800. Extremely compact 3″ waveform monitor.



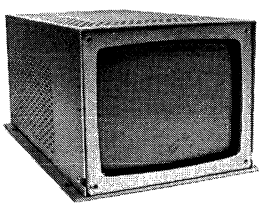
Ruggedized 12″ MIL-Spec raster scan display includes sealed face panel that provides EMI shielding and visual contrast enhancement.



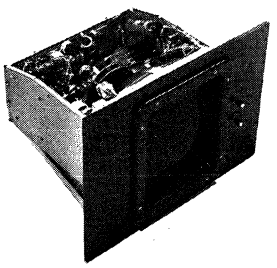
Nonfade 8″ cardioscope display. Infodex supplied the industry's earliest nonfade designs in 1972. Many 8″ and 17″ versions are still in use in hospitals worldwide. Ruggedized 6″ and 12″ models are recommended for new design.



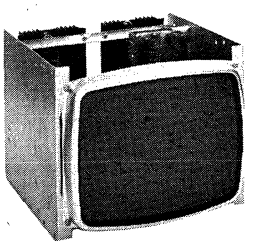
Model 7715. 6″ flat face raster scan display.



7″ flat face monitor accepts 15.75 KHz & 24.25 KHz incoming signals with internal sensing of line rate & automatic switching from one circuit to the other.



Ruggedized 8″ x 11″ display includes special yoke supports designed to withstand 100g shocks.



Model 2780. 12″ X-Y display for medical applications, including ultrasound and nonfade cardiac.

Infodex CRT Displays include a wide range of standard sizes, capabilities, and features that encompass most needs of builders of military, industrial, and medical equipment. Custom models are also supplied in single or production quantities to satisfy individual requirements or provide special features. Recent applications for Infodex displays include:

MILITARY (MIL SPEC)

Flight simulators, Automatic carrier landing systems, Radar bomb directors, Weapons system trainers, Airborne and ground based electronic warfare systems.

MEDICAL

Ultrasonic diagnostic systems, X-Ray film recording (e.g., CAT scanners), EKG monitors, Nonfade cardiac monitors, Pulse monitors, X-Ray image intensifiers.

INDUSTRIAL

Graphic slide and film recorders, Engine analyzers, Television monitors, Oceanographic displays, Computer output graphics, Waveform monitors.

Most Infodex OEM displays are supplied as compact one piece assemblies, without enclosures, for direct installation behind control panels. Screens up to seven inch diagonal are typically flat face, and include both magnetic and electrostatic deflection amplifiers, video amplifiers, and high voltage power supplies. The only connections needed to use circuits are low level video and sync inputs, or X and Y deflection signals for random access displays. Units may be supplied to operate from 12, 15, 24, or 28 Vdc sources within user equipment, or from 110/220 Vac.

Custom displays may be variations of standard designs to provide special electrical or mechanical features, including repackaging to fit unusual or restricted spaces. Even completely new custom designs enjoy a head start based on our experience in solving CRT display problems for an extremely wide range of applications.

In military and medical applications, there can be no tradeoff on reliability, yet continuous operation is common at elevated temperatures and high humidity, and technical maintenance is often unavailable on site. Some techniques we have developed to deal with these hostile environments include:

- Sealing and encapsulating high voltage components to permit safe operation under conditions of 100% humidity, *with* condensation.
- Mechanical designs that can support tubes and deflection yokes to prevent damage or misalignment by severe shock and vibration.
- EMI shielding through the CRT faceplate, combined with optical filtering to enhance contrast in high ambient light conditions, while simultaneously avoiding fog due to condensation at 100% humidity, and permitting easy field replacement.
- Functionally separate replaceable modules that are designed for safe, easy fault isolation and fast replacement in the field.
- Diagnostic output signals that indicate normal conditions within the equipment, or the presence and location of a fault.

THE FOLLOWING TABLE LISTS THE MAJOR FEATURES OF SEVERAL REPRESENTATIVE DISPLAY MONITORS.

TYPE	MODEL	DEFLECTION	RATE	POWER	REMARKS
3″ X-Y	7800	Electrostatic	1 MHz	12 Vdc	Mount easily to user's panel.
6″ X-Y	2750A	Magnetic	25,000 cm/sec	12 Vdc	For waveforms in audio range.
	2750B	Magnetic	125,000 cm/sec	15 Vdc	For fast waveforms.
6″ RASTER	7715	Magnetic	525 line	12 Vdc	600 line resolution.
	7715A	Magnetic	525 line	15 Vdc	800 line resolution.
	77M138	Magnetic	525 line	15 Vdc	Mil-Spec.
7″ RASTER	7725	Magnetic	525 line	15 Vdc	1000 line resolution.
9″ RASTER	77M14A	Magnetic	525/875 line	28 Vdc	Dual mode auto sense.
	77M46A	Magnetic	525 line	28 Vdc	Mil-Spec. See ad pg. D•1410 in Section 3475.
12″ X-Y	2780	Magnetic	200,000 cm/sec	24 Vdc	Ultrasound display.
12″ RASTER	77M145	Magnetic	525 line	115 Vac	Mil-Spec.

INFODEX INCORPORATED
395 WEST MAIN STREET, WATERBURY, CT 06702 • (203) 757-9291

At Infodex, we are specialists who manufacture just one product line — monitors and CRT displays. OEMs and builders of military, industrial, medical, and computer graphics equipment know that we can deliver one unit or 1000, and meet military specifications and industry standards.

STANDARD AND CUSTOM MONITORS AND DISPLAYS

Sizes from 1″ to 21″, with capabilities for on/off modulation or video images with shades of gray. Raster scan, stroke writing, and X-Y or waveform display. Many models already tested for shock, vibration, humidity, temperature, altitude, and EMI. Compact OEM configurations for simple, easy mounting. Models for direct viewing and film recording. Special displays for high ambient light conditions in industrial and airborne applications.

PRECISION X-Y CRT DISPLAYS

5″ and 7″ displays with extremely high resolution, brightness, and linearity. X-Y deflection with high slew rates and fast settling. High stability and repeatability. Precision power supplies, deflection amplifiers, tube mounts, and other components and modules separately available.

INFODEX EXPERIENCE BENEFITS USERS

Our experience in design, manufacturing, and testing of CRT displays means that every model benefits from proven approaches, especially in meeting stringent performance and environmental specifications. We have developed methods for mounting tubes and deflection yokes to withstand extremes of shock and vibration, yet remain compact and easily serviced. We have provided special combinations of CRT, optical filter, and antireflection coatings to provide bright, high contrast displays for use under high ambient light conditions.

INFODEX DISPLAYS CAN MEET MIL AND INDUSTRIAL STANDARDS

Workmanship on virtually all units, whether for military or commercial applications, meets MIL STD 454. The MIL-I-45208 level of 9858 Quality Assurance Program is in place, and we have quality assurance facilities to support all MIL SPEC production. All models conform to applicable EIA and ARINC standards, and are designed to comply with UL requirements, or to facilitate obtaining UL approval.

INFODEX FACILITIES FOR CRT DISPLAY TESTING

Infodex test equipment includes specialized generators that can provide a wide range of input signals as well as standard EIA test signals. Light measuring instruments permit accurate measurement of peak and average luminance, spot size, line width, contrast ratio, and modulation transfer function in accordance with accepted standards.

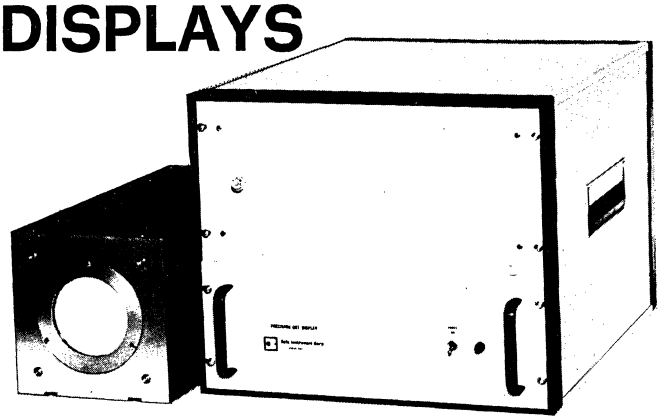
INFODEX DISPLAYS ARE COST EFFECTIVE

Standard models and standard subassemblies are kept in inventory, and can be quickly assembled or modified for fast delivery. Many designs have already been environmentally tested. Many special designs have already been delivered to users in production quantities.

THE RESULT

Infodex customers get reliable, proven CRT displays that can meet all applicable specifications, in less time and at lower cost than in house designs.

PRECISION X-Y CRT DISPLAYS



Infodex Precision CRT Displays are high performance X-Y displays that combine high resolution with accurate deflection, fast settling, and high stability. They are used in precision display applications such as:

- Film recorders and hard copy recorders
- Precision radar and sonar displays
- Computer output graphics displays
- Flying spot scanners
- Precision television monitors

PD series displays use magnetically deflected flat face cathode ray tubes with small deflection angles to achieve small spot size with minimum geometric distortion. Spot growth is minimized by dynamic focus, and electronic linearity correction is used to improve deflection accuracy and minimize pincushion distortion.

The displays are capable of random access X-Y deflection precisely proportional to X-Y input voltages (±5V full scale) at all rates from dc to the maximum specified bandwidth. Options include sawtooth and raster generators and PPI (rho-theta) generators for internal generation of deflection signals.

Spot intensity is controlled by separate unblanking (on/off) and video (analog) inputs. Options include phosphor protection circuits that blank the spot whenever writing speed drops below an adjustable minimum value, and gamma corrected video amplifiers that linearize the relationship between video signal amplitude and spot intensity.

PD displays consist of separate CRT and electronics assemblies that may be located several feet apart. The CRTs thus may be separately mounted in display panels, in camera or recorder structures, or other locations with restricted mounting space. The electronics assemblies are rack mounted chassis that contain low and high voltage power supplies, magnetic deflection amplifiers, video amplifiers, and low level correction and linearization circuits. An attractive metal cabinet is optionally available (see figure).

PRECISION DISPLAY COMPONENTS

High voltage supplies, deflection amplifiers, video amplifiers, linearization circuits, and precision adjustable tube mounts are separately available for OEMs who integrate precision CRT displays into their end products.

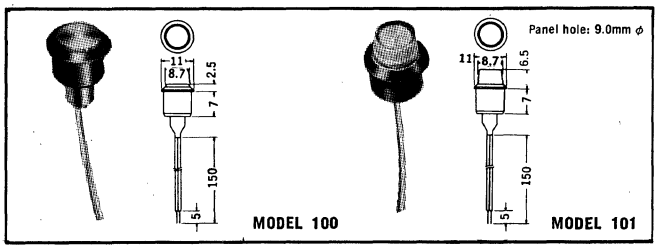
	PD900	PD950	PD1200	PD1250	PD1400
TUBE SIZE (DIA)	5″	5″	5″	5″	7″
USEFUL DIAMETER	4.25″	4.25″	4.25″	4.25″	6.25″
SPOT SIZE*, CENTER WITHIN USEFUL DIAMETER	.0015″ .0025″	.0015″ .0020″	.0007″ .0010″	.0013″ .0015″	.0008″ .0015″
SETTLING TIME (TO .1%)	10 usec	10 usec	14 usec	12 usec	14 usec
LINEARITY**	±1.0%	±.25%	±.5%	±.5%	±.5%
SMALL SIGNAL BANDWIDTH	1 MHz	1 MHz	.75 MHz	1 MHz	.75 MHz

* Measured by the slit analyzer method at the 50% point.
** Maximum deviation from ideal location anywhere within useful area, referred to full useful diameter.

INTER-MARKET INCORPORATED

1946 LEHIGH AVENUE, GLENVIEW, ILLINOIS 60025 • (312) 729-5330 • TWX 910-651-1997

MODELS 100/101 — MODULAR INDICATORS

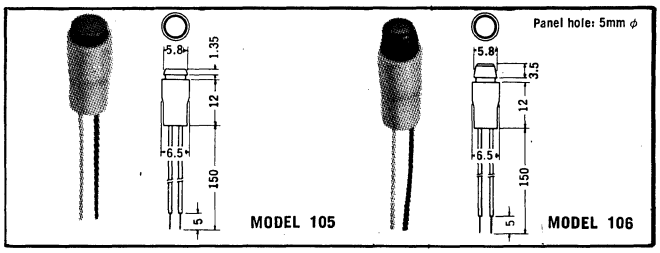


Modular concept provides low cost and great versatility. Rubber bushing snaps into 9mm panel cut out. Lens then snaps into bushing from front while light source fits in from behind. Ordering example: F606-101-R

SPECIFICATIONS — LIGHT SOURCE — LENSES

Light Source	Type	Voltage	mA	Flush Lens	Top Hat Lens
Incandescent	F606	5-6.3V	50		
Incandescent	F614	12-14V	80	100-R Red	101-R Red
Incandescent	F628	24-48V	40	100-A Amber	101-A Amber
Neon	N5115	100-120V AC	1.5	100-G Green	101-G Gren
Green Glow	G5115	100-120V AC	1.5	100-B Blue	101-B Blue
Red LED	L-617RL	2.0 Typ	10	100-W White	101-W White
Green LED	L-617GL	1.9 Typ	10	100-C Clear	101-C Clear
Yellow LED	L-617YL	1.9 Typ	10		

MODELS 105/106 — MODULAR INDICATORS

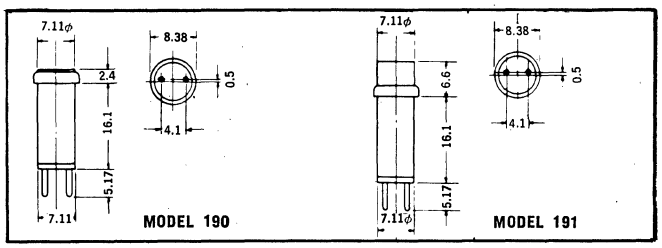


Miniature modular concept requires only 5mm panel hole. They are installed by pressing the lens through the panel from the front into the rubber bushing containing the lamp on the back. Ordering example: F305-105-R

SPECIFICATIONS — LIGHT SOURCE — LENSES

Light Source	Type	Voltage	mA	Flush Lens	Top Hat Lens
Incandescent	F305	4-6V	60		
Incandescent	F314	12-14V	40	105-R Red	106-R Red
Incandescent	F328	24-28V	24	105-A Amber	106-A Amber
Neon	N3115	100-120V AC	1.0	105-G Green	106-G Green
Red LED	L-317RL	2.0 Typ	10	105-B Blue	106-B Blue
Green LED	L-317GL	1.9 Typ	10	105-W White	106-W White
Yellow LED	L-317YL	1.9 Typ	10		

MODELS 190/191 — CARTRIDGE LAMPS

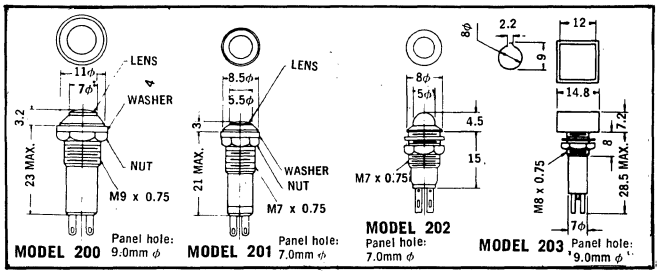


Cartridge style lamps are available in both flush and top hat type lens. Can be used in place of similar types from other manufacturers. Cartridge Lamp holders are also available as CLH-B (black) or CLH-S (silver).

SPECIFICATIONS — LIGHT SOURCE — LENSES

Light Source	Type	Voltage	mA	Flush Lens	Top Hat Lens
Incandescent	CLF06	5-7V	200		
Incandescent	CLF14	12-14V	80	190-R Red	191-R Red
Incandescent	CLF28	24-28V	40	190-Y Yellow	191-Y Yellow
Neon	CLN115	110-120	1.5	190-G Green	191-G Green
Green Glow	CLG	110-120	1.5	190-B Blue	191-B Blue
Red LED	CLLR	2.0	10	190-W White	191-W White
Green LED	CLLG	1.9	10	190-C Clear	191-C Clear
Yellow LED	CLLY	1.9	10		

MODELS 200 to 203 — INCANDESCENT INDICATORS

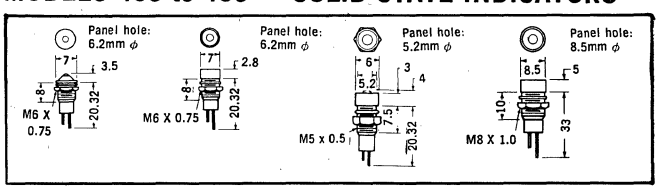


Model 200 is rugged chrome plated brass with long life T1¾ lamp. Model 201 is smaller version of 200 above. Model 202 is chrome plated brass with removable lens for lamp replacement. Model 203 is designed to accommodate custom legends and is front relampable.

SPECIFICATIONS — LIGHT SOURCE — LENSES

Series	Type	Voltage	mA	Lens
200	FA06	5-7	50	R — Red
	FA14	12-14	30	
201	FB06	5-7	50	Y — Yellow
	FB14	12-14	30	
202	FK05	4-6	60	G — Green
	FK14	12-14	40	
	FK28	24-28	24	B — Blue
203	FJ06	5-7	200	
	FJ14	12-14	80	W — White
	FJ28	24-28	40	

MODELS 406 to 409 — SOLID STATE INDICATORS

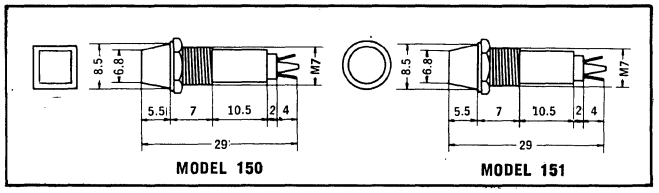


All of chrome plated brass except 409 is black anodized only, with low current LED lamp. Ordering example: LED-406R

SPECIFICATIONS — LIGHT SOURCE — LENSES

Type	Color (All)	Volts (All)	MA (All)	MCD
LED-406 LED-407 LED-440 LED-409	R — Red G — Green Y — Yellow	2.0	1.0	1.2

MODELS 150/151 — UNIVERSAL INDICATORS



Attractive, low cost plastic assembly, mounts in 7mm hole with nut and washer supplied. Square or round in a variety of light sources and colors. Ordering example: F151-12R

HOW TO ORDER: XX - 15X - XXX

LIGHT SOURCE	SHAPE	VOLTS	COLOR
F — Incandescent	0 — Square	06 — 6 Volts	A — Amber
L — LED	1 — Round	12 — 12 Volts	G — Green
NR — Neon, w/resistor		24 — 24 Volts	R — Red
		10 — 110 Volts	C — Clear
		20 — 220 Volts	B — Blue
			Y — Yellow

LED T.M.

4009 Pacific Coast Hwy
Torrance, CA 90505
(213) 534-1505
Telex: 4945454
FSC #8Z410

LED Lamps & Indicators

BASED LEDS

DIRECT INCANDESCENT Replacement

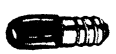
SIZE: T1 (3mm) SUB-MIDGET FLANGE
LEDS: ULTRA-BRITES, HI-EFFICIENCY
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V TO 28V (RESIS. BUILT-IN)
REPLACES: 8022,682,685,714,6839 ETC

SIZE: T1 (3mm) BIPIN
LEDS: ULTRA-BRITES, HI-EFFICIENCY
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V TO 28V (RESIS. BUILT-IN)
REPLACES: 7680,7683,7714,8099,7839

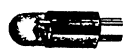
SIZE: T1-3/4 (5mm) MIDGET FLANGE
LEDS: MULTICHIP, DUALCHIP, ULTRAS
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V-110VAC (RESIS. BUILT-IN)
REPLACES: 345,328,380,327,387 ETC

SIZE: T1-3/4 (5mm) MIDGET GROOVE
LEDS: MULTICHIP, DUALCHIP, ULTRAS
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V-110VAC (RESIS. BUILT-IN)
REPLACES: 337,386,346,334,388 ETC

SIZE: T1-3/4 (5mm) MIDGET SCREW
LEDS: MULTICHIP, DUALCHIP, ULTRAS
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V-110VAC (RESIS. BUILT-IN)
REPLACES: 342,378,389,373,335 ETC



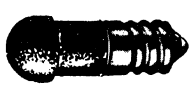
SIZE: T1-3/4 (5mm) WEDGE BASE
LEDS: MULTICHIP, DUALCHIP, ULTRAS
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V TO 32V (RESIS. BUILT-IN)
REPLACES: 56,79,84,86,73,74,85 ETC



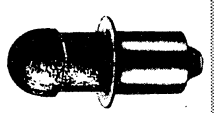
SIZE: T1-3/4 (5mm) BIPIN
LEDS: MULTICHIP, DUALCHIP, ULTRAS
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V-110VAC (RESIS. BUILT-IN)
REPLACES: 7362,7328,7387,7374 ETC

SIZE: T2-1/2, T3-1/4 MIN. BAYONET
LEDS: CLUSTER, MULTICHIP, DUALCHIP
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V-110VAC (RESIS. BUILT-IN)
REPLACES: 755,1815,1819,120MB ETC

SIZE: T3-1/4, 63-1/2 MIN. SCREW
LEDS: CLUSTER, MULTICHIP, DUALCHIP
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V TO 60V (RESIS. BUILT-IN)
REPLACES: 40,46,1487,1821,1447 ETC



SIZE: T3-1/3, B3-1/2 MIN. FLANGED
LEDS: CLUSTER, MULTICHIP, DUALCHIP
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V TO 60V (RESIS. BUILT-IN)
REPLACES: 7680,7683,7714,8099,7839



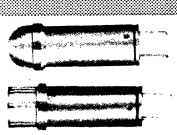
SIZE: T2 TELEPHONE SLIDES #5 & #6
LEDS: MULTICHIP, DUALCHIP, ULTRAS
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V-110VAC (RESIS. BUILT-IN)
REPLACES: 6,10,12,24ESB,120PSB ETC

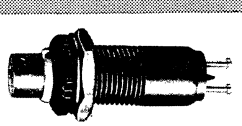
SIZE: T2 TELEPHONE SLIDES #2 & #3
LEDS: MULTICHIP, DUALCHIP, ULTRAS
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V-110VAC (RESIS. BUILT-IN)
REPLACES: 24E,24X,30X,48, 60X ETC

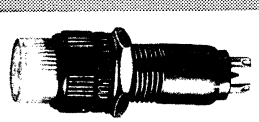
SIZE: T2 TELEPHONE SLIDES #1 & #8
LEDS: MULTICHIP, DUALCHIP, ULTRAS
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V TO 60V (RESIS. BUILT-IN)
REPLACES: 24E1,A1,A3,K2,C2,48C ETC

SIZE: RFI/EMI SHIELDED INDICATORS
LEDS: MULTICHIP, DUALCHIP, ULTRAS
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V-110VAC (RESIS. BUILT-IN)
REPLACES: VARIOUS INCANDES., NEONS

SIZE: BIPIN RELAMPABLE CARTRIDGES
LEDS: CLUSTER, MULTICHIP, DUALCHIP
COLOR: RED, ORANGE, YELLOW, GREEN
VOLTS: 2V-110VAC (RESIS. BUILT-IN)
REPLACES: VARIOUS INCANDES, NEONS ETC







LEDTRONICS, INC.

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M

MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O

OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P

PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

WPS word processing software

Y

YIG yttrium iron garnet

Z

ZIF zero insertion force

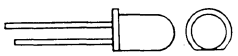
DISCRETE, PC MOUNT & PACKAGED LEDs

LEECRAFT

Leecraft high brightness, discrete LEDs are supplied in T 1¾, T 1 Miniature, T ¾ Mini Axial sizes and in high and low profile types. Dual colors and flashers are also available. Special types are produced to order.

T 1¾ High Profile

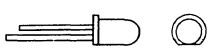
L111



PART NUMBER	COLOR STYLE	MCD-20 mA MIN.	MCD-20 mA TPY.	DC VOLTS† TYP.	DC VOLTS† MAX.	VIEW ANGLE	PEAK NANOMETER
54-L111DR	Red Diff.	3	9	2.0	3.0	65°	635
54-L111DG	Green Diff.	3	6	2.2	3.0	75°	562
54-L111DY	Yellow Diff.	2.5	8	2.1	3.0	65°	585
54-L111DA	Amber Diff.	3	6	2.0	3.0	65°	635
54-L111CR	Red Clear	17	40	2.0	3.0	28°	635
54-L111CG	Green Clear	30	60	2.2	3.0	35°	562
54-L111CY	Yellow Clear	10	45	2.1	3.0	28°	585
54-L111CA	Amber Clear	17	40	2.0	3.0	28°	635
54-L121DR	Red Diff.	6	12	2.1*	2.5*	60°	700
54-L121DG	Green Diff.	5	8	2.1	2.5	60°	555
54-L121DY	Yellow Diff.	8	16	2.1	2.5	60°	580
54-L121DA	Amber Diff.	8	16	2.2	2.5	60°	605
54-L121CR	Red W. Clear	40	80	1.7	2.0	30°	660
54-L121CG	Green W. Clear	50	80	2.1	2.5	30°	555
54-L121CY	Yellow W. Clear	60	90	2.2	2.5	30°	580
54-L121CA	Amber W. Clear	60	90	2.2	2.5	30°	605

T 1 Miniature

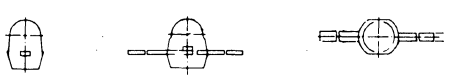
L311



PART NUMBER	COLOR STYLE	MCD-20 mA MIN.	MCD-20 mA TYP.	DC VOLTS* TYP.	DC VOLTS* MAX.	VIEW ANGLE	PEAK NANOMETER
54-L311DR	Red Diff.	2	4	2.0	3	90°	635
54-L311DG	Green Diff.	2	5	2.2†	3	90°	562
54-L311DY	Yellow Diff.	2	4	2.1	3	90°	585

T ¾ Mini Axial

L411

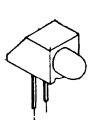


PC board mount for diagnostic or condition indicators. Compact, requires minimum space.

PART NUMBER	COLOR STYLE	MCD-5 mA MIN.	MCD-5 mA TYP.	DC VOLTS† TYP.	DC VOLTS† MAX.	VIEW ANGLE	PEAK NANOMETER
54-L411DR	Red Diff.	0.2	0.5	1.6	2.0	90°	635

† Current Level @ 20 mA
* Current Level @ 10 mA

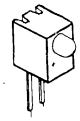
L611 Series — T 1¾ Right Angle



Black housing with contoured bottom facilitates PC board washing.

PART NUMBER	COLOR	LUMINOUS INTENSITY @ 20 mA MIN. MCD	LUMINOUS INTENSITY @ 20 mA TYP. MCD	FORWARD VOLTAGE @ 20 mA TYP.	FORWARD VOLTAGE @ 20 mA MAX.	PEAK EMISSION WAVE LENGTH @ 20 mA	VIEWING ANGLE	LED
L611DR	Red	2.0	9.0	2.1	3	635 nm	65°	54-L111DR
L611DG	Green	3.0	6.0	2.1	3	562 nm	65°	54-L111DG
L611DY	Yellow	2.5	8.0	2.1	3	585 nm	65°	54-L111DY

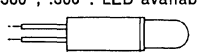
L613 Series — T 1 Right Angle



PART NUMBER	COLOR	LUMINOUS INTENSITY @ 20 mA MIN. MCD	LUMINOUS INTENSITY @ 20 mA TYP. MCD	FORWARD VOLTAGE @ 10 mA TYP.	FORWARD VOLTAGE @ 10 mA MAX.	PEAK EMISSION WAVE LENGTH @ 20 mA	VIEWING ANGLE	LED
L613DR	Red	2.0	4.0	2.0	3	635 nm	90°	54-L311DR
L613DG	Green	2.0	5.0	2.2†	3	562 nm	90°	54-L311DG
L613DY	Yellow	2.0	4.0	2.1	3	585 nm	90°	54-L311DY

L7111 Spacers

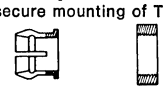
A reliable solution to jostling of free standing LEDs which can be unstable when moved. Units include LED and Spacer in one package.
To order: last 3 digits of Part # represent off-the-board height to base of LED. In choices of .810″; .560″; .500″. LED availability includes 54-L111, 54-L211 or 54-L311.



PART NUMBER	COLOR	LUMINOUS INTENSITY @ 20 mA MIN. MCD	LUMINOUS INTENSITY @ 20 mA TYP. MCD	FORWARD VOLTAGE @ 10 mA TYP.	FORWARD VOLTAGE @ 10 mA MAX.	PEAK EMISSION WAVE LENGTH @ 20 mA	VIEWING ANGLE	LED
L7111DR-810	Red	3	9	2.1	3	635 nm	65°	54-L111DR
L7111DG-810	Green	3	6	2.1	3	562 nm	65°	54-L111DG
L7111DY-810	Yellow	2.5	8.0	2.1	3	585 nm	65°	54-L111DY

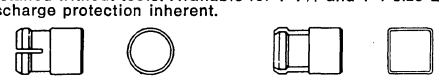
Clip Mounts

Leecraft Clip Mounts offer secure mounting of T 1¾ LEDs.



Snap in Lens Mount

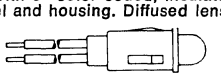
Easily installed without tools. Available for T 1¾ and T 1 size LEDs. Electrostatic discharge protection inherent.



LED	LENS	RED	GREEN	YELLOW	CLEAR
T 1¾	RD	89-L810R	89-L810G	89-L810Y	89-L810WW
T 1¾	SQ	89-L811R	89-L811G	89-L811Y	89-L811WW
T 1	RD	89-L812R	89-L812G	89-L812Y	89-L812WW

L59 Series

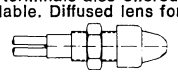
.250 snap fit mounting with 6″ color coded, insulated wire termination. Integrated black nylon bezel and housing. Diffused lens for wide viewing angle.



TERMINATION	LENS STYLE	2 VOLTS	VOLTAGE RATING (NOMINAL) 6 VOLTS	VOLTAGE RATING (NOMINAL) 12 VOLTS	24 VOLTS	LED
Insulated Wire	Red Diffused	L59D-R2-W	L59D-R6-W	L59D-R12-W	L59D-R24-W	L111DR
	Green	L59D-G2-W	L59D-G6-W	L59D-G12-W	L59D-G24-W	L111DG
	Yellow	L59D-Y2-W	L59D-Y6-W	L59D-Y12-W	L59D-Y24-W	L111DY

L58 Series

.191 mounting with plated brass bezel and housing. 6″ insulated, color coded terminal wires. Bare wire terminals also offered. Splash-proof design for oil and water resistance available. Diffused lens for wider viewing angle.



TERMINATION	LENS STYLE	2 VOLTS	VOLTAGE RATING (NOMINAL) 6 VOLTS	VOLTAGE RATING (NOMINAL) 12 VOLTS	24 VOLTS	LED
Insulated Wire	Red Diffused	L58D-R2-W	L58D-R6-W	L58D-R12-W	L58D-R24-W	L291
	Green	L58D-G2-W	L58D-G6-W	L58D-G12-W	L58D-G24-W	L291
	Yellow	L58D-Y2-W	L58D-Y6-W	L58D-Y12-W	L58D-Y24-W	L291

L45R Series

5/16″ mount with Chrome plated bezel and nylon housing. Provided with 3/16″ brass male tabs, color coded.

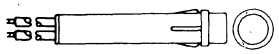
LENS COLOR	LENS STYLE	2 VOLTS	VOLTAGE RATING (NOMINAL) 6 VOLTS	VOLTAGE RATING (NOMINAL) 12 VOLTS	24 VOLTS	LED
Red	Hi-Hat	L45RN-R2-2111	L45RN-R6-2111	L45RN-R12-2111	L45RN-R24-2111	L-111CR
Green	Hi-Hat	L45RN-G2-2112	L45RN-G6-2112	L45RN-G12-2112	L45RN-G24-2112	L-111CG
Yellow	Hi-Hat	L45RN-Y2-2116	L45RN-Y6-2116	L45RN-Y12-2116	L45RN-Y24-2116	L-111CY

Leecraft Mfg. Co., Inc., 21-20 44th Rd., Long Island City, NY 11101 (718) 392-8800 TWX: 710 582 2897 FAX: (718) 937-4896

LEECRAFT

INDICATOR LIGHTS

L39UR Series — LED Indicator Light

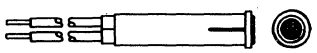


MOUNTING HOLE: Snap fits 5/16" (7.93 mm) mounting hole
PANEL RANGE: .030-.052 (.762-1.32 mm)
HOUSING: White Nylon
TERMINATION: 6" insulated wire, color coded
BEZEL: Chrome Plated
LED: 54-L111C

LENS COLOR	LENS STYLE	VOLTAGE RATING (NOMINAL) 2 VOLTS	6 VOLTS	12 VOLTS	24 VOLTS
Red	Hi-Hat	L39UR-R2-2111	L39UR-R6-2111	L39UR-R12-2111	L39UR-R24-2111
Green	Hi-Hat	L39UR-G2-2112	L39UR-G6-2112	L39UR-G12-2112	L39UR-G24-2112
Yellow	Hi-Hat	L39UR-Y2-2116	L39UR-Y6-2116	L39UR-Y12-2116	L39UR-Y24-2116
Red	Flush	L39UR-R2-2311	L39UR-R6-2311	L39UR-R12-2311	L39UR-R24-2311
Green	Flush*	L39UR-G2-2312	L39UR-G6-2312	L39UR-G12-2312	L39UR-G24-2312
Yellow	Flush	L39UR-Y2-2316	L39UR-Y6-2316	L39UR-Y12-2316	L39UR-Y24-2316

* Flush styles available in minimum orders of 1000 pieces (only).

36U Series



High brightness Neon with built-in resistor. Features low profile flange for front panel 7/64" projection. Various lens colors and bezel combinations available. UL Recognized. CSA approved.
To order: select Voltage from table below. Add suffix from lens color table. Example: 36UN-2311.
Friction Fit in 5/16" mounting hole.

Series Voltage Code

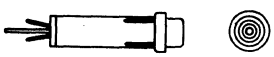
WITHOUT BEZEL	CHROME BEZEL	VOLTS	CURRENT	LIFE (Hrs)
36UN	36URN	125	1/3 W	25,000
36UHN	36UHRN	250	1/3 W	25,000

Lens Type

HOUSING COLOR	RED	GREEN*	BLUE	AMBER	WHITE	CLEAR
Flush - White	-2311	-2312	-2314	-2313	-2315	-2317
Flush - Black	-1311	-1312	-1314	-1313	-1315	-1317
Hi-Hat**	-2111	-2112	-2114	-2113	-2115	-2117

* For line Voltage: Green Neon provided.
** Requires Bezel.

45 Series



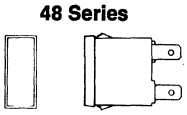
With choice of high brightness neon or incandescent lamps. Has 1/8" brass male tab terminals for quick connect and assembly. 3/16" male tab optional. Tabs can be tinned for soldering. With speed nut. UL recognized. CSA approved.

Series Voltage Code

WITHOUT BEZEL	CHROME BEZEL	VOLTS	CURRENT	LIFE (Hrs)
45N	45RN	125	1/3 W	25,000
45HN	45HRN	250	1/3 W	25,000
45NG1	45RNG1	6	.20A	5,000
45NG3*	45RNG3	14	.08A	1,500
45NG5†	45RNG5	28	.04A	4,000
45NG18	45RNG18	28	.04A	25,000

* Recommended for 12V. Life at 12V: 12,000 hours.
† Recommended for 24V. Life at 24V: 32,000 hours.
To order: see example under 36U Series and substitute Model #, e.g. 45N-2311. Specify T3 to indicate 3/16" tab terminals.

48 Series



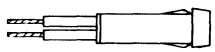
One piece compact design with tapered lens to enhance front panel design. In red, amber, blue, green and white for panel thicknesses from .031-100". Supplied with 3/16" male tab terminals or 105°C stranded, insulated leads . . . standard wire length 6". Suggested hole size is .320"x.865" for secure snap fit. UL recognized. CSA approved.
To order: select part number from chart. To specify wire leads, omit "T".

Tab Terminal Part Numbers

VOLTAGE	CURRENT	LIFE (Hrs)	WHITE	RED	GREEN**	BLUE	AMBER
110-125	1/3 W	25,000	48-2T	48-3T	48-4T	48-5T	48-9T
210-250	1/3 W	25,000	48H-2T	48H-3T	48H-4T	48H-5T	48H-9T
6	.20A	5,000	48G1-2T	48G1-3T	48G1-4T	48G1-5T	48G1-9T
14	.08A	1,500	48G3-2T	48G3-3T	48G3-4T	48G3-5T	48G3-9T
28	.04A	4,000	48G5-2T	48G5-3T	48G5-4T	48G5-5T	48G5-9T
28	.04A	25,000	48G18-2T	48G18-3T	48G18-4T	48G18-5T	48G18-9T

** High Brightness green lamp supplied.

65 Series



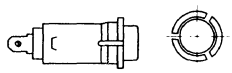
Choice of high brightness neon or incandescent lamps. Minimum back panel projection, one piece Lexan lens and housing to snap mount in 5/16" hole. Has 6" wire leads. Panel range .032" to .047". In 6V to 250V units. UL recognized. CSA approved.
To order: select Part # from table below. Add Suffix # from Lens Type Color Table as provided on this page. To specify 3/16" tab terminals add Suffix T3 to part #.

Complete Parts Numbers

LENS COLOR	6 VOLTS	12 VOLTS	28 VOLTS	125 VOLTS	250 VOLTS
Red	65G1-0131	65G3-0131	65G5-0131	65-0131	65H-0131
Green*	65G1-0132	65G3-0132	65G5-0132	65-0132	65H-0132
Amber	65G1-0133	65G3-0133	65G5-0133	65-0133	65H-0133
Blue	65G1-0134	65G3-0134	65G5-0134	65-0134	65H-0134
White	65G1-0135	65G3-0135	65G5-0135	65-0135	65H-0135

* High Brightness green lamp supplied.

32 Series



With choice of high brightness neon or miniature incandescent lamps. Nylon housing, with or without Chrome bezel. Square lens require bezel. Internal dropping resistors for neon. 3/16" tab terminals or 6" wire leads. UL listed, CSA approved.
To order: select part # from table below. Specify lens type, color, bezel. Add T3 suffix for tab terminals. For 6" wire leads, remove T with suffix.

Series Voltage Code

WITHOUT BEZEL	CHROME BEZEL	VOLTS	CURRENT	LIFE (Hrs)
32	32R	125	1/3 W	25,000
35	35R	250	1/3 W	25,000
32G1	32RG1	6	.20A	5,000
32G3*	32RG3	14	.08A	1,500
32G5†	32RG5	28	.04A	4,000
32G18	32RG18	28	.04A	25,000

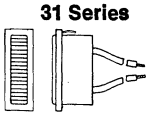
* Recommended for 12V. Life at 12V: 12,000 hours.
† Recommended for 24V. Life at 24V: 32,000 hours.

Lens Suffix Code

LENS COLOR	WITH 6" WIRE LEADS: FLAT CYL.	DOME	FLUSH	HI-HAT	SQUARE	WITH 3/16" TAB TERMINALS: FLAT CYL.	DOME	FLUSH	HI-HAT	SQUARE
Red	-2111	-2211	-2311	-2511	-2911	-2111T	-2211T	-2311T	-2511T	-2911T
Green*	-2112	-2212	-2312	-2512	-2912	-2112T	-2212T	-2312T	-2512T	-2912T
Amber	-2113	-2213	-2313	-2513	-2913	-2113T	-2213T	-2313T	-2513T	-2913T
Blue	-2114	-2214	-2314	-2514	-2914	-2114T	-2214T	-2314T	-2514T	-2914T
White	-2115	-2215	-2315	-2515	-2915	-2115T	-2215T	-2315T	-2515T	-2915T
Clear	-2117	-2217	-2317	-2517	-2917	-2117T	-2217T	-2317T	-2517T	-2917T

* High Brightness green lamp supplied.

31 Series



Choice of high brightness neon or incandescent lamps. Variety of lens colors & voltages. Chrome plated bezels standard. Snap fits to 1.281" x .395" mounting holes. No other hardware necessary. Available with 1/4" tab terminals or 6" wire leads. Other male tabs available. Recommended panel thickness to .090", but accommodates others. White nylon housing. 3-terminal dual colors available. UL recognized. CSA approved.
To order: select from table immediately below, then add suffix from color table. To specify 6" wire leads, remove "T" from suffix code.

Series Voltage Code

SINGLE INDICATOR	DUAL MESSAGE	VOLTAGE	CURRENT	LIFE (Hrs)
31	31D	125	1/3 W	25,000
31H	31DH	250	1/3 W	25,000
31G1	31DG1	6	.20A	5,000
31G3*	31DG3	14	.08A	1,500
31G5†	31DG5	28	.04A	4,000
31G18	31DG18	28	.04A	25,000

* Recommended for 12V. Life at 12V: 12,000 hours.
† Recommended for 24V. Life at 24V: 32,000 hours.

Lens Color Suffix Code

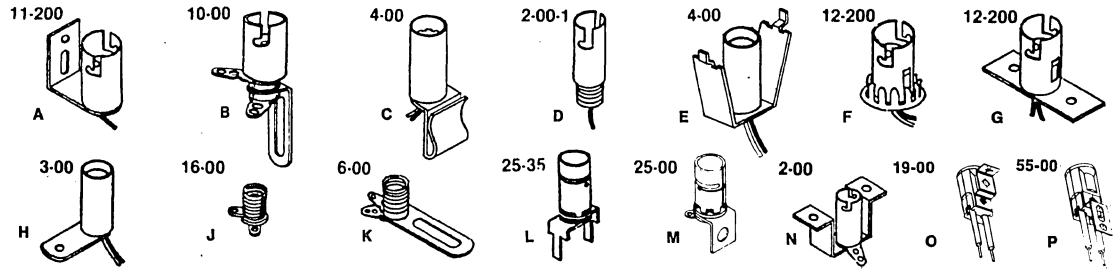
TERMINATIONS	RED	GREEN*	AMBER	BLUE	WHITE	CLEAR
Wire Leads	-2111	-2112	-2113	-2114	-2115	-2117
Tab Terminals	-2111T	-2112T	-2113T	-2114T	-2115T	-2117T

* High Brightness green lamp supplied.

Leecraft Mfg. Co., Inc., 21-20 44th Rd., Long Island City, NY 11101 (718) 392-8800 TWX: 710 582 2897 FAX: (718) 937-4896

LAMPHOLDERS

LEECRAFT



Series 2-00 Miniature Bayonet

For low voltage miniature Bayonet incandescent lamps. Plated steel shell with fibre insulating sleeve, 6″ wire leads. Bracket insulated from shell 02-40-1 and 02-30N-1 are supplied with one 6″ lead. No insulating sleeve. Shell grounded to bracket.

Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style
02-01	O	02-07	J	02-14	E
02-02	C	02-08	M	02-40-1	F
02-06	B	02-12	H	02-30N-1	D

Series 4-00 Candelabra Screw

For line and low voltage candelabra screw base lamps. Features a heavy molded hi-temperature thermoplastic housing extending above socket shell and 6″ wire leads. UL Listed - CSA Approved. 75 Watts maximum.

Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style
04-01	O	04-05	*	04-08	M
04-02	C	04-06	B	04-12	H

* Reverse of B

Series 25 Midget Grooved

For midget grooved, low voltage standard and lens-end lamps. Supplied with tinned solder lugs. Bracket insulated from shell.

Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style
25-06	B	25-12	H
25-08	M	25-35	L

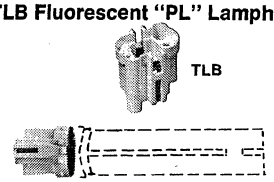
Series 5-00 Minature Screw

For low voltage miniature screw base lamps. Supplied with 2 tinned solder lugs. Bracket insulated from shell.

Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style
05-05	*	05-07	J
05-06	B	05-08	M

* Reverse of B

TLB Fluorescent "PL" Lampholders



Energy saving. Hi-impact, hi-temp plastic materials with brass terminals. TLB-07 takes 5, 7, 9W lamps. TLB-13 takes 13W lamp. For exit signs, desk lamps, track lighting, etc. UL listed. CSA approved.

Leecraft No.	Style	Lamp
TLB-07-08	5, 7, 9W	horz't'l screw-in
TLB-13-08	13W	horz't'l screw-in
TLB-07-60	5, 7, 9W	vert'l screw-in
TLB-13-60	13W	vert'l screw-in
TLB-07-82R	5, 7, 9W	reverse snap-in
TLB-13-82R	13W	reverse snap-in

Series 16-00 Midget Screw

For low voltage midget screw lamps. Supplied with tinned solder lugs. Bracket insulated from shell.

Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style
16-07	J	16-08	M

Series 10-00, 11-200 Single Contact Candelabra Bayonet

For line and low voltage single contact candelabra bayonet base lamps. 10-00 Series is supplied with 2 tinned solder lugs. Bracket insulated from shell. The 11-200 Series is supplied with one 6″ wire lead. Shell grounded to bracket.

Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style
10-06	B	11-271	A
10-08	M	11-272	*

* Reverse of A

Series 19-00 Candelabra Screw

For line and low voltage lamp. Has heat resistant, rugged housing; inner brass terminals. 6″ wire leads. To 75W. Other brackets available. UL listed. CSA approved.

Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style
19-41X	P	19-83	Q

Series 55-00 Intermediate Screw

For intermediate lamps, line voltage. 6″ wire leads. Inner brass terminals. Heat resistant molded housing. Other brackets available. To 75 W. UL listed. CSA approved.

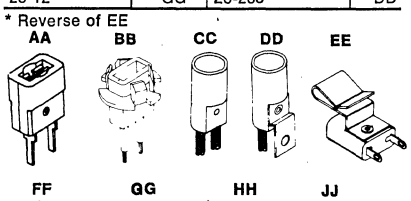
Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style
55-41X	P	55-83	Q

WEDGE BASE
Series 23-00 - Miniature - For T 3¼ & T 5 Lamps

Molded housing. Insulated mounting brackets. Simple push-in lamp insert with two solder terminals or 6″ wire leads. PC board type also available. Series 23-200-1 has grounded mounting bracket and one wire lead.

Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style
23-01	EE	23-14	HH
23-02	*	23-35	AA
23-07	FF	23-240PL	BB
23-207	CC	23-272	JJ
23-12	GG	23-288	DD

* Reverse of EE



Series 53 - Subminiature - For T 1¾ Lamps

Supplied with solder lugs, 6″ wire leads or PC board types; and in bracket/wire lead combo's. Other brackets available. Use for low voltage and tight space needs. Insulated molded housing. Easy lamp insertion.

Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style
53-07	FF	53-208	DD
53-207	CC	53-35	AA
		53-240PL	BB

Series 12-200 Double Contact Candelabra Bayonet

For low and line voltage double contact candelabra bayonet base lamps. Supplied with 6″ wire leads. Shell and bracket are grounded; contacts are floating. UL listed - CSA approved. 75 Watts maximum.

Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style
12-225	G	12-230BN	D
12-240	F	12-211	N
12-271	A		

Series 7-00 Miniature Bayonet

For low voltage lamps. Tinned solder lugs with mounting bracket insulated from shell. Fibre insulating sleeve available.

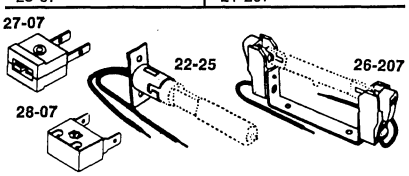
Leecraft No.	Mtg. Style	Leecraft No.	Mtg. Style
07-01	O	07-11	N
07-02	C	07-12	H
07-06	B	07-14	E
07-07	J	07-20	*
07-08	M	07-35	L

* Similar to M, 1 5/16″ Long

Halogen Cycle Lampholders

Series 27-00 for G.E. and other G4 Two Pin Halogen Cycle lamps. Ceramic construction. Tabs (.110″). Series 28-00 similar to Series 27-00 except surface mount. Series 21-07 similar to Series 27-00 above except for use with T-2¼ wedge base Halogen lamps. Series 21-207—wire leads.

Leecraft No.	Leecraft No.
27-07	21-07
28-07	21-207



22-00 SERIES Candelabra Bayonet. For Single-ended, double contact G.E. or other Quartzline lamps.

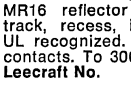
26-00 SERIES for use with recessed single contact, double-ended lamps. Sold individually. Bracket not supplied except on order. For G.E. and other lamps.

TYPE 22-25 Straight Bracket (shown)
TYPE 22-27 Step Bracket
TYPE 26-07 ¼″ Male Tab
TYPE 26-207 4″ Silicone Insulated Wire

QLB Halogen Energy Savers

For G5.3 size 2-pin base Halogen lamps. 200°C lead wires. 6″ standard length. Widely used for precise filament location and with MR16 reflector lamp types. For architectural, track, recess, instrumentation and fiber optics. UL recognized. Ceramic housing, stainless steel contacts. To 300V/12A.
Leecraft No. QLB-6

38-00 High Temp Series



Used with G6.3 pin Halogen lamps. Special runway helps adjust brackets for ideal lamp focusing, precise filament location, and tight spacing. 200°C Silicon rubber. For display, decorative, track and instruments. Ceramic housing, stainless contacts. 300V/12A; 750W rating.

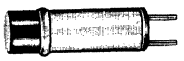
Leecraft No.	Mtg. Style
38-07	⅛″ male tabs
38-274	Bracket & wire leads

Leecraft Mfg. Co., Inc., 21-20 44th Rd., Long Island City, NY 11101 (718) 392-8800 TWX: 710 582 2897 FAX: (718) 937-4896

Littelfuse®

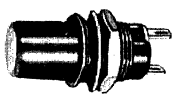
LITTELITES® SELECTOR GUIDE

WRITE OR CALL FOR OUR COMPLETE CATALOG.

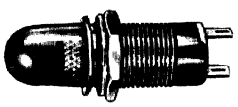


900 Series Cartridge Lamps

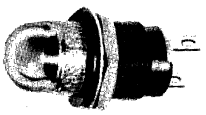
Cartridge Lampholders



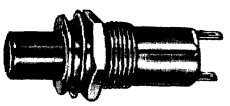
920 Series Subminiature



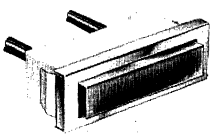
921 Series Subminiature



922, 923, 924 Series Subminiature



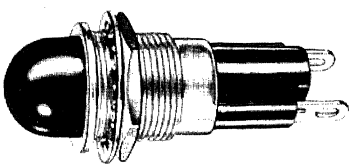
925, 926, 927 Series Subminiature



960 Series Rectangular Snap-Mount Plastic

970 Series 5/16" Diameter Snap-Mount Plastic

980 Series 1/2" Diameter Snap-Mount Plastic



930 Series Miniature Lampholders

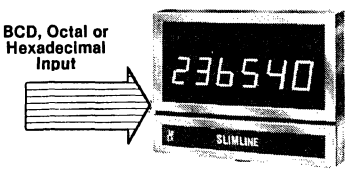
LITTELITES

		CARTRIDGE LAMPS & HOLDERS					SUBMINIATURE LAMPHOLDERS								MINIATURE LAMPHOLDERS	SNAP-MOUNT PLASTIC LITES		
		CARTRIDGE LAMPS		CARTRIDGE LAMPHOLDERS		SOCKETS												
		900 SERIES	901 SERIES	910 SERIES (Mates with 900 SERIES Cartridge lamps)	911 SERIES (Mates with 901 SERIES Cartridge lamps)	910-000***	920 SERIES	921 SERIES	922 SERIES	923 SERIES	924 SERIES	925 SERIES	926 SERIES	927 SERIES	930 SERIES	960 SERIES (Rectangular)	970 SERIES (5/16" DIA.)	980 SERIES (1/2" DIA.)
MOUNTINGS	FRONT MOUNT						X	X	X	X	X			X	X	X	X	X
	REAR MOUNT			X	X						X	X	X					
	MOUNTING HOLE SIZE			3/8"	3/8"		15/32"	15/32"	15/32"	17/32"	15/32"	3/8"	3/8"	15/32"	11/16"	1.281" X .395"	.312" / .318"	.500" / .510"
	MAXIMUM PANEL THICKNESS			3/8"	3/8"		3/16"	7/16"	1/4"	1/4"	1/4"	1/8"	3/16"	5/16"	3/8"	.090"	W/BEZ .090 / W/O BEZ .125	W/BEZ .090 / W/O BEZ .125
TERMINATIONS	SOLDER LUG			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	SOLDER CUP			X	X	X												
	SCREW TYPE														X			
	TURRET PIN			X	X	X												
	6" WIRE LEADS															X	X	X
	1/8" Q.C.																X	
	3/16" Q.C.															X		X
	1/4" Q.C.															X		
	.040 STAIN. BI-PIN	X	X															
	.040 TIN BI-PIN	X	X															
OPTIONS	D-HOLE MOUNTING			X	X										X			
	DRIP-PROOFING											X	X	X	X			
LAMPS	INCANDESCENT	X					X		X	X	X	X	X	X	X	X	X	X
	NEON STANDARD	X	X					X				X	X	X	X	X	X	X
	NEON GREEN		X													X	X	X
	NEON BLUE		X													X	X	X
	LED RED	X															X	
	LED GREEN	X															X	
	LED YELLOW	X															X	
	LAMPS INCLUDED	X	X	NA	NA	NA										X	X	X
UL	LISTED														X	X	X	X
	RECOGNIZED	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X
CSA	APPROVED	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X

SLIMLINE® DISPLAYS

LOCAL & DISTANT

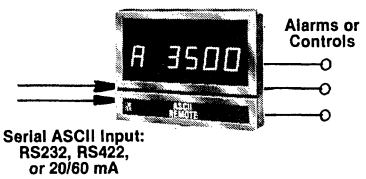
LOCAL DISPLAY



Accepts BCD, octal or hexadecimal code and displays up to 6 digits in either an LCD or LED display. Meter will accept full parallel or data bus input. Large, bright displays are highly readable even in high ambient light conditions. Easy panel drilling, mounting and wiring.

• Latch capability • 2 to 6 digit models • LED or LCD displays • Large, bright, easily-read numerals • Non-glare faceplate • Polarity, decimal point, colons available • Accepts 5 to 24 V input • Surface mounting • 3-year warranty • Price: $140 - $200

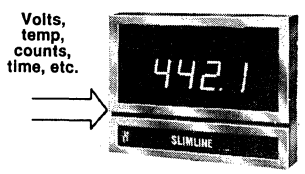
DISTANT DISPLAY



Units accept 2-wire serial ASCII input for numerical and most alpha character display. There are also ASCII controlled output capabilities to provide alarm or control functions. There is individual character control (dimming, flashing and blanking).

• Accepts RS232, 422 or 20/60 mA loop • 110 - 9600 baud • Limited alpha capability • μprocessor based • Large, bright display, easily read • Flexible addressing capability • ASCII Command switch outputs • Rugged industrial design • 3-year warranty • Price: $325 - $450

SIGNAL READOUT



Display a wide range of volts, amps, watts, resistance, counts, temperature, etc. with these units. Meters include full input conditioning and built-in A-to-D signal conversion. Unit can be field scaled to read out directly in any desired engineering unit.

• 2 to 6 digits • Highly rugged, accurate input circuitry • Preset units • Data outputs available • μprocessor-based units • Easy wiring - no soldering necessary • Easy panel surface mounting • Large, bright easily-read display • 3-year warranty • Price: $140 - $350

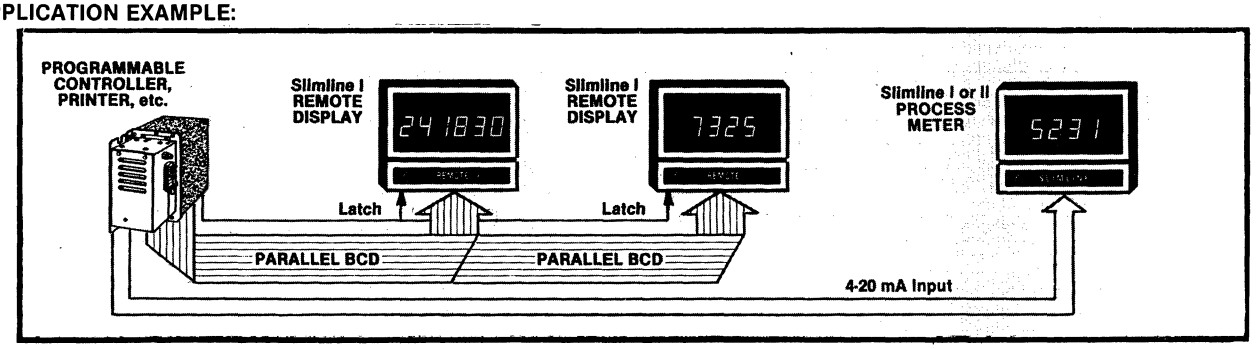
LARGE DISPLAY

Meters feature 3 or 5-inch, 7 segment, incandescent displays. Many different colors are available Meter will accept inputs from:

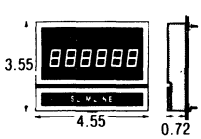
1) Parallel data (BCD, octal, hexadecimal)
2) Serial ASCII (RS232, 422, 20/60 mA)
3) Wide metering range (volts, amps, temperature, counts, time, etc.)

• Self-contained displays • Bright displays for long distance viewing • Decimal point or colons available • Latching and blanking capabilities • Rugged, NEMA-12 industrial enclosure • Great for distances up to 250' • Price: $650 - $750

APPLICATION EXAMPLE:



SLIMLINES' UNIQUE FEATURES



Size: 4.55" x 3.55" x 0.72". Panel surface mounting means easy & fast installation. Also fast wiring – no soldering needed.

High Quality: Less downtime, long useful life. Much better investment: socketed parts and highest quality components. Conservative design; works well in harsh factory environments, not like other meters that are made to only work in a laboratory.

Who Uses: With over 1 million meters shipped, NES is recognized as the leader in high quality industrial meters. Some users are: the Space Shuttle, Air Force 1, virtually all of the Fortune 1000's and tens of thousands of others.

Other Products: NES designs & manufactures over 3,000 different products from Broadcast Automation Computers to the broadest range of panel meters available.

Please call us. It is easy to talk to one of our expert Application Engineers. They care about your problem and will do all they can to assure your success.

***Call:* (312) 426-5900**

***NES, Inc.* NATIONWIDE ELECTRONIC SYSTEMS**
3003 Wakefield Drive, Carpentersville, IL 60110 • (312) 426-5900

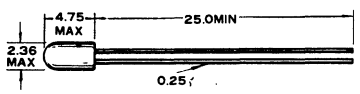
For other products in EEM from NES, see Sections 2000, 2200, 2325 & 2950.

OSHINO

unit in m/m

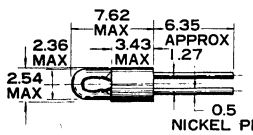
SUBMINIATURE LAMP BULBS

1. T-3/4 Wire Terminals — US Mil. Std MS90452



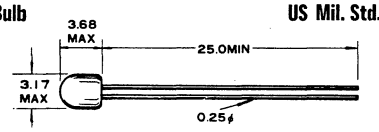
1.5-5V

2. T-3/4 Bi-Pin



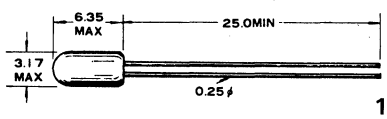
1.5-5V

3. T-T-1 Short Bulb — US Mil. Std. MS90451



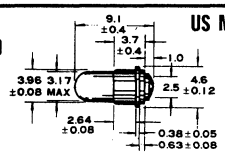
1.5-5V

4. T-1 Wire Terminals — US Mil. Std. MS24367



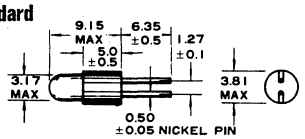
1.5-28V

5. T-1 Sub-Midget Flanged Base (SM4s/4) — US Mil. Std. MS24515 MS3338



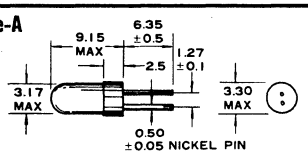
1.5-28V

6. T-1 Bi-Pin Standard



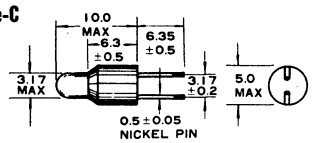
1.5-28V

7. T-1 Bi-Pin Type-A



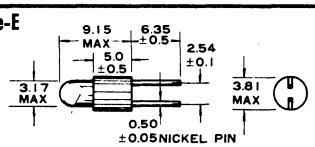
1.5-28V

8. T-1 Bi-Pin Type-C



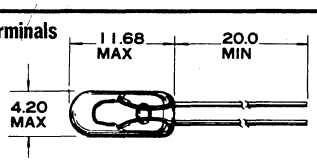
1.5-28V

9. T-1 Bi-Pin Type-E



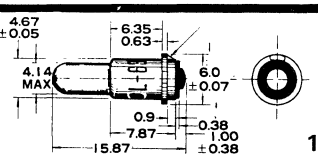
1.5-28V

10. T-1 1/4 Wire Terminals



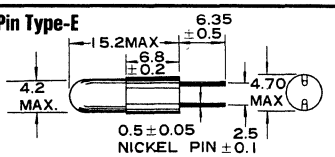
1.5-60V

11. T-1 1/4 Special Flarged



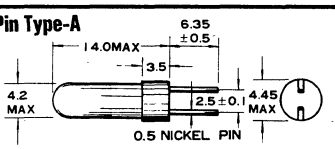
1.5-60V

12. T-1 1/4 Bi-Pin Type-E



1.5-60V

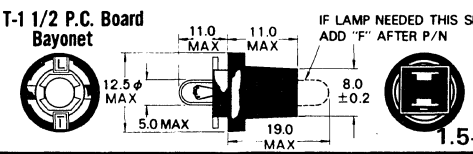
13. T-1 1/4 Bi-Pin Type-A



1.5-60V

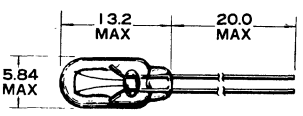
14. T-1 1/2 P.C. Board Bayonet

IF LAMP NEEDED THIS SIDE ADD "F" AFTER P/N



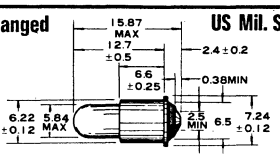
1.5-60V

15. T-1 3/4 Wire Terminals



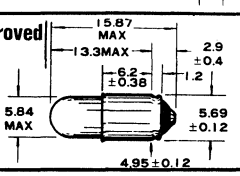
1.5-60V

16. T-1 3/4 Midget Flanged (MF6s/8) — US Mil. Std. MS25237 JIS C7522



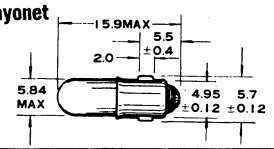
1.5-60V

17. T-1 3/4 Midget Groved (MG6s/9)



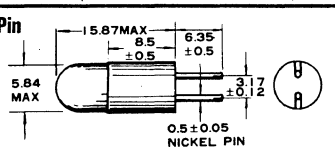
1.5-60V

18. T-1 3/4 Midget Bayonet (BA5s)



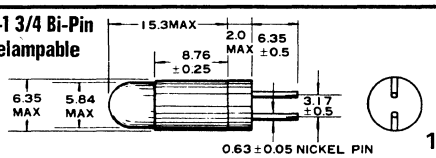
1.5-60V

19. T-1 3/4 Bi-Pin



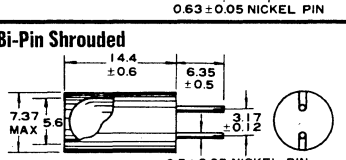
1.5-60V

20. T-1 3/4 Bi-Pin Relampable



1.5-60V

21. T-1 3/4 Bi-Pin Shrouded



1.5-28V

OSHINO ELECTRIC LAMP WORKS, LTD.
Shinagawa, Tokyo, Japan.

For additional information contact:
WAMCO, INC.
11555-A Coley River Circle, Fountain Valley, California 92708
TEL: (714) 545-5560 TELEX: 678459 WAMCO INC

REFAC

THE SEARCH STOPS HERE.

Make REFAC your one source for electronic displays and keyboards.

LED's

LED lamps, digits, displays, modules, assemblies, arrays, and opto-electronic devices by OPCOA®.

LCD's

Numeric, alphanumeric, instrument, dot matrix displays, and intelligent modules by OPTEL®.

Incandescents

Sunlight readable digits and alphanumeric displays. Connectors and drivers from PINLITE®.

Switches & Keyboards

Sealed, touch, keyboard, and miniature switches from WILD ROVER®.

Call or write us for more information.

REFAC Electronics Corporation

P.O. BOX 809 WINSTED, CT 06098 203-379-2731 .TWX 710-449-6464

SEIKO INSTRUMENTS

LIQUID CRYSTAL DISPLAYS

As one of the oldest and largest manufacturer's of Liquid Crystal Displays in the world, Seiko Instruments can meet your needs for standard LCD's, dot matrix modules, and custom displays. We exceed your expectations in quality, reliability, delivery, and cost. Contact Seiko Instruments when your design calls for LCD's, you will like the results.

INDUSTRY STANDARD LIQUID CRYSTAL DISPLAYS

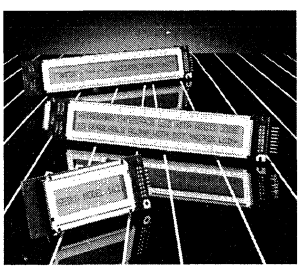
- ☐ Wide viewing angle
- ☐ Excellent contrast
- ☐ Wide operating voltage range
- ☐ CMOS compatible
- ☐ High Quality—long life
- ☐ Low Cost
- ☐ Standard Operating Temperature – 10°C to 60°C
- ☐ Extended Operating Temperature – 30°C to 85°C
- ☐ Various polarizer and reflectors including color
- ☐ Attached pins or elastomer versions are available
- ☐ Compatible with other manufacturer's LCD's

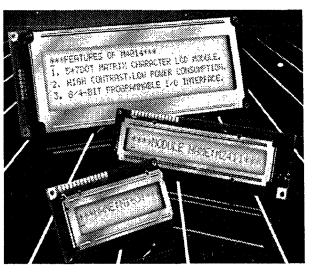
Model No.	Digit Ht. (Inch)	Glass Size (Inch)	Description
SP-530	0.35	2.00 x 0.90 x 0.103	3½ DIGIT, +, ←, :
SP-531	0.35	2.00 x 0.90 x 0.103	4 DIGIT, :
SP-516	0.30	2.00 x 0.90 x 0.103	4½ DIGIT, +, ←, : , :
SP-521	0.50	2.00 x 1.20 x 0.103	3½ DIGIT, +, LO BAT, :
SP-503	0.50	2.00 x 1.20 x 0.103	3½ DIGIT, +, ←, :
SP-505	0.50	2.00 x 1.20 x 0.103	4 DIGIT, :
SP-501	0.47	2.00 x 1.20 x 0.103	4½ DIGIT, +, LO BAT, : , :
SP-532	0.50	2.75 x 1.20 x 0.103	6 DIGIT, :, :
SP-535	0.50	3.70 x 1.20 x 0.103	8 DIGIT, :, :, :
SP-537	0.70	2.75 x 1.50 x 0.103	4 DIGIT, :
SP-508	0.70	2.75 x 1.50 x 0.103	3½ DIGIT, :, +, ←
SP-538	0.70	3.20 x 1.50 x 0.103	5 DIGIT, :
SP-511	0.70	3.70 x 1.50 x 0.103	6 DIGIT, :, :
SP-540	1.0	3.70 x 1.80 x 0.103	4 DIGIT, :
SP-541	1.0	4.50 x 1.80 x 0.103	5 DIGIT, : , :
SP-542	1.0	5.35 x 1.80 x 0.103	6 DIGIT, :, :
SP-533	—	2.75 x 1.20 x 0.103	101 bar graph
SP-539	—	3.70 x 1.50 x 0.103	2 column, 20 bars each

DOT MATRIX MODULES

Seiko Instruments "Smart Dot" modules all have the LCD drivers and controller on board which provides easy interface and saves host CPU overhead.

- ☐ 5 x 7 dot matrix plus cursor
- ☐ Character generator and Data RAM on board
- ☐ Wide logic voltage range
- ☐ Serial and parallel interface versions available
- ☐ EL Backlight Option





PARALLEL INTERFACE Unit: mm

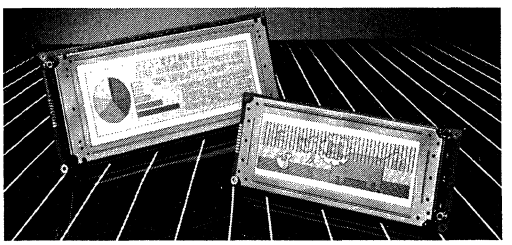
Model	Outside Dim. (WxHxD)	No. Char. x No. Lines	Char. Size (WxH) With Cursor	Dot Size (WxH)
M1611	85x30x10	16x1 line	2.9x5.3	0.5x0.5
M1631	80x36x10	16x1 line	3.2x8.7	0.55x0.7
M1612	106x30x10	16x2 lines	2.9x5.3	0.5x0.5
M2411	126x36x10	24x1 line	3.2x8.7	0.55x0.7
M3211	186x33x10	32x1 line	3.4x6.0	0.6x0.6
M3212	186x33x10	32x2 lines	2.9x5.1	0.5x0.5
M4011	186x33x10	40x1 line	2.7x5.0	0.45x0.45
M4012	186x33x10	40x2 lines	2.7x5.0	0.45x0.45
M4014	200x70x13	40x4 lines	3.1x6.0	0.54x0.57
M8011	260x43x9.4	80x1 line	2.3x4.4	0.39x0.43
M1641	80x36x11.3	16x1 line	3.07x6.56	.55x.75
M1632	85x30x10	16x2 lines	2.78x4.89	.5x.55
M4032	182x33.5x11	40x2 lines	3.2x5.55	.6x.65
M4024	190x54x10	40x4 lines	2.78x4.89	.5x.55

SERIAL INTERFACE Unit: mm

Model	Outside Dim. (WxHxD)	No. Char. x No. Lines	Char. Size (WxH) With Cursor	Dot Size (WxH)
M1621	106x35.6x10	16x1 line	2.9x5.3	0.5x0.5
M1622	106x35.6x10	16x2 lines	2.9x5.3	0.5x0.5
M3221	190x33x10	32x1 line	3.4x6.0	0.6x0.6
M3222	190x33x10	32x2 lines	2.9x5.1	0.5x0.5
M3214	210x80x13	32x4 lines	3.50x6.45	0.62x0.65
M4021	190x33x10	40x1 line	2.7x5.0	0.45x0.45
M4022	190x33x10	40x2 lines	2.7x5.0	0.45x0.45

GRAPHIC MODULES Unit: mm

Model	Outside Dim. (WxHxD)	Dot Format (Rox x Column)	Display Area (WxH)	Dot Size (WxH)
F1632	210x80x13	32x160	143.9x33.8	0.8x0.96
F2416	220x80x13	64x240	149.9x41.2	0.55x0.57
F4816	270x70x13	64x480	215.9x31.9	0.375x0.425
F481C	290x110x13	128x480	215.9x63.9	0.375x0.425
F642D	285x122x11	200x640	224x90	0.31x0.41



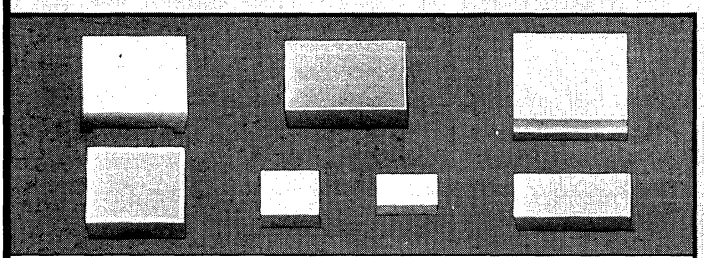
CUSTOM LIQUID CRYSTAL DISPLAYS

- ☐ Satisfy Your Specific Needs
- ☐ Create Your Own Graphics
- ☐ Glass size ¼″ x ½″ up to 9″ x 5″
- ☐ Static Drive up to 1/100 Duty Cycle
- ☐ Exclusive Electrodeposition Process for *Multicolor Displays*
- ☐ Silk Screening for Symbols
- ☐ Colored Polarizer and Reflectors
- ☐ Selectively Colored Polarizers
- ☐ Custom Modules

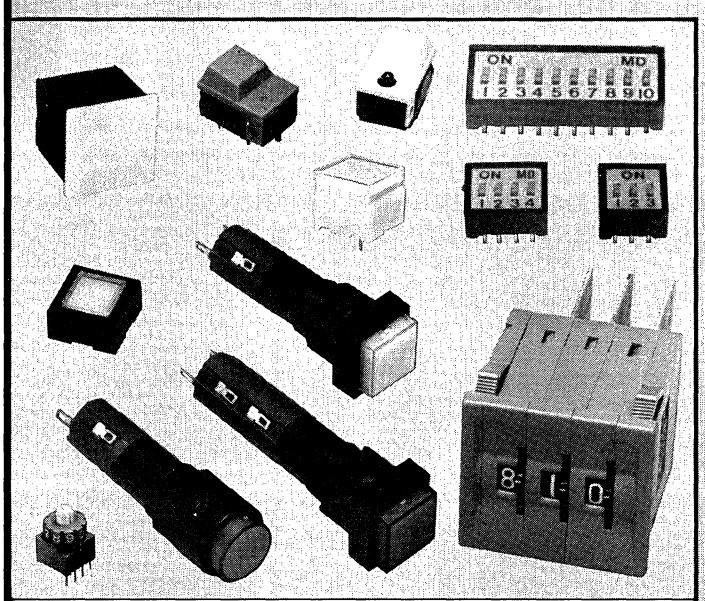
SEIKO INSTRUMENTS U.S.A., INC., 2990 W. Lomita Blvd., Torrance, CA 90505 • (213) 530-8777

Optoelectronics from SHELLY!

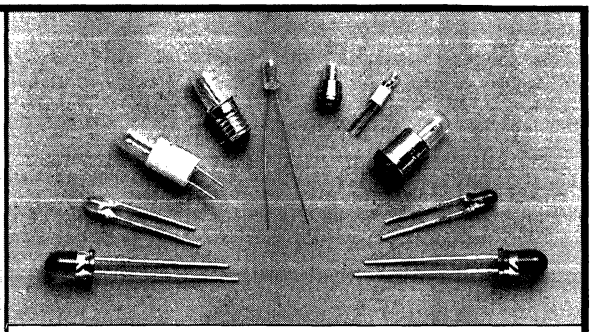
- COMMERCIAL and INDUSTRIAL TEMPERATURE RANGE FLUID and GUEST HOST LCDs
- INCANDESCENT and NEON LAMPS
- LED LIGHT BARS and LEDs
- SWITCHES
- INDICATORS
- MULTI-MESSAGE DISPLAYS



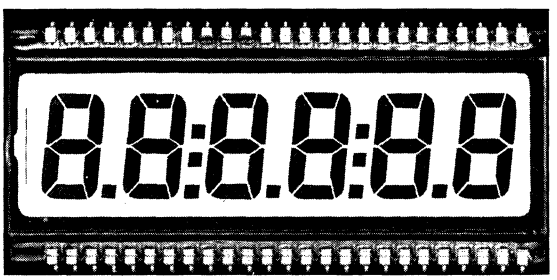
LED LIGHT BARS—large area indicators



SWITCHES—LED or incandescent lighted pushbutton ■ lighted and unlighted momentary key ■ thumbwheel and pushwheel ■ rotary coded ■ DIP ■ illuminated PCB mount

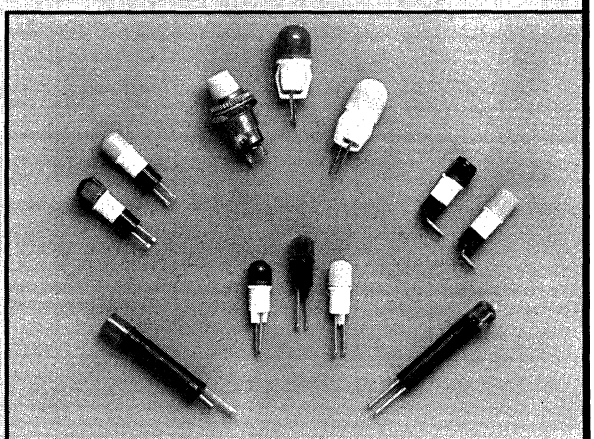


INCANDESCENT & NEON LAMPS
LED LAMPS

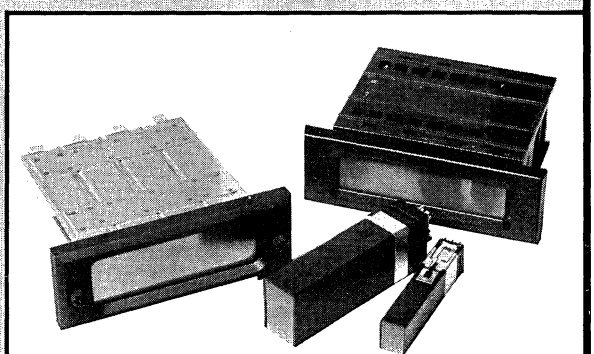


LCDs—2, 3½, 4, 5, 6 and 8-digit configurations .5", .7" and 1.0" character heights

COMMERCIAL & INDUSTRIAL TEMPERATURE RANGE FLUID & GUEST HOST LCDs



INDICATORS—based lamp ■ front relampable ■ incandescent ■ LED ■ neon

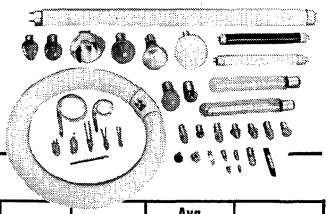


MULTI-MESSAGE DISPLAYS

SHELLY associates

14281 Chambers Road ■ Tustin, California 92680
(714) 669-9850 ■ FAX: 714-669-1081 ■ TLX: 85-2263

SHOGYO INTERNATIONAL CORPORATION
DEPT. EM, 287 NORTHERN BOULEVARD
GREAT NECK, NEW YORK 11021
(516) 466-0911
CABLE: "SHOGYONEWYORK"
TELEX: 12218 + 4758024
FAX: (516) 466-0922



INCANDESCENT LAMPS

Volts	Amps ±10%	M.S.C.P. ±25%	Avg. Life (Hrs.)	Filament Shape
T-¾				
1.15	.090	.003	5,000	C-2R
2.5	.110	.001	10,000	C-2R
4.5	.022	.018	5,000	C-2R
4.5	.021	.017	5,000	C-2R
5.0	.015	.02	1,000	C-2R
5.0	.021	.034	10,000	C-2R
5.0	.060	.03	100,000	C-2R
5.0	.060	.05	100,000	C-2R
5.0	.060	.15	3,000	C-2R
5.0	.075	.09	25,000	C-2R
5.0	.080	.15	15,000	C-2R
5.0	.115	.15	40,000	C-2R
5.0	.115	.20	5,000	C-2R
T-1				
1.25	.012	.004	1,000	C-6
1.35	.220	.02	25,000	C-2R
1.5	.075	.03	16,000	C-2R
2.5	.015	.001	10,000	C-2R
2.5	.100	.10	10,000	C-2R
2.5	.320	.21	5,000	C-2R
3.0	.008	.001	16,000	C-2R
3.0	.0125	.001	16,000	C-2R
5.0	.017	.005	10,000	C-2R
5.0	.021	.034	10,000	C-2R
5.0	.030	.03	16,000	C-2R
5.0	.045	.04	10,000	C-2R
5.0	.060	.03	100,000	C-2R
5.0	.060	.05	100,000	C-2R
5.0	.060	.15	5,000	C-2R
5.0	.075	.09	25,000	C-2R
5.0	.080	.16	3,000	C-2R
5.0	.115	.15	40,000	C-2R
5.0	.125	.22	5,000	C-2R
10.0	.027	.10	10,000	C-2F
12.0	.060	.15	16,000	C-2F
14.0	.065	.15	16,000	C-2F
18.0	.026	.15	16,000	C-2F
28.0	.024	.15	16,000	CC-2F
T-1¼				
1.3	.03	.006	100	S-2
1.35	.06	.006	500	C-2R
2.5	.40	.55	30	C-2R
3.0	.19	.25	350	C-2R
5.0	.06	.03	100,000	C-2R
5.0	.06	.05	100,000	C-2R
5.0	.115	.15	40,000	C-2R
6.0	.06	.13	3,000	C-2R
6.0	.20	.63	1,000	C-2R
6.3	.20	.55	5,000	C-2R
14.0	.08	.50	1,000	C-2F
28.0	.04	.32	1,000	C-2F
T-1½				
2.5	.20	.10	500	C-2R
6.0	.03	.24	1,000	C-2R
6.0	.08	.07	5,000	C-2V
6.0	.167	.30	5,000	C-2R
6.0	.20	.75	350	C 2R
6.75	.178	.60	200	C-2R
12.0	.03	.08	1,000	C-2V
12.0	.083	.24	5,000	C-2R
13.5	.089	.57	200	C-2V
24.0	.03	.10	5,000	C-2F
24.0	.04	.24	5,000	C-2F
28.0	.04	.34	1,000	C-2F
T-1¾				
1.35	.06	.01	500	C-2R
2.5	.20	.22	500	C-2R
2.5	.35	.21	10,000	C-2R
2.7	.06	.04	6,000	C-2R
3.0	.015	.004	10,000	C-6
3.0	.35	.30	10,000	C-2R
4.5	.120	.05	25,000	C-2R
5.0	.06	.03	100,000	C-2R
5.0	.06	.05	100,000	C-2R
5.0	.06	.15	5,000	C-2R
5.0	.115	.15	40,000	C-2R
5.0	.19	.45	1,000	C-2R
6.0	.04	.03	10,000	C-2R
6.0	.20	.10	50,000	C-2F
6.0	.20	.60	1,000	C-2R
6.3	.04	.02	50,000	C-2F
6.3	.075	.22	500	C-2R
6.3	.15	.34	5,000	C-2F
6.3	.15	.45	3,000	C-2R
6.3	.20	.40	50,000	C-2F
6.3	.20	.55	3,000	C-2R
10.0	.014	.002	10,000	C-2F
10.0	.04	.08	5,000	C-2F
11.0	.022	.03	10,000	C-2F
12.0	.04	.12	10,000	C-2F
14.0	.04	.15	5,000	C-2F
14.0	.08	.30	50,000	C-2F

Volts	Amps ±10%	M.S.C.P. ±25%	Avg. Life (Hrs.)	Filament Shape
T-1¾ cont.				
14.0	.08	.50	750	C-2F
14.0	.10	.50	10,000	C-2F
14.0	.10	.70	500	C-2F
18.0	.04	.15	10,000	C-2F
22.0	.04	.30	2,000	C-2F
24.0	.05	.50	1,000	C-2F
28.0	.04	.20	50,000	C-2F
28.0	.04	.30	25,000	C-2F
28.0	.04	.34	7,000	C-2F
28.0	.06	.34	25,000	C-2F
28.0	.065	.65	5,000	C-2F
48.0	.025	.20	5,000	C-2F

Volts	Amps ±10%	M.S.C.P.	End Foot Candles Average	Avg. Life (Hrs.)	Filament Shape
T-2					
6.0	.140	.12	500	20,000	C-2F
12.0	.170	.48	2,000	12,000	C-2F
24.0	.073	.85	3,000	10,000	C-2F
28.0	.040	.17	1,600	5,000	C-2F
48.0	.053	.52	1,800	10,000	C-7A
60.0	.050	.67	2,600	7,500	C-7A
4.0	.040	.03	200	10,000	C-6
5.0	.040	.04	225	8,000	C-6
6.0	.040	.025	250	15,000	C-2V
10.0	.010	red glow	red glow	15,000	C-2F
10.0	.017	.01	60	20,000	C-2V
10.0	.040	.07	450	5,000	C-2V
12.0	.040	.09	650	15,000	C-2V
16.0	.017	.02	150	15,000	C-2V
16.0	.040	.17	900	7,500	C-2F
18.0	.040	.14	1,000	10,000	C-2F
24.0	.017	.02	150	15,000	C-2F
24.0	.040	.12	850	8,000	C-2F
28.0	.040	.25	1,500	6,000	C-2F
48.0	.040	.44	3,000	5,000	C-2F

Volts	Amps ±10%	End Foot Candles Average	Avg. Life (Hrs.)	Filament Shape
4.0	.190	450	5,000	C-2
6.0	.140	510	15,000	C-2V
6.0	.290	270	15,000	C-2V
6.0	.040	180	4,000	C-2
8.0	.090	600	1,000	C-2
10.0	.110	600	10,000	C-2V
10.0	.250	900	1,000	C-2V
12.0	.100	1,200	12,000	C-2V
12.0	.035	650	2,000	C 6
12.0	.170	1,500	5,000	C-2V
16.0	.100	720	5,000	C-2V
16.0	.290	840	1,000	C-7A
18.0	.040	800	1,000	C-2F
18.0	.100	600	1,000	C-2V
20.0	.034	—	1,000	C-2V
24.0	.030	600	1,000	C-2V
24.0	.040	1,000	4,000	C-2F
24.0	.072	1,400	6,000	C-2F
24.0	.100	1,500	8,000	C-2F
24.0	.035	600	8,000	C-2F
24.0	.090	1,120	7,000	C 2F
24.0	.035	600	8,000	C-2F
30.0	.072	2,000	3,000	C-7A
30.0	.100	3,000	4,000	C-7A
35.0	.040	1,000	7,500	C-2F
35.0	.072	700	5,000	C-7A
35.0	.100	750	5,000	C-7A
40.0	.040	—	1,000	C-7A
44.0	.072	1,250	1,000	C-7A
48.0	.072	2,000	5,000	C-7A
48.0	.100	2,200	5,000	C-7A
48.0	.035	475	10,000	C-7A
48.0	.021	100	20,000	C-7A
48.0	.045	1,000	5,000	C-7A
55.0	.100	1,800	5,000	C-7A
55.0	.050	1,400	5,000	C-7A
60.0	.050	1,600	5,000	C-7A

Volts	Amps ±10%	M.S.C.P. Nom.	Avg. Life (Hrs.)	Filament Shape
T-3				
14.0	.17	1.7	250	C-2V
24.0	.17	3.3	250	C-2V
T-3¼				
2.0	.06	.02	1,000	C-6
2.0	.06	.04	1,000	S-2
2.5	.50	.5	3,000	C-2R
3.2	.16	.2	3,000	C-2R
3.2	.35	.5	3,000	C-2R
4.0	.06	.07	1,000	S-2
5.0	.09	.25	1,500	C-2R
6.0	.45	1.4	1,000	C-6
6.3	.15	.33	50,000	C-2R
6.3	.15	.38	20,000	C-2R
6.3	.15	.52	3,000	C-2R
6.3	.25	.65	20,000	C-2R

Volts	Amps ±10%	M.S.C.P. Nom.	Avg. Life (Hrs.)	Filament Shape
T-3¼ cont.				
6.3	.25	.9	3,000	C-2R
6.3	.36	.67	5,000	C-2R
6.3	.36	.67	5,000	C-2R
6.3	.40	1.5	3,000	C-2R
7.0	.50	2.0	3,000	C-2R
13.0	.33	3.0	1,000	C-2V
14.0	.08	.31	50,000	C-2F
14.0	.15	1.5	200	C-2V
14.0	.19	1.0	4,000	C-2F
14.0	.20	1.4	3,000	C-2V
14.0	.24	2.0	500	C-2F
13.0	.33	3.0	1,000	C-2V
14.0	.33	2.0	5,000	C-2F
14.0	.27	2.0	1,500	C-2F
14.0	.33	2.0	3,000	C-2F
14.0	.35	3.0	1,500	C-2F
14.4	.10	.86	1,000	C-2V
14.4	.12	.75	1,000	C-2F
18.0	.15	1.8	250	C-2V
24.0	.17	3.3	250	C-2V
28.0	.04	.34	1,000	C-2F
28.0	.06	.64	5,000	C-2F
28.0	.07	1.0	1,000	C-2F
28.0	.10	1.6	1,000	C-2F
28.0	.17	3.0	1,500	C-2F
28.0	.17	3.5	500	C-2F
36.0	.10	2.5	1,000	C-2V
37.5	.05	.65	3,000	C-2F
48.0	.10	3.3	1,000	C-2V
55.0	.05	1.1	5,000	C-5

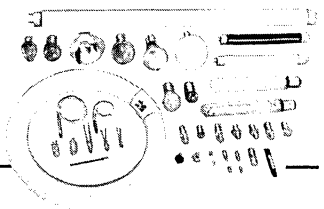
Volts	Amps ±10%	M.S.C.P. Nom.	Avg. Life (Hrs.)	Filament Shape
T-4				
18.0	.17	2.2	250	C-2V
T-4½				
6.3	.80	3.6	3,000	C-2R
9.8	.50	6.0	15	C-2R
28.0	.30	6.0	500	C-2F
T-5				
3.7	2.75	11.0	100	C-6
6.5	2.75	25.0	125	C-6
TL-¾				

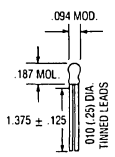
Volts	Amps ±10%	Spot Character-istics	Avg. Life (Hrs.)	Filament Shape
5.0	.060	None	100,000	C-2R
5.0	.115	None	40,000	C-2R
TL-1 Lens-End Lamps				
1.5	.075	None	16,000	C-2R
5.0	.060	None	100,000	C-2R
5.0	.075	None	16,000	C-2R
5.0	.115	None	40,000	C-2R
TL-1½ Lens-End Lamps				
2.5	.200	None	500	C-2R
6.0	.200	None	500	C-2R
28.0	.040	None	1,000	C-2F
TL-1¾ Lens-End Lamps				
5.0	.22	None	10,000	C-2R
2.5	.35		10,000	C-2R
GTL-1¾ Lens-End Lamps				
2.5	.35		10,000	C-2R
GTL-2¾ Lens-End Lamps				
1.20	.20	—	5	S-2
2.15	.22	—	5	C-2R
GTL-3 Lens-End Lamps				
1.20	.22	—	5	S-2
2.25	.25	—	5	C-6
2.33	.27	—	10	C-6

Volts	Amps ±10%	M.S.C.P. Nom.	Avg. Life (Hrs.)	Filament Shape
B-3½				
2.33	.27	.40	10	C-2R
2.35	.35	.45	35	C-2R
2.38	.50	.80	15	C-2R
2.47	.30	.45	30	C-2R
2.70	.15	.25	45	C-2R
3.57	.50	1.50	15	C-2R
3.70	.30	.90	30	C-2R

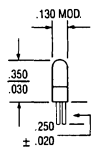
The products illustrated and listed are only a small representation of the full range of items available.

SHOGYO INTERNATIONAL CORPORATION
DEPT. EM, 287 NORTHERN BOULEVARD
GREAT NECK, NEW YORK 11021
(516) 466-0911
CABLE: "SHOGYONEWYORK"
TELEX: 12218 + 4758024
FAX: (516) 466-0922

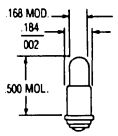




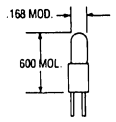
T-¾



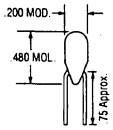
T-1



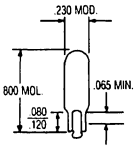
T-1¼



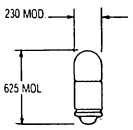
T-1¼



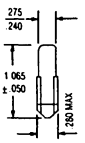
T-1½



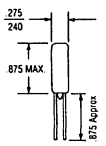
T-1¾



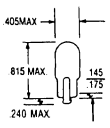
T-1¾



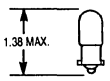
T-2



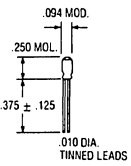
T-2



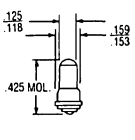
T-3¼



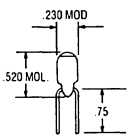
T-4½



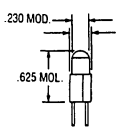
TL-¾



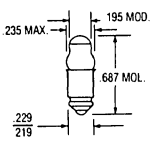
TL-1 LENS-END LAMP



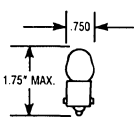
TL-1¾ LENS-END LAMP



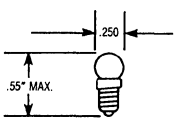
TL-1¾ LENS-END LAMP



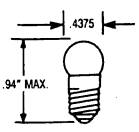
GTL-1¾ LENS-END LAMP



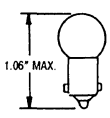
B-6



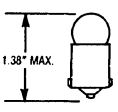
G-2



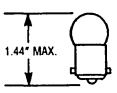
G-3½



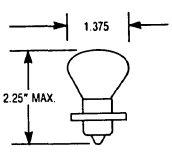
G-4



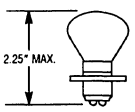
G-5



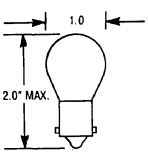
G-6



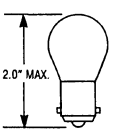
RP-11



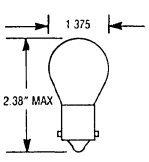
RP-11



S-8



S-8



S-11

INCANDESCENT LAMPS

All of the following incandescent lamps are available with wire terminals, bi-pin, flanged, wedge, knerled, midget grooved, bayonet and slide bases.

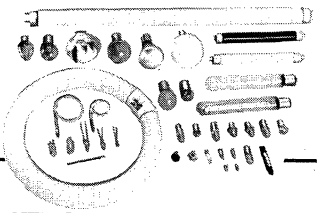
Volts	Amps ±10%	M.S.C.P. Nom.	Avg. Life (Hrs.)	Filament Shape
B-3½ cont.				
4.75	.50	2.20	15	C-2R
4.82	.50	1.90	30	C-2R
5.95	.50	3.10	15	C-2R
7.20	.55	5.50	5	C-2R
8.63	.50	4.50	15	C-2R
12.50	.25	2.70	50	C-2R
B-6				
6.5	1.78	15.0	100	C-6
12.8	.94	15.0	100	C-6
G-2				
7.0	.063	.085	3,000	C-2V
14.0	.065	.066	3,000	C-2F
28.0	.040	.320	1,000	C-2F
G-3½				
1.25	.30	.10	10	S-2
1.3	.10	.03	50	S-2
1.35	.06	.02	50	S-2
2.33	.27	.42	10	C-2R
2.46	.50	.90	15	C-2R
2.47	.30	.50	15	C-2R
2.5	.50	.50	3,000	C-6
3.69	.50	1.60	15	C-2R
3.7	.30	.98	15	C-2R
3.8	.43	1.60	1	C-2R
6.3	.15	.35	3,000	C-6
6.3	.15	.38	3,000	C-2R
6.3	.25	.55	3,000	C-2R
6.3	.25	.50	3,000	C-2V
7.5	.22	1.00	1,000	C-2R
12.0	.20	1.70	250	C-2V
14.0	.20	2.00	250	C-2V
14.4	.10	.75	1,000	C-2V
14.4	.10	.90	1,000	C-2R
14.4	.12	.75	3,000	C-2V
14.4	.12	1.00	1,000	C-2V
18.0	.15	1.50	250	C-2V
24.0	.035	.23	3,000	C-2V
28.0	.17	3.50	500	C-2V
G-4				
4.9	.30	1.2	50	C-2R
4.9	.30	1.4	30	C-2R
5.0	.50	2.3	15	C-2R
5.1	.15	.6	100	C-2R
6.0	.04	.1	500	C-6
6.0	.45	2.2	100	C-2R

Volts	Amps ±10%	M.S.C.P. Nom.	Avg. Life (Hrs.)	Filament Shape
G-4 cont.				
6.15	.50	3.4	15	C-2R
6.5	.50	1.9	500	C-2R
7.0	.40	2.0	500	C-6
7.0	.41	2.0	500	C-2R
12.5	.25	2.4	250	C-2V
14.0	.24	2.0	500	C-2V
14.0	.24	2.0	500	C-2F
14.0	.25	2.7	250	C-2V
14.0	.27	1.6	500	C-2R
14.0	.27	2.0	1,500	C-2F
18.0	.25	3.5	250	C-2V
G-5				
20.0	.25	4.2	250	C-2V
28.0	.17	3.0	500	C-2F
G-5½				
2.5	.80	1.3	150	C-2R
2.5	.80	1.3	150	S-2
G-6				
6.5	1.05	6.0	500	C-2R
7.0	.63	3.0	1,000	C-2R
12.0	.26	2.3	250	C-2V
13.0	.58	6.0	750	C-2R
13.5	.41	4.0	1,500	C-2R
13.5	.59	4.0	3,000	C-2R
13.5	.59	4.0	3,000	2/C-2R
14.0	.63	6.0	1,000	2/C-2R
24.0	.18	2.8	1,000	C-2F
28.0	.23	3.0	3,000	2/C-2V
28.0	.30	6.0	500	C-2F
28.0	.37	6.0	1,000	2/C-2V
34.0	.16	3.8	275	C-2F
G-16½				
5.5	2.00	14.0	50	C-8Z major
6.0	.82	5.0	100	C-12 minor
R-12 Available: Frosted/Reflectorized				
13.0	1.54	—	300	C-8
28.0	.71	—	300	CC-8
RP-11				
5.5	6.25	50.0	100	C-2V
6.2	3.87	32.0	125	2/C-2V
6.2	3.91	32.0	200	C-2R

Volts	Amps ±10%	M.S.C.P. Nom.	Avg. Life (Hrs.)	Filament Shape
RP-11 cont.				
12.5	2.00	32.0	400	C-2R
12.5	3.00	50.0	300	C-2V
4.5	1.25	5.7	75	C-6
5.9	6.36	50.0	200	C-6
5.9	6.53	50.0	200	C-2V
6.0	2.35	19.0	75	C-6
6.2	4.13	32.0	200	C-2V
6.2	4.23	32.0	200	2/C-2V
12.5	3.00	50.0	300	C-2V
12.8	2.08	32.0	300	C-2V
S-8				
5.0	.60	3.0	20	C-2R
6.4	2.63	21.0	200	C-6
6.4	2.80	21.0	200	C-2V
6.4	3.00	23.0	500	C-2V
6.5	2.75	23.0	100	C-6
6.7	1.90	15.0	500	C-6
6.8	1.91	15.0	300	C-2R
6.8	2.00	15.0	750	C-2R
8.0	2.00	21.0	1,500	C-2R
8.0	2.20	20.0	500	C-2R
12.8	1.04	15.0	500	C-2R
12.8	1.44	21.0	500	C-6
12.8	1.80	32.0	200	C-6
12.8	2.10	32.0	600	C-6
28.0	.51	15.0	300	C-2V
28.0	.66	21.0	300	C-2V
28.0	.70	21.0	400	C-2V
28.0	.90	32.0	300	C-2V
40.0	.22	3.5	1,000	C-13
44.0	.17	6.0	200	C-7A
6.4	2.63	21.0	200	C-6 major
7.0	.75	3.0	1,000	C-6 minor
12.8	1.26	21.0	300	2/C-2R
12.8	1.34	21.0	200	C-6 major
14.0	.59	6.0	1,000	C-6 minor
12.8	1.80	32.0	200	C-6 major
14.0	.59	4.0	3,000	C-6 minor
12.8	2.10	32.0	600	C-6 major
14.0	.51	4.0	3,000	C-6 minor
28.0	.61	15.0	1,000	2/C-2V
28.0	1.02	32.0	500	2/C-6
S-11				
6.2	4.50	32.0	400	C-6
28.0	.90	32.0	300	C-2V
28.0	1.29	50.0	300	C-2V

The products illustrated and listed are only a small representation of the full range of items available.

SHOGYO INTERNATIONAL CORPORATION
DEPT. EM, 287 NORTHERN BOULEVARD
GREAT NECK, NEW YORK 11021
(516) 466-0911
CABLE: "SHOGYONEWYORK"
TELEX: 12218 + 4758024
FAX: (516) 466-0922



STANDARD VOLTAGE LAMPS

Bulb	Base	Volts	Filament Design	M.O.L. (inches)	L.C.L. (inches)	Apprx. Hrs. Life	Apprx. Initial Lumens
3 WATTS-5 WATTS							
S-6	Cand.	120	C-7A	1 7/8	1 5/16	3000	12
		125-30	C-7A	1 7/8	1 5/16	3000	12
	D.C. Bay.	120	C-7A	1 13/16	—	3000	12
		130	C-7A	1 13/16	—	3000	12
C-7	Cand.	120	C-7A	2 1/8	—	3000	16
S-11	S.C. Bay.	10	C-2R	2 3/8	1 1/4	1000	—
S-14	Medium	34	C-9	3 1/2	—	1000	—
S-11	S.C. Bay	10	C-2V	2 3/8	1 1/4	1000	—
			C-12				
6 WATTS							
S-6	Cand.	120	C-7A	1 7/8	1 5/16	1500	44
		125-130	C-7A	1 7/8	1 5/16	1500	44
		120	C-1	1 7/8	—	5000+	—
		135, 145	C-7A	1 7/8	1 5/16	1500	42
		155	C-7A	1 7/8	1 5/16	1500	42
		120	C-7A	1 7/8	—	1500	—
		130	C-7A	1 7/8	—	1500	—
		120	C-7A	1 7/8	—	1500	34
		120	C-7A	1 7/8	—	1500	—
		130	C-7A	1 7/8	—	1500	—
	D.C. Bay.	120	C-7A	1 13/16	1 1/16	1500	43
		125-130	C-7A	1 13/16	1 1/16	1500	43
		130	C-7A	1 13/16	—	1500	—
		135, 145	C-7A	1 13/16	1 1/16	1500	—
	Intermed.	120	C-7A	1 13/16	—	1500	—
T-4½	Cand.	120	C-7A	1 7/8	—	1500	42
		125-130	C-7A	1 7/8	—	1500	42
T-4	Cand.	115-125	2C-2F	1 7/16	1	1500	—
S-6	Cand.	6	C-2R	1 7/8	1 5/16	1500	—
		12	C-2V	1 7/8	1 5/16	1500	—
		18	C-2V	1 7/8	1 5/16	1500	—
		24	C-2V	1 7/8	1 5/16	1500	—
	D.C. Bay.	24	C-2V	1 13/16	1 1/16	1500	—
	Cand.	30	C-2V	1 7/8	1 5/16	1500	50
		32	C-2V	1 7/8	1 5/16	1500	—
		48	C-7A	1 7/8	1 5/16	1500	—
		60	C-7A	1 7/8	1 5/16	1500	—
	D.C. Bay.	60	C-1	1 13/16	1 1/16	1500	—
	S.C. Bay.	60	C-1	1 13/16	1 1/16	1500	—
	Cand.	75	C-7A	1 7/8	1 5/16	1500	—
	D.C. Bay.	75	C-7A	1 13/16	1 1/16	1500	—
7 WATTS							
C-7	Cand.	115-125	C-7A	2 1/8	—	3000	46
		130	C-7A	2 1/8	—	3000	46
		115-125	C-7A	2 1/8	—	3000	36
	Cand.	115-125	C-7A	2 1/8	—	3000	—
7½ WATTS-9 WATTS							
S-11	Medium	115-125	C-7A	2 1/4	—	1400	53
		130	C-7A	2 1/4	—	1400	53
		115-125	C-7A	2 1/4	—	1400	39
		130	C-7A	2 1/4	—	1400	39
		115-125	C-7A	2 1/4	—	1400	—
		130	C-7A	2 1/4	—	1400	—
		115-125	C-7A	2 1/4	—	1400	—
G-16½	2-Lug Sleeve	12	C-2R	2 15/16	—	1500	—
10 WATTS							
C-7	D.C. Bay.	115-125	C-7A	2 3/16	—	5000+	40
		115-125	C-1	2 3/16	1 1/16	5000+	—
		115-125	C-7A	2 3/16	—	5000+	—

Bulb	Base	Volts	Filament Design	M.O.L. (inches)	L.C.L. (inches)	Apprx. Hrs. Life	Apprx. Initial Lumens
10 WATTS cont.							
C-7	Cand.	115-125	C-7A	2 1/8	—	5000+	42
		115-125	C-7A	2 1/8	—	5000+	—
S-14	Medium	115-125	C-9	3 1/2	2 1/2	1500	80
		115-125	C-9	3 1/2	2 1/2	1500	79
		115-125	C-9	3 1/2	—	1500	—
		115-125	C-9	3 1/2	—	1500	45
S-11	Intermed.	115-125	C-7A	2 5/16	1 5/8	1500	80
		130	C-7A	2 5/16	1 5/8	1500	80
	Intermed.	115-125	C-7A	2 5/16	1 5/8	1500	79
	Intermed.	130	C-7A	2 5/16	—	1500	—
		130	C-7A	2 5/16	1 5/8	1500	—
	Cand.	115-125	C-7A	2 1/4	1 9/16	1500	—
	S.C. Bay.	120	C-7A	2 3/8	1 1/4	1500	—
S-6	Cand.	230, 250	C-7A	1 7/8	1 5/16	1500	74
	D.C. Bay.	230, 250	C-7A	1 13/16	1 5/16	1500	74
	Intermed.	250	C-7A	1 13/16	—	1500	—
11 WATTS-13½ WATTS							
S-14	Medium	130	C-9	3 1/2	2 1/2	3000	80
		130	C-9	3 1/2	2 1/2	3000	79
		130	C-9	3 1/2	—	3000	—
		130	C-9	3 1/2	—	3000	59
		130	C-9	3 1/2	—	3000	51
		130	C-9	3 1/2	2 1/2	3000	—
S-11	S.C. Bay.	10	CC-6	2 3/8	1 1/4	1000	—
		11	C-2V	2 3/8	1 1/4	2500	—
		10	C-2V	2 3/8	1 1/4	1000	—
			C-12				
15 WATTS							
B-10	Cand.	115-125	C-7A	3 3/4	1 5/8	1500	136
G-16½		115-125	C-7A	3	1 5/8	1500	130
		115-125	C-7A	3	—	1500	120
		120	C-7A	3	1 5/8	4000	—
T-7	D.C. Bay.	115-125	C-7A	2 1/4	—	(29)	115
		115-125	C-7A	2 1/4	—	(29)	113
	Intermed.	115-125	C-7A	2 1/4	—	(29)	115
T-7	Cand.	115-125	C-7A	2 1/4	—	1000	115
T-8		115-125	C-7A	3 1/16	—	750	150
T-10	Medium	115-125	C-8	5 5/8	—	2500	—
S-14		130	C-9	3 1/2	2 1/2	3000	—
S-11	Cand.	115-125	C-7A	2 1/4	1 9/16	700	150
		120	C-7A	2 1/4	1 3/8	200	150
	Medium	115-125	C-7A	2 1/4	—	400	142
	S.C. Bay.	120	C-7A	2 3/8	1 3/16	200	—
T-6½	Intermed.	120	C-8	5 1/2	—	1000	244
		125-130	C-8	5 1/2	—	1000	244
		120	C-8	5 1/2	—	1000	240
		125-130	C-8	5 1/2	—	1000	240
	D.C. Bay.	120	C-8	5 5/16	—	1000	244
		125-130	C-8	5 5/16	—	1000	244
		120	C-8	5 5/16	—	1000	240
		125-130	C-8	5 5/16	—	1000	240
		115-125	C-7A	2 5/8	—	(63)	240
		115-125	C-7A	2 5/8	—	(63)	235
T-8	Intermed.	115-125	C-7A	2 5/8	—	(63)	240
	Cand.	115-125	C-7A	2 5/8	1 1/2	(63)	—

Bulb	Base	Volts	Filament Design	M.O.L. (inches)	L.C.L. (inches)	Apprx. Hrs. Life	Apprx. Initial Lumens
15 WATTS cont.							
T-10	Medium	120	C-8	5 5/8	—	1000	248
		125-130	C-8	5 5/8	—	1000	248
		120	C-8	5 5/8	—	1000	244
		125-130	C-8	5 5/8	—	1000	244
		115-125	C-8	5 5/8	—	2500	—
R-14	Intermed.	120	CC-2V	2 2/16	—	1500	—
S-11	Long Shell Medium	6	C-6	2 5/8	—	50	—
T-8	S.C. Pref.	6	C-8	3 1/8	1 5/8	50	—
S-11	S.C. Bay.	10	CC-6	2 5/8	1 1/4	1000	—
R-14	S.C. Bay.	12	CC-8	2 5/8	—	2000	—
		28	CC-8	2 5/8	—	2000	—
T-8½	Medium	34	C-8	5 3/8	—	1000	—
T-6½	D.C. Bay.	230	C-8	5 5/16	—	1000	—
T-10	Medium	250	C-17A	5 5/8	—	1000	—
30 WATTS							
R-20	Medium	115-125	C-7A	3 15/16	—	2000	210
G-16½	D.C. Bay.	115	CC-2V Horiz.	3 5/16	1 13/16	500	—
S-11	S.C. Pref.	6	C-6	2 3/8	1 5/8	500	—
S-11	German Cand.	6	C-6	2 1/2	1 13/16	50	—
	D.C. Bay.	32	C-7A	2 3/8	1 1/4	500	—
T-8	Disc	60	C-8	1 1/4	—	1500	—
S-11	D.C. Bay	64	C-7A	2 3/8	1 1/4	500	350
		75	C-7A	2 3/8	1 1/4	500	—
40 WATTS							
B-10	Cand.	115-125	C-9	3 1/4	1 5/8	1500	—
		115-125	C-9	3 1/4	—	1500	—
B-13	Medium	115-125	C-9	4 3/8	2 3/8	1500	425
		115-125	C-9	4 3/8	—	1500	385
F-15	Medium	115-125	C-9	4 3/8	—	1500	435
		120	C-9	4 3/8	—	4000	—
		115-125	C-9	4 3/8	—	1500	390
		115-125	C-9	4 3/8	—	1500	—
G-16½	Cand.	115-125	C-7A	3	—	1500	245
	D.C. Bay	115	CC-2V Horiz.	3 5/16	1 13/16	500	—
G-25	Medium	115-125	C-9	4 7/16	—	1500	310
		115-125	C-9	4 7/16	—	1500	—
G-40	Medium	115-125	C-9	6 13/16	—	2500	355
		130	C-9	6 13/16	—	2500	355
		115-125	C-9	6 13/16	—	2500	385
T-6½	Intermed.	115-125	C-8	5 1/2	—	750	—
T-8	Medium	120	C-23	11 7/8	—	1000	430
		125-130	C-23	11 7/8	—	1000	430
		120	C-23	11 7/8	—	1000	425
		125-130	C-23	11 7/8	—	1000	425
		120	C-8	5 5/8	—	1000	450
T-10		125-130	C-8	5 5/8	—	1000	450
		120	C-8	5 5/8	—	1000	445
		125-130	C-8	5 5/8	—	1000	445
	Medium With Spring Contact	120	CC-8	5 5/8	—	1000	430
	Medium Prefocus	120	CC-2V	3 15/16	1½	1000	—

NEON LAMPS

NEON GLOW INDICATOR LAMPS

Lamp No. ANSI	Lamp No. Trade	Volts	Nom. Cur. (mA)	Watts	Life	Bulb	Base	Series Resist. (Ohms)	Max. Over-all Lgth. (in.)
A1A	NE-2	105-125	0.5	1/17	25,000	T-2	Wire Term.	150,000	1.0
A1B	—	105-125	0.3	1/25	25,000	T-2	Wire Term.	220,000	1/2
A1C	—	105-125	1.2	1/7	25,000	T-2	Wire Term.	47,000	1/2
A2A	NE-2A	105-125	0.3	1/25	10,000	T-2	Wire Term.	220,000	—
A2B	NE-2V	105-125	0.7	1/12	25,000	T-2	Wire Term.	100,000	3/4
A3C	NE-2U	105-125	1.9	1/4	25,000	T-2	Wire Term.	30,000	3/4
A7A	—	105-125	—	1/15	25,000	T-2	Wire Term.	100,000	3/4
A9A	NE-2E	105-125	0.7	1/15	100,000	T-2	Wire Term.	100,000	3/4
B1A	NE-51	105-125	0.3	1/25	15,000	T-3¼	Min. Bay.	220,000	1 3/16
B2A	NE-51H	105-125	2.0	1/7	25,000	T-3¼	Min. Bay.	40,000	1 3/16
B4A	NE-7	105-125	2.0	1/4	7,500	T-4½	Wire Term.	30,000	1¼
B5A	NE-17	105-125	2.0	1/4	7,500	T-4½	D.C. Bay.	30,000	1½
B6A	NE-21	105-125	2.0	1/4	7,500	T-4½	S.C. Bay.	30,000	1½
B7A	NE-45	105-125	2.0	1/4	7,500	T-4½	Cand. Scr.	30,000	1 17/32
B8A	NE-47	105-125	2.0	1/4	7,500	T-4½	S.C. Bay.	30,000	1½
B9A	NE-48	105-125	2.0	1/4	7,500	T-4½	D.C. Bay.	7,500	1½
C2A	NE-2H	105-125	1.9	1/4	25,000	T-2	Wire Term.	30,000	3/4
C7A	NE-2D	105-125	0.7	1/12	25,000	T-2	S.C. Mid. Flg.	100,000	15/16
C9A	NE-2J	105-125	1.9	1/4	25,000	T-2	S.C. Mid. Flg.	30,000	1 15/16
F3A	NE-57	105-125	2.0	1/4	7,500	T-4½	Cand. Scr.	30,000	1 17/32
F4A	NE-58	210-250	2.0	1/2	7,500	T-4½	Cand. Scr.	100,000	1 17/32

PREHEAT START FLUORESCENT LAMPS

Bulb	Lamp Number	Color Desc.	Color Temp. K	Base	Nom. Watts (W)	Nominal Length (mm)	Tube Diameter (in.)	Tube Diameter (type)	Tube Diameter (mm)	Tube Diameter (in.)	Apprx. Initial Lumens (2)	Apprx. Initial Lumens (m)	Apprx. Life (hrs.)
	F4T5/D	Daylight	6,500		4	134.5	6	15.5	5/8	T-5	120		3,000
	F4T5/CW	Cool White	4,300		4	134.5	6	15.5	5/8	T-5	135		3,000
	F6T5/D	Daylight	6,500		6	210.5	9	15.5	5/8	T-5	250		3,000
	F6T5/CW	Cool White	4,300		6	210.5	9	15.5	5/8	T-5	300		3,000
	F8T5/D	Daylight	6,500		8	287	12	15.5	5/8	T-5	400		3,000
	F8T5/CW	Cool White	4,300		8	287	12	15.5	5/8	T-5	470		3,000
	F10T8/D	Daylight	6,500	Med	10	330	13	25.5	1	T-8	445		5,000
	F10T8/CW	Cool White	4,300		10	330	13	25.5	1	T-8	490		5,000
	F15T8/D	Daylight	6,500		15	436	18	25.5	1	T-8	775		5,000
	F15T8/CW	Cool White	4,300		15	436	18	25.5	1	T-8	850		5,000
	F20T10/D	Daylight	6,500		20	589	24	32	1¼	T-10	1,070		7,500
	F20T10/CW	Cool White	4,300		20	589	24	32	1¼	T-10	1,210		7,500
	F40T10/D	Daylight	6,500		40	1,198	48	32	1¼	T-10	2,790		10,000
	F40T10/CW	Cool White	4,300		40	1,198	48	32	1¼	T-10	3,170		10,000

TECHNICAL INFORMATION

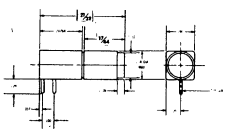
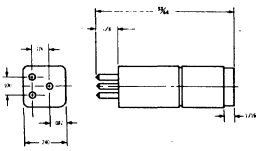
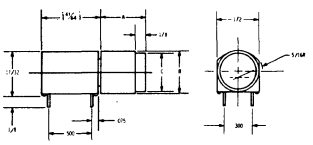
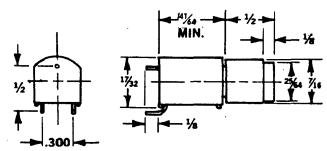
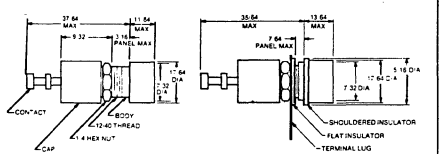
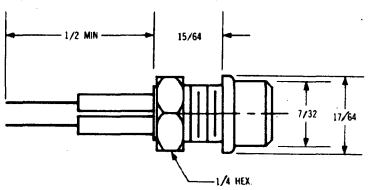
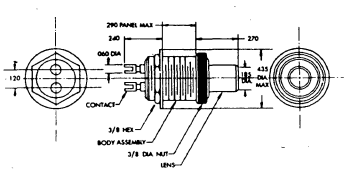
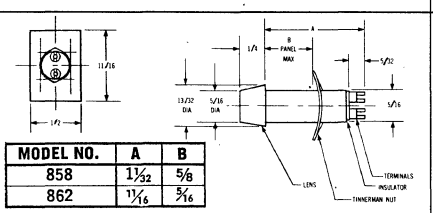
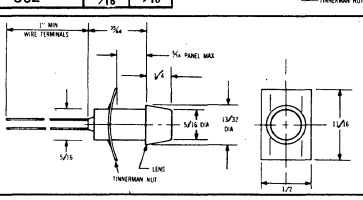
WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

THE SLOAN COMPANY

"THE TOUCH OF BRILLIANCE IN PANEL DESIGN"

7704 San Fernando Road, P.O. Box 367, Sun Valley, CA 91353
(213) 875-1123 • TWX 910-498-2250

SERIES	DRAWINGS	LENS COLOR	HOW TO ORDER
101 T-1 BASED LAMP LENS BAYONET TYPE. LENS STYLES AVAILABLE — DS, DSC, Q, QB.		**TRANSPARENT** / **TRANSLUCENT** **RL** — Red / **RLUC** — Red ***BL** — Blue / **WLUC** — White **GL** — Green / ***BLUC** — Blue **AL** — Amber / **GLUC** — Green **CL** — Clear / **ALUC** — Amber * Not recommended for LED	**EXAMPLE:** 101-RL-DSC 101 = Model No.; RL = Lens Color DSC = Lens Style
111 T-1 BASED LAMP LENS BAYONET TYPE. SAME AS 101.			
864 T-1¾ BASED LAMP LENS BAYONET TYPE. LENS STYLES AVAILABLE — DS7, DSC7, Q7, QB7. DS8, DSC8, Q8, QB8.		**TRANSPARENT** / **TRANSLUCENT** **RL** — Red / **RLUC** — Red ***BL** — Blue / **WLUC** — White **GL** — Green / ***BLUC** — Blue **AL** — Amber / **GLUC** — Green **CL** — Clear / **ALUC** — Amber * Not recommended for LED	**EXAMPLE:** 864-RL-DSC 864 = Model No.; RL = Lens Color DSC = Lens Style
874 T-1¾ BASED LAMP LENS BAYONET TYPE. SAME AS 864.			
107 T-1 BASED LAMP REAR RELAMPABLE. LENS STYLES AVAILABLE — STD, DS, DSC, Q, QB.		(Translucent) **R** — Red **W** — White ***B** — Blue **G** — Green **A** — Amber **C** — Clear	**EXAMPLE:** 107 = Body Type; RLUC = Lens Color DS = Lens Style; FB60 = Lamp Type
105 T-1 LAMP FIXED LENS STYLES AVAILABLE — STD, DS, DSC, Q, QB		(Transparent) / (Translucent) **RL** — Red / **RLUC** — Red ***BL** — Blue / **WLUC** — White **GL** — Green / ***BLUC** — Blue **AL** — Amber / **GLUC** — Green **CL** — Clear / **ALUC** — Amber * Not recommended for LED	**EXAMPLE:** 105 = Body Style; R = Lens Color STD = Lens Style; F60 = Lamp Type
106 T-1 LAMP FIXED			**EXAMPLE:** 106 = Model No.; CL = Lens Color F60 = Lamp Type
858 **862** FIXED NEON	 **MODEL NO.** / **A** / **B** 858 / 1/32 / 5/8 862 / 11/16 / 5/16	**R** — Red **W** — White * **B** — Blue * **G** — Green **A** — Amber **C** — Clear * Not recommended for Neon	**EXAMPLE:** 858-C-AIB-220K 858 = Model No.; C = Lens Color AIB = Lamp Type; 220K = Resistor
859 FIXED NEON			

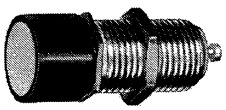
THE SLOAN COMPANY

"THE TOUCH OF BRILLIANCE IN PANEL DESIGN"

7704 San Fernando Road, P.O. Box 367, Sun Valley, CA 91353
(213) 875-1123 • TWX 910-498-2250

SERIES

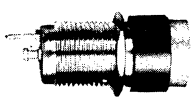
855 T-1¾ BASED LAMP



BODY STYLES AVAILABLE S OR SI

LENS STYLES AVAIL. — STD, DS, DSC, Q, QB, D, M, SE, MB

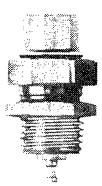
856 T-1¾ BASED LAMP



AVAILABLE IN BODY STYLE S ONLY

(2 TERMINAL BODY ONLY)
LENS STYLES AVAIL. — M, Q, DS, MB, QB, DSC

102

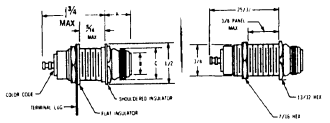


T-1 BASED LAMP

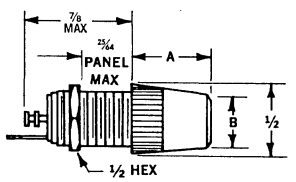
AVAILABLE IN ALL BODY TYPES

LENS STYLES AVAILABLE — STD, DSC, QB, DS, Q.

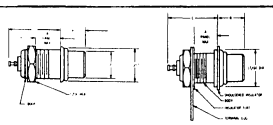
DRAWINGS



LENS STYLES	A — S	A — SI	B	C
STD	5/16	11/32	17/64	3/8
D	21/64	3/8	3/8	1/2
DS, DSC, Q, QB	23/64	25/64	23/64	7/16
M, MB	5/8	21/32	7/16	1/2
SE	27/64	15/32	—	1/2



LENS STYLE	A	B
M, MB	7/8	3/8
DS, DSC, Q, QB	13/32	15/32



BODY TYPES	A	B	C
SI	5/32	21/64	27/64
SSI	3/16	13/64	29/64
SKI	17/64	9/32	15/32
SRI	19/64	1/4	1/2
S	13/64	19/64	7/16
SS	15/64	17/64	15/32
SK	5/16	1/4	31/64
SR	11/32	7/32	33/64

LENS COLOR

TRANSLUCENT EXCEPT M & MB LENS

R — Red
W — White
*B — Blue
G — Green
A — Amber
C — Clear

(Transparent)	(Translucent)
RL — Red	RLUC — Red
*BL — Blue	WLUC — White
GL — Green	*BLUC — Blue
AL — Amber	GLUC — Green
CL — Clear	ALUC — Amber

* Not recommended for LED

M & MB LENS TRANSPARENT EXCEPT FOR WHITE

R — Red
W — White
*B — Blue
G — Green
A — Amber
C — Clear

ALL LENS EXCEPT M & MB

(Transparent)	(Translucent)
RL — Red	RLUC — Red
*BL — Blue	WLUC — White
GL — Green	*BLUC — Blue
AL — Amber	GLUC — Green
CL — Clear	ALUC — Amber

(Translucent)

R — Red
W — White
*B — Blue
G — Green
A — Amber
C — Clear

(Transparent)	(Translucent)
RL — Red	RLUC — Red
*BL — Blue	WLUC — White
GL — Green	*BLUC — Blue
AL — Amber	GLUC — Green
CL — Clear	ALUC — Amber

* Not recommended for LED

HOW TO ORDER

EXAMPLE:

855S (Body Type) G (Lens Color)
4 (Color Code) D (Lens Style)
327 (Lamp Type)

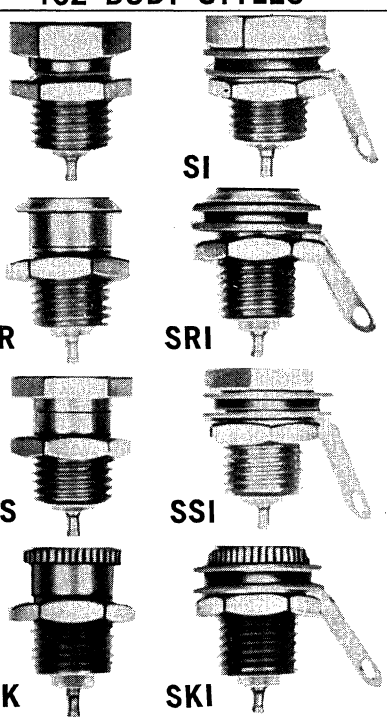
EXAMPLE:

856 (Model No.) R (Lens Color)
QB (Lens Style) 327 (Lamp Type)

EXAMPLE:

102SI-AL-DSC
102SI (Body Type) AL (Lens Color)
DSC (Lens Style)

102 BODY STYLES



102 LENS STYLES

STD

Full 180° visibility and maximum illumination

DS

Matte black anodized bezel prevents sidelight emission. Blends with dark colored panels; contrasts with light colored panels.

DSC

Aluminum anodized bezel (silver appearing) prevents sidelight emission. Blends with light colored panels; contrasts with dark colored panels.

Q

Aluminum anodized bezel (silver appearing) allows 180° visibility. Blends with light colored panels; contrasts with dark colored panels.

QB

Matte black anodized bezel. Allows 180° visibility. Blends with dark colored panels; contrasts with light colored panels.

855 LENS STYLES

STD

Flat slightly projected lens gives 180° visibility. Lens on the 855 differs, see drawing.

QB

Matte black anodized bezel. Allows 180° visibility. Blends with dark colored panels; contrasts with light colored panels. BI-COLOR has the added feature white when unlighted and colored when lighted.

DS

Matte black annodized bezel prevents sidelight emmision. Blends with dark colored panels; contrasts with light colored panels. BI-COLOR has the added feature, white when unlighted and colored when lighted.

D

Skirted lens covers, metal parts for neat panel appearance. Large lighted surface assures positive indication. BI-COLOR has the added feature white when unlighted and colored when lighted.

DSC

Aluminum anodized bezel (matte silver appearing) prevents sidelight emission. Blends with light colored panels; contrasts with dark colored panels. BI-COLOR has the added feature, white when unlighted and colored when lighted.

M

Large lens for maximum visibility from all angles. Engineered to offer the most uniform light distribution. Full 180° visibility.

Q

Aluminum anodized bezel (matte silver appearing) allows 180° visibility, blends with light colored panels; BI-COLOR has the added feature, white when unlighted and colored when lighted.

SE

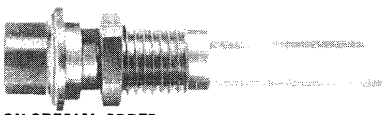
Edgelight for plastic panels. Small diameter light gasket minimizes wasted panel space. Can be relamped with gloved hands.

THE SLOAN COMPANY

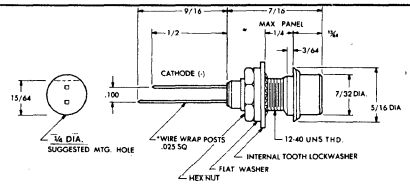
"THE TOUCH OF BRILLIANCE IN PANEL DESIGN"

7704 San Fernando Road, P.O. Box 367, Sun Valley, CA 91353
(213) 875-1123 • TWX 910-498-2250

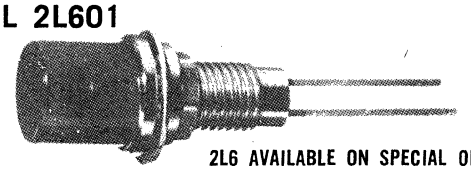
MODEL 2L501



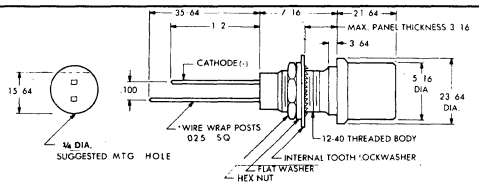
2L5 AVAILABLE ON SPECIAL ORDER



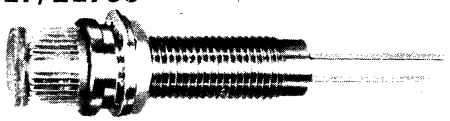
MODEL 2L601



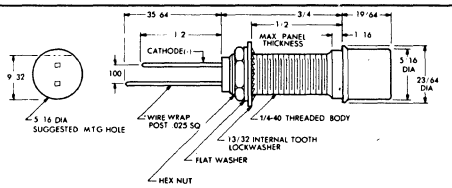
2L6 AVAILABLE ON SPECIAL ORDER



MODEL 2L7/2L703



WATERPROOF VERSION AVAILABLE



HOW TO ORDER

Example: 2A501W - ATP - F△ L● 5 / 20 - 2

MODEL

2L501
2R501 — Red
2A501 — Amber
2G501 — Green

2L601
2R601 — Red
2A601 — Amber
2G601 — Green

2L7
2R7 — Red
2A7 — Amber
2G7 — Green

2L703
2R703 — Red
2A703 — Amber
2G703 — Green

TERMINALS
W — Wire Wrap Post (Solderable)*
L — Wire Leads

LENS COLOR
R — Red
A — Amber
G — Green
C — Clear
W — White

LENS CHARACTERISTICS
TL — Translucent
TP — Transparent

LENS STYLE
F — Flat
D — Dome

LENSING
L — Lensed,
P — Plain

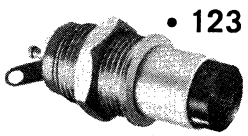
VOLTAGE†/CURRENT†
See below†

BODY
1 — "D" Flat
2 — Roun

2L601 — w/r — Voltage + current not to exceed .125W
w/o — 2.0 VDC (Typ), 35 mA (Max)
2L7/2L703 — w/r — Voltage + current not to exceed .500W
w/o — 2.0 VDC (Typ), 35 mA (Max)
2L501 — w/r — Voltage + current not to exceed .125W
w/o — 2.0 VDC (Typ), 50 mA (Max)

* — Wire Wrap is Gardner-Denver™ △ — 2L501 Only † — To order without internal resistor omit callout for voltage and current
● — 2L501/2L7/2L703

MODELS 121 • 122 • 123 • 124



- Front relampable.
- All models designed to use a T-1 flange based incandescent or LED lamp.
- All models are two terminal.
- RFI shielding can be provided on request.
- Hot stamping of lenses can also be furnished upon request.
- A variety of lens colors available.
- Waterproof version available.

MODEL	BODY DIA.	MTG. HOLE	WATERPROOF
121	9/32	13/64	NO
122	9/32	13/64	YES
123	5/16	21/64	NO
124	5/16	21/64	YES

LENS STYLES

QB

Black anodized bezel allows 180° visibility. Blends with dark colored panels; contrasts with light colored panels.

Q

Aluminum anodized bezel allows 180° visibility. Blends with light colored panels; contrasts with dark colored panels.

STB

Full 180° visibility • Maximum illumination • Black bezel.

STC

Full 180° visibility • Maximum illumination • Black bezel.

DS

Black anodized aluminum bezel prevents sidelight emission. Blends with dark panels; contrasts with light colored panels.

DSC

Aluminum anodized bezel (silver appearing) prevents sidelight emissions. Blends with light colored panels; contrasts with dark colored panels.

HOW TO ORDER

Example: 121 B - RL - STB - 682

MODEL
121
122
123
124

BODY COLOR
B — Black (Anodize)
C — Clear (Anodize)

4LO ALSO AVAILABLE ON SPECIAL ORDER

LENS COLOR

Transparent	Translucent
RL — Red	RLUC — Red
AL — Amber	ADUC — Amber
GL — Green	GLUC — Green
BL — Blue	*BLUC — Blue*
CL — Clear	WLUC — White

* Not recommended for LED.

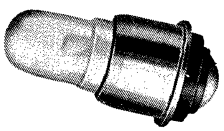
LENS STYLE
STB
STC
DS
DSC
QB
Q

LAMP
T-1 Incandescent or LED.
(Contact factory for lamp specifications)

THE SLOAN COMPANY
"THE TOUCH OF BRILLIANCE IN PANEL DESIGN"

7704 San Fernando Road, P.O. Box 367, Sun Valley, CA 91353
(213) 875-1123 • TWX 910-498-2250

4L001 SERIES
T-1 FLANGED BASE LED



ACTUAL SIZE

HOW TO ORDER

Example: 4R001

MODEL — LED COLOR

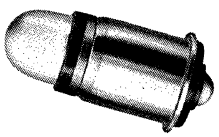
4R001 — Red
4A001 — Amber
4G001 — Green

ELECTRICAL

1.7-2.2 VDC (Typ)
@ 20 mA

4LO ALSO AVAILABLE ON SPECIAL ORDER

5L001 SERIES
T1-¾ FLANGED BASE LED



HOW TO ORDER

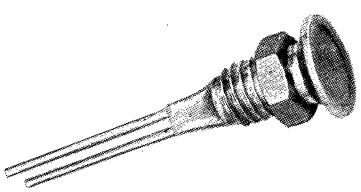
Example: 5A001 - 5 / 15

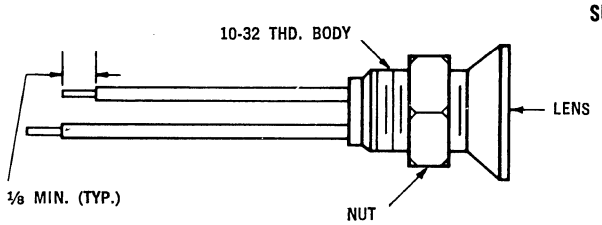
MODEL — LED COLOR	VOLTAGE	CURRENT
5A001 — Amber 5G001 — Green 5R001 — Red	†	†

ELECTRICAL

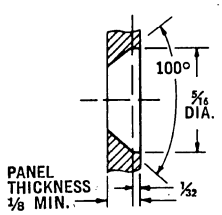
w/o Resistor — 2.0 VDC (Typ), 35 mA (Max)
w/Resistor — Voltage X current not to exceed .250W
† — To order without internal resistor omit callout for voltage and current.

MODEL 109 (INCANDESCENT)/1L9 (LED)





SUGGESTED MOUNTING



ELECTRICAL SPECIFICATIONS

LED

MODEL	CURRENT (mA)	VOLTAGE (Volts)
1R9	20	1.7 (TYP.)
1A9	20	2.2 (TYP.)
1G9	20	2.2 (TYP.)

Many other lamps available — consult factory.

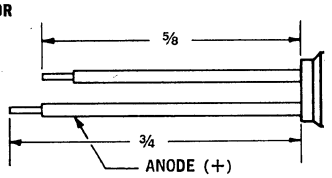
INCANDESCENT

MODEL	CURRENT (Amps)	VOLTAGE (Volts)
F60	.060	5.0
F44	.026	18.0
F59	.024	28.0

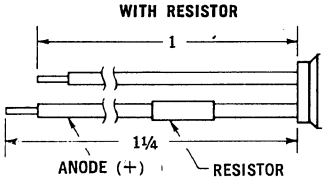
LEAD DIMENSIONS

1L9 (LED)

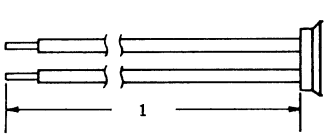
WITHOUT RESISTOR



WITH RESISTOR



109 (INCANDESCENT)



HOW TO ORDER

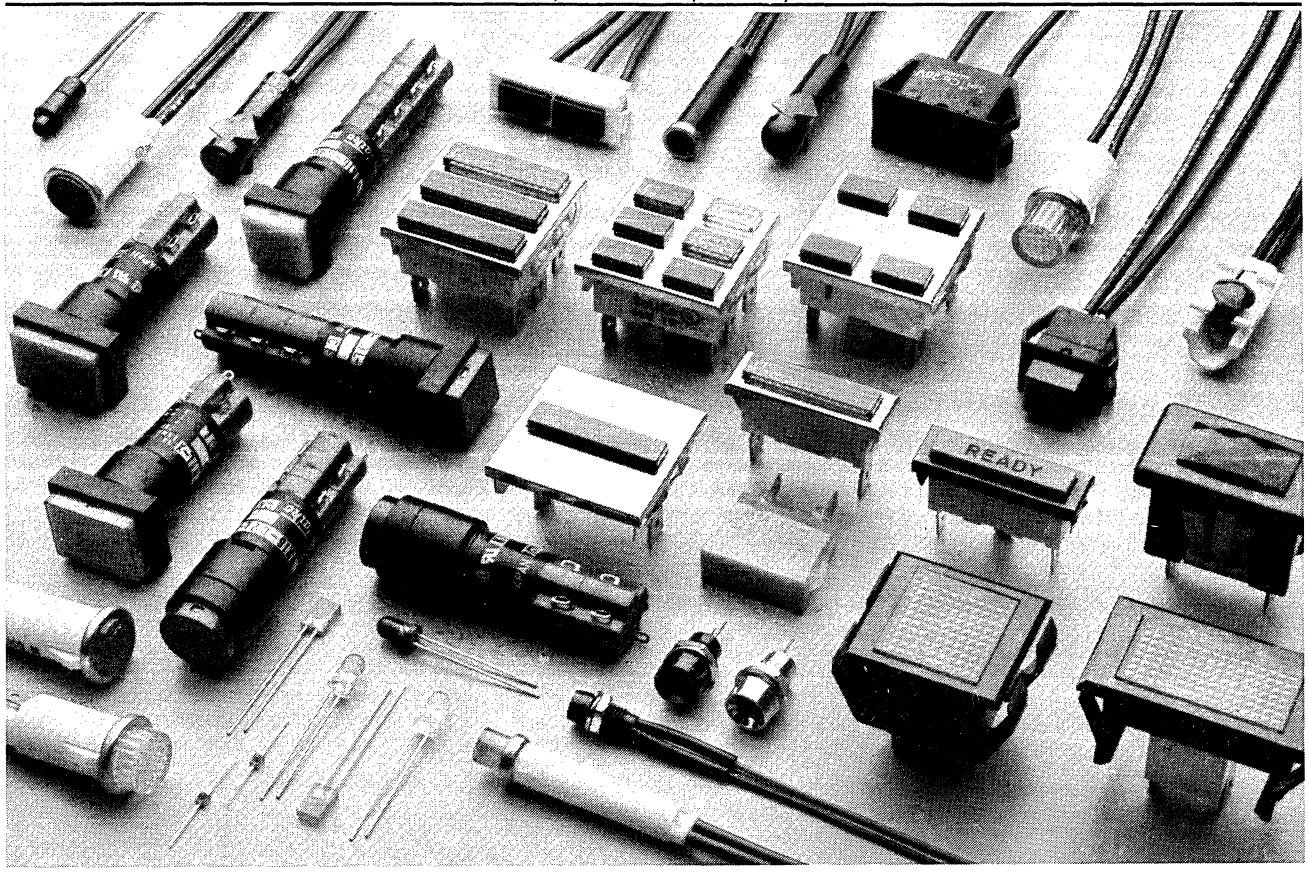
Examples: 1R9 - R TP - 5/15 - 6″

MODEL	LENS COLOR	LENS TYPE	VOLTAGE/ CURRENT	LEADS
1R9 — Red 1G9 — Green 1A9 — Amber	R — Red G — Green A — Amber C — Clear W — White	TP — Transparent TL — Translucent	To order without resistor omit callout for voltage and current.	Extended leads in inches (if required).

Examples: 109 - G TL - F60 - 12″

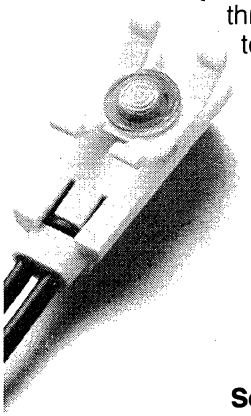
MODEL	LENS COLOR	LENS TYPE	LAMP TYPE	LEADS
109	R — Red G — Green A — Amber B — Blue C — Clear W — White	TP — Transparent TL — Translucent	F60 F59 F44	Extended leads in inches (if required).

SoLiCo has lots of ways to see the light.

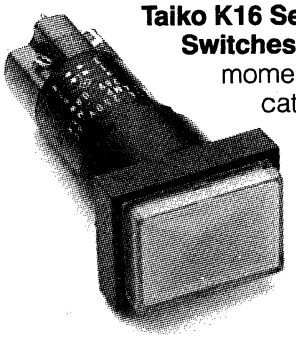


SoLiCo pilot lights, indicator lights and lighted pushbuttons come in a wide variety of styles and sizes for a broad range of products and applications. Give us your panel depth, required hole size, mounting method, lens size and style, material, and termination. Chances are, we'll have an inexpensive standard part for your needs. We'll even send you a free sample on request.

Series 8000 Snap-in Indicator Lights. Real time savers. Snap into .375″ hole from front of panel. Pre-wired leads. Red, green, yellow or amber LED's. Red or green neon. Lens bodies domed or flat, translucent or transparent. Bright, quick, easy.



QM-100 Snap-in Indicator Lights. Lens fits through panel front. Lamp snaps to it from back. Pre-wired 6″ leads. Standard blue or green neon lamp. 4 lens shapes, 6 colors. UL and CSA rated at 125–250V.

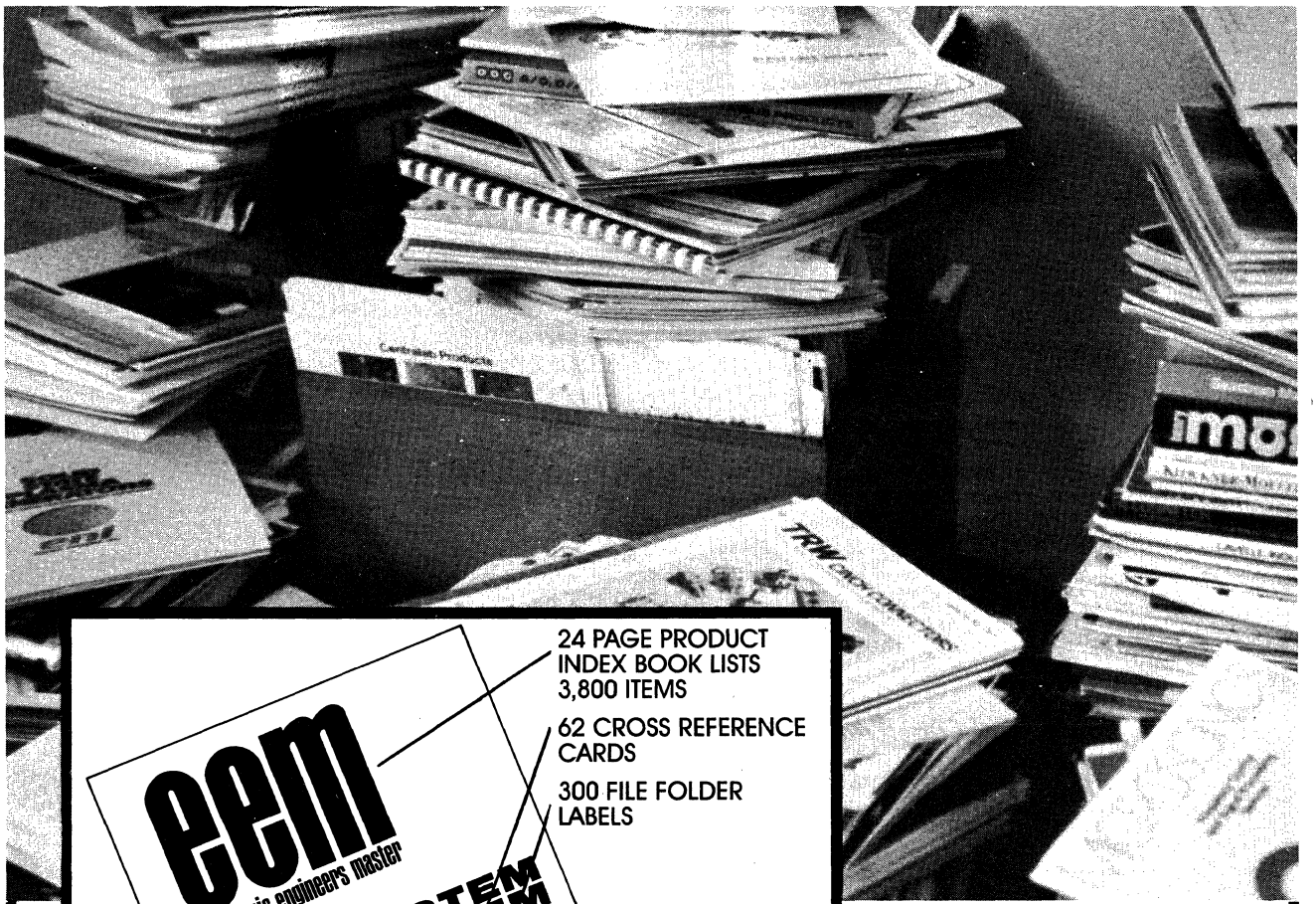


Taiko K16 Series Lighted Pushbutton Switches. Incandescent or LED. In momentary, maintained, and indicator styles. Solder lug terminals, independent lamp terminals, and T1 BiPins for durability. Round, square, or rectangular. Lenses clear or in 5 colors. 1, 2, 3, or 4-pole double-make/double-break contacts. Fit 5/8″ round hole.

Special items and special assistance, too. Contact our factory sales department for quick solutions to unique lighting demands. Technical aid is always available to help you find the light that's best for your application. To find out just how many ways SoLiCo can help you see the light, call for our full-line brochure—**(203) 527-3092**

SoLiCo

Sorenson Lighted Controls, Inc. 75 Locust Street, Hartford, CT 06114



ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

SIGNALEX®

HIGH VISIBILITY DISPLAYS

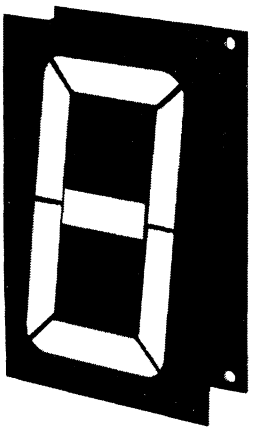
ENERGY-SAVING: Electromagnetically-operated Signalex displays require no power to maintain continuous indication. Inherently bi-stable, Signalex displays draw power only at the instant of change.

INHERENT MEMORY: Indication is maintained even with loss of power.

DIRECT ACCESS: Signalex displays can change from one number to any other—without a run-through of numbers. The unit immediately displays the transmitted number.

LOW MAINTENANCE: The rugged Signalex design assures long life and dependability. With no bulbs to replace, they are virtually maintenance-free.

HIGH-VISIBILITY: Signalex displays can be used indoors and out, in temperatures ranging from -40°C to +75°C. Their light-reflecting segments give high visibility in bright ambient light.


402L

7 SEGMENT MODELS

DISPLAY SIZES	1½"	4"	6"	9"	12"	18"	24"
SIGNALEX MODEL	152L	402L	602L	900L	1200L	1810L	2410L
Character Size H x W	1-9/16" x 15/16" (40 x 24 mm)	4-1/16" x 2-5/16" (103 x 59 mm)	6-1/16" x 3-9/15" (154 x 91 mm)	9" x 6" (228 x 152 mm)	12" x 8" (305 x 204 mm)	18" x 12" (46 x 30 cm)	24" x 16" (61 x 41 cm)
Vane Width	5/32" (4 mm)	7/16" (11 mm)	11/16" (17 mm)	1-1/8" (29 mm)	1-1/2" (38 mm)	2-1/4" (5.7 cm)	3" (7.6 cm)
Frame Size H x W	1-7/8" x 1-5/16" (49 x 33 mm)	5" x 3-1/4" (127 x 83 mm)	7-1/4" x 5-1/8" (184 x 130 mm)	11" x 8-1/4" (279 x 210 mm)	14" x 11" (356 x 279 mm)	21" x 16½" (533 x 419 mm)	28" x 22" (711 x 559 mm)
Pulse Length, min.	30 ms	50 ms	90 ms	150 ms	200 ms	300 ms	400 ms
Pulse Power, Each Vane	0.35 W	0.93 W	1.4 W	3.6 W	3.6 W	9.0 W	9.0 W
Viewing Dist., max.	50 Feet (15 Meters)	160 Feet (50 Meters)	240 Feet (75 Meters)	360 Feet (110 Meters)	480 Feet (150 Meters)	720 Feet (220 Meters)	960 Feet (300 Meters)
Weight	2-1/4 oz. 65 gm.	8-1/2 oz. 240 gm.	12-2/3 oz. 360 gm.	1-1/2 lbs. 680 gm.	2-1/4 lbs. 1020 gm.	4-1/2 lbs. 2. kg	6 lbs. 2.7 kg

U.S. Patent Nos. 3,886,545; 4,117,478; U.S. Design Patent 249,985 and Patents Pending

Operation: Individually controlled segments, pulse-operated through a bi-stable magnetic circuit.

Voltage: 12V. DC ±10% standard. Other voltages available.

Coils: Standard is bifilar wound with 3 leads per segment. Model 152L has terminal pins for direct PCB mounting.

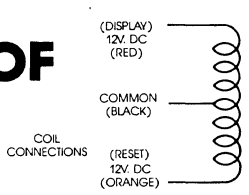
Temperature: -40°C to +75°C.

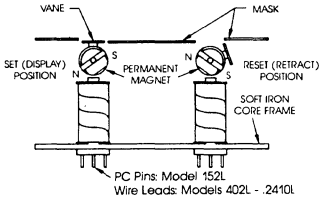
Relative Humidity: Up to 95% R.H. at any temperature in the range, provided no consideration present.

Power to Maintain Display: NONE

Vane Colors: White, Saturn-Yellow, Orange-Red Fluorescents. Black background standard. Other high-visibility colors available.

PRINCIPLE OF OPERATION





Signalex® displays operate on a well-proven electromagnetic principle. A short pulse in a coil produces a magnetic field that acts upon a permanent magnet located in a rotor, part of which is the vane itself.

The magnet is either attracted or repelled, turning the rotor and vane with it. In either display or reset position the magnetic circuit is stable so that the vane can remain in either position with no power in the coil. The permanent magnet pole is attracted to the soft iron core which will hold the vane in position until a reverse pulse is passed.

The rotor and magnet assemblies are the only moving parts in the display. Their light weight and low inertia give fast response time. High lubricity plastic bearings are used.

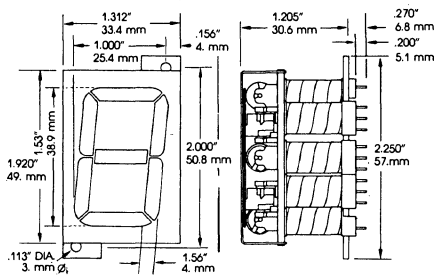
THE STAVER COMPANY INCORPORATED
41 Saxon Avenue, P.O. Box H, Bay Shore, NY 11706
(516) 666-8000 TLX: 6711657 STAVER

SIGNALEX®

SIGNALEX®

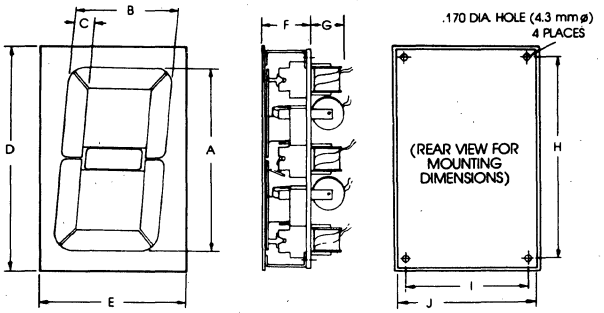
HIGH VISIBILITY 7-SEGMENT DISPLAYS

MODEL 152L



Connections: 3 per coil (1 to display, 1 to reset, 1 common)
Pulse Power: 31ma at 12V.
Pulse Length: 30ms min., display or reset
Character Slope: 5°
Visibility: Up to 70° either side of perpendicular to the front face.
Temperature Range: -40°C to + 75°C

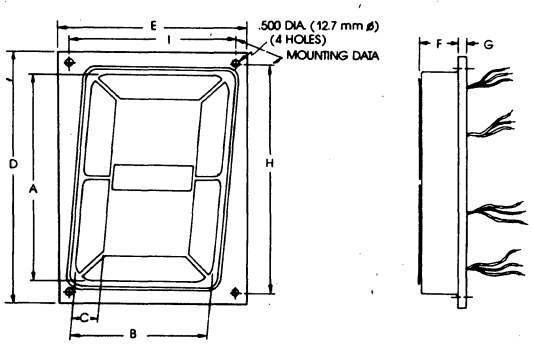
MODELS 402L & 602L



Materials: Front Mask: Steel, Bearings: Polyester.
Hazardous Areas: Recognized by Underwriters Laboratories, Inc., No. MH10471. BASEEFA Class 2 No. 4054 J.

(in.) Dim.	A	B	C	D	E	F	G	H	I	J
Model 402L	4-1/16	2-5/16	7/16	5	3-1/4	1-1/16	3/4	4-1/2	2-5/8	3-1/8
Model 602L	6-1/16	3-9/16	11/16	7-1/4	5-1/8	1-5/16	3/4	6-1/2	4-1/2	5

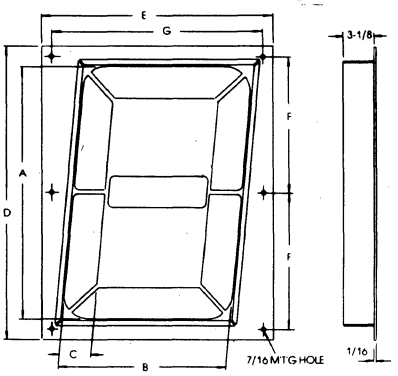
MODELS 900L & 1200L



(in.) Dim.	A	B	C	D	E	F	G	H	I
Model 900L	9	6	1-1/8	11	8-1/4	2-1/32	3/16	10°	7-1/4°
Model 1200L	12	8	1-1/2	14	11	2-1/16	3/16	13	10

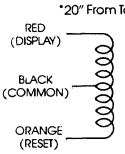
Length of Leads: 7" Min. for 402L & 602L. 30" Min. for 900L & 1200L
Bearings: High lubricity polyester, replaceable.
Vanes: Individually replaceable.
Visibility: 402L & 602L Series—To 60° either side.
900L & 1200L Series—To 75° either side.

MODELS 1810L & 2410L

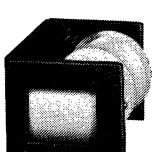


(in.) Dim.	A	B	C	D	E	F	G
TYPE 1810L	18"	12	2 1/4	21	16 1/2	20°	14 1/2
TYPE 2410L	24"	16	3	28	22	13	20

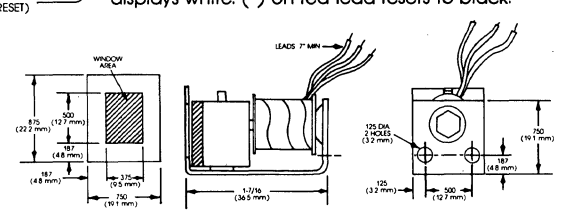
*20° From Top to Bottom MTG Hole. No Center Holes.



Coil Connection (402L & larger) (7 coils per digit)
With black lead connected to (-), (+) on red lead displays white. (+) on orange lead resets to black.
With black lead connected to (+), (-) on orange lead displays white. (-) on red lead resets to black.



SIGNALEX® TYPE A ANNUNCIATOR



Window Size: 3/8" H x 1/2" W (9.5 mm x 12.7 mm)
Displays per Window: 2
Operating Temp. Range: -40°C to +75°C
Operating Mode: Bi-stable, pulsed
Min. Pulse Length: 30ms. either display
Power/Pulse: 1.1W
Coil Resistance: 125. Ω ± 10%
Standard Voltage: 12 V. DC*
Standard Colors: Black & White, Yellow, Red.*
Leads: 7" Min.:
*Others Available.

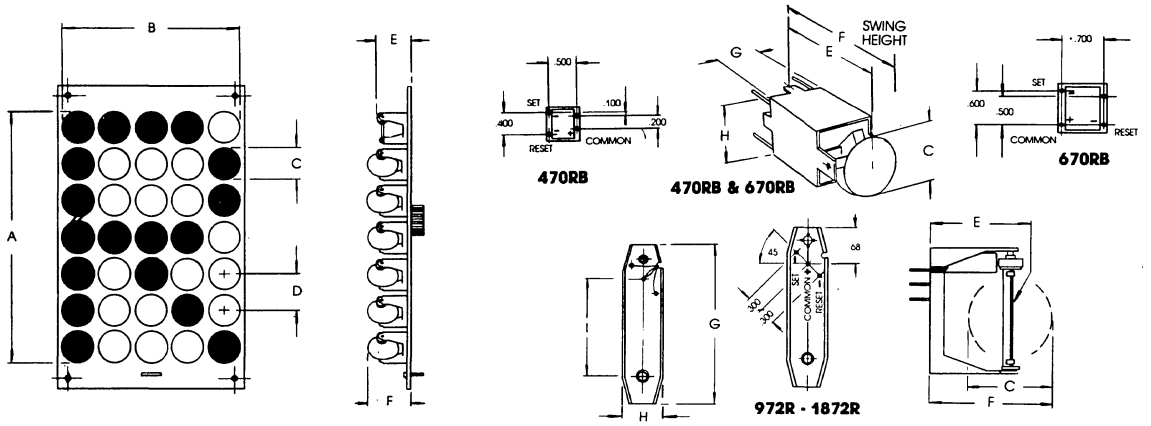
U.S. Patent No. 3,936,818

THE STAVER COMPANY INCORPORATED
41 Saxon Avenue, P.O. Box H, Bay Shore, NY 11706
(516) 666-8000 TLX: 6711657 STAVER

SIGNALEX®

SIGNALEX®

HIGH VISIBILITY ALPHANUMERIC DISPLAYS AND INDIVIDUAL GRAPHIC ELEMENTS



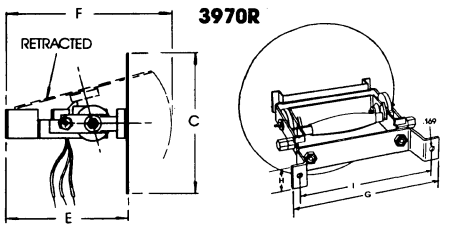
Model Number	Dim. A Char. Hgt. in.	mm.	Dim. B Char. Width in.	mm.	Dim. C Dot Dia. in.	mm.	Dim. D Dot Pitch in.	mm.	Dim. E Display Hgt. in.	mm.	Dim. F Swing Hght. in.	mm.	Dim. G Length in.	mm.	Dim. H Width in.	mm.	Dim. I Mounting in.	mm.
470R	4.06	103	2.62	67	.5	12.7	.593	15.1	.98	24.9	1.13	28.6	.58	14.7	.58	14.7	—	—
670R	6.00	152	4.25	108	.75	19.0	.875	22.2	1.33	33.8	1.57	39.7	.84	21.3	.84	21.3	—	—
972R	9.00	230	6.37	162	1.12	28.0	1.31	33.3	1.45	36.8	2.10	53.3	1.81	46.0	.75	19.0	.596	15.1
1272R	12.00	300	8.50	216	1.50	38.0	1.75	44.5	1.45	36.8	2.29	58.2	2.24	56.9	.75	19.0	1.026	26.1
1672R	16.00	406	11.37	289	2.00	51.0	2.34	59.5	1.45	36.8	2.54	64.5	2.74	69.6	.75	19.0	1.526	38.8
1872R	18.00	457	12.75	324	2.25	57.0	2.62	66.7	1.45	36.8	2.66	67.6	2.99	76.0	.75	19.0	1.776	45.1
3970R	39.50	1000	28.00	711	5.00	127.0	5.75	146.0	4.30	109.2	5.87	149.1	4.50	114	1.0	25.4	4.000	102.0

U.S. Patent Nos. 4,327,357; 4,393,362 and Patents Pending

ELECTRICAL DATA

SPECIFICATIONS	470RB	670RB	972R-1872R	397OL	397OR
Pulse Length, Min. @ 12V	2ms	2ms	2ms	300ms	—
Pulse Length, Min. @ 16V	1ms	1ms	1ms	225ms	—
Pulse Length, Min. @ 30V	.4ms	.4ms	.4ms	—	2ms
Current @ 12V Single Coil	.27 amp	.34 amp	.29 amp	.35 amp	1.5 amp*
Current @ 12V Bifilar Coil	.54 amp	.68 amp	.58 amp	.70 amp	3.0 amp*
Type of Coil	Center Tapped Coil with 3 Terminals				
DC Res. Center to Each Side	22.5	17.5	20.5	17	8.5
Operating Temperature Range	All Models -40 C to +75 C				
Operating Rel. Humidity	All Models: Up To 95% @ +75 C				
Standard Colors	All Models: White, Yellow, Red				

*30 Volts



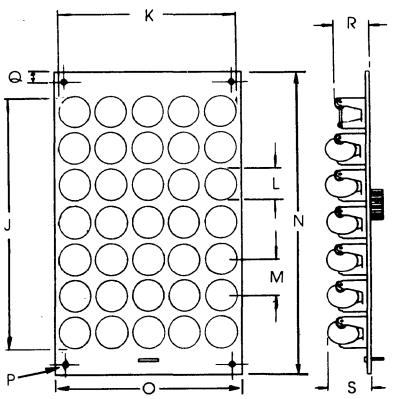
35 DOT 7 X 5 ALPHANUMERIC MATRICES

Model Number	Dia. J Char. Hght. in.	mm.	Dia. K Char. Width in.	mm.	Dia. L Dot Dia. in.	mm.	Dia. M Dot. Pitch in.	mm.	Dia. N Matrix Hght in.	mm.	Dia. O Matrix Width in.	mm.	Dia. P Mtg. Hole in.	mm.	Dia. Q Hole Offset in.	mm.	Dia. R Thickness in.	mm.	Dia. S Swing Hght in.	mm.
670R-35BC	6	152	4.25	108	.75	19	.875	22.2	7.75	197	4.25	114	.178	4	.25	6	1.35	34	1.57	39.7
972R-35BC	9	230	6.37	162	1.12	28	1.31	33.3	11.87	301	6.53	166	.195	5	.25	6	1.80	43	2.07	52.6
1272R-35BC	12	300	8.50	216	1.50	38	1.75	44.5	15.00	386	8.72	224	.195	5	.50	13	1.80	43	2.25	57.2
1672R-35BC	16	406	11.37	289	2.00	51	2.34	59.5	19.50	502	11.69	301	.195	5	.50	13	1.80	43	2.54	64.5
1872R-35BC	18	457	12.75	324	2.25	57	2.62	66.7	21.63	557	13.09	337	.195	5	.50	13	1.80	43	2.66	67.6

SPECIFICATIONS—ALL MATRIX MODELS

	670R-35BC	972R-1872R-35BC
Pulse Length, Min. @ 12V	2ms	2ms
Pulse Length, Min. @ 18V	1ms	1ms
Pulse Length, Min. @ 36V	.5ms	.5ms
Current Each Dot @ 12V	680ma	580ma
Coil Res. Center to Each Side	17.5 ohms	20.5 ohms
Coil Winding	Center Tapped Coil	
Coil Addressing	All Models	X-Y Matrix

	670R-35BC	972R-1872R-35BC
Ground Polarity	Negative	Negative
Diodes	1N4004	1N4004
PCB Material	FR-4 or Equivilent	
Operating Temperature Range	All Models: -40C to +75C	
Operating Rel. Humidity	All Models: Up To 95% @ + 75C	
Standard Colors	All Models: White, Yellow, Red	



670R - 1872 R - 35BC

Signalex products are protected by the following patents: U.S. Pat. Nos. 3.886.545; 3.936.818; 4.177.478; 4.327.357; 4.393.362; U.S. Design Patent 249.985; and other Patents Pending.

Copyright 1985. Printed in U.S.A. Specifications are subject to change without notice. Signalex is a registered trademark of The Staver Company, Inc.

THE STAVER COMPANY INCORPORATED

41 Saxon Avenue, P.O. Box H, Bay Shore, NY 11706
(516) 666-8000 TLX: 6711657 STAVER

Copyright 1985
eem/1985

SIGNALEX®

EEM PRODUCT SELECTION GUIDES

Use the EEM Product Selection Guides. There are 34 Guides in this edition of EEM. See page 2 (A•2, B•2, C•2, D•2) of each volume to locate the Product Selection Guides that pertain to your needs.

SYLVANIA Miniature Lighting | GTE

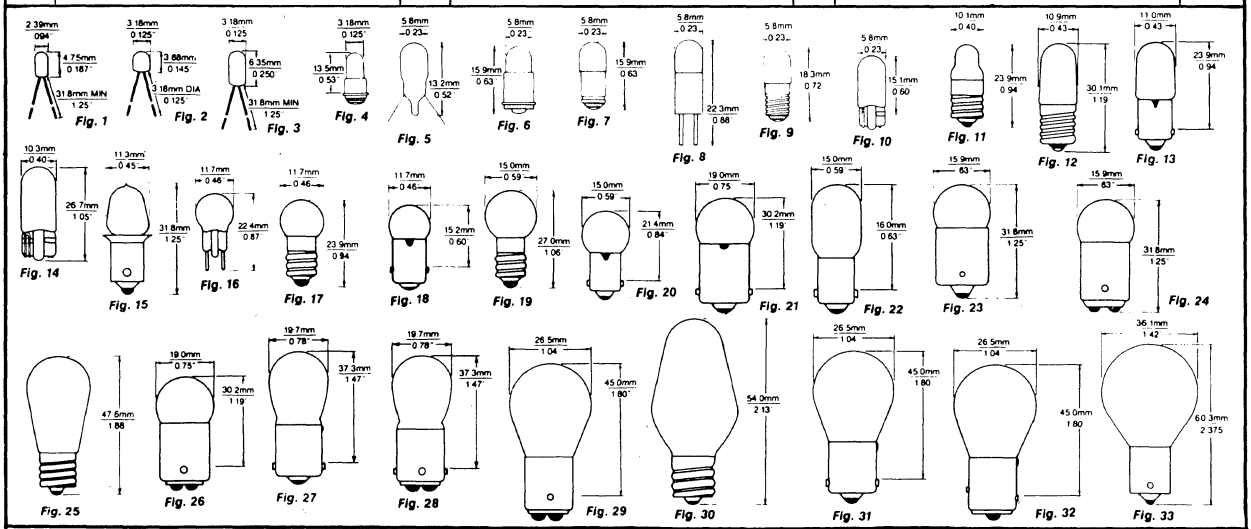
GTE Products Corporation
West Main Street, Dept. EM, Hillsboro, NH 03244
(603) 464-5533

MINIATURE, SUBMINIATURE AND MICROMINIATURE LAMPS

Lamp No.	Bulb	Volts	Amps	M.S. C.P.	Fig.
PR2	B-3½	2.38	.50	.80	15
PR3	B-3½	3.57	.50	1.50	15
PR4	B-3½	2.33	.27	.40	15
PR6	B-3½	2.47	.30	.45	15
PR7	B-3½	3.7	.30	.90	15
PR12	B-3½	5.95	.50	3.10	15
PR13	B-3½	4.75	.50	2.20	15
PR18	B-3½	7.2	.55	5.5	15
6S6	S-6	120	6W	.....	25
7C7	C-7	115–125	7W	.....	30
12	G-3½	6.3	.15	.35	16
13	G-3½	3.7	.30	.98	17
14	G-3½	2.47	.30	.50	17
19	G-3½	14.4	.10	.90	16
27	G-4½	4.9	.30	1.4	19
31	G-4½	6.15	.30	2.0	19
41	T-3¼	2.5	.50	.50	12
43	T-3¼	2.5	.50	.50	13
44	T-3¼	6.3	.25	.90	13
45	T-3¼	3.2	.35	.50	13
46	T-3¼	6.3	.25	.90	12
47	T-3¼	6.3	.15	.52	13
48	T-3¼	2.0	.06	.04	12
49	T-3¼	2.0	.06	.04	13
51	G-3½	7.5	.22	1.0	18
53	G-3½	14.4	.12	1.0	18
53X	G-3½	14.4	.12	1.0	18
55	G-4½	7.0	.41	2.0	20
57	G-4½	14.0	.24	2.0	20
57X	G-4½	14.0	.24	2.0	20
63	G-6	7.0	.63	3.0	21
67	G-6	13.5	.59	4.0	21
81	G-6	6.5	1.02	6.0	21
82	G-6	6.5	1.02	6.0	26
87	S-8	6.8	1.91	15.0	31
88	S-8	6.8	1.91	15.0	29
89	G-6	13.0	.58	6.0	21
93	S-8	12.8	1.04	15.0	31
112	TL-3	1.2	.22	.....	11
123	G-3½	1.25	.30	.10	17
136	G-4½	1.25	.60	.20	19

Lamp No.	Bulb	Volts	Amps	M.S. C.P.	Fig.
158	T-3¼	14.0	.24	2.0	14
161	T-3¼	14.0	.19	1.0	14
168	T-3¼	14.0	.35	3.0	14
194	T-3¼	14.0	.27	2.0	14
222	TL-3	2.25	.25	.....	11
301	G-5	28.0	.17	3.0	23
302	G-5	28.0	.17	3.0	24
303	G-6	28.0	.30	6.0	21
305	S-8	28.0	.51	15.0	31
307	S-8	28.0	.67	21.0	31
308	S-8	28.0	.67	21.0	29
309	S-11	28.0	.9	32.0	33
313	T-3¼	28.0	.17	3.5	13
327	T-1¾	28.0	.04	.34	6
328	T-1¾	6.0	.20	.34*	6
330	T-1¾	14.0	.08	.5	6
331	T-1¾	1.35	.06	.006	6
334	T-1¾	28.0	.04	.34	7
344	T-1¾	10.0	.014	.004	6
382	T-1¾	14.0	.08	.30	6
387	T-1¾	28.0	.04	.30	6
388	T-1¾	28.0	.04	.30	6
680	T-1	5.0	.06	.03	3
682	T-1	5.0	.06	.029	4
683	T-1	5.0	.06	.05	3
685	T-1	5.0	.06	.048	4
713	T-1	5.0	.075	.09	3
714	T-1	5.0	.075	.08	4
715	T-1	5.0	.115	.15	3
718	T-1	5.0	.115	.132	4
1003	B-6	12.8	.94	15.0	27
1004	B-6	12.8	.94	15.0	28
1034	S-8	12.8	1.80	32.0	32
		14.0	.59	3.0	
1076	S-8	12.8	1.80	32.0	29
1133	RP-11	6.2	3.91	32.0	34
1156	S-8	12.8	2.10	32.0	31
1157	S-8	12.8	2.10	32.0	32
		14.0	.59	3.0	

Lamp No.	Bulb	Volts	Amps	M.S. C.P.	Fig.
1176	S-8	12.8	1.34	21.0	29
		14.0	.59	6.0	
1183	RP-11	5.5	6.25	50.0	34
1195	RP-11	12.5	3.0	50.0	34
1445	G-3½	14.4	.135	.7	18
1447	G-3½	18.0	.15	1.5	17
1495	T-4½	28.0	.30	6.0	22
1764	T-1¾	28.0	.04	.34	5
1784	T-1¾	6.0	.20	.60	5
1813	T-3¼	14.4	.10	.86	13
1815	T-3¼	14.0	.20	1.4	13
1816	T-3¼	13.0	.33	3.0	13
1819	T-3¼	28.0	.04	.34	13
1820	T-3¼	28.0	.10	1.6	13
1829	T-3¼	28.0	.07	1.0	13
1847	T-3¼	6.3	.15	.38	13
1850	T-3¼	5.0	.09	.25	13
1864	T-3¼	28.0	.17	3.0	13
1869	T-1¾	10.0	.014	.004	5
1888	T-3¼	7.0	.50	2.0	13
1889	T-3¼	14.0	.27	2.0	13
1891	T-3¼	14.0	.24	2.0	13
1893	T-3¼	14.0	.33	2.0	13
1895	G-4½	14.0	.27	2.0	20
2162	T-1¾	14.0	.10	.5	5
2182	T-1¾	14.0	.08	.30	5
2187	T-1¾	28.0	.04	.30	5
6832	T-1	5.0	.06	.05	2
6833	T-¾	5.0	.06	.05	1
6838	T-1	28.0	.024	.15	3
6839	T-1	28.0	.024	.15	4
7152	T-1	5.0	.115	.15	2
7327	T-1¾	28.0	.04	.34	8
7328	T-1¾	6.0	.20	.6	8
7344	T-1¾	10.0	.014	.004	8
7382	T-1¾	14.0	.08	.30	8
7387	T-1¾	28.0	.04	.30	8
7931	T-1¾	1.35	.06	.006	8

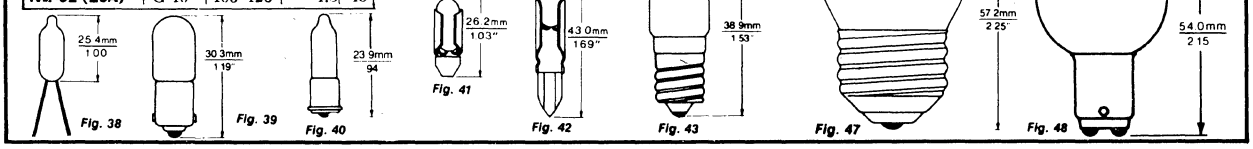


NEON GLOW INDICATOR LAMPS

Lamp No.	Bulb	Circuit Volts	Ext. Res. (K-ohms)	Fig.
NE-2 (A1A)	T-2	105–125	150	38
NE-2A (A2A)	T-2	105–125	220	38
NE-2V (A2B)	T-2	105–125	100	38
NE-2E (A9A)	T-2	105–125	100	38
NE-51 (B1A)	T-3¼	105–125	220	39
NE-51H (B2A)	T-3¼	105–125	27	39
NE-17 (B5A)	T-4½	105–125	30	45
NE-45 (B7A)	T-4½	105–125	None	43
NE-47 (B8A)	T-4½	105–125	30	44
NE-48 (B9A)	T-4½	105–125	30	45
NE-2H (C2A)	T-2	105–125	30	38
NE-2D (C7A)	T-2	105–125	100	40
NE-2J (C9A)	T-2	105–125	30	40
NE-57 (F3A)	T-4½	105–125	None	43
NE-58 (F4A)	T-4½	210–150	None	43
NE-30 (J5A)	S-11	105–125	None	47
NE-56 (J9A)	S-11	210–150	None	47
NE-84 (K1A5)	T-2	105–125	30	41
NE-32 (L5A)	G-10	105–125	4.8	48

NEON GLOW CIRCUIT COMPONENT LAMPS

Lamp No.	Bulb	Start. Volts (DC)	Nom. Cur. (mA)	Fig.
NE-96 (4AB)	T-2	120–150	0.5	38
NE-97 (4AC)	T-2	110–140	0.5	38
NE-23 (5AB)	T-2	60–90	0.3	38
NE-68 (5AC)	T-2	60–90	0.3	38
NE-81 (5AG)	T-2	64–80	0.3	38
NE-76 (5AG-A)	T-2	68–76	0.4	38
NE-83 (5AH)	T-2	60–100	5.0	38
NE-86 (5AJ)	T-2	55–90	1.5	38
NE-67 (6AC)	T-3¼	55–90	0.2	39
NE-16 (7AA)	T-4½	67–87	1.5	45
NE-3 (8AA)	T-2	55–90	0.3	46
NE-4 (8AB)	T-2	60–90	0.3	42
NE-75	T-2	60–90	0.4	38

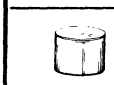


SYLVANIA Miniature Lighting | GTE

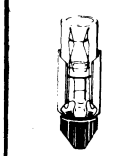
GTE Products Corporation
West Main Street, Dept. EM, Hillsboro, NH 03244
(603) 464-5533

SINGLE SOCKET ASSEMBLIES FOR T-2 SLIDE BASE INDICATOR LAMPS

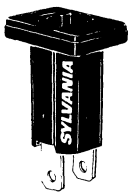
Available sockets include P N 30153 (round flange) and P N 30151 (rectangular flange). Sockets may be used with or without colored lens cap covering end of bulb which extends .18" beyond .09" flange. Socket P N 30153 (round flange) can also be used with round (.70" dia. x .48" high) or square (.70" x .70" x .48" high) lenses. Both sockets 1.14" M.O.L. Mounting hole, .50" dia. Sockets accept T-2 lamps rated at 4, 5, 6, 10, 12, 14, 16, 18, 24, 28 or 48 volts.



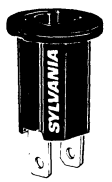
End Cap



Indicator Lamp

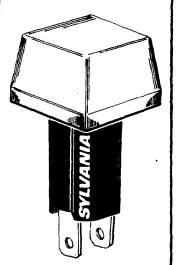


P/N 30151

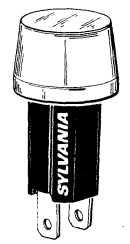


P/N 30153

With End Cap



With Square Lens



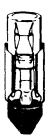
With Round Lens

*Polycarbonate end caps are press fit to the lamp; cannot be used with lamps rated over 1.1 watts. Pyrex end caps must be cemented to the lamp with a translucent silicone rubber adhesive.

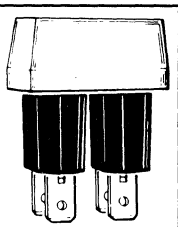
Part Number	Description
30151	Socket, rectangular flange
30153	Socket, round flange
38001	End cap, (*), red
38002	End cap, (*), yellow
38003	End cap, (*), white
38004	End cap, (*), green
38005	End cap, (*), blue
38006	End cap, (*), pearl white
38007	End cap, (*), orange
38071	End cap, Pyrex, red
38072	End cap, Pyrex, yellow
38073	End cap, Pyrex, white
38074	End cap, Pyrex, green
38075	End cap, Pyrex, blue
30160	Lens, round, red
30161	Lens, round, clear
30162	Lens, round, amber
30163	Lens, round, white
30164	Lens, round, green
30165	Lens, round, blue
30170	Lens, square, red
30171	Lens, square, clear
30172	Lens, square, amber
30173	Lens, square, white
30174	Lens, square, green
30175	Lens, square, blue

TWIN LIGHT ASSEMBLIES FOR T-2 SLIDE BASE INDICATOR LAMPS

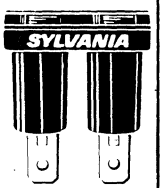
T-2 lamp



Complete Ass'y.

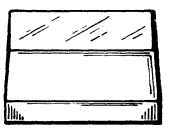


TWIN LIGHT SOCKETS



Ordering Number	Description	No. of Contacts
31351	Both sides common	2
31352	One side common	3
31353	Individual contacts	4

TWIN LIGHT LENSES



Ordering Number	Color
30180	Red
30182	Amber
30183	White
30184	Green
30185	Blue

STRIP SOCKET ASSEMBLIES FOR T-2 SLIDE BASE INDICATOR LAMPS

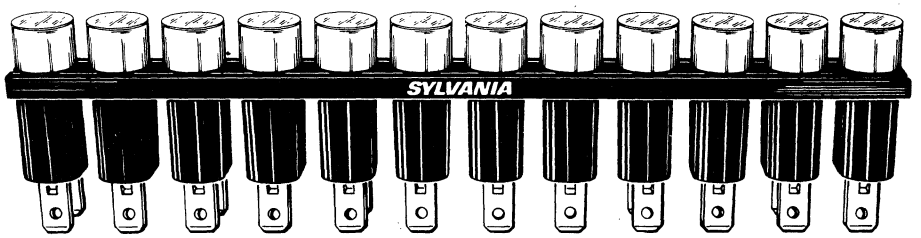


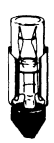
Illustration is of strip of 12 sockets complete with T-2 Slide Base Indicator Lamps and end caps.

Strip socket assemblies may be used with or without end caps listed above. Polycarbonate caps are press fit to the lamp; cannot be used with lamps rated over 1.1 watts. Pyrex caps must be cemented to the lamp with a translucent silicone rubber adhesive. Strip socket assemblies are available with 2 thru 12 sockets on 1 2" or 3 4" centers; common ground or individual contacts. Sockets accept T-2 indicator lamps rated at 4, 5, 6, 10, 12, 14, 16, 18, 24, 28 or 48 volts.

INDICATOR LAMP STRIP SOCKETS

Number of Sockets	Ordering Number 1/2" Centers Common Ground	1/2" Centers Individual Contacts	3/4" Centers Common Ground	3/4" Centers Individual Contacts
2	31301	31311	31321	31337
3	31302	31312	31322	31338
4	31303	31313	31323	31334
5	31304	31314	31324	31339
6	31305	31315	31325	31333
7	31306	31316	31326	31340
8	31307	31317	31327	31341
9	31308	31318	31328	31342
10	31309	31319	31329	31343
11	31310	31320	31330	31344
12	31250	33250	31275	33275

T-2 SLIDE BASE INDICATOR LAMPS FOR ABOVE ASSEMBLIES



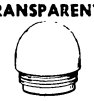
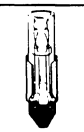
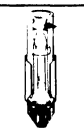
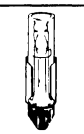
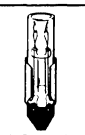
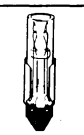
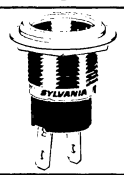
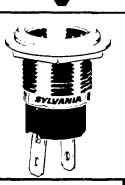
Lamp Number	Design Volts	Design Amperes	Design Watts	Filament	M.S.C.D.	Average End Foot Candles	Rated Average Life (Hrs.)
4ESB	4.0	.040	.16	C-6	.03	200	10,000
5ESB	5.0	.040	.20	C-6	.04	225	8,000
6ESB	6.0	.040	.24	C-2V	.025	250	10,000
53B	6.0	.240	1.44	C-2V	.24	2,000	5,000
10ASB	10.0	.010	.10	C-2F	.001	.....	50,000
10CSB	10.0	.017	.17	C-2V	.01	60	20,000
10ESB	10.0	.040	.40	C-2V	.07	450	10,000
12ESB	12.0	.040	.48	C-2V	.09	650	10,000
14FSB	14.0	.080	1.12	C-2F	.50	4,000	500
16CSB	16.0	.017	.27	C-2F	.016	80	15,000
16ESB	16.0	.040	.64	C-2F	.17	800	7,500
18ESB	18.0	.040	.72	C-2F	.14	850	5,000
24CSB	24.0	.017	.42	C-2F	.02	100	15,000
24ESB	24.0	.040	.96	C-2F	.12	850	8,000
28ESB	28.0	.040	1.12	C-2F	.25	1,500	6,000
48ESB	48.0	.040	1.92	CC-2F	.44	3,000	5,000

SYLVANIA Miniature Lighting | GTE

GTE Products Corporation
West Main Street, Dept. EM, Hillsboro, NH 03244
(603) 464-5533

UNIVERSAL PILOT LAMP HOUSING FOR T-2 SLIDE BASE PILOT LAMPS

A variety of lens styles, each available in a choice of colors, plus a standard socket (P. N 30099) provide a wide choice of configurations for virtually every application when used with T-2 slide base Pilot Lamps rated at 5, 6, 12, 28, 48, 60 or 120 volts. **Dimensions: Lenses**—Height, .38"; diameter, .63". **Socket**—Front of panel to end of terminals, .91"; mounting hole, .75" dia.

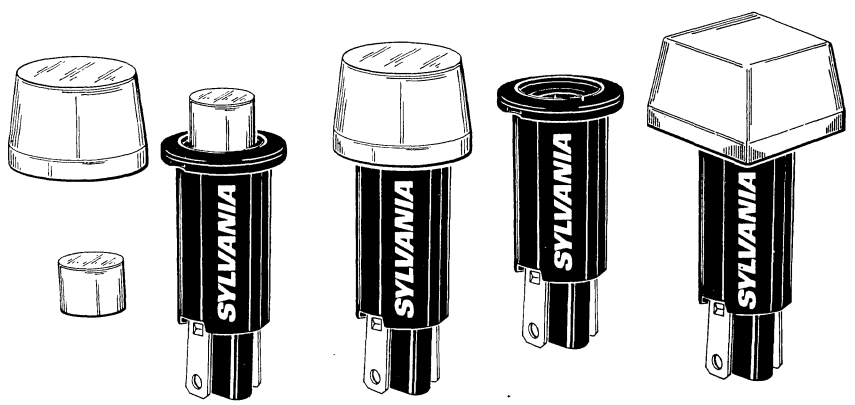
	FLAT TOP	JEWELED	TRANSPARENT	FLUTED	TRANSLUCENT
Choose your lens & color . . .					
add a T-2 Pilot Lamp . . .					
and insert into socket # 30099					

LENSE PART NO'S.	
30200	Flat Top Translucent—Red
30212	Flat Top Translucent—Green
30213	Flat Top Translucent—Blue
30214	Flat Top Translucent—Yellow
30100	Jeweled—Red
30102	Jeweled—Green
30103	Jeweled—Blue
30106	Jeweled—Amber
30110	Transparent—Red
30112	Transparent—Green
30113	Transparent—Blue
30111	Transparent—Amber
30114	Transparent—Yellow
30116	Transparent—Clear
30120	Fluted—Red
30122	Fluted—Green
30124	Fluted—Blue
30126	Fluted—Amber
30125	Fluted—Clear
30130	Dome Translucent—Red
30132	Dome Translucent—Green
30131	Dome Translucent—Yellow
30133	Dome Translucent—White

SOCKET	
30099	Socket

SINGLE SOCKET ASSEMBLIES FOR T-2 SLIDE BASE PILOT LAMPS

Socket P. N 30152 plus round (.70" dia. x .48" high) or square (.70" x .70" x .48" high) lens also uses T-2 slide base Pilot Lamps rated at 5, 6, 12, 24, 28, 48, 60 or 120 volts. Sockets can also be used without lens, with or without colored end cap covering end of bulb which extends .18" beyond .09" socket flange. **Dimensions:** Socket 1.31" M.O.L.; mounting hole .50" dia.



*Polycarbonate end caps are press fit to the lamp; cannot be used with lamps rated over 1.1 watts.

#Pyrex end caps must be cemented to the lamp with a translucent silicone rubber adhesive.

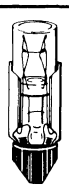
LENSES		
	Ordering Number	
Color	Round Lens	Square Lens
Red	30160	30170
Clear	30161	30171
Amber	30162	30172
White	30163	30173
Green	30164	30174
Blue	30165	30175

POLYCARBONATE END CAPS*	
Color	Ordering Number
Red	38001
Yellow	38002
White	38003
Green	38004
Blue	38005
Pearl White	38006
Orange	38007

PYREX END CAPS#	
Color	Ordering Number
Red	38071
Yellow	38072
White	38073
Green	38074
Blue	38075

SOCKET	
30152	Socket

T-2 SLIDE BASE PILOT LAMPS FOR ABOVE HOUSING AND ASSEMBLIES



Lamp No.	Design Volts	Amps	Watts	Filament	M.S. C.D.	Average End Foot Candles	Rated Average Life (Hours)
5SLB	5	.12	.6	C-2V	...	1,600	2,500
6PSB	6	.14	.8	C-2F	.12	500	20,000
6SLB	6	.144	.6	C-2V	...	1,700	2,500
12PSB	12	.17	2.0	C-2F	.35	2,000	12,000
24PSB	24	.073	1.7	C-2F	.50	3,000	10,000
28PSB	28	.04	1.1	C-2F	.29	1,600	5,000
48PSB	48	.053	2.5	C-7A	.7	1,800	7,500
60PSB	60	.05	3.0	C-7A	.73	2,600	7,500
120PSB	120	.025	3.0	CC-7A	.36	1,200	10,000

WIRE LEAD INDICATOR LAMPS

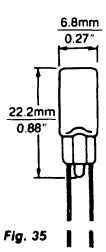


Fig. 35

Lamp No.	Volts	Amps.	M.S. C.P.
4ES	4	.04	.03
5ES	5	.04	.04
6ES	6	.04	.025
10AS	10	.01	.001
10CS	10	.017	.01
10ES	10	.04	.07
12ES	12	.04	.09
16CS	16	.017	.016
16ES	16	.04	.17
18ES	18	.04	.14
24CS	24	.017	.02
24ES	24	.04	.12
28ES	28	.04	.25
48ES	28	.04	.44

WIRE LEAD PILOT LAMPS

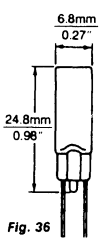


Fig. 36

Lamp No.	Volts	Amps	M.S. C.P.
6PS	6	.14	.12
12PS	12	.17	.35
24PS	24	.073	.5
28PS	28	.04	.29
48PS	48	.053	.7
60PS	60	.05	.73
120PS	120	.025	.36
120PS/6	120	.052	1.43

MINIATURE BAYONET BASE PILOT LAMPS

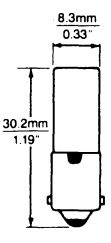


Fig. 37

Lamp No.	Volts	Amps	M.S. C.P.
6MB	6	.140	.12
12MB	12	.170	.35
24MB	24	.073	.50
28MB	28	.040	.29
48MB	48	.053	.70
60MB	60	.050	.73
90MB	90	.033	.37
120MB	120	.025	.36
120MB/6	120	.052	1.43

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M

MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O

OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P

PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

WPS word processing software

Y

YIG yttrium iron garnet

Z

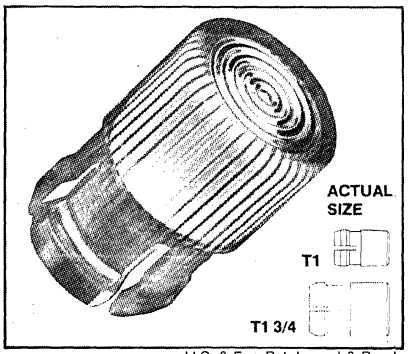
ZIF zero insertion force

VISUAL COMMUNICATIONS COMPANY

P.O. BOX 986 EL SEGUNDO, CALIFORNIA 90245 U.S.A. (213) 822-4727

MINIATURE INDICATORS

CLIPLITE® LENS/MOUNTS FOR T1 & T1 3/4 LEDs



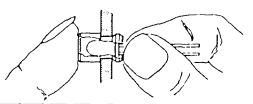
U.S. & For. Pat. Issued & Pend.

FEATURES

- Installs with finger pressure — no tools required —takes only six seconds
- Increases viewing angle up to 180 degrees using either diffused or point source LEDs
- Protects LED against being pushed back through panel — LED backout
- Moisture seals easily to panel with the application of common sealants
- Intensifies apparent brightness up to 125% by the use of striated lines and fresnel rings
- Guards against IC damage by electrostatic discharge transmitted thru exposed LED

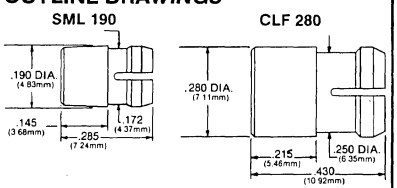
SIMPLE TWO-STEP INSTALLATION

1 Snap the CLIPLITE into panel hole.

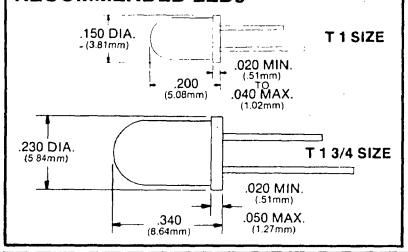


2 While holding the CLIPLITE tight to the panel with your finger, insert the LED into the CLIPLITE from the back.

OUTLINE DRAWINGS



RECOMMENDED LEDs



SPECIFICATIONS

MATERIAL — Polycarbonate

LENS — Flat top design using fresnel rings and striated lines

MOUNTING — Both size CLIPLITEs mount from the front of the panel. Holes should be deburred but not chamfered. The T1 3/4 mounts in a .250 ± .002 (6.35mm) hole on 3/8" centers. Panel thickness from 1/16" to 1/8". The T1 mounts in a .172 ± .002 (4.4mm) hole on 1/4" centers. Panel thickness from 1/32" to 1/16". P C BOARD attached T 1 LED, major dia. .125, slips into the SML 190 CLIPLITE mounted in a 1/16" thick panel.

NOTE: For panels less than prescribed, standard metal or plastic washers can be used to increase panel thickness.

ORDERING CODES

CLF 280 RTP

MODEL
SML 190 (T 1 SIZE)
CLF 280 (T 1 3/4 SIZE)

COLOR

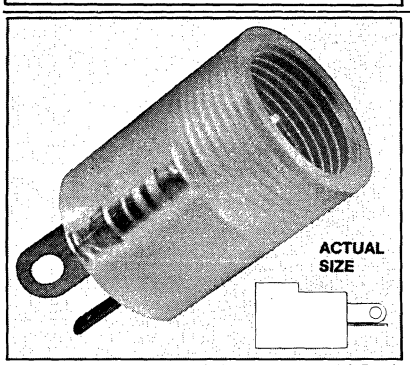
RTP Red Transparent	YTP Yellow Transparent
ATP Amber Transparent	CTP Clear Transparent
GTP Green Transparent	BTP Blue Transparent

OEM PRICES

QUANTITY	100	500	1000
SML 190	17.00/C	14.00/C	11.00/C
CLF 280	18.00/C	15.00/C	12.00/C

All colors can be combined for price advantage per line item. For higher quantity pricing contact VCC. Prices subject to change without notice.

CONXRITE® SOLDERLESS LED CONNECTOR

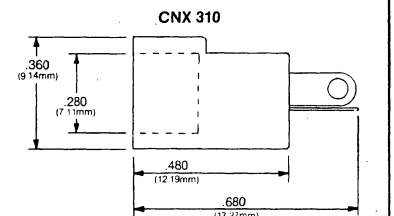


U.S. & For. Pat. Issued & Pend.

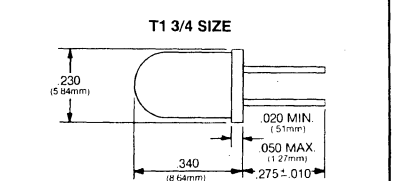
FEATURES

- Internal resistor for 3V to 28V circuits - when external resistor is required or desired Conxrite is available without built-in resistor
- Requires no tools — provides a simple fast press-fit connection to either Cliplite or clip mount
- Stress relieved connection controls the problem of broken LED leads
- When preassembled to the wiring harness final assembly of the panel mounted LED is greatly simplified
- Various colored Cliplite lenses are available for use with the Conxrite.
- Makes field replacement of defective LEDs practical and cost-effective

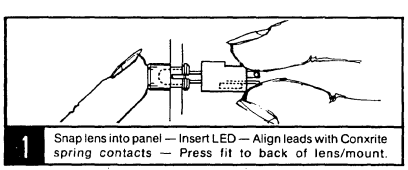
OUTLINE DRAWINGS



RECOMMENDED LEDs

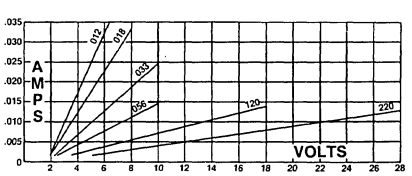


EASY INSTALLATION



1 Snap lens into panel — Insert LED — Align leads with Conxrite spring contacts — Press fit to back of lens/mount.

RESISTOR SELECTION GUIDE



SPECIFICATIONS:

MATERIAL:
Housing — Polypropylene (Natural)

Terminals — Phosphor bronze, tin-plated
Compatible with AMP FASTON Terminals

Resistor — Melf 1/4 watt resistor provides current limiting to 28 volts

Panel Mounts — Cliplite CLF 280 Series - Polycarbonate (see specs above). Clip mount polypropylene (Hewlett Packard P/N 5082-4707 or equal)

Note: Trim LED lead length to .275 ± .010 (7.24 .254mm)

ORDERING CODES

CNX 310 012

MODEL

RESISTOR CODE

CODE	VALUE	CODE	VALUE
000	NO RESISTOR	056	560 OHMS
012	120 OHMS	120	1200 OHMS
018	180 OHMS	220	2200 OHMS
033	330 OHMS		

OEM PRICES

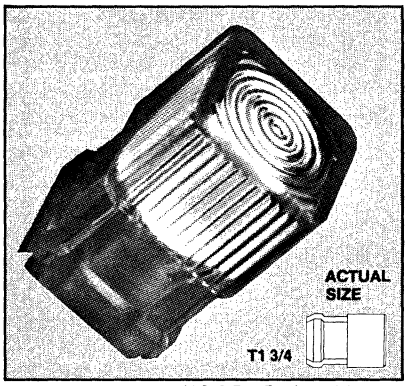
QUANTITY	100	500	1000
CNX 310 (NO RESISTOR)	.50	.43	.36
CNX 310 (RESISTOR)	.64	.55	.46

All units and values can be combined for price advantage. For higher quantity pricing contact VCC. Prices subject to change without notice.

VCC MINIATURE INDICATORS

VISUAL COMMUNICATIONS COMPANY

P.O. BOX 986 EL SEGUNDO, CALIFORNIA 90245 U.S.A. (213) 822-4727



U.S. & For. Pat. Issued & Pend.

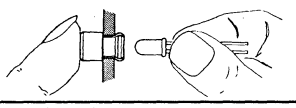
CUBELITE® SQUARE LENS/MOUNTS FOR LEDs

FEATURES

- Enhances aethestics — eliminates "dark corners"— produces a completely even light pattern
- Mounts either as a single square lens or stacks — gangs in bar configuration
- Increases viewing angle up to 180 degrees using either diffused or point source LEDs
- Intensifies apparent brightness up to 140% by the use of striated lines and fresnel rings
- Installs with finger pressure — no tools required —takes only six seconds
- Guards against IC damage by electrostatic discharge transmitted thru exposed LED

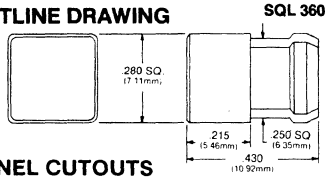
EASY TWO-STEP INSTALLATION

1 Snap CUBELITE in a ¼ inch square panel hole.

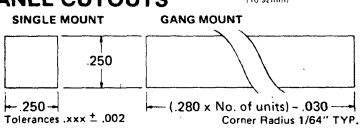


2 Holding CUBELITE firmly to panel, insert LED into CUBELITE from the back. Installs in just 6 seconds.

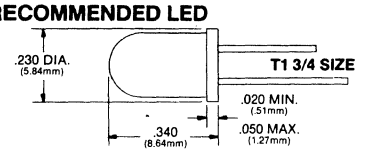
OUTLINE DRAWING



PANEL CUTOUTS



RECOMMENDED LED



SPECIFICATIONS

MATERIAL — Cellulose acetate butyrate

LENS — Square design using fresnel rings and striated lines

SINGLE MOUNT — Square punched hole .250 on 3/8" centers. Panel thickness 1/16" to 1/8"

GANG MOUNT — Slotted hole .250 by (.280 x No. of units) minus .030. Panel thickness 1/8"

Hole Tolerance: .XXX ± .002. Corner Radius 1/64" TYP Holes should be deburred but not chamfered

SUGGESTED PUNCH SOURCES — Porter Precision Cincinnati OH; Strippet Div. Houdaille Industries, Inc. Akron NY; Unipunch Products Inc. Buffalo NY; Wiederman Co. King of Prussia PA

ORDERING CODES

SQL 360 RTP

MODEL

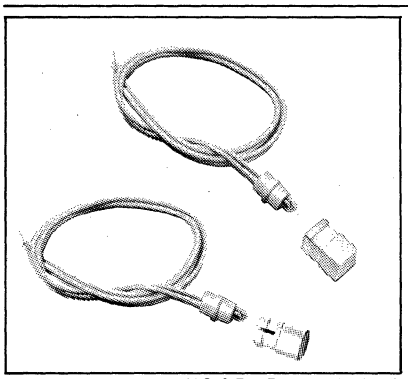
COLOR

RTP Red Transparent	YTP Yellow Transparent
ATP Amber Transparent	CTP Clear Transparent
GTP Green Transparent	BTP Blue Transparent

OEM PRICES

QUANTITY	100	500	1000
SQL 360	20.00/C	17.00/C	14.00/C

All colors can be combined for price advantage per line item. For higher quantity pricing contact VCC. Prices subject to change without notice.



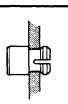
U.S. & For. Pat. Issued & Pend.

CLIPLITE®/CUBELITE® RD. & SQ. INCANDESCENT INDICATORS

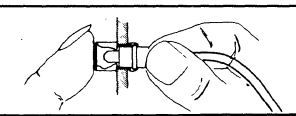
FEATURES

- Installs with finger pressure — no tools required — takes only 6 seconds
- Provides 180 degrees of visability using either transparent or translucent lenses
- Voltages vary from 5 to 28 — a special 5 volt lamp is available for IC compatibility
- Produces a brighter display than LEDs — provides extremely long life.

SIMPLE TWO-STEP INSTALLATION



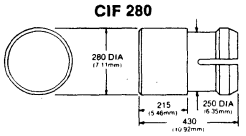
1 Snap lens into panel hole.



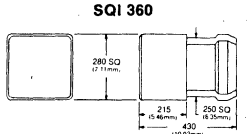
2 Holding lens firmly to panel, insert lamp into lens mount from the back. Installs in just 6 seconds.

OUTLINE DRAWINGS

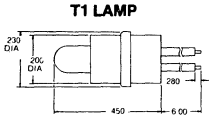
CIF 280



SQI 360



T1 LAMP



SPECIFICATIONS

CLIPLITE (CIF 280) — Produced from cellulose acetate butyrate plastic. Round design with flat top using fresnel rings and striated lines. Mounts from the front of the panel in a .250 ± .002 (6.35mm) hole on 3/8" centers. Panel thickness from 1/16" to 1/8". Holes should be deburred but not chamfered.

CUBELITE (SQI 360) — Produced from cellulose acetate butyrate plastic. Square shape with flat top using fresnel rings and striated lines. Single mount in a square punched hole .250 on 3/8" centers. Panel thickness 1/16" to 1/8". Gang mounts in a slotted hole .250 by (.280 X No. of units) minus .030. Panel thickness 1/8". Hole tolerance: .XXX ± .002; Corner Radius 1/64". Holes should be deburred but not chamfered.

LAMP — Aged and selected, fitted with a plastic base and using 6 inch 28 AWG stranded U.L. approved insulated leads. Available from 5 to 28 volts.

SUGGESTED PUNCH SOURCES — Porter Precision Cincinnati OH; Strippet Div. Akron NY; Unipunch Products Inc. Buffalo NY; Wielderman Co. King of Prussia PA

ORDERING CODES

CIF 280 RTL **05 020**

MODEL

CIF 280 (CLIPLITE)
SQI 360 (CUBELITE)

COLOR

LAMP NO.

VOLTS	/AMPS
05	020
05	060
14	040
28	024

RTL Red Translucent	RTP Red Transparent
GTL Green Translucent	ATP Amber Transparent
ATL Amber Translucent	GTP Green Transparent
WTL White Translucent	YTP Yellow Transparent
BTL Blue Translucent	CTP Clear Transparent
	BTP Blue Transparent

OEM PRICES — LAMP & LENS ASSEMBLY

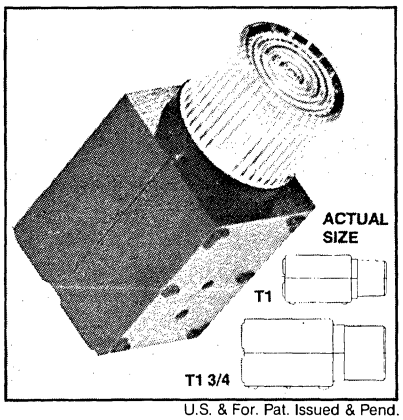
QUANTITY		1	50	100	500	1000
CIF 280	05 020	1.32	1.21	1.10	.95	.81
&	05 060	1.25	1.14	1.04	.90	.77
SQI 360	14 040	1.55	1.41	1.28	1.11	.95
	28 024	2.42	2.20	1.98	1.72	1.47

Lens colors can be combined for price advantage per line item only. For higher quantity pricing contact VCC. Prices subject to change without notice.

VCC MINIATURE INDICATORS

VISUAL COMMUNICATIONS COMPANY
P.O. BOX 986 EL SEGUNDO, CALIFORNIA 90245 U.S.A. (213) 822-4727

P-C-LITE® PCB MOUNTS FOR T1 & T1 3/4 LEDs



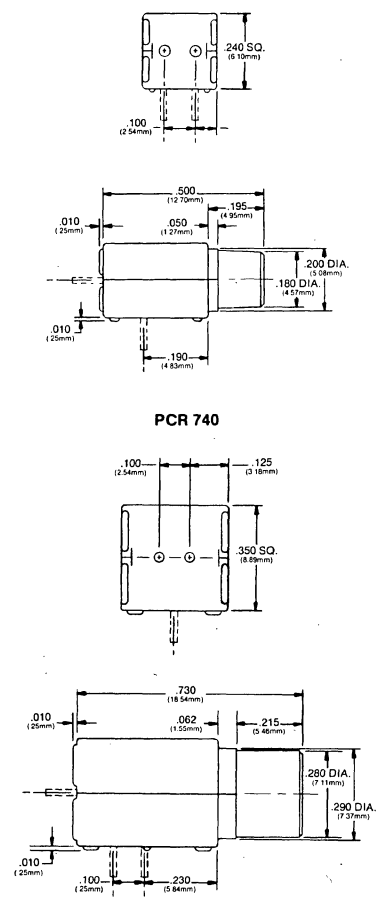
U.S. & For. Pat. Issued & Pend.

FEATURES

- Wave solders horizontally or vertically without special jigs or fixtures
- Stabilizes LED during packaging and physically protects after assembly
- Mounts flush, recessed or fully extended thru display panel without attachments
- Height compatible with switches and other circuit board mounted components
- Increases LED apparent brightness and viewing angle up to 180 degrees
- Guards against IC damage by electrostatic discharge transmitted thru exposed LED

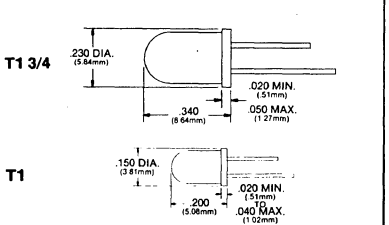
OUTLINE DRAWING

PCL 490

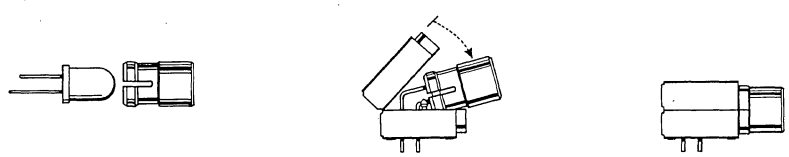


PCR 740

RECOMMENDED LEDs

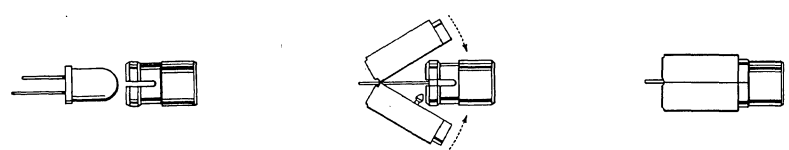


HORIZONTAL MOUNT



Snap LED into lens — insert LED leads through holes in mount base — close mount, bending leads into position.

VERTICAL MOUNT



Snap LED into lens — insert LED leads through holes in mount — close mount.

SPECIFICATIONS

BODY — General purpose nylon (black)

LENS — Cellulose acetate butyrate. Flat top design using fresnel rings and striated lines

MOUNTING — P C Board horizontally or vertically on .100 inch hole centers

(PCL 490) — Panel thickness from 1/64" to 3/16" thru a 7/32" (5.56mm) clearance hole

(PCR 740) — Panel thickness from 1/32" to 9/32" thru a 5/16" (7.94mm) clearance hole

Permits full projection to flush mounting of the lens portion thru the panel

LED Standard LEDs. See drawings to left. No attempt should be made to bend a lead with a stepped thickness

ORDERING CODES

PCL 490 RTP

MODEL

PCL 490 (T1 SIZE)
PCR 740 (T1 3/4 SIZE)

COLOR

RTP Red Transparent
ATP Amber Transparent
GTP Green Transparent
YTP Yellow Transparent
CTP Clear Transparent
BTP Blue Transparent

OEM PRICES

QUANTITY	100	500	1000
PCL 490	34.00/C	28.00/C	22.00/C
PCR 740	36.00/C	30.00/C	24.00/C

All colors can be combined for price advantage per line item. For higher quantity pricing contact VCC. Prices subject to change without notice.

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

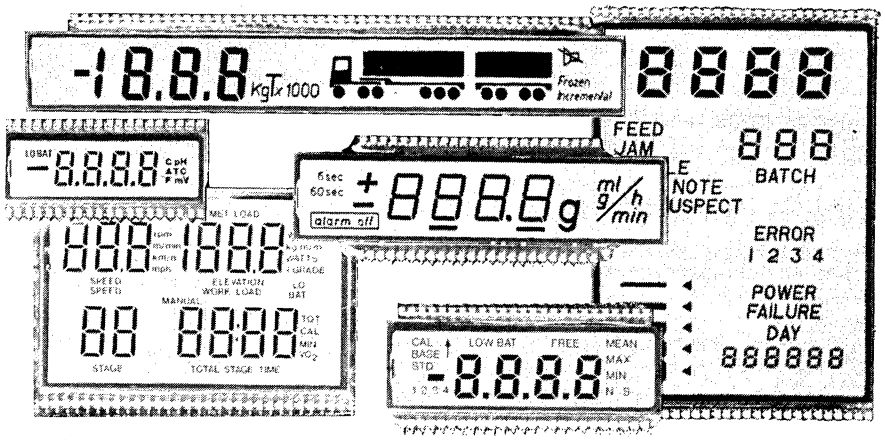
VL ELECTRONICS, INC.
2775 Glendower Ave., Los Angeles, CA 90027, U.S.A.
Tel: 213/661-8883 • Telex: 821554 • Fax: 213/6633711

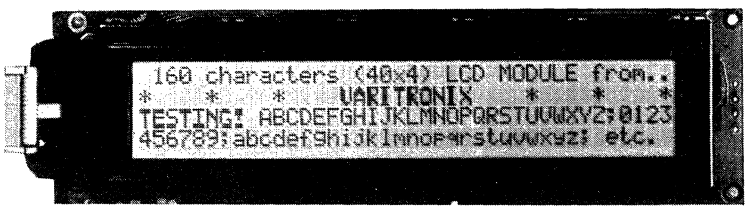
VARITRONIX LTD.
9/F., Liven House, 61-63 King Yip St., Kwun Tong, Hong Kong
Tel: 3-894317; Telex: 36643 VTRAX HX • Fax: 3/7556033

CUSTOM DESIGNS

FEATURES

- Highest Quality
- LCD Prototypes from your drawings within 3 weeks
- Send us your artwork for a quotation



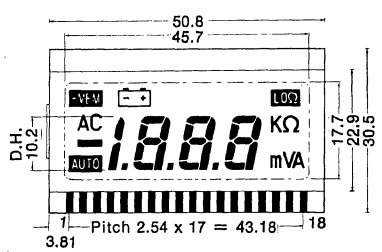


ALPHA-NUMERIC/ DOT MATRIX/ GRAPHIC LCD MODULES

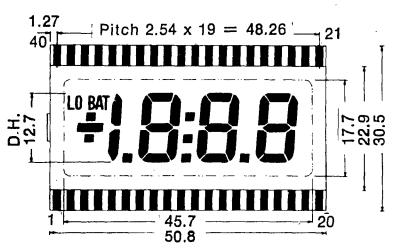
- High contrast
- Wide viewing angle
- Industry standard controller
- Int. ROM with 96 ASCII char.
- Options available:
  EL backlighting
  negative image
  wide temperature
  color polarizer

Model Number	Characters x lines	Character Format	Digit Size with Cursor	Effective Viewing Area	Module Size (WxHxD)
MDL-16166R-1	16x1	5x8	6.3	64.5x13.8	80.0x36.0x12.0
MDL-16119-1	16x1	5x11	8.7	64.5x13.8	80.0x36.0x12.0
MDL-16265-1	16x2	5x8	5.55	61.0x15.8	84.0x44.0x12.0
MDL-16268-1	16x2	5x7+Cursor	9.3	110.0x24.0	160.0x52.0x12.0
MDL-24166-1	24x1	5x8	6.30	100.0x13.8	126.0x36.0x12.0
MDL-24119-1	24x1	5x11	8.7	100.0x13.8	126.0x36.0x12.0
MDL-40166-1	40x1	5x8	6.3	154.4x13.8	192.0x56.0x12.0
MDL-40166-1	40x2	5x8	5.55	154.4x15.8	182.0x33.5x12.0
MDL-40466-1	40x4	5x8	5.55	154.4x27.6	196.0x56.0x12.0

VIM-309-1, VIM-309-2



VI-302-1, VI-302-2

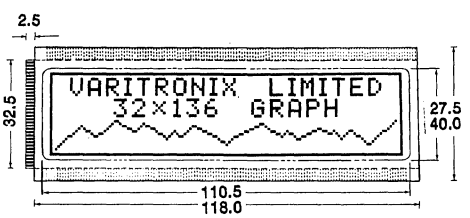


Model	Char. Ht.	Digits
VI-102	76.0	1
VI-201	12.7	2
VI-351	6.4	3½
VIM-309	10.2	3½
VI-302	12.7	3½
VI-320	25.4	3½
VI-402	12.7	4
VI-509	10.2	4½
VI-510	20.5	4½
VI-505	17.8	5
VIM-806	9.0	8
VG-080	32x 80	Graphic
VG-136	32x136	Graphic

All dimensions in mm

STANDARD LCD's FOR GENERAL APPLICATIONS

VG 136-32

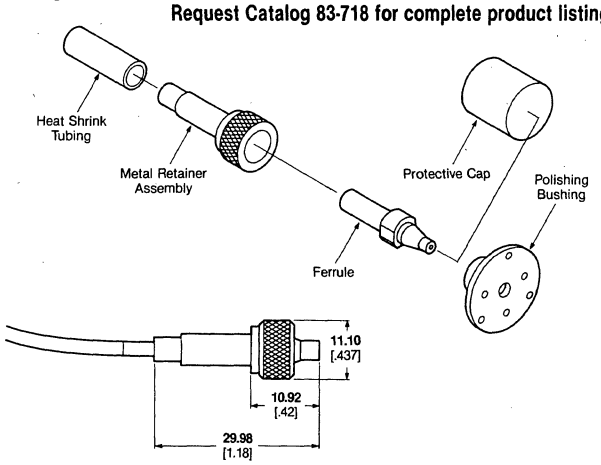


Also available
40 segment bar-graph display
Model No. VBG-413

AMP OPTIMATE Simplex Connectors

Features: ■ Low loss — less than 1.5 dB ■ Terminates fiber sizes from 125 through 1140 microns in diameter ■ Accommodates a wide variety of cable construction ■ Repeatable coupling efficiency ■ Field installable ■ Corrosion resistant ■ Metal coupling nut and body for secure mechanical integrity ■ Performance and reliability at low cost ■ Designer and Installation kits available

Request Catalog 83-718 for complete product listing



Typical Assembled View

Kits for Glass Fibers

Fiber Size Dia. (Over Cladding)	Kit Part Numbers Cable O.D. (Over Jacket)			
µm	2.5 [.098]*	3.0 [.118]	3.8 [.150]	4.4 [.173]
125	501067-1	501067-2	501067-3	501067-4
140	501068-1	501068-2	501068-3	501068-4
200	501069-1	501069-2	501069-3	501069-4
230**	501070-1	501070-2	501070-3	501070-4
250	501071-1	501071-2	501071-3	501071-4
1140	501072-1	501072-2	501072-3	501072-4

* Spacer tube included with these kits. ** Or plastic clad silica.

Kits for Plastic Fibers

Fiber Size Dia. (Over Cladding)	Kit Part Numbers Cable O.D. (Over Jacket)
µm	2.2 [.087]*
250	501073-1
500	501074-1
750	501075-1
1000	501076-1

* Spacer tube included with these kits.

Note: Kits include heat shrink tubing, metal retainer assembly, ferrule, polishing bushing and protective cap. A spacer tube is included with certain kits as marked.

Tooling for Connector Kits

Die Set for Hand Tool 58190-1 Cable O.D. (Over Jacket)				
Glass Fibers				Plastic Fibers
2.5 [.098]	3.0 [.118]	3.8 [.150]	4.4 [.173]	2.2 [.087]
312831-1	312831-1	312831-2	312831-3	312831-1

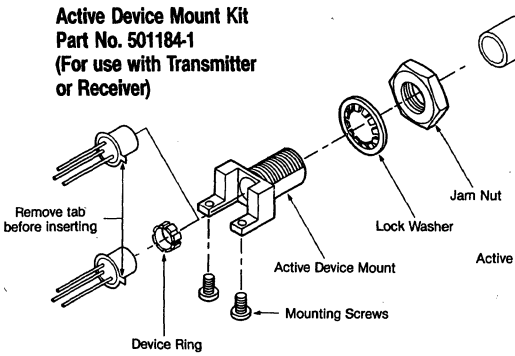
Hand Tool Part No. 58190-1 Cleaving Tool Part No. 228793-1

Active Device Mount (ADM) Kits

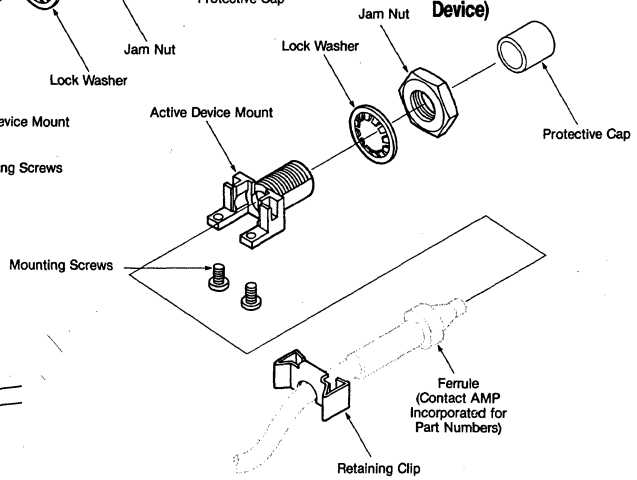
Features: ■ Corrosion resistant construction ■ Performance and reliability at low cost ■ Metal bodies help provide EMI/RFI shielding for sensitive electro-optic circuitry ■ Active device mounts designed for use with TO 18/46/52 and Honeywell Plastic Sweetspot™ (or equivalent) ■ Thermoplastic device ring provides optical and mechanical alignment of active devices ■ D-Cut shoulder on coupling bushing and panel mount ADM provides orientation and aids installation

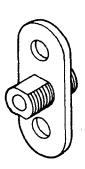
Request Catalog 83-718 for complete product listing

Active Device Mount Kit Part No. 501184-1 (For use with Transmitter or Receiver)

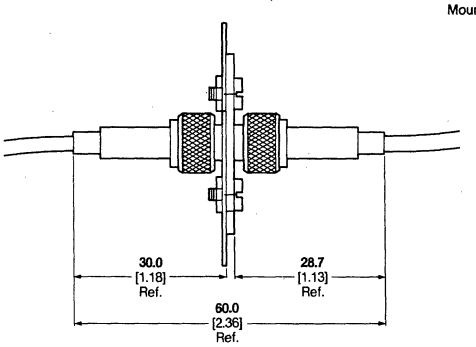


Active Device Mount Kit Part No. 501182-1 (For use with Leaded Device)





Panel Mount Coupling Bushing Part No. 501185-1



Typical Assembled View

Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

Specifications subject to change. Consult AMP Incorporated for latest design specifications.

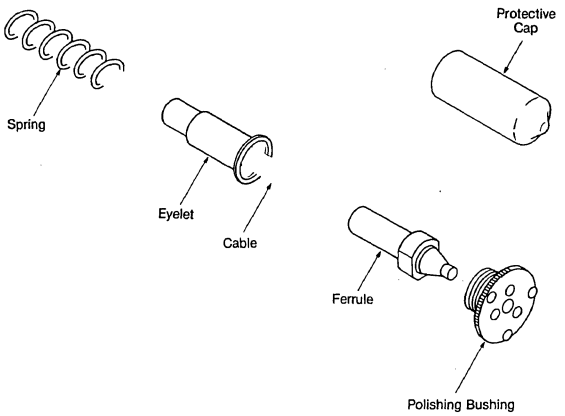
AMP, OPTIMATE — Trademarks of AMP Incorporated.

AMP INCORPORATED

AMP OPTIMATE Duplex Connectors

Features: ■ Low loss — less than 1.5 dB ■ Performance and reliability at low cost ■ Terminus accommodates dual channel or single channel cable with various size jacket diameters ■ Terminates fiber sizes from 125 through 1000 microns in diameter ■ PC Board receptacle accepts two TO-52 size active devices ■ Polarized mating ■ Field installable ■ Designer and Installation kits available

Request Catalog 83-718 for complete product listing



Terminus Kits for Glass Fibers

Fiber Size Dia. (Over Cladding)	Kit Part Numbers Cable O.D. (Over Jacket)			
µm	2.5 [.098]*	3.0 [.118]	3.8 [.150]	4.4 [.173]
125	501165-1	501165-2	501165-3	501165-4
140	501166-1	501166-2	501166-3	501166-4
200	501167-1	501167-2	501167-3	501167-4
230**	501168-1	501168-2	501168-3	501168-4
250	501169-1	501169-2	501169-3	501169-4

* Spacer tube included with these kits. ** Or plastic clad silica.

Terminus Kits for Plastic Fibers

Fiber Size Dia. (Over Cladding)	Kit Part Numbers Cable O.D. (Over Jacket)
µm	2.2 [.087]*
250	501170-1
500	501171-1
750	501172-1
1000	501173-1

* Spacer tube included with these kits.

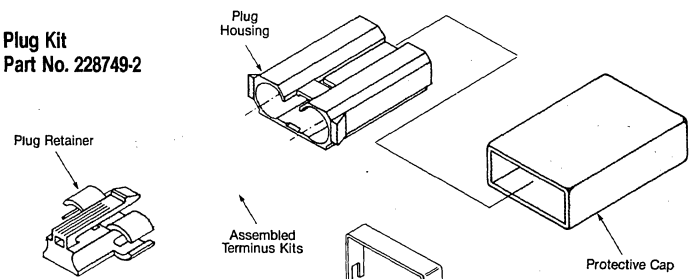
Tooling for Terminus Kits

Die Set for Hand Tool 58190-1 Cable O.D. (Over Jacket)				
Glass Fibers				Plastic Fibers
2.5 [.098]	3.0 [.118]	3.8 [.150]	4.4 [.173]	2.2 [.087]
312831-1	312831-1	312831-2	312831-3	312831-1

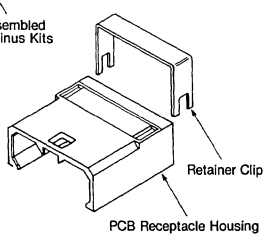
Cleaving Tool Part No. 228793-1

Note: Kits include spring, eyelet, ferrule, polishing bushing and protective cap. A spacer tube is included with certain kits as marked.

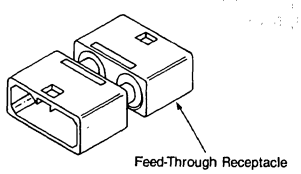
Plug Kit
Part No. 228749-2

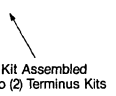


PCB Receptacle Kit
Part No. 228748-1



Feed-Through Receptacle
Part No. 228910-1





Plug Kit

Kit Part Numbers	Kit Component Part Numbers		
	Plug Housing	Plug Retainer	Protective Cap
228749-2	228914-1	228913-1	20115-1

PCB Receptacle Kit

Kit Part Numbers	Kit Component Part Numbers	
	Receptacle Housing	Retainer Clip
228748-1	228915-1	228916-2

Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

Specifications subject to change. Consult AMP Incorporated for latest design specifications.

AMP, OPTIMATE — Trademarks of AMP Incorporated.

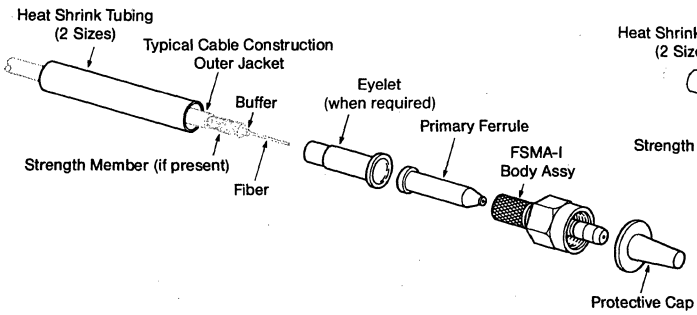
AMP INCORPORATED

AMP OPTIMATE FSMA (SMA Style) Connectors

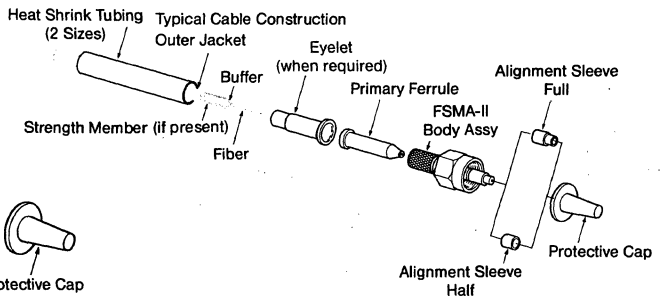
Features: ■ Terminates fiber sizes from 125 through 1000 microns in diameter ■ Design parameters conform to the proposed NATO and IEC interface standards for military and instrument applications ■ Industry compatible with 905 style connectors ■ Resilient tip design of FSMA-I minimizes mating tolerance problems ■ Metal coupling nut and contact body ensure RFI/EMI shielding ■ Environmental sealing available† ■ Single crimp design allows all crimps to be made simultaneously with one tool ■ Internal alignment ferrule improves mechanical and optical performance and serves as an assembly aid during termination to cable ■ Corrosion resistant construction ■ Performance and reliability at low cost

Request Catalog No. 83-718 for complete product listing

FSMA-I Connector Kit



FSMA-II Connector Kits



FSMA-I Connector Kits

Connector Body Material	Fiber Size Diameter Nominal Jacket O.D. (Over Cladding) µm	Connector Kit Part Numbers: Nominal Jacket O.D. Less than 3.0 [.118] w/o Strength Members	Nominal Jacket O.D. 3.0 [.118]* w/ Strength Members	Nominal Jacket O.D. 3.8 [.150] w/ Strength Members	Nominal Jacket O.D. 4.4 [.173] w/ Strength Members
Nickel Plated Brass	125	501002-1	501003-1	501004-1	501005-1
	140	501002-2	501003-2	501004-2	501005-2
	200	501002-3	501003-3	501004-3	501005-3
	230	501002-4	501003-4	501004-4	501005-4
	250	501002-5	501003-5	501004-5	501005-5
	500	501002-8	501003-8	501004-8	501005-8
	750	1-501002-0	1-501003-0	1-501004-0	1-501005-0
	1000	1-501002-1	1-501003-1	1-501004-1	1-501005-1
Aluminum	125	501106-1	501107-1	501108-1	501109-1
	140	501106-2	501107-2	501108-2	501109-2
	200	501106-3	501107-3	501108-3	501109-3
	230	501106-4	501107-4	501108-4	501109-4
	250	501106-5	501107-5	501108-5	501109-5
	500	501106-6	501107-6	501108-6	501109-6
	750	501106-7	501107-7	501108-7	501109-7
	1000	501106-8	501107-8	501108-8	501109-8

Note: Kit includes eyelet, primary ferrule, body assembly, heat shrink tubing and protective cap. A spacer tube is included with certain kits as marked.

FSMA-II Connector Kits

Connector Body Material	Fiber Size Diameter Nominal Jacket O.D. (Over Cladding) µm	Connector Kit Part Numbers: Nominal Jacket O.D. Less than 3.0 [.118] w/o Strength Members**	Nominal Jacket O.D. 3.0 [.118]* w/ Strength Members	Nominal Jacket O.D. 3.8 [.150] w/ Strength Members	4.4 [.173] w/ Strength Members
Stainless Steel	125	501029-1	501030-1	501031-1	501032-1
	140	501029-2	501030-2	501031-2	501032-2
	200	501029-3	501030-3	501031-3	501032-3
	230	501029-4	501030-4	501031-4	501032-4
	250	501029-5	501030-5	501031-5	501032-5
	500	501029-6	501030-6	501031-6	501032-6
	750	501029-7	501030-7	501031-7	501032-7
	1000	501029-8	501030-8	501031-8	501032-8
Aluminum	125	501035-1	501036-1	501037-1	501038-1
	140	501035-2	501036-2	501037-2	501038-2
	200	501035-3	501036-3	501037-3	501038-3
	230	501035-4	501036-4	501037-4	501038-4
	250	501035-5	501036-5	501037-5	501038-5
	500	501035-6	501036-6	501037-6	501038-6
	750	501035-7	501036-7	501037-7	501038-7
	1000	501035-8	501036-8	501037-8	501038-8

Note: Kit includes eyelet, primary ferrule, body assembly, alignment sleeves (half and full), heat shrink tubing and protective cap. A spacer tube is included with certain kits as marked.

Tooling for Connector Kits

Description	Nominal Jacket O.D.: Less than 3.0 [.118] w/o Strength Members**	3.0 [.118] w/ Strength Members	3.8 [.150] w/ Strength Members	4.4 [.173] w/ Strength Members
Die Set for Hand Tool 58190-1	(Not Req'd)	312831-1	312831-2	312831-3

Hand Tool Part No. 58190-1
Cleaving Tool Part No. 228793-1
Polishing Bushing Part No. 228025-1

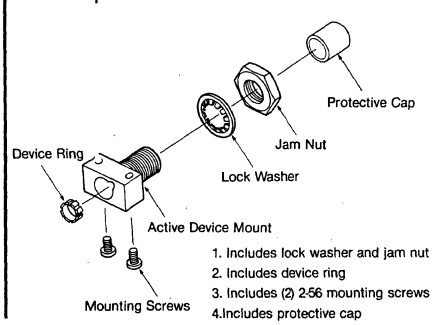
*Spacer tube included with these kits

**Eyelet not required with these kits

† For environmental sealing, order optional o-ring 19195-2.

Active Device Mounts for TO-18, TO-46, TO-52, and Honeywell Low-Cost Plastic Sweetspot™ Devices

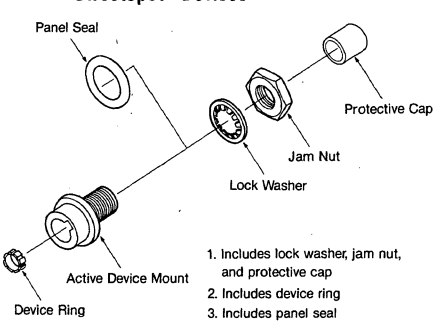
PCB Mount— Part No. 501054-1[2-3-4]
PCB/Panel Mount— Part No. 501055-1[1-2-3-4]



1. Includes lock washer and jam nut
2. Includes device ring
3. Includes (2) 2-56 mounting screws
4. Includes protective cap

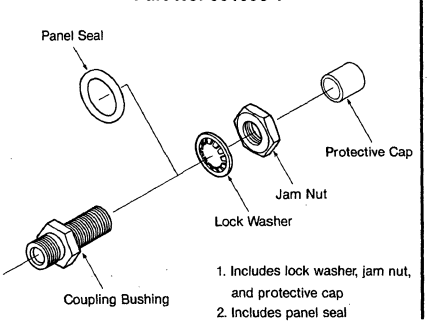
Active Device Mount Kits for TO-18, TO-46, TO-52, and Honeywell Low-Cost Plastic Sweetspot™ Devices

Panel Mount Kit— Part No. 501052-1[1-2]
Sealed Panel Mount Kit— Part No. 501053-1[1-2-3]



1. Includes lock washer, jam nut, and protective cap
2. Includes device ring
3. Includes panel seal

Coupling Bushing Unsealed— Part No. 501049-1[1]
Sealed— Part No. 501050-1[1-2]



1. Includes lock washer, jam nut, and protective cap
2. Includes panel seal

Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

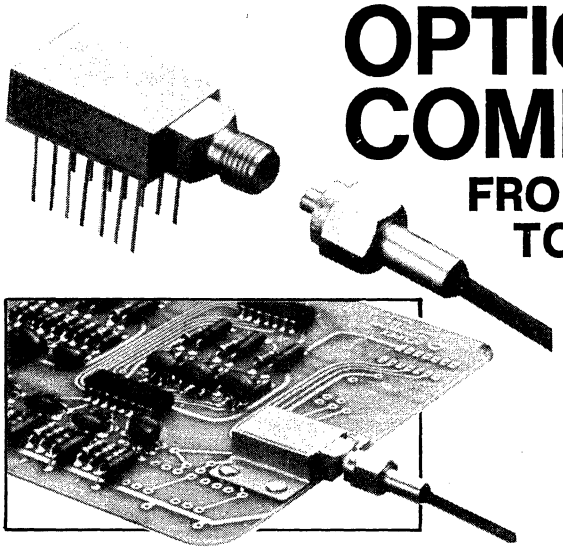
Specifications subject to change. Consult AMP Incorporated for latest design specifications.

AMP, OPTIMATE — Trademarks of AMP Incorporated.

AMP INCORPORATED

OPTICAL COMMUNICATIONS

FROM OPTO-HYBRIDS TO COMPLETE SYSTEMS



MERET, Inc., a leader in optical communications since 1975, offers a wide range of components, subsystem assemblies and complete turnkey systems for fiber optic and atmospheric communication. Products listed here are available from stock.

OPTO-HYBRIDS EMITTERS/TRANSMITTERS

Part Number	Radiated Power (μW at 100 mA) Total	50μ Fiber	200μ Fiber	Rise Time (ns)	Bandwidth
LIGHT EMITTING DIODES — 800 nm					
ML25	—	20	100	2	dc-150 MHz
TL37	10,000	—	250	10	dc- 35 MHz
TL38	1,000	20	450	10	dc- 35 MHz
ANALOG TRANSMITTERS					
X275-4	10,000	—	250	25	dc- 15 MHz
X288-4	1,000	20	450	6	dc- 40 MHz
X259-20	—	20	100	2	dc-150 MHz
VIDEO TRANSMITTERS					
X285TV	1,000	20	450	25	6 Hz-15 MHz
X288TV	1,000	20	450	6	6 Hz-40 MHz
DIGITAL TRANSMITTERS					
MLT459	—	20	100	2	dc-200 Mbps
MLT458	—	20	100	4	dc- 60 Mbps
MLT478	10,000	—	250	8	dc- 50 Mbps
MLT488	1,000	—	450	8	dc- 50 Mbps

TRANSIMPEDANCE AMPLIFIERS

Part Number	Transimpedance (mV/μA)	Rise Time (ns)	Bandwidth	NEI (pA/√Hz)
MA8309	4	2	dc-200 MHz	2.5
MA8201	160	120	dc- 5 MHz	0.5

ANALOG FIBER OPTIC DATA LINKS

System Number	Transmitter Part No.	Rcvr. Part No.	Bandwidth	Loss Budget (dB) for S/N > 40 dB 50μ	200μ
MDL271-4	X275-4	R1100	dc- 2 MHz	—	−26
MDL288-4	X278-4	R1800	dc-25 MHz	−10	−20
MDL259-20	X259-20	R5900	20 Hz-140 MHz	Note 1	Note 1

VIDEO FIBER OPTIC DATA LINKS

MDL285TV	X285TV	R1150	6 Hz- 8 MHz	−17	−30
MDL288TV	X288TV	R1750	6 Hz-35 MHz	− 7	−20

MULTI-CHANNEL TURNKEY FIBER OPTIC SYSTEMS

MERET can supply complete multi-channel systems in cage rack mount configurations. Using MERET hybrid modules, up to 24 channels of analog or digital transceivers can be housed in a single standard 19-inch cage, together with all necessary decoupling, power supplies, fuses, switches, indicators, and alarms. Applications include multi-channel remote surveillance video systems with digital links for camera control, data communications systems, and RGB video and sync for computer graphics and CAD/CAM. MERET turnkey systems are supplied with ruggedized multi-channel cable, and we can also provide field installation services and customer training.

OPTO-HYBRIDS DETECTORS/RECEIVERS

Part Number	Type	Active Area (mm)	Responsivity (μA/μW)	Rise Time (ns)	Bandwidth	NEP (pW/√Hz)
PIN AND AVALANCHE PHOTODIODES						
TD31	PIN	1.0	0.5	3	dc-100 MHz	0.1
MD33	PIN	2.5	0.6	8	dc- 40 MHz	0.2
TD25	APD	0.5	50	0.5	dc-500 MHz	0.05
ANALOG RECEIVERS						
R1100	PIN	1.0	60*	70	dc- 5 MHz	1.0
R1900	PIN	1.0	2*	3	dc-100 MHz	3.0
R5100	APD	0.5	3,000*	60	dc- 6 MHz	0.05
R5900	APD	0.5	100*	2	dc-150 MHz	0.1
MULTISTAGE VIDEO RECEIVERS						
R1150	PIN	1.0	3,600*	40	6 Hz-10 MHz	1.0
R1750	PIN	1.0	600*	8	6 Hz-40 MHz	2.0
R5750	APD	0.5	20,000*	8	6 Hz-40 MHz	0.1
DIGITAL RECEIVERS						
R1105	PIN	1.0	60*	3	dc- 5 Mbps	3 †
R1155	PIN	1.0	3,600*	3	dc- 5 Mbps	0.2†
R1805	PIN	1.0	5*	3	dc- 35 Mbps	15 †
R5805	APD	0.5	200*	3	dc- 35 Mbps	0.3†
R5908	APD	0.5	50*	3	dc-150 Mbps	1 †

* (mV/μW)
† Threshold (μW)

DIGITAL FIBER OPTIC DATA LINKS

System Number	Transmitter Part No.	Rcvr. Part No.	Data Rate	Loss Budget (dB) for BER < 10^{-9} 50μ	200μ
MDL481	MLT488	R1105	dc- 5 Mbps	−13	−23
MDL4811	MLT488	R1155	dc- 5 Mbps	−24	−34
MDL488	MLT488	R1805	dc- 35 Mbps	− 3	−13
MDL4877	MLT488	R1885	dc- 30 Mbps	−13	−23
MDL4595	MLT459	R5908	dc-150 Mbps	Note 1	Note 1

Note 1: Range limited to 200 meters maximum due to material dispersion. Built-to-order laser systems for distances up to 2 km are available.

ATMOSPHERIC OPTICAL DATA LINKS**

System Number	Description	Bandwidth or Data Rate	Beamwidth (Xmtr) (mr)	FOV (Rcvr) (mr)
MDL623TV-200	Video (TV) Transmission up to 200 meters	6 Hz to 6 MHz	7	17
2MDL821-200	Duplex TTL Transmission up to 200 meters	DC to 5 Mbps	10	35
2MDL823-400	Duplex TTL Transmission up to 400 meters	DC to 4 Mbps	7	17
2MDL871RS-100	Duplex RS422 for Wide Dynamic Range; 1 meter to 100 meter (Robotics, etc.)	DC to 1Mbps	20	35

WIDE FOV MINIATURE HYBRID ATMOSPHERIC LINKS

System Number	Description	Bandwidth or Data Rate	Beamwidth (Xmtr) (deg)	FOV (Rcvr) (deg)
MDL675-15	Analog or TV Transmission up to 15 meters	6 Hz to 6 MHz	10	4
MDL870-20	TTL Transmission up to 20 meters*	DC to 500 Kbps	10	100

* External optics can significantly increase the range.

** TI links to 1 Km are now available.

MERET, inc.

Specialists in Optical Communications

1815 24th STREET, SANTA MONICA, CA 90404 • (213) 828-7496 • TELEX: 65-2468 SNM

PHOTODYNE INC.

THE STATE-OF-THE-ART IN OPTICAL INSTRUMENTATION

FIBER OPTIC INSTRUMENTATION

FIBER OPTICS

MODEL	DESCRIPTION	MEASUREMENT FUNCTIONS	SPECIAL FEATURES
8XE	Fiber Optic Source Driver	Adjustble constant current source from 1mA to 100mA, regulated to 0.25%.	Accepts a variety of Photodyne plug-in LED sources. Longwave and shortwave.
11XE*	Fiber Optic Power Meter	Single function, absolute power in dBm units. Built-in silicon detector, spectrally calibrated at 820 nm. Responsive from 600-1000 nm.	Pocket size, one-button operation with LCD backlight mode.
12XE	Fiber Optic Power Meter	Single function, absolute power in dBm units. Built-in germanium detector, spectrally calibrated at 1300 nm.	Pocket size, one button operation with LCD backlight mode.
22XLC	Fiber Optic Multimeter	Absolute measurements in 'dBm, RCVR A only' mode, direct dB loss measurement in 'dB, RCVR A only' and (A-B) dB, Dual-Mode.	4½ digit custom LCD, Analog o/p directly proportional to the display, IEEE-488 BUS interface capability via Model 488XLI. Uses plug-in sensor heads with spectral range of 400-1800 nm and power range from -80 to 0 dBm. Accepts a variety of plug-in LED sources.
118/128	Loss Test Sets	Field usable Loss Test Sets with separate transmit and receive modules for installed cable. Series 118 for shortwave power, Range -80 to 0 dBm; Series 128 for longwave power, Range -60 to 0 dBm. Readout in dBm. Choices available for either 50/125 or 100/140 fiber and most standard industry connectors.	Tough "tool-box" style instrumentation. Easy to use. 3½ digit back lit LCD readout. Autoranging over 6 to 8 decades.
1100XM	Spectral Analyzer	A precision monochromator for characterizing fiber optic sources in the range: 600 to 1800 nm. Wavelength readout resolution 0.2 nm.	Fiber in, fiber out. Direct wavelength readout. Connects directly to any Photodyne XL radiometer.
1500XP	Optical Waveform Analyzer (820 nm)	Plug-in module operates with any oscilloscope to display optical waveforms proportional to the incident optical power. Measure rise/fall times with response to 2 nanoseconds.	Built-in avalance photodiode with fast response characteristics. Uses Photodyne Fiber Optic Adapters.
1600XP	Optical Waveform Analyzer (1300 nm)	Displays waveform proportional to the incident optical power from DC to 150MHz with maximum 3ns rise and fall time. It responds to wavelengths from 800 nm up to 1600 nm.	Low noise Ge-APD. Sensitive input amplifier. 50 Ohm buffered output.
1800 A/B	Fiber Optic Step Attenuator	Step attenuator in 1 dB increments, range of 0-89 dB.	Low insertion loss V 5dB, typical 3dB.
1950XF/XR	Fiber Optic Continuous Attenuator	Computer calibrated dial for direct readout of attenuation -0 to 70dB. (XF - Field Case, XR - Lab Case).	.05dB resolution, Cal: 800 nm and 1300 nm.
2200XF 2250XF	Fiber Optic Test Set	Absolute measurements in dBm or watts. Direct dB loss measurements or ambient suppression. Multi-wavelength capability. XMTR constant current output for plug-in LED sources.	Ruggedized and portable for field operation. Power range: − 80 to + 6 dBm. Spectral range: 400-1800 nm. Built-in battery pack for portable operation.
5500XFA	Optical Time Domain Reflectometer	The 5500 optical pulse echo measurement system utilizes back-scattered light detection to automatically determine the distance to faults, connectors, splices, breaks, and end of fiber, while simultaneously displaying the loss of the connector or splice, as manifested in the optical return signal. This system can measure distance to defects over a range of 5 meters to 20 kilometers with a resolution of 1 meter.	
7700XR 7750XR	Optical Signal Generator	Model 7700XR/7750XR provides calibrated optical test signals for fiber optics systems evaluations. The output is an optical signal that is absolutely calibrated in intensity and wavelength (820 nm), adjustable in frequency from DC to 10MHz, and adjustable in intensity through a 20dB range. The average power output is displayed on a 3½ digit meter. The maximum power output is 50 microwatts into a 50/125 micron fiber. Shortwave (7700). Longwave (7750).	
488XLI	GPIB Interface	Model 488XLI is an IEEE Standard 488-1978 Bus Interface Adapter for the Photodyne XL (XL, XLA, XLC) series of optical instrumentation. Provides 4½ digit accuracy, TALK ONLY and ADDRESSABLE modes, as well as power for the XL instrument. Applications include optical ATE systems, data logging, LED and laser measurements, and a general purpose A/D converter.	

LIGHT MEASUREMENT INSTRUMENTATION

RADIOMETRY/PHOTOMETRY

MODEL	DESCRIPTION	MEASUREMENT FUNCTIONS	SPECIAL FEATURES
33XLC	Chopped Light Multimeter	Selectable log or linear display units. True AC/DC frequency response.	4½ digit custom LCD, Analog o/p directly proportional to the display, IEEE-488 bus interface capability via Model 488CLI. Uses plug-in sensor heads. Accepts a variety of plug-in LED sources.

MODEL	DESCRIPTION	MEASUREMENT FUNCTIONS	SPECIAL FEATURES
44XLA	Optical Power Meter	Six decade linear reading -1 nW to 2 mW with Model 150 Sensor Head, 1 mW to 2 Watts with Model 350 Head. Ambient light suppression mode.	Uses interchangeable sensor heads.
88XLA	Radiometer/Photometer	Nine decade linear reading with sensitivity to 1 picowatt and 220-1800 nm wavelength range. Ambient light suppression mode. Autozeroing and autospectral calibration.	Uses interchangeable sensor heads with direct reading in radiometric and photometric units. LCD backlight function.
14XE/19XE	CRT Radiance Meters	Hand-held pocket-type meters ideal for setting up RGB color monitors. May also be used as transfer standards from engineering to manufacturing, and for maintenance. Model 14XE is calibrated in cd/m^2 (nits) and foot-lamberts; Model 19XE in W/m^2/sr.	One hand operation. Rapid and easy measurement, no focusing needed. Direct readout on large 3½ digit back lit LCD. Battery and line operation.
15XE/18XE	Pocket Size Radiometers	Photodyne's small hand-held radiometers will find applications ranging from laser power measurements to fiber optic measurements. Model 15XE covers the spectral range 700 nm to 1800 nm; Model 18XE cover the range 400 nm to 1150 nm. They are battery powered and are supplied in a zipper pouch.	One hand operation. Large 3½ digit LCD with back lighting. Operates from 9 volt battery or line voltage.

LASER/PULSE MEASUREMENTS

MODEL	DESCRIPTION	MEASUREMENT FUNCTIONS	SPECIAL FEATURES
66XLA	Optical Power/Energy Meter	Six decade linear reading in power and energy, 1 nW to 2 mW and 1 mJ to 2 mJ with Model 150, 1uW to 2 W and 1 uJ to 2 J with Model 350 Head. Spectral range from 220-1800 nm.	Uses interchangeable sensor heads. Applications in radiometry and photometry. Backlight function.

DENSITOMETER/REFLECTOMETER

MODEL	DESCRIPTION	MEASUREMENT FUNCTIONS	SPECIAL FEATURES
99XL	Densitometer/Reflectometer	General purpose densitometer/reflectometer displays in optical density units.	Various transmission and reflection measurement heads are available.

ACCESSORIES

DESCRIPTION	FEATURES
Plug-In Sensor Heads	All Photodyne XL instruments are interchangeable plug-in sensor heads consisting of detector and detector/filter combinations. Broad line of sensors for both radiometric and photometric applications. Specific applications include low-light level measurements, radiometric response, UV, visible light, IR, LED measurements, and CRT evaluation. Spectral calibration data included with every sensor head.
Fiber Optic Adapters	Fiber optic adapters screw onto sensor heads. Available for most fiber optic connectors including AMP, Amphenol, Deutsch, Siecor, ITT Cannon, NEC, etc. Also available are bare fiber adapters.
LED Sources	Plug-in LED sources, longwave and shortwave, are available for use with 8XE, 22XLC, 33XLC, 66XLC instruments. Includes fiber pigtail sources along with mounted fiber optic receptacles. Contact Photodyne for complete current list.

All spectral calibrations are traceable to the National Bureau of Standards (Washington, D.C.). Modern Measurement technology utilizes new Silicon Photodiode Standard Detector and Photodyne's state-of-the-art Spectral Analysis Microcomputer. Each calibration consists of a three page computer printout which includes responsivity data, quantum efficiency, photometric response, and plot of spectral response. Contact factory for special calibration requirements.

* Patents Pending
** Sensor heads not included with Photodyne XL instruments (except 99XL).

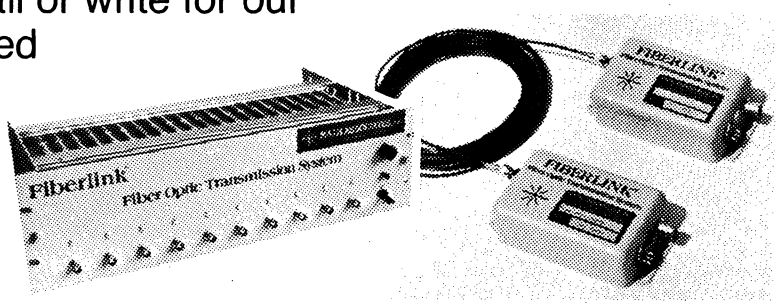
PHOTODYNE INC.
1175 Tourmaline Drive
Newbury Park, California 91320 U.S.A.
Phone: (818) 889-8770 (805) 499-3636
Telex: 18-1159

Always a step ahead.....

BOEING ... BROOKHAVEN ... BULOVA SYSTEMS
DOW JONES ... EXXON NUCLEAR
FORD AEROSPACE ... GE ... GTE LABS
GENERAL ATOMIC ... GENERAL MOTORS ... IBM
LIVERMORE LABS ... McGRAW EDISON
PRINCETON UNIV ... PERKIN ELMER
SANDIA LABS ... UNIV. CA — LOS ALAMOS
WESTINGHOUSE

Industry Leaders specify our Fiber Optic Transmission Systems for all kinds of signals

— audio, video, hi-voltage control, TTL logic levels, status indications, DC levels, industrial control, etc. Our Fiberlink® Analog & Digital Systems can be battery-powered for outdoor use. Multiple systems are rack-mounted. Call or write for our new expanded 44-page Fiberlink catalog.



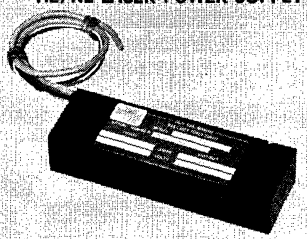
FIBERLINK A Division of Math Associates, Inc.
2200 Shames Drive, Westbury, NY 11590 USA 516/334-6800

Laser Power Supplies • Fiber Splicers
Laser Diode Pulsers • Laser Simulators

Power Technology Incorporated

Address correspondence to: Box 9769 Little Rock, Arkansas 72219 501-568-1995
Plant location: 7925 Mabelvale Cutoff Mabelvale, Arkansas 72103 TWX 910-722-7313

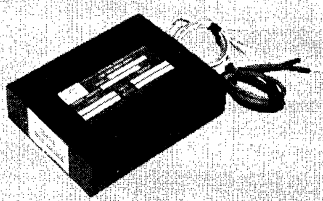
HE/NE LASER POWER SUPPLY



MODEL L23

Many shapes and sizes of this very compact supply are offered to fit a large variety of instrument packages. Numerous options are available, including an inhibit circuit to replace electro-mechanical relays for BRH compliance. Switching mode regulation provides exceptionally high efficiency while operating a plasma tube with a regulation of ± 1 mA. The high efficiency allows operation with a minimum of heat sink and a minimum of heating within an instrument, increasing the life of heat sensitive components.

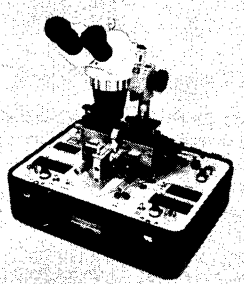
HE/NE LASER POWER SUPPLY



MODEL L92

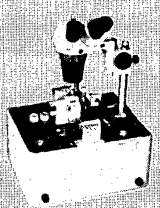
Features of this product include isolation of the laser tube or leads from the AC line, operation from either 115 or 230 VAC by switching one lead, switching mode current regulation for high efficiency, and power output of 5 to 18 W. The L92 is housed in a molded fiberglass case, and fully potted for maximum protection from dust and moisture. Size: 1.15 x 3.30 x 4.25" (29.2 x 83.8 x 108 mm).

The Model L45 same as Model L92 except case dimensions. Contact P.T.I. for further information.



PFS-300 SERIES OPTICAL FIBER SPLICER

Operating from internal batteries or from a variety of external power sources, the PFS-300 Series splicers are ideal universal instruments in the laboratory, out in the field during installations and repairs, or as part of a production line. The combination of ruggedness and rigidity that makes this splicer so versatile has many important ramifications, particularly in the field of single mode lightwave transmissions.



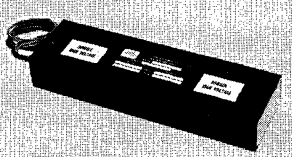
MODEL PFS-240 OPTICAL FIBER SPLICER

Featuring a modular stereo microscope and sturdy aluminum case, P.T.I.'s Model PFS-240 provides high level splicing performance, convenience, ease of operation, and ruggedness.

The stereo microscope will satisfy the most critical requirements for high-quality 3-D magnified images. With objectives 2X-4X as standard, rotation of a knurled ring selects either 40X or 80X. A lense attachment of 1.5X allows magnification of 60X to 120X.

Stereo zoom microscope, with magnification of 14X to 90X, provides large flat fields of view, crisply resolved. By rotating a knurled ring, magnifications are variable. A 1.5X lense attachment will allow magnification of 21X to 135X.

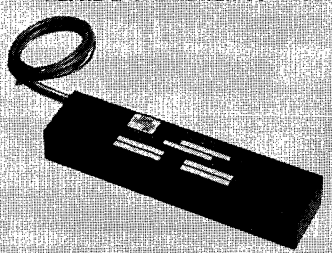
With the added features, our PFS-200 basic design is maintained. See inside page for specifications.



40 AND 75 W HeNe AND CO_2 LASER POWER SUPPLIES

Operating from 115 or 230 VAC. All units are housed in black fiberglass cases and are fully potted for maximum protection from dust and moisture. Typical applications of the L87 is 20-25 MW HeNe while the L93 is 10-15 MW HeNe. Typical applications of the CO_2 L89 is 75 W input and 40 W input for the L94. L87 and L89 sizes: 1.42 x 2.79 x 9.10" (36 x 69 x 231 mm). L93 and L94 sizes: 1.15 x 2.43 x 8.60" (29.2 x 61.7 x 219 mm).

HE/NE LASER POWER SUPPLY



MODELS L41, L43

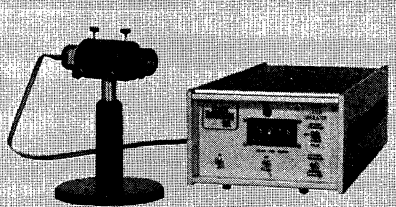
This series allows your choice of AC input voltages of 50-400 Hz, which makes it particularly suitable for export. Features include isolation of the laser tube or lead from the AC line, switching mode current regulation, high efficiency, and exceptional compactness for a supply that delivers 4 to 20 W output. All models are housed in black fiberglass cases and are of a fully potted construction for maximum protection from dust and moisture. Size: .945 x 1.445 x 6.05" (24 x 36.7 x 154 mm).

ILM LASER DIODE PULSER

ILM SERIES

The ILM Series Laser Diode Pulser is designed to drive the ITT Ls 7711 or Laser Diode Labs LDT 350 Series Fiber Coupled laser arrays. An internal power supply allows operation from any available D.C. voltage between 10 and 28 volts. Pulser dimensions and mountings is compatible with close spaced multiple arrays such as the ITT Ls7729, Ls7717, Ls7730, and Laser Diode Labs LDT 391.

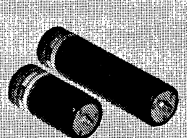
LASER DIODE SIMULATOR



CS100

This convenient, easy to use simulator is compact and self contained. It provides a pulsed 1.06 micron infrared signal source simulating a laser. Because of its portability, it is ideally suited to laboratory or field testing of laser systems or fiber optics. A double pulse option allows testing of laser range-finders. Output power is 20 mW at 20 ns and 1.06 microns. Input voltage can be 115 VAC, 230 VAC or 12 VDC.

LASER DIODE PULSER



ILC SERIES

The ILC produces more average output power for driving laser diodes at 7 to 200 ns widths than avalanche or SCR pulsers. Models are available for pulse current of 1 through 100 A. Fast rise and fall times, with internal clock for pulse rates of 100 through 10,000 PPS. Size: (for internal supply) 1" x 4.25" (25 mm x 108 mm) or 1.25" x 4.25" (32 mm x 108 mm). (with customer supplied external supply) 1" x 2.5" (25 mm x 64 mm) or 1.25" x 2.5" (32 mm x 64 mm).

TRW OPTASPLICE* Optical Fiber Splice Kit

TRW offers three complete OPTASPLICE Optical Fiber Splice Kits OSK3-1, OSK4-1, OSK5-1. The Kits contain all of the necessary tools for making fast affordable, low-loss fiber splices in the field. A supplemental OSK2-1 Kit is also available. A detailed description of each Kit is given below.

The tools and materials contained in the TRW OPTASPLICE Splice Kits are used to prepare and splice optical fibers, using the scribe and cleave technique. The heart of this technique is the patented TRW OPTASPLICE splice module (supplied separately). It's designed for easy low-loss field splicing of optical fibers without the need for time consuming polishing and expensive fusion processes.

TRW OPTASPLICE Splice Kits are lightweight and portable. They can easily be stored in a van or automobile for immediate field access. The OPTASPLICE Splice Kits can be used in hazardous areas where standard fusion splicing cannot. They are simple to use and require no special operator skills.

Model OSK2-1 Splice Kit

Supplementary Splice Kit includes:

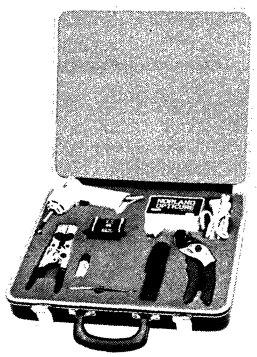
- Splice assembly fixture Dist. Part No. OSK-F
- OPTASCRIBE* Model 500 fiber cleaving tool Dist. Part No. OSC-500
- 30X Microscope Dist. Part No. OSK-M
- Crimp tool Dist. Part No. OSK-CT
- Tweezers Dist. Part No. OSK-TW
- UV adhesive Dist. Part No. OSK-A

The Model 500 can also be used as a stand-alone general purpose tool for scribing and cleaving optical fibers.

Model OSK3-1 Splice Kit

Complete Splice Kit. Same as OSK2-1 with the addition of:

- DC Portable, rechargeable UV light source Dist. Part No. OSK3-16
- UV battery charger Dist. Part. No. OSK3-R16



Model OSK4-1 Splice Kit

Complete Splice Kit. Same as OSK3-1 Kit except for the UV light source.

- 110V AC OPTICURE hand-held high-intensity light source. Dist. Part No. OSK4-0

Model OSK5-1 Splice Kit

Complete Splice Kit. Same as OSK3-1 Kit except for the UV light source.

- 110V AC free-standing light source Dist. Part No. OSK5-21

*Trademark TRW Inc.

TRW OPTALIGN* Fiber Optic Connectors

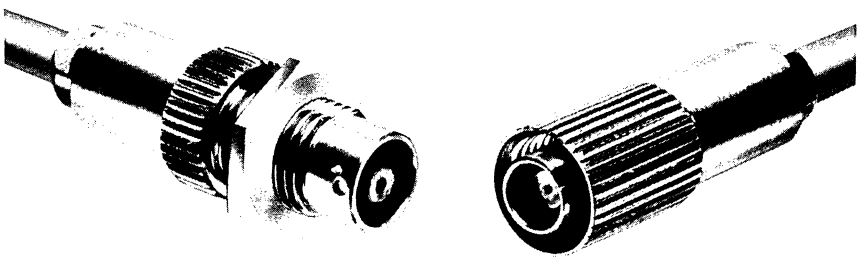
Model MM (Multi Mode)
Model SM (Single Mode)

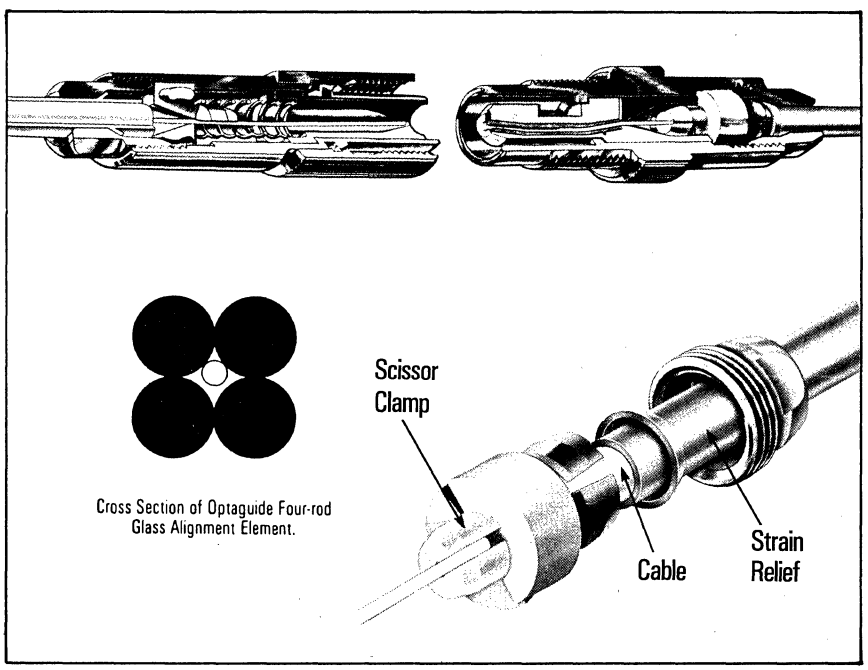
Directly applicable to computers, telecommunications, cable television, medical, instrumentation and military requirements, TRW fiber optic connectors provide state-of-the-art advances in reliable coupling of optical fibers.

TRW OPTALIGN Connectors provide precise, stable and repeatable connections. Typical insertion losses are 0.2 dB for multi mode; 0.8 dB for 4/80 single mode fiber; 0.3 dB for 8/125 single mode fiber, depending on the quality of the fiber being used.

TRW OPTALIGN Connectors employ the patented all-glass alignment guide. This guide is curved and permits entering fibers to meet deep within one of the vee-shaped grooves. This inherent self-aligning characteristic provides excellent shock and vibration immunity.

TRW OPTALIGN Fiber Optic Connectors provide a clean, chemically inert protective enclosure for optical fibers. They even accept fiber diameters that might be at opposite tolerance limits. Because of the alignment element within the connector, close tolerances for the connector envelope are not required to achieve low losses. The result is lower connection cost.





Cross Section of Optaguide Four-rod Glass Alignment Element.

Outer Shell: Aluminum—machined and anodized.

Internal Scissor Clamp: Molded plastic.

Fiber Alignment Element: Four-glass-rod array, fused and slightly curved, and fitted to plastic insert.

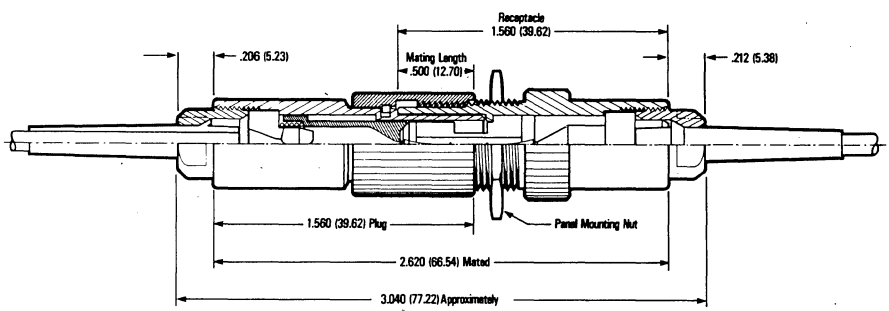
Strain Relief: Molded rubber.

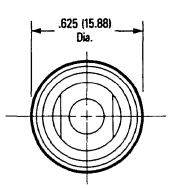
Mechanical Coupling: Threaded ring.

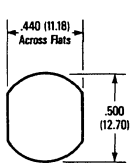
Zero Gap Compressive: Fiber mating assured, even under vibration and shock (MIL STD 202 test).

Insertion Loss: Single Mode: Less than 1.0 dB Multi Mode: 0.2 dB typical.

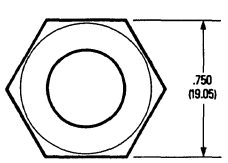
Behind Panel Distance: .810" (21mm) for mounted receptacle.







Suggested Panel Opening



Panel Mounting Nut

Ordering Information

Model MM (Multi Mode)

Plug Distributor Part No. OMM-P02
Socket Distributor Part No. OMM-S02

Model SM (Single Mode)

Plug Distributor Part No. OSM-P03
Socket Distributor Part No. OSM-S03

*Trademark TRW Inc.

CONNECTOR DIVISION, TRW ELECTRONIC COMPONENTS GROUP, 1501 MORSE AVENUE, ELK GROVE VILLAGE, IL 60007-5782 • (312) 981-6000

Airflyte

SLIP RING ASSEMBLIES

GENERAL PURPOSE SLIP RINGS

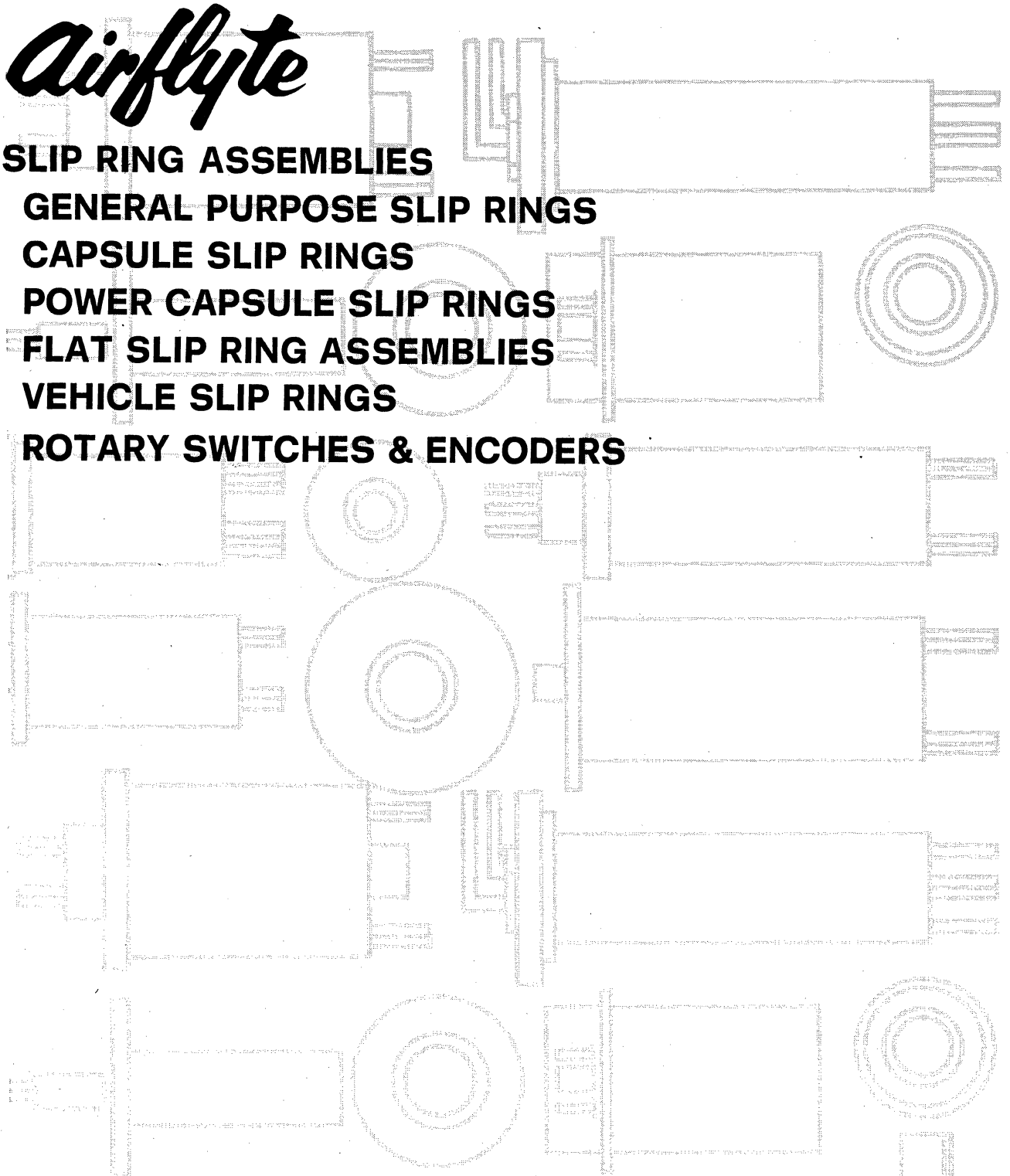
CAPSULE SLIP RINGS

POWER CAPSULE SLIP RINGS

FLAT SLIP RING ASSEMBLIES

VEHICLE SLIP RINGS

ROTARY SWITCHES & ENCODERS



SEE OUR COMPLETE CATALOG, PAGES B•1132-B•1137

Airflyte

ELECTRONICS CO.
NEW HOOK ROAD • BAYONNE, NEW JERSEY 07002
TELEPHONE: (201) 436-2230 TWX: 710-729-4489

DC, SERVO, ROTARY

Manufacturer	EEM Page No.	Volts, DC Min.	Volts, DC Max.	Torque, Oz. In. Min.	Torque, Oz. In. Max.	Speed, RPM Min.	Speed, RPM Max.
DIRECT DRIVE							
Electro-Craft	B•1147						
IMC Magnetics	B•1161						
Kollmorgen	B•1163			134	115K	600	5500
Magnetic Technology	B•1168			22.50	1350	143	3055
Micro Mo	B•1175						
Motor-Tronics	B•1176						
Pittman	B•1179		40.00		24		
SDP	B•1191						
Servo-Tek	B•1185				2		
Vernitech	B•1197						
Vernitron	B•1202	15.00	90.00	2.0	100.0		
REDUCTION DRIVE							
IMC Magnetics	B•1161						
Servo-Tek	B•1185				200		

SLIP RINGS

Manufacturer	EEM Page No.	Capsule Slip Rings	Power Capsule Slip Rings	Power Slip Rings	Power Cartridge Type Brushes	General Purpose Slip Rings	Flat Slip Ring Assemblies	Pancake Slip Rings	Separate Rotors & Brush Blocks	Vehicle Slip Rings	Rotary Switches	Encoders	Motorized Potentiometers
Airflyte	B•1132	●		●		●							
	B•1133	●		●		●							
	B•1134		●			●	●						
	B•1135		●	●		●							
	B•1136			●		●							
	B•1137									●	●	●	
ETI Systems	B•1150												●
	B•1151												●
	B•1152												●
Fabricast	B•1154	●	●	●		●			●				
	B•1155			●					●				
	B•1156	●	●	●		●							
	B•1157	●	●	●		●							
	B•1158			●					●				
	B•1159	●	●	●	●	●		●	●				
Graphite Metallizing	B•1160			●		●			●				
Maury Instr.	B•1170			●					●				

AC, ROTARY, CONTINUOUS ROTATION

Manufacturer	EEM Page No.	Phase 1	Phase 2	Phase 3	Volts, AC Min.	Volts, AC Max.	Freq., Hz Min.	Freq., Hz Max.	Input, Watts Min.	Input, Watts Max.	Torque, Oz. In. Min.	Torque, Oz. In. Max.	Output, RPM Min.	Output, RPM Max.	Ratio, X:1 Min.	Ratio, X:1 Max.	Rated HP Min.	Rated HP Max.
INDUCTION,																		
Eastern Air Dvcs.	B•1146	●					50	60					600	12000			1/300	1/2
IMC Magnetics	B•1161	●			115	220	60	400	6.50	2700.00	0.10	510.00	3400	18000			1/3000	3
Robbins & Myers	B•1184	●										176.00					1/150	1/3
SDP	B•1191											1600						
Shinano Kenshi	B•1187	●				115	50	60			4.20	27.80						
TRW	B•1195	●	●	●	27	200	60	400	8.00	65.00	0.05	1.50	500	24000				
SYNCHRONOUS,																		
Bodine	B•1140	●			115	230	50	60	18.40	188.60	50.00	720.00		72				
Crouzet	B•1145	●											300	450				
Eastern Air Dvcs.	B•1146	●					50	60					600	12000			1/300	1/2
IMC Magnetics	B•1161	●			26	208	50	400	5.70	430.00	0.03	180.00	1800	24000			1/1700	1/3
SDP	B•1191											1600						
Shinano Kenshi	B•1187	●			100	115	50	60				11.11	900	3600				
Superior	B•1192	●	●		120	240	50	60			25.00	1500.00	29	200				
TORQUE,																		
IMC Magnetics	B•1161	●			18	200	50	400	1.30	255.00	0.15	320.00	725	1000				
SDP	B•1191																	

DC, STEPPER

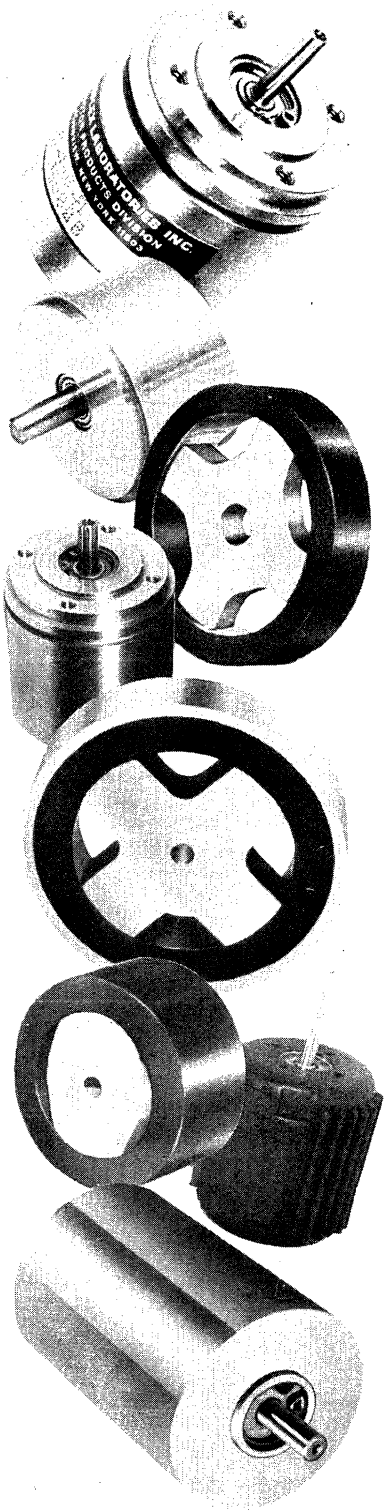
Manufacturer	EEM Page No.	Volts, DC Min.	Volts, DC Max.	Holding Torque, Oz. In. Min.	Holding Torque, Oz. In. Max.	Dynamic Torque, Oz. In. Min.	Dynamic Torque, Oz. In. Max.	Degrees/Step Min.	Degrees/Step Max.	Response, Steps/Sec. Min.	Response, Steps/Sec. Max.
ROTARY											
Airpax	B•1138	3.70	14.00		28			7.50	15.00		900
Bodine	B•1140	1.30	7.10	50	1125				1.80		
Clifton Precision	B•1144							0.90	90.00		
Crouzet	B•1145			3	39				7.50		
Eastern Air Dvcs.	B•1146			50	400			1.80	90.00		
Portescap	B•1181							.0563			
SDP	B.1191				90			1.8	3.6		
Shinano Kenshi	B•1187							0.90	3.75		
Superior	B•1192							0.72	15.00		20k
Vernitech	B•1197							7.50	90.00	100	1000

LINEAR

						Linear Force Oz.	Linear Force Lbs.	Travel/Pulse Min. In.	Travel/Pulse Max. In.	Travel Min. In.	Travel Max. In.
Airpax	B•1138		12.00			15.00	19.00	.001	.004	0.5	3.0

DC, ROTARY, CONTINUOUS ROTATION

Manufacturer	EEM Page No.	Volts, DC		Reduction, X:1		Torque, Oz. In.		Speed, RPM		Output, HP		Output, Watts	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
BRUSHLESS, DIRECT DRIVE													
Aeroflex	B•1131												
Airpax	B•1138	24	48			30.00	700.00						
Axial Magnetics	B•1139	6	24			5.0	50						
Buehler	B•1142	12	48										
Canon	B•1143					1.90	5.00						
Clifton Precision	B•1144												
Eastern Air Dvcs.	B•1146												
Electro-Craft	B•1147												
IMC Magnetics	B•1161												
Kollmorgen	B•1163					883	34.6K	2100	7500	7.1	16.5		
Magnetic Technology	B•1168												
Motor-Tronics	B•1176												
Pittman	B•1179												
Robbins & Myers	B•1184												
SDP	B•1191												
Shinano Kenshi	B•1187												
Sierracin/Magnedyne	B•1189					15.00	3456.00					74	518
Vernitron	B•1199	4	38			0.30	148.00					9	502
BRUSHLESS, REDUCTION DRIVE													
Kollmorgen	B•1163												
Magnetic Technology	B•1168												
Motor-Tronics	B•1176												
BRUSH TYPE, DIRECT DRIVE													
Airpax		12	24			16.00	16.00						
Buehler	B•1142					0.10	100.00						
Canon	B•1143	6	24			.01	20.00						
Clifton Precision	B•1144												
Eastern Air Dvcs.	B•1146												
Electro-Craft	B•1147												
IMC Magnetics	B•1161												
Mabuchi	B•1167	1	26			.02	49.00	3050.0	21.7k				
Maxon	B•1171												
Micro Mo	B•1174	1.5	180				415	1500	20.3K	.00015	4.62	.11	3442
Motor-Tronics	B•1176												
Pittman	B•1179												
Portescap	B•1181												
Robbins & Myers	B•1184												
SDP	B•1191												
Shinano Kenshi	B•1187												
TRW	B•1194	6	50			0.10	0.20	5500.0	17500.0			2	5
BRUSH TYPE, REDUCTION DRIVE													
Brevel	B•1141		12	16.5	762.6	7.00	240.00	4.5	183.0				
Buehler	B•1142					2.10	429.00						
Canon	B•1143	6	24	8.0	300.0	0.70	139.00	1.3	600.0				
Clifton Precision	B•1144												
Eastern Air Dvcs.	B•1146												
Electro-Craft	B•1147												
IMC Magnetics	B•1161												
Maxon	B•1171												
Micro Mo	B•1174	1.5	180		1000K	0.71	45.3K	.006	4710				
Motor-Tronics	B•1176												
Pittman	B•1179												
Portescap	B•1181												
Robbins & Myers	B•1184												
SDP	B•1191												
Shinano Kenshi	B•1187												
TRW	B•1194	6	50	3.8	36.9k	1.00	300.00						
TORQUE, DIRECT DRIVE													
Aeroflex	B•1131												
Clifton Precision	B•1144					6.00	2700.00						
Eastern Air Dvcs.	B•1146												
Electro-Craft	B•1147												
IMC Magnetics	B•1161												
Magnetic Technology	B•1168												
Maxon	B•1171												
SDP	B•1191												
Sierracin/Magnedyne	B•1179					30.01850 lb.-ft.						53	8130



Aeroflex *brushless dc motors and torquers*

We're more than just a motor company

State-of-the-art design backed by 25 years of engineering and field experience . . . Aeroflex motors and torquers are working, accurately and reliably, in the most difficult military, aerospace and industrial applications. Time and again they have proven how well they can perform in hostile environments on land, sea or in the air . . . in outer space or in the ocean's depths.

Aeroflex fractional and subfractional H.P. brushless D.C. motors offer equal — or better — performance than brush motors, with no compromise in size. They are ideal for those special applications where environment, service life or other brush motor limitations cannot be tolerated. Their high torque-to-inertia ratios, excellent heat transfer characteristics, high efficiencies (75%) and freedom from downtime make them a cost effective choice.

Aeroflex torquers are designed and built for the same demanding kind of use. They're available from 1" O.D. to 24" O.D. in torques from tenths of an oz.-in. to hundreds of ft.-lbs. With designs like this in stock, it's usually a simple matter to meet your application needs.

Should you require a special motor or torquer, we'll work to your specification or help you develop one that meets your need. We can also help you with the electronic drive interface, or even provide the complete electronic/motor assembly.

We're more than just a motor company.

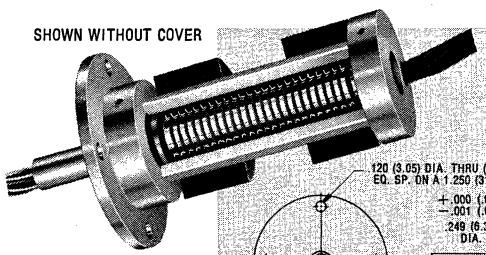
For Technical "Hotline" Assistance, Ask for Mike Ruderman.

MAGNETIC PRODUCTS DIVISION
AEROFLEX LABORATORIES INC.
SOUTH SERVICE ROAD • PLAINVIEW, LONG ISLAND, N. Y. 11803
TEL.: (516) 694-6700 • TWX: 510-224-6417

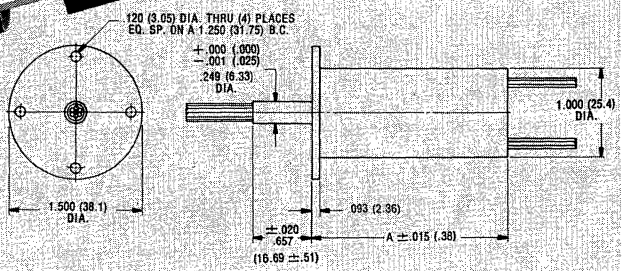
Airflyte ELECTRONICS CO.

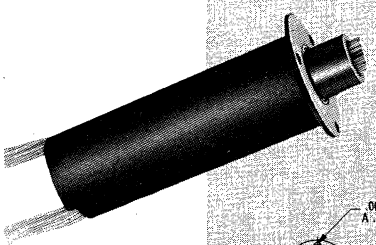
CAPSULE SLIP RING ASSEMBLIES

SHOWN WITHOUT COVER



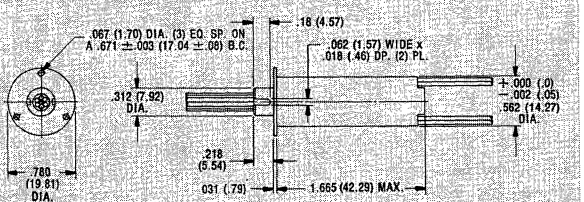
CAY-110
UP TO **30** RINGS

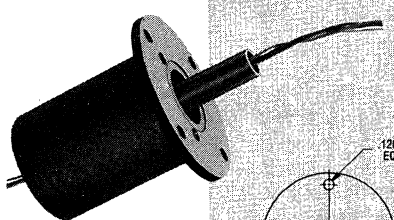




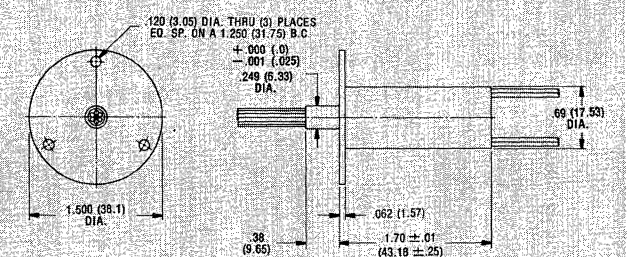
CAY-604
UP TO **40** RINGS

No. of Rings	Inches "A"	Milli-Meters
4-12	1.48	37.6
13-24	2.20	55.9
25-30	2.56	65.0





CAY-245
UP TO **20** RINGS



These Slip Ring Assemblies have found wide use in gyro gimbal and instrument applications. The fully enclosed and tested assemblies feature fine diameter gold alloy brushes mated to compatible gold alloy rings for excellent noise characteristics at low torque levels. Although miniature in size, the assemblies are surprisingly rugged and are able to withstand most military environmental specifications.

Units have been fully tested to the environmental parameters listed below, proving their ruggedness and reliability. All units are factory tested before shipment and a copy of the test data is available with each unit upon request.

The units shown here are only a sample of those available which include a 50 ring capsule of .685 diameter.

SPECIFICATIONS

MECHANICAL

1. Rings: Gold alloy
2. Brushes: Gold alloy wire, spring temper
3. Ball Bearings: Stainless steel, shielded
4. Shaft: Stainless steel
5. Housing: Anodized aluminum
6. Rotation: Bi-directional

ELECTRICAL

1. Current: Signal level to 1 amp maximum
2. Voltage: Micro-volts to 110 volts rms
3. Dielectric Strength: 500 volts rms (all combinations)
4. Leadwire: #30 AWG teflon insulated, 15″ long minimum
5. Noise: ±5 micro-volts per ma

ENVIRONMENTAL

1. Temperature Shock: +85°C for 1 hour and immediately transferred to −55°C for 1 hour
2. Shock: 18 shocks, 20 "g" with duration of 11 ±1 ms (MIL-E-5272C, Procedure V)
3. Vibration: MIL-STD-202B, Method 204, test condition B
4. Altitude: 50,000 ft. and −55°C
5. Humidity: MIL-E-5272C, Procedure III (95% R.H. @ 120°F for 360 hours)

ORDERING INFORMATION

CAY-☐☐ ☐☐

☐☐ — No. of Rings

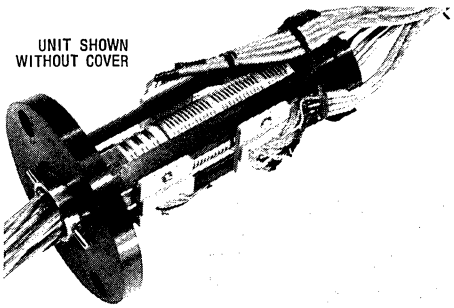
☐☐ — Model

	CAY-110	CAY-604	CAY-245
MECHANICAL			
Torque	1.0 in.-oz. max. (24 rings)	1.0 in.-oz. max.	0.5 in.-oz. max. (20 ring assembly)
Speed	500 rpm max.	200 rpm max.	200 rpm max.
Life	10^8 revs. min.	5×10^6 revs. min.	10^7 revs. min.
ELECTRICAL			
Contact Resistance Variation	5 milliohms max. at max. speed	20 milliohms max. at max. speed	5 milliohms max. at max. speed
No. of Rings	30 max.	40 max.	20 max.

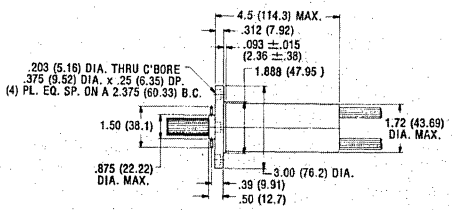
NEW HOOK ROAD, BAYONNE, NEW JERSEY 07002 201-436-2230 TWX-710-729-4489

Airflyte ELECTRONICS CO.

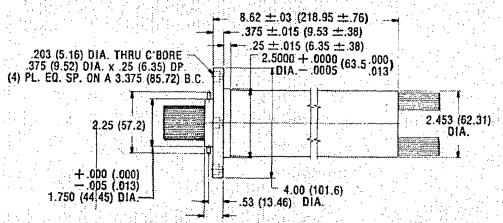
CAPSULE SLIP RING ASSEMBLIES



CAY-150
UP TO **48** RINGS



CAY-1120
UP TO **90** RINGS



These assemblies, specially designed for gyro-rate table and centrifuge applications, have found wide use because of their versatility and compact size. The standard assembly, can be supplied (at slight extra cost) with internally shorted rings for double and triple current ratings, and with single, double and triple shielded wire. Featuring gold alloy wire brushes and compatible gold alloy rings, these assemblies are manufactured from proven production tooling at a very nominal cost. Special assemblies with switching circuits and others with non-standard materials for use in severe environments are available.

SPECIFICATIONS

MECHANICAL

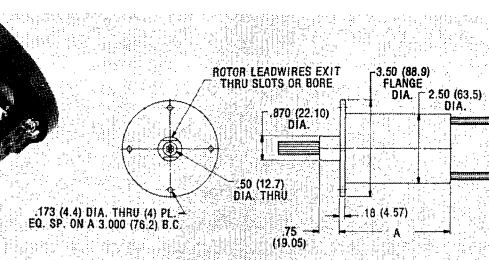
1. Rings: Gold alloy
2. Brushes: Gold alloy wire, spring temper
3. Ball Bearings: Stainless steel
4. Shaft: Stainless steel, type 303
5. Housing: Anodized aluminum
6. Rotation: Bi-directional

ELECTRICAL

1. Current: Signal level to 2.0 amps
2. Voltage: 400 vdc maximum
3. Dielectric Strength: 1000 Volts rms (all combinations)
4. Contact Resistance:
   A. Less than 8 milliohms @ 200 rpm
   B. Less than 2 milliohms @ 10 rpm
5. Leadwire: #28 awg 18″ long

	CAY-150	CAY-1120
Torque	.125 in.-oz. per ring	.18 in.-oz. per ring
Speed	600 rpm max. — intermittent	100 rpm max.
Life	2000 hrs. @ 100 rpm	1000 hrs. @ 100 rpm

CAY-1030
UP TO **30** RINGS



NO. OF RINGS	A
1 THRU 16	4.00 (101.6)
17 THRU 30	5.75 (146.05)

• LONG LIFE • HIGH SPEED

SPECIFICATIONS

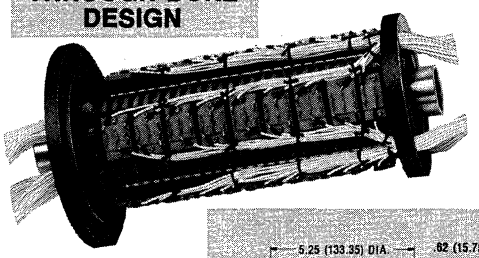
1. Rings: Coin silver
2. Brushes: Silver graphite, two per ring
3. Ball Bearings: Stainless steel, shielded
4. Shaft: Anodized aluminum
5. Housing: Anodized aluminum
6. Torque: .03 in.-lb. per ckt. approx.
7. Speed: Up to 5000 rpm
8. Life: 5000 hrs. at 100 rpm
9. Rotation: Bi-directional
10. Current: 5 amps max. per ring
11. Voltage: 250 Volts DC max.
12. Dielectric Strengths: 500 VRMS (all combinations)
13. Contact Resistance: 10 milliohms max. (excluding wires)
14. Noise: 10 milliohms max.
15. No. of Rings: 30 max.
16. Leadwire: #22 AWG, 24″ lg., both ends

NEW HOOK ROAD, BAYONNE, NEW JERSEY 07002 201-436-2230 TWX-710-729-4489

Airflyte ELECTRONICS CO.

POWER CAPSULE SLIP RING ASSEMBLIES

"THROUGH-BORE" DESIGN

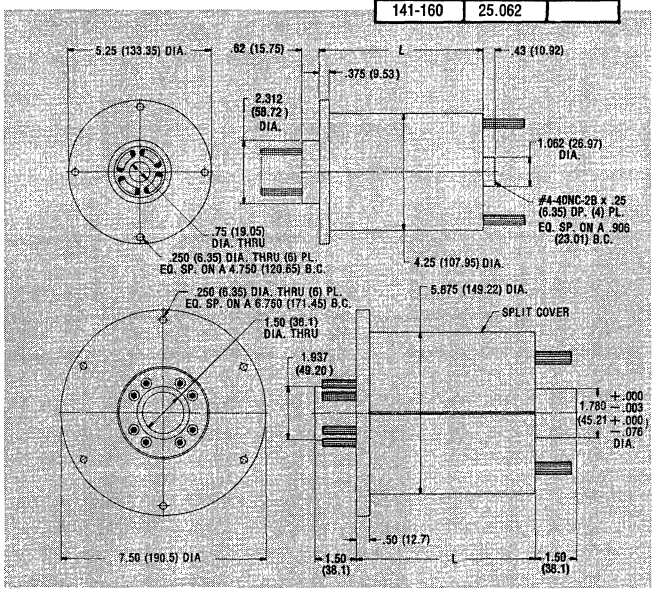


UNIT SHOWN WITHOUT COVER

No. of Rings	DAY-705 "L" ±.025"	DAY-710 "L"
10-20	5.375	4.725
21-40	8.187	6.700
41-60	11.000	8.675
61-80	13.812	10.650
81-100	16.625	12.625
101-120	19.437	14.600
121-140	22.250	
141-160	25.062	

DAY-705
UP TO **160** RINGS

DAY-710
UP TO **120** RINGS



DAY-705

These slip-rings are built to your order using many standard components which have proven themselves over many years of reliable operation. The "platter-type" design includes one coin silver ring on each side of each molded sub-assembly; and, leaf type silver graphite brushes which are molded in an insulating block and perfectly matched to the face of each ring. Inasmuch as the assemblies are the stack-up type, we are able to custom build them to your specifications—using our standard components—with a very minimum lead time required.

DAY-710

Similar in construction to our DAY-705, this platter type unit features two coin silver rings on each side of each platter for greater package density, and a "through bore" design which can be used for the passage of fluid or gas lines.

SPECIFICATIONS

MECHANICAL

1. Rings: Coin silver
2. Brushes: Silver graphite
3. Ball Bearings: Stainless steel, shielded
4. Shaft: Anodized aluminum
5. Housing: Anodized aluminum
6. Speed: 500 rpm maximum
7. Rotation: Bi-directional

ELECTRICAL

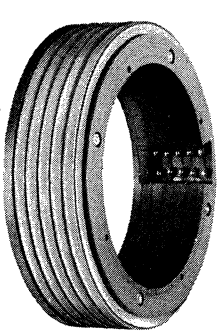
1. Voltage: 0 to 150 Volts AC or DC
2. Dielectric Strength: 500 Volts rms (all combinations)

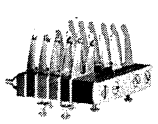
	DAY-705	DAY-710
Torque	½ in.-oz. per circuit	¾ in.-oz. per circuit
Life	3000 hrs. @ 100 rpm	2500 hrs. @ 100 rpm
Current	5 amps max. per circuit	5 amps max. per circuit
Contact Resistance Variation	8 milliohms peak @ max. speed	10 milliohms max.

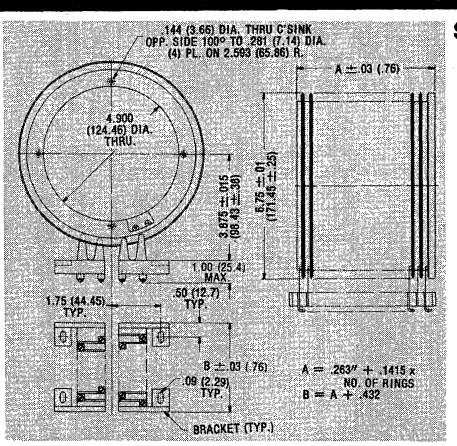
FLAT RING ASSEMBLIES & MATCHING BRUSH BLOCKS

CAY 94

- General purpose
- "Stack-up capability (up to 200 rings or more
- Low noise
- Long life







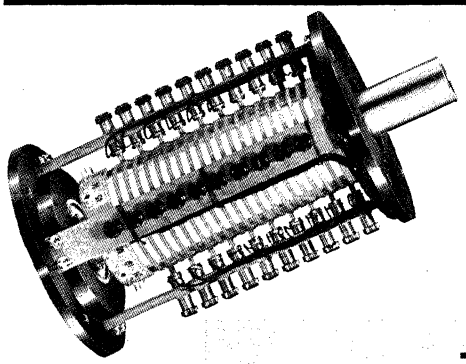
SPECIFICATIONS

1. Rings: Coin silver
2. Brushes: Silver graphite (two per ring)
3. Brush Leafs: Beryllium copper
4. Insulation: Phenolic
5. Leadwire: Available upon request
6. Speed: 750 rpm max.
7. Life: 1000 hours @ 100 rpm
8. Current: 5 amps per rings; 10 amps per ring when 4 brushes are used
9. Voltage: 300 VRMS
10. Dielectric Strength: 500 Volts rms (all combinations)
11. Insulation Resistance: 10 megohms minimum at 500 VDC
12. Noise: The contact resistance change in each circuit shall be less than .005 ohms at maximum speed
13. Units with less than 11 rings have one bracket per brush block

NEW HOOK ROAD, BAYONNE, NEW JERSEY 07002 201-436-2230 TWX-710-729-4489

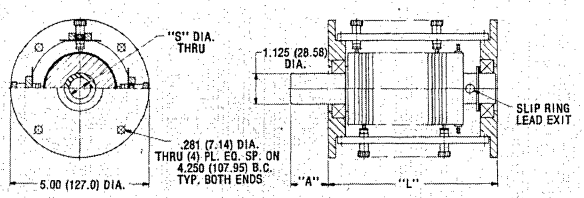
Airflyte ELECTRONICS CO.

POWER CAPSULE SLIP RING ASSEMBLIES



... AS AN ASSEMBLY

CAY-125
UP TO **30** RINGS



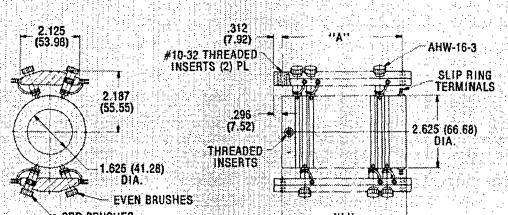
NOTES:
To determine "L" dimension use the following formula:

$$\text{"L"} = 2.62\ (66.55) + \frac{\text{(NO. OF RINGS)}}{4}$$

"S" = .750 (19.05) or 1.000 (25.4)
"A" = .750 (19.05) or 1.000 (25.4)

... OR AS SEPARATES

CAY-755
UP TO **30** RINGS



NOTES:
To determine the "L" and "A" dimensions, use the following formulas:

$$\text{"L"} = 1.093\ (27.76) + \frac{\text{(NO. OF CIRCUITS)}}{4}$$

"A" = "L" − .218 (5.54)
†Two identical brush blocks are supplied with each CAY-755 assembly.
†REPLACEMENT PARTS
Cartridge Assembly: AHW-16
Spring: AHW-15
Holder: AHW-14
Cap: AHW-13
Silver Graphite Brush: ABR-12-1

CAY-125

A general purpose, off-the-shelf slip ring assembly especially applicable for strain gage and thermocouple measurements where rotating detector circuits must be brought out to stationary measuring equipment.

CAY-755

The standard cartridge, (AHW-16), has been used for many years on our CAY-125 assembly and is now available with the CAY-755 which is also drawn, or individually, for use on any ring which is a minimum of ⅛" wide. The silver graphite brushes, coil springs, caps and holders may be purchased individually or as an assembly and are all available from stock.

SPECIFICATIONS

MECHANICAL

1. Rings: Coin silver
2. Brushes: Spring loaded silver graphite, two per ring
3. Torque: 0.2 in-lbs. per ring
4. Speed: 5000 rpm maximum
5. Life: 1000 hours minimum @ 500 rpm
6. Rotation: Bi-directional

ELECTRICAL

1. Current: 10 amps per circuit with two brushes per ring
2. Voltage: 0-250 Volts AC or DC
3. Dielectric Strength: 500 Volts rms (all combinations)
4. Contact Resistance Variation: 10 milliohms maximum at maximum speed
5. No. of Rings: 30 maximum

ENVIRONMENTAL

1. Operating Temperature: 0° to 200°F
2. Humidity: 85%

ORDERING INFORMATION

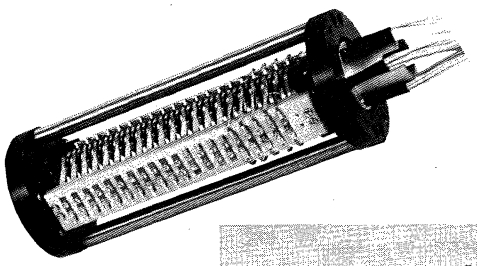
CAY-☐☐☐ ☐☐ ☐

- Model
- No. of Rings
- Special Variations

NEW HOOK ROAD, BAYONNE, NEW JERSEY 07002 201-436-2230 TWX-710-729-4489

Airflyte ELECTRONICS CO.

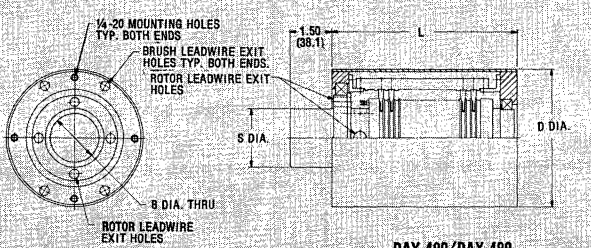
MULTI-PURPOSE SLIP RING ASSEMBLIES



These assemblies, designed for use in commercial equipment, have been used in applications ranging from thermocouples to the transmission of medium power. They feature coin silver rings, silver graphite brushes, convenient terminals on both the slip ring and brush blocks, and a rotor design which allows the leadwires to be exited through the shaft bore, or under the bearing when a shaft clearance hole is required. The wide variety of sizes and configurations available, including "in-between" shaft diameters, allows the designer to select a standard assembly for his application, eliminating time consuming and costly design charges.

DAY-490/499
UP TO **50** RINGS

. . . AS AN ASSEMBLY

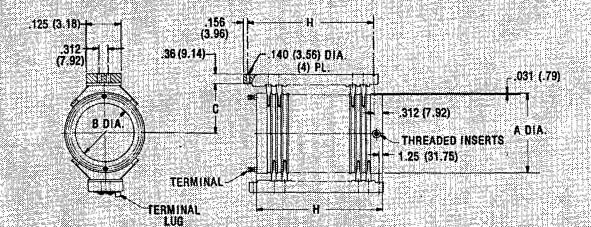


DAY-490/DAY-499

No. of Rings	Inches "L"	Milli-Meters
6-10	4.88	123.95
11-20	6.75	171.45
21-30	8.63	219.2
31-40	10.50	266.7
41-50	12.38	314.45

. . . OR AS SEPARATES

CAY-731/740
UP TO **50** RINGS



To determine "H" dimension use the following formula:
"H" = .750 + 1875 x (No. of Rings)

SPECIFICATIONS

MECHANICAL

1. Frame: Anodized aluminum (DAY-490/DAY-499 only)
2. Rings: Coin silver
3. Brushes: Silver graphite, two per ring
4. Leafs: Beryllium copper
5. Insulation: Epoy or laminated plastic

ELECTRICAL

1. Current: 10 amperes per circuit (20 amperes available at extra cost)
2. Voltage: 250 Volts maximum AC or DC
3. Dielectric Strength: 750 Volts rms (all combinations)
4. Insulation Resistance: 50 megohms minimum at 500 VDC
5. Contact Resistance Variation: 10 milliohms maximum at maximum speed
6. No. of rings: 50 maximum

ENVIRONMENTAL

1. Operating Temperature: 0 to 250°F
2. Humidity: 95% maximum

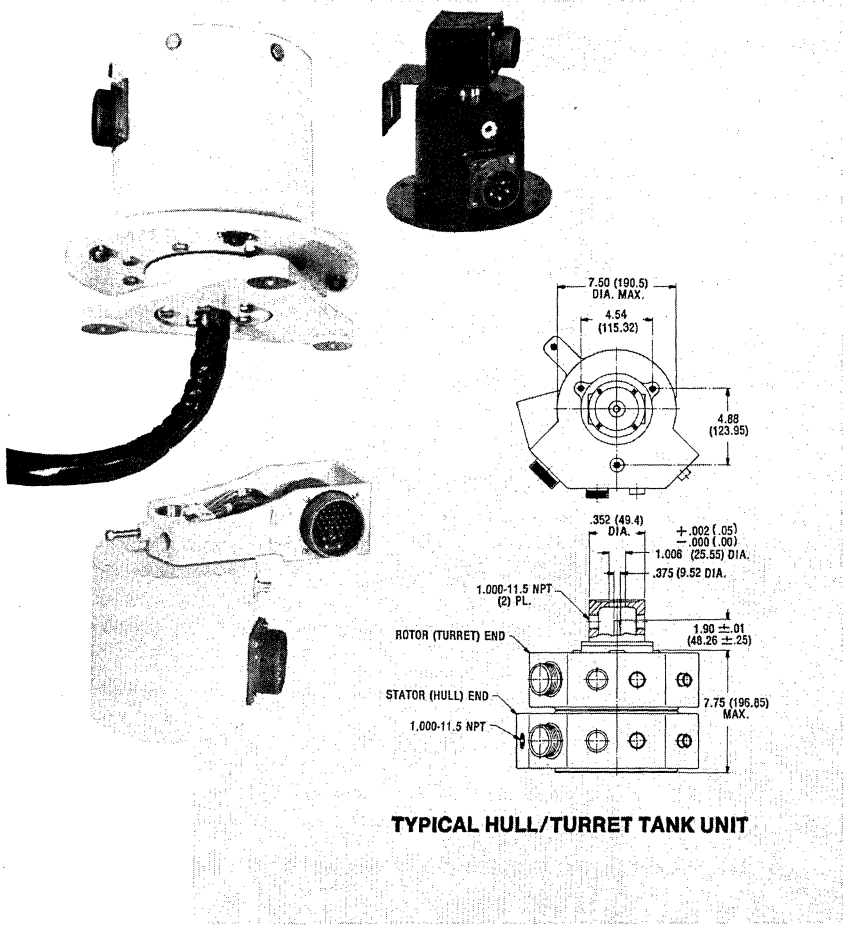
For use when bearing mounted assemblies are not practical, the CAY-731/CAY-740 should be specified.

Part No.	Max. Speed RPM	Min. LIFE 10^4 Rev.	Max. Torque Per Ring lb.-in.	Max. Torque Per Ring gm-cm	DAY-490/DAY-499 "B" Dia. in.	"B" Dia. mm	"D" Dia. in.	"D" Dia. mm	"S" Dia. in.	"S" Dia. mm	CAY-731/CAY-740 "A" Dia. in.	"A" Dia. mm	"B" Dia. in.	"B" Dia. mm	"C" Dia. in.	"C" Dia. mm
DAY-490/CAY-731	5000	50	.21	240	1.00	25.4	4.00	101.6	1.250	31.75	1.875	47.63	1.250	31.75	1.447	36.75
DAY-491/CAY-732	4000	40	.30	350	1.75	44.45	5.00	127.0	2.125	53.98	2.750	69.85	2.125	53.98	1.829	46.46
DAY-492/CAY-733	3000	30	.40	460	2.75	69.85	6.50	165.1	3.125	79.38	3.750	95.25	3.125	79.38	2.281	57.94
DAY-493/CAY-734	2500	25	.50	580	3.75	95.25	7.50	190.5	4.125	104.8	4.875	123.8	4.125	104.8	2.822	71.68
DAY-494/CAY-735	2000	20	.61	700	4.75	120.7	8.50	215.9	5.125	130.2	5.875	149.2	5.250	133.4	3.307	84.00
DAY-495/CAY-736	1500	15	.71	820	5.75	146.1	9.50	241.3	6.125	155.6	7.000	177.8	6.250	158.8	3.857	97.97
DAY-496/CAY-737	1500	15	.82	950	6.75	171.5	10.50	266.7	7.125	181.0	8.000	203.2	7.250	184.2	4.342	110.3
DAY-497/CAY-738	1000	10	.92	1060	7.75	196.9	11.50	292.1	8.125	206.4	9.000	228.6	8.250	209.6	4.837	122.9
DAY-498/CAY-739	1000	10	1.02	1180	8.75	222.3	13.00	330.2	9.125	231.8	10.000	254.0	9.250	235.0	5.332	135.4
DAY-499/CAY-740	750	7.5	1.12	1290	9.75	247.7	14.00	355.6	10.125	257.2	11.000	279.4	10.250	260.4	5.827	148.0

NEW HOOK ROAD, BAYONNE, NEW JERSEY 07002 201-436-2230 TWX-710-729-4489

Airflyte ELECTRONICS CO.

VEHICLE SLIP RING ASSEMBLIES



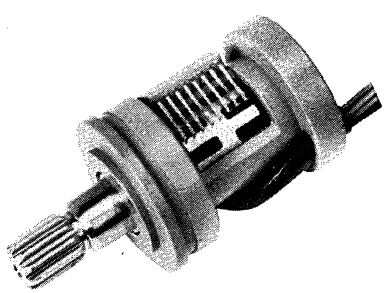
TYPICAL HULL/TURRET TANK UNIT

Airflyte Electronics has experience in the design and manufacture of assemblies for personnel carriers, tanks and other military vehicles. We have built slip rings for periscopes, turrets and commander stations. These assemblies range in size from 6″ or less in outside diameter to slip rings with clearance holes larger than 28″. This type of assembly is characterized by its rugged construction, usually has two high power rings, several low power and up to 50 signal rings. Illustrated are several of the configurations we have built in production quantities.

SPECIFICATIONS

1. Voltage: from 28 VDC to 208 VAC
2. Current: from 1 amp to 600 amps
3. Frequency: DC to 100 MHz
4. Speed: Usually about 20 rpm
5. Noise: Less than 10 mΩ peak to peak
6. Hydraulics: 3000 psi operating
7. Pneumatics: 1500 psi operating
8. Torque: 15 ft.-lb. max. (no hydraulics)
9. Life: 3000 hrs.
10. Environmental: Vibration, shock, etc. per MIL SPEC
11. Terminations: Connectors & fittings customer compatible

ENCODERS & SWITCHES



Airflyte encoders and rotary switches feature drum construction with solid gold alloy conducting segments embedded in epoxy and machined flush. Brushes are multi-strand, spring-temper gold-alloy. As small as ½″ diameter.

ENCODERS

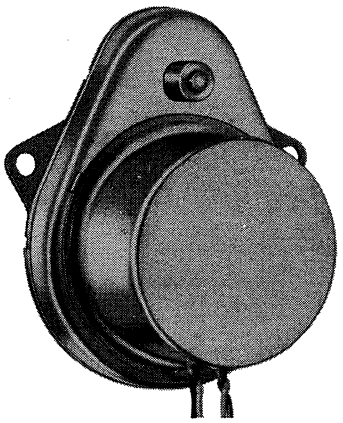
Special encoders with BCD, Gray, True Binary or non-standard codes are available. Units supplied with or without logic circuitry.

SWITCHES

When close accuracy, repeatability and size are important, specify Airflyte rotary switches for timing and positioning applications. Successfully replaces snap action switches and cams. Pre-set to eliminate installation time. Zero hysteresis.

NEW HOOK ROAD, BAYONNE, NEW JERSEY 07002 201-436-2230 TWX-710-729-4489

AC, DC, and Stepper Motors

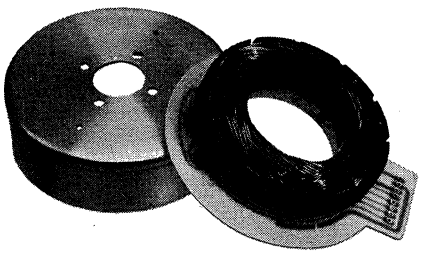


Reversible Synchronous Motors

For commercial/industrial use. 50 or 60 Hz operation; voltages from 12 to 230 Vac. PM rotor, 2-coil windings. Electrically reversible. Rotor speeds 300 rpm at 60 Hz or 720 rpm at 60 Hz. Torque 0.75 oz.-in and 1.1 oz.-in. respectively. Output speeds from 300 rpm to 1/1000 rpm.

81300 Series 300 rpm rotor
S7100 Series 720 rpm rotor

Ask for Reference Sheets CM803 and S7100

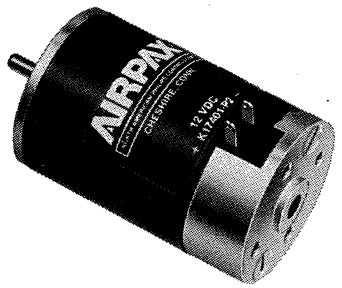


Three-phase Brushless DC Motors

Consist of 4-pole permanent magnet field rotors and 3-phase wye-connected stator windings. Electronically commutated servo; Hall cells provided. Shipped as assembly kits. User provides logic, drivers and spindles. Assembled motors with spindles available. Efficiency up to 85%. Stall torques from 30 oz.-in. to 700 oz.-in. Optimum power output. Excellent speed control. No major EMI. Minimum maintenance, long life. Particularly well-suited for rigid and floppy disk drives, phase-locked servo spindle controls and high reliability tape recorders.

L85101 Series 24Vdc
K85401 Series 24Vdc
K85601 Series 48Vdc

Ask for Reference Sheet CM834

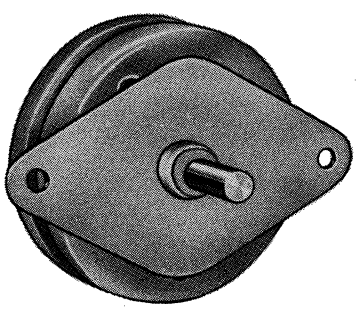


Size 15 Iron Rotor DC Motors

Bidirectional, 2-pole permanent magnet motors designed for speed control and servo applications. Available with voltage ratings of 12 or 24Vdc providing stall torque of 16 oz.-in. All have linear torque speed characteristics with minimum magnetic cogging at low speeds.

K17401—P2 Series 12Vdc
K17401—P3 Series 24Vdc

Ask for Reference Sheet CM827

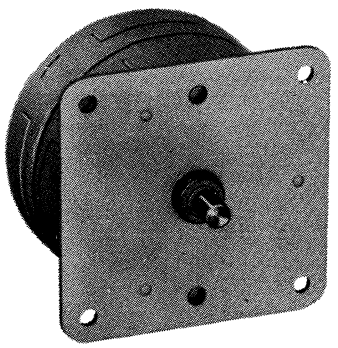


Industrial-Type Stepper Motor

2-phase stator and permanent magnet rotor. Running torque up to 8 oz.-in., holding torque up to 13.7 oz.-in. Running rates to 900 steps/sec. Bidirectional. 5V or 12Vdc. 7° 30′ or 15° step angle. Suitable for use in instrumentation and computer peripherals. Also available as a synchronous motor.

82700 Series 7° 30′ Step angle
83700 Series 15° Step angle

Ask for Stepper Motor Handbook

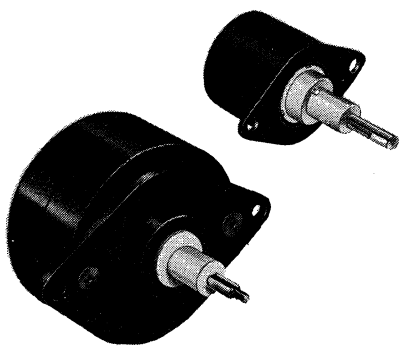


Low-Cost, High Torque Stepper Motor

A bidirectional permanent magnet stepper motor. Standard construction provides unipolar or bipolar operation, a 7° 30′ or 15° step angle and roller or sleeve bearings. Max. torque up to 28 oz.-in. Max. running rate 400 steps/sec. Operating voltages from 3.7Vdc to 14Vdc. Highly effective with long life and efficient utilization of power. Also available as a synchronous motor.

82900 Series 7° 30′ Step angle

Ask for Stepper Motor Handbook



Accurate, Incremental Digital Linear Actuators

These components accurately and incrementally actuate and control devices that must be "pushed" or "pulled". Linear forces from 15 oz. to 19 lbs. They operate on 12Vdc; offer linear travel of .001" to .004" per pulse. Shaft extensions from 0.5" to 3".

92100 Series 21 ozs. force
92200 Series 75 ozs. force
92400 Series 19 lbs. force

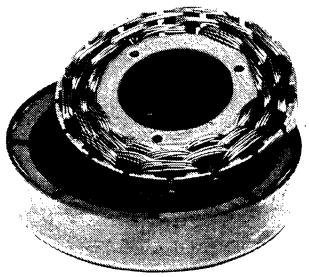
Ask for Linear Actuator Catalog

AIRPAX®

We give you control.

Airpax Corporation,
a North American Philips Company
Cheshire Industrial Park
Cheshire, CT 06410
(203) 272-0301

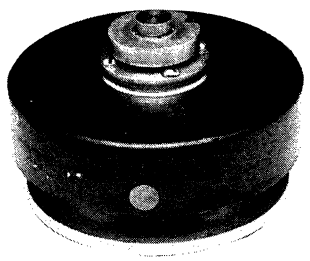
BRUSHLESS DC MOTORS FROM AXIAL MAGNETICS



ROTOR AND STATOR SET, Brushless DC

Max Dia: 3.00 inches
Length: .63 inches
Max ID: 1.40 inches
Torque Sensitivity: 10.0 oz-in/amp
Resistance: 5.0 ohms

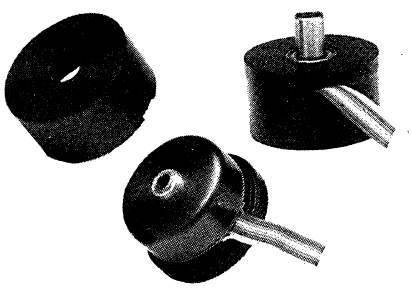
This shows the middle size of a family of 4.00, 3.00, and 2.00 inch diameter ceramic magnet motor sets available in various lengths and ratings. Available with mounted Hall Effect Sensors.



SPINDLE MOTOR, Brushless DC

Max Dia: 4.00 inches
Length: 1.5 inches
Shaft Runout: .0005 inches
Torque Sensitivity: 5.0 oz-in/amp
Resistance: .5 ohms

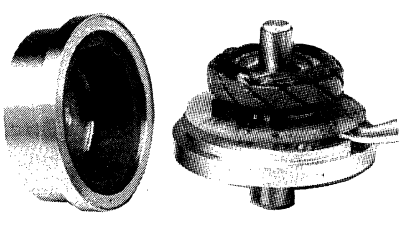
Example of complete motor sold in prototype and small quantities made by Axial Magnetics for 6, 12, and 24 volt systems. Torque Sensitivities of up to 50 oz-in/amp have been supplied in this 4.00 inch diameter with Delta connected 3 phase windings.



HOLLOWSHAFT MOTOR, Brushless DC

Max Dia: 2.25 inches
Length: 1.25 inches
Shaft ID: .25 inches
Shaft Runout: .0005 inches
Torque Sensitivity: 4.2 oz-in/amp
Resistance: 22.0 ohms

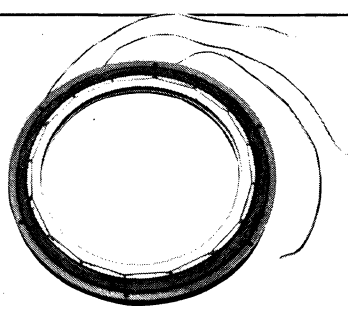
Custom design for slow speed rotation of laser prism for etching electronic circuits.



PRECISION SPINDLE MOTOR, Brushless DC

Max Dia: 2.00 inches
Length: 1.25 inches
Hub Radial Runout: .0001 inches
Torque Sensitivity: 2.8 oz-in/amp
Resistance: 3.8 ohms

Prototype motor built into 3 disk, 5.25 inch Winchester Disk Hub. Hall Effect Sensors are visible between stator and base. Connection was 3 phase center tapped for half wave drive.



TORQUE MOTOR ROTOR AND STATOR SET, Brushless DC

Max Dia: 6.50 inches
Length: .45 inches
Max ID: 4.75 inches
Torque Sensitivity: 24 oz-in/amp
Resistance: 2.4 ohms

This is the largest of a family of inner member rotate Rare Earth Magnet designs having maximum diameters of 6.50, 5.50, 4.50, 3.50 and 2.50 inch diameters.

AXIAL MAGNETICS
Custom Electro Magnetics 15922 Strathern Street, Van Nuys, CA 91406 • 818/994-3346

UL RECOGNIZED D-C STEPPER & 72 R/MIN SYNCHRONOUS MOTORS & CONTROLS

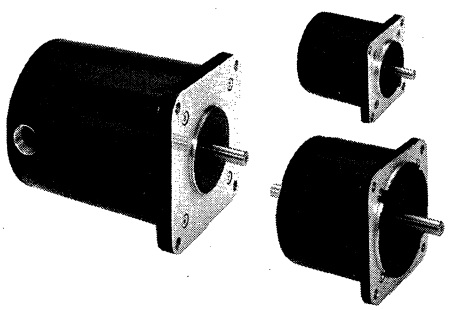
In Stock At Your Bodine Distributor

HY-Sync™ A-C Synchronous Motors

- Eliminates Need for Clutches and Brakes—
  1. Holding Torque at Stop with D-C Applied
  2. Starts in 16 to 25 Milliseconds
- Twice as much Torque Per Frame Size than Competitive Stocked Brands

Frame Size/ Stack	Bodine 72 RPM Sync	Most Stocked Brand
23/1	50 Oz-in	25 Oz-in
34/1	115 Oz-in	50 or 80 Oz-in
34/2	230 Oz-in	Not stocked
42/1	360 Oz-in	150 or 250 Oz-in
42/2	720 Oz-in	400 or 700 Oz-in

- Designed for Exceptionally Long Life
- Availability from Stock
- UL/CSA Recognized



Quality Stepping Motors

- 1.8° Steppers Designed for Maximum Reliability
- 100% Testing Before Shipment
- 3% Step Accuracy—.001" TIR Mounting Accuracy Standard in Sizes 23 and 34
- Construction Recognized by U.L. (File #E47177) and Component Certification by CSA
- Physically and Electrically Compatible with many Competitive Motors; 8 Leads Standard
- U.L. Recognized Class F Insulation System—Operated at Reduced Temperature for Long Winding Life

Easy-To-Interface Indexer

- BCD with No Multiplexing Required
- Computer Setable Decel Initiation Point to Minimize Traverse Times
- Cost Effective Chassis Versions Available
- Electronic Damping Optional

Versatile Translators

- Accept CCW & CW Pulses or Pulses + Direction
- Drive Motor from up to 100 VDC Supply
- Enclosed and Chassis

Write For Free Catalogs

For information on HY-Sync™ motors, request Catalog HY.
For Bodine stepper motors and controls ask for Catalog ST.

HY-Sync™, SYNCHRONOUS—115 V.—60 Hz—72 Rpm (50 Hz and 230 V. available)

Size	Model No. Single Shaft	Model No. Dual Shaft	Max. Amps	Phase Shift Network Resistor Ω/W	Phase Shift Network Resistor Part No.	Phase Shift Network Capacitor μF/V	Phase Shift Network Capacitor Part No.	Rated Torque Oz-in.	Max. Radial Load Lbs.	Max. Axial Load Lbs.	Max. Length In.
23 2.3" Dia.	2018	*	.16	300/7	443-40301	1.6/250	494-00051	50	15	25	2.31
	—	*	—	Delayed Introduction				—	15	25	3.31
34 3.4" Dia.	2021	*	.24	500/18	443-63501	2.7/250	494-00066	115	45	75	2.83
	2022	*	.49	200/50	443-72201	5.6/250	494-00069	230	45	75	4.21
42 4.2" Dia.	2024	*	.66	200/80	443-70201	7.5/250	494-00068	360	45	150	5.12
	2025	*	1.64	100/175	443-70012	20/250	494-00067	720	100	150	7.27

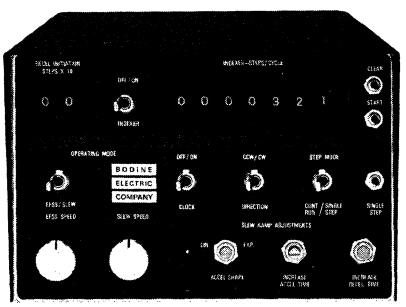
STEPPER—(D-C)—1.8°

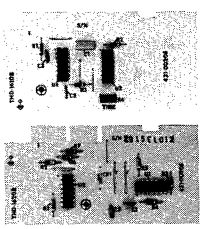
Size	Model No. Single Shaft	Model No. Dual Shaft	Nominal D-C Volts	Amps/ Phase	Res./ Phase Ohms	Induct./ Phase mH	Holding Torque Oz-in.	Nom. Rotor Inertia Oz-in-Sec^2 Times 10^{-3}	Max. Length In.	Weight Lbs.
23 2.3" Dia.	2000	2100	1.3	3.8	0.34	0.59	50	1.5	2.31	1.3
	2009	2109	4.7	1.0	4.7	8.70	50	1.5	2.31	1.3
	2001	2101	1.6	4.7	0.34	0.81	100	3.0	3.31	2.1
	2010	2110	4.8	1.6	3.0	7.07	100	3.0	3.31	2.1
	2002	2102	2.1	4.6	0.46	1.08	150	4.5	4.31	3.0
	2011	2111	3.3	2.9	1.14	2.90	150	4.5	4.31	3.0
34 3.4" Dia.	2003	2103	1.7	4.7	0.37	1.14	150	9.75	2.83	3.5
	2012	2112	2.7	3.1	0.88	2.86	150	9.75	2.83	3.5
	2004	2104	2.4	4.6	0.52	2.25	300	19.5	4.21	6.0
	2013	2113	3.0	4.0	0.75	3.18	300	19.5	4.21	6.0
	2005	2105	2.6	5.5	0.48	2.36	450	28.5	5.60	8.6
	2014	2114	4.3	3.5	1.23	6.58	450	28.5	5.60	8.6
42 4.2" Dia.	2006	2106	2.3	6.1	0.38	3.04	625	54.6	5.12	9.0
	2015	2115	4.2	3.5	1.45	12.48	625	54.6	5.12	9.0
	2007	2107	3.6	6.1	0.59	5.94	1125	110.5	7.27	15.7
	2016	2116	7.1	3.1	2.30	22.93	1125	110.5	7.27	15.7

STEPPER CONTROLS**

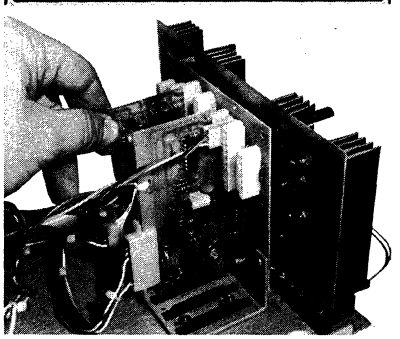
Model No.	Bodine Type	Description
2900	THH-1800C	4 Amp Translator, to 3000 PPS
2901	THD-1810C	8 Amp Translator, to 5000 PPS
2902	THD-1830E	Encased Modular Translator, CMOS or TTL Level Pulses to 15,000 PPS
2903	THD-1850E	Encased Modular Indexer, 7 Digits to 15,000 PPS
2904	THD-1000B	8 Amp Power Driver Module, Accepts 4 CMOS Phase Inputs to 15,000 PPS

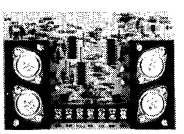
* Not normally stocked. ** Non-encased modules to duplicate THD-1830 and 1850 also available.

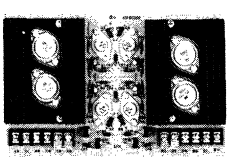




Damping Cards





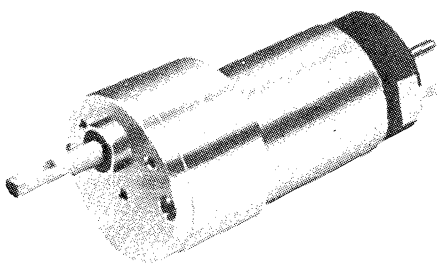


Translators

BODINE® ELECTRIC COMPANY
Small Motors, Gearmotors, Electronic Motion Controls
For over Eighty years, "the power behind the leading products."®
2500 West Bradley Place Telephone: 312-478-3515
Chicago, 60618 USA Telex: 25-3646

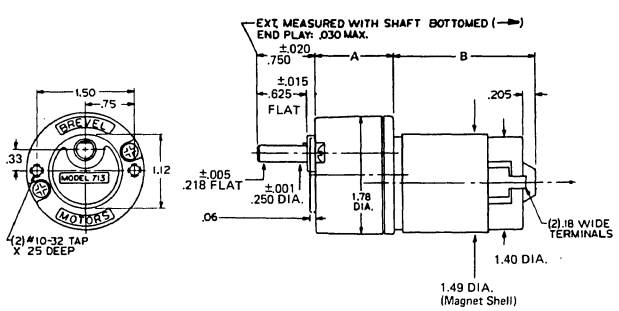
BREVEL MOTORS

Model 713
Stock D.C. Gearmotor

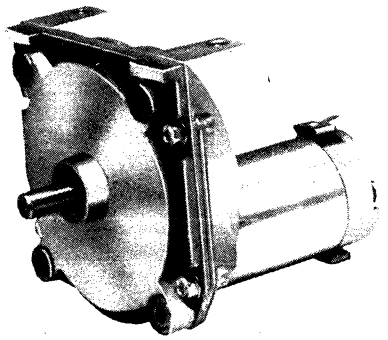


The Model 713 D.C. Gearmotor was designed for low torque applications. The extremely compact gearmotor is ideal for robots, instrumentation, and other uses where space is at a minimum, but quality and reliability is of maximum concern.

Several models of each design are available as stock items from over 100 Brevel Distributors nationwide. . .or Brevel will custom design to fit your applications.

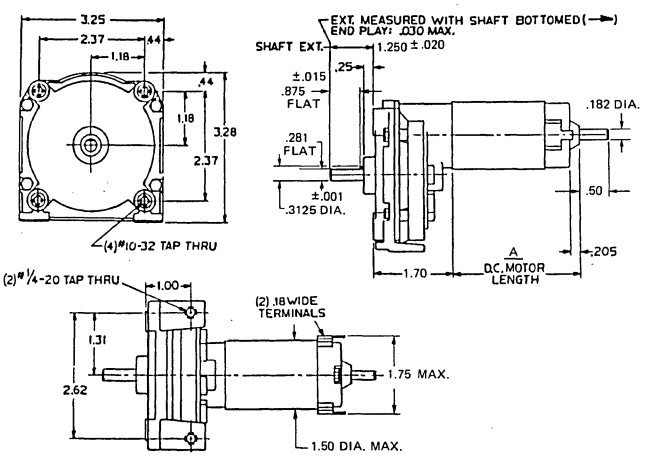


Model 780
Stock D.C. Gearmotor



The Model 780 D.C. Gearmotor was designed for high torque applications. The rugged Model 780 is ideal for pumps, vending machines, lift mechanisms and other uses where tough reliable operation is demanded.

Several models of each design are available as stock items from over 100 Brevel Distributors nationwide. . .or Brevel will custom design to fit your applications.



ALL SPECIFICATIONS @ 12V DC

Stock Model No.	No-Load RPM	Starting Torque Lbs.-In.	Nominal Running AMPS	Running Torque @ RPM Lbs.-In.	Dimension A	Dimension B	Gear Train Ratio
713-982922	5.8	*103	.75	20.0 – 4.6	1.20	2.31	604.0:1
713-982923	9.4	* 63	.75	20.0 – 5.9	1.20	2.31	374.0:1
713-982924	16.4	* 36	.75	12.0 – 10.0	1.20	2.31	213.0:1
713-982925	26.0	* 22	.75	7.5 – 16.0	1.20	2.31	132.0:1
713-982926	39.8	* 32	1.25	10.8 – 25.0	.93	3.06	75.3:1
713-982927	46.0	14.4	.75	4.8 – 29.0	.93	2.31	75.3:1
713-982928	64.4	20.0	1.25	6.6 – 42.0	.93	3.06	46.6:1
713-982929	112.0	12.7	1.25	4.2 – 73.0	.93	3.06	26.6:1
713-982930	145.6	9.8	1.25	3.2 – 94.5	.93	3.06	20.0:1
713-982931	183.0	7.0	1.25	2.6 – 110.7	.93	3.06	16.5:1

*TORQUE LOAD MUST NOT EXCEED 20 LBS–IN

ALL SPECIFICATIONS @ 12V DC

Stock Model No.	No-Load RPM	Starting Torque Lbs.-In.	Nominal Running AMPS	Running Torque @ RPM Lbs.-In.	Dimension A	Gear Train Ratio
780-982956	4.5	*240	1.6	120 – 3.0	2.675	762.6:1
780-982957	7.5	*170	1.6	75 – 4.8	2.675	472.0:1
780-982958	12	140	1.6	60 – 7.5	2.675	271.8:1
780-982959	23	70	1.6	30 – 16	2.675	150.5:1
780-982960	34	70	2.5	33 – 20	3.425	97.2:1
780-982961	62	40	2.2	18 – 40	3.425	53.1:1
780-982962	90	27	2.2	13 – 60	3.425	35.4:1
780-982963	175	16	2.0	6.5 – 130	3.425	19.0:1

*TORQUE LOAD MUST NOT EXCEED 150 LBS–IN

BREVEL MOTORS INC.

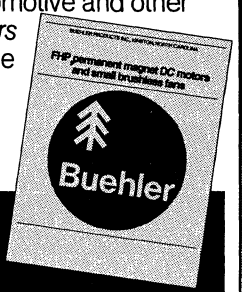
a subsidiary of

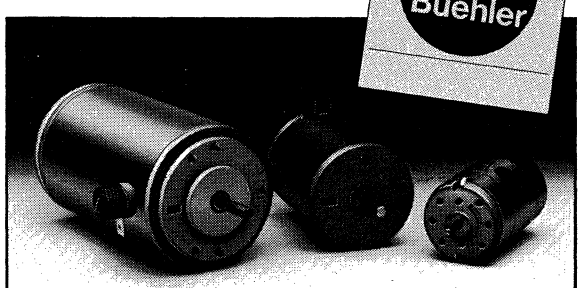
VERNITRON CORPORATION

BROAD AND 16th STREETS
CARLSTADT, NEW JERSEY 07072
TELEPHONE: (201) 933-0220
TELEX: 642-606

BUEHLER
DC MOTORS AND FANS

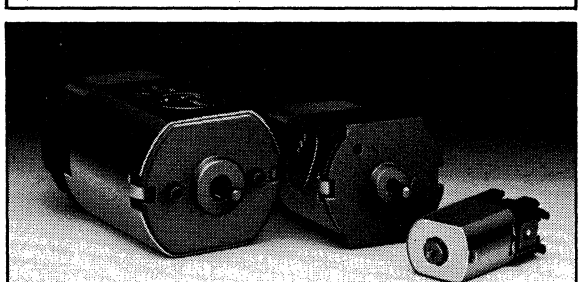
Buehler FHP motors and DC fans are used the world over in computer peripherals, business machines, instruments, automotive and other industrial applications. *Motors can be customized* (if volume warrants) to meet specific OEM applications. Call or write for catalog.



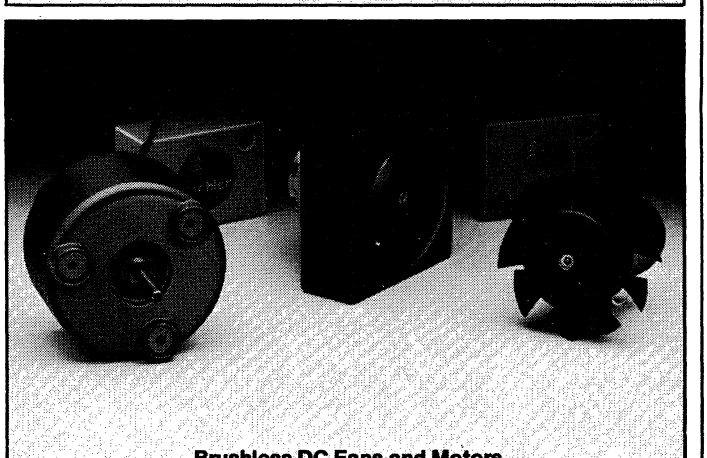


Series 13 DC Motors
Diameters from 14mm to 52mm; starting torques from .1Ncm to 70Ncm (.14 in. oz. to 100 in. oz.); 25 basic types; sleeve or ball bearings.

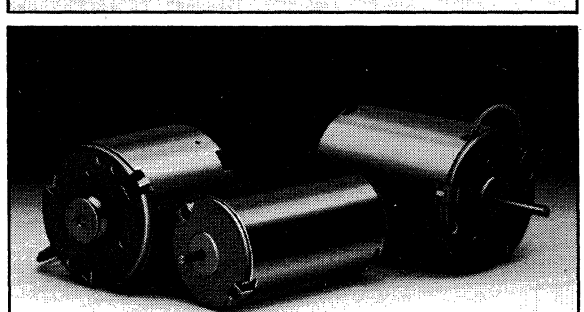
Miniature DC Gearmotors
Over 60 different ratios and voltages; output torques from 1.5Ncm to 300Ncm (2.1 in. oz. to 429 in. oz.); lightweight, compact, high durability.



Series 16 DC Motors
Diameters from 10mm to 24mm; starting torques from .07Ncm to .7Ncm (.1 in. oz. to 1 in. oz.); low cost, high durability. Maximum space efficiency.



Brushless DC Fans and Motors
10,000 hour service life at 60° ambient; low noise and electrical interference; fan air flow may be automatically regulated with temperature. Nominal fan voltages available in 12V, 24V and 48V.



DC Motors with Tachometers
Integral AC and DC tachometers; sleeve or ball bearings; low mechanical and electrical noise. Long service life. Maximum reliability.

Buehler

BUEHLER PRODUCTS, INC.

P.O. BOX 33400
RALEIGH, NC 27606
(919) 469-8522 TWX 510 928 0549

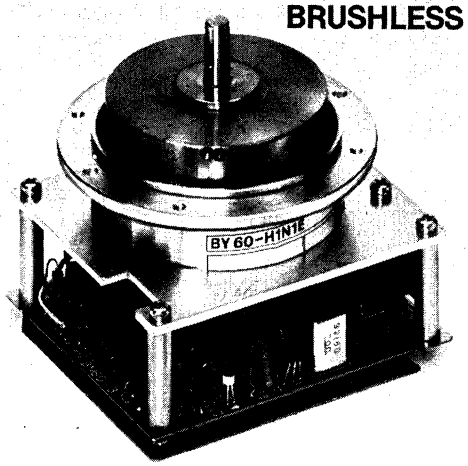
Sub-fractional DC Motors

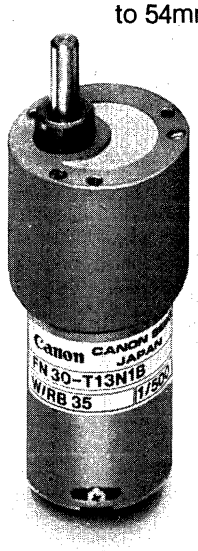
GEARMOTORS

- Over 100 different combinations
- Ratios from 8:1 to 3000:1
- 50 to 20,000 g-cm rated torque
- 1.3 to 600 rpm
- 6 to 24 VDC
- Concentric or offset shaft
- Gearheads from 20mm to 54mm dia.

BRUSHLESS

- Inner and outer rotor types
- Axial and radial gap types
- 39mm to 60mm diameter
- 120 to 300 g-cm starting torque
- With or without electronics





CORELESS

- 22mm to 30mm dia.
- 70 to 220 g-cm starting torque
- Ball bearings available on some models

IRON CORE

- Over 70 models
- 13mm to 50mm dia.
- 18 g-cm to 3000 g-cm starting torque
- Integral AC tach, mechanical governer models available
- Ball or sleeve bearings on some models

Canon®

If you are an OEM with a requirement for sub-fractional DC motors call Canon directly or send for our free short form catalog.

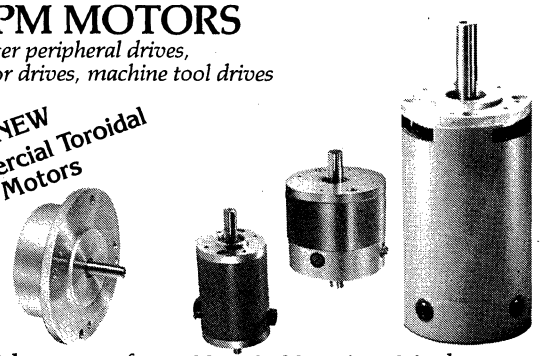
CANON U.S.A., INC.
Components Division
One Canon Plaza Lake Success, N.Y. 11042
Tel: (516) 488-6700 Telex: 96-1333
Cable: CANON USA LAKS

Dependable...fractional horsepower motors by Clifton Precision

DC PM MOTORS

Computer peripheral drives, conveyor drives, machine tool drives

NEW Commercial Toroidal Motors



. . . with torques from 90 to 3500 oz-in., 2 inch to 4 inch O.D. Advanced magnetic materials . . . cartridge brushes

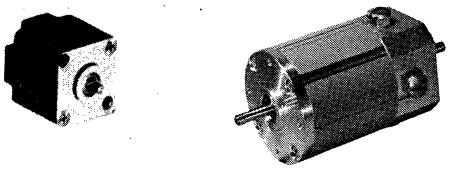
BRUSHLESS DC MOTORS

Floppy and Winchester disk drives, machine tool drives, pumps, fans, robotics

. . . with 40 to 150 mm O.D.; 1, 2, or 3 phase. Available in parts sets or housed, with inner or outer rotors. Will customize upon request.

MINIATURE DC PM INSTRUMENT MOTORS

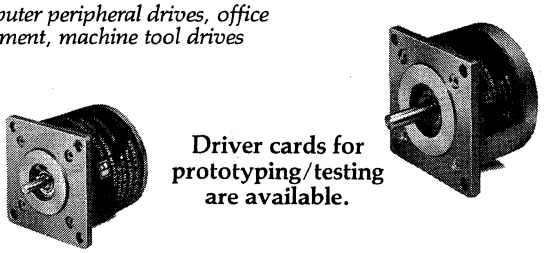
Computer peripheral drives, instrument recorders, laboratory instruments, medical equipment, robotics



. . . with torques from 2 to 50 oz-in. .75 inch cube to 1.32 inch O.D. Cartridge brushes, Alnico or rare earth magnets

PM, HYBRID, and VR STEPPER MOTORS

Computer peripheral drives, office equipment, machine tool drives

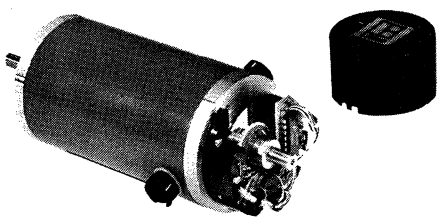


Driver cards for prototyping/testing are available.

. . . with step angles 1.8°, 1.875°, 3.6°, 15°, 30°, 45°, 90°; .75 inch to 2.3 inch O.D. Ceramic, Alnico or rare earth magnets. Available with integral encoders.

INTEGRAL MOTOR/ENCODER ASSEMBLIES

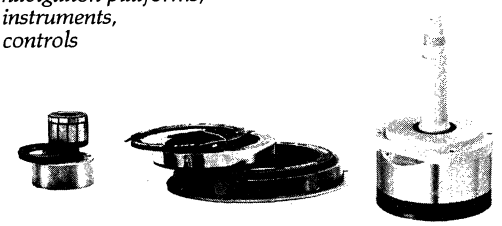
Computer peripheral drives, office equipment, machine tool drives



Optical encoder resolution to 2500 cycles. Solid-state, gallium arsenide light source, integral assemblies, no assembly or alignment necessary

DC PM HOLLOW SHAFT TORQUE MOTORS

Inertial navigation platforms, aircraft instruments, aircraft controls



. . . with torques from 6 to 2700 oz-in., 1.1 inch to 20 inch O.D. Precision tolerances, gold commutators, high reliability

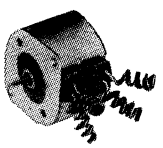
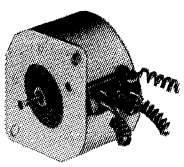
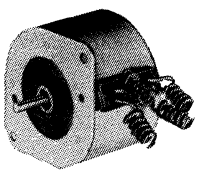
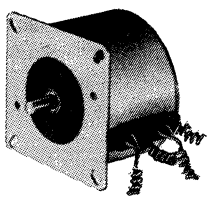
For further information on Stepper Motors and Brushless DC Motors, call Dave Smith at Murphy, NC (704) 837-5115; for all other motor information, call Clifton Heights, PA (215) 622-1000.

Litton **Clifton Precision**

MARPLE AT BROADWAY, CLIFTON HEIGHTS, PA. 19018 ▪ (215) 622-1000

Permanent Magnet Motors

Stepper Motors - 7.5° - 2 Phase and 4 Phase

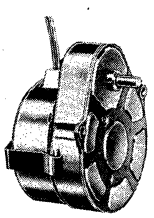
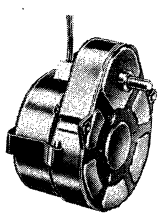
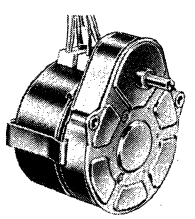
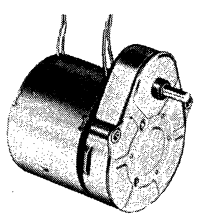
PART NUMBER	82 910.0	82 920.0	82 930.0	82 940.0
Stepper Motors				
Diameter	1.4" (35.5 mm)	2" (51 mm)	2.25" (57.5 mm)	2.55" (65 mm)
Holding Torque (2 Phase)	3.1 in. oz.	8.5 in. oz.	23 in. oz.	39 in. oz.

Reversible Synchronous Motors

Above Stepper Motor sizes are available as Reversible Synchronous Motors (300 or 450 RPM) 82 500 Series

Synchronous Gear Motors (Pear Shape)

- High Torque, instant stop
- Uni-directional or reversible
- Precision double bushing
- Standard round, flatted or knurled shaft
- UL, CSA and most European standards.
- Optional: Dual Voltage, friction or one way clutch, low temperature lubrication, etc.

Rotation	Uni-Directional		Reversible	
Torque	Standard Torque	High Torque	Standard Torque	High Torque
Part Number	82 344	82 334	82 514	82 524
Synchronous Gear Motors				
Static Torque	300 in. oz.	300 in. oz.	300 in. oz.	300 in. oz.
Dynamic Torque	75 in. oz.	75 in. oz.	75 in. oz.	75 in. oz.
Running Torque @ 1 RPM	155 in. oz.	580 in. oz.	420 in. oz.	1200 in. oz.
Power Input	2.7 w	2.8 w	2.7 w	3.5 w

Also available from Crouzet: ***Shaded Pole Gear Motors***

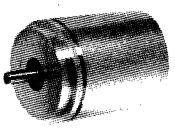
Crouzet®

Crouzet Controls, Inc.
1083 State Parkway, Schaumburg, IL 60195
Tel: 312/843-2200 - Telex: Crouzet 206 297

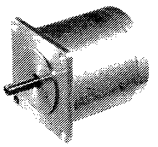
Eastern Air Devices

Dept. EM, 1 Progress Dr., Dover, NH 03820 • (603) 742-3330 • TWX (510) 297-4454

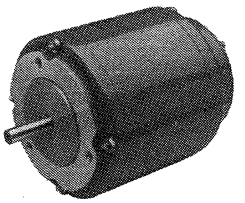
STEPPING MOTORS



Sizes 8 through 20 VR and PM stepping motors, 7.5, 10, 15, 22.5, 30, 45, and 90 degree step angles with a wide range of voltage and torque ratings. Heat sinks and mechanical dampers available.



Size 23 (2 7/32" dia.) and size 34 (3 3/8" dia.) permanent magnet stepping motors with 1.8, 1.875, 2, 2.5, 5, and 7.5 degree step angles. Torque ratings from 50 to 150 oz. in. for size 23, and 150 to 450 oz. in. for size 34.



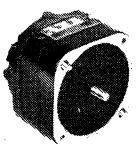
Size 42 (4 3/16" dia.) permanent magnet stepping motors with 1.8 degree step angles. Torque ratings from 450 to 1100 oz. in.

BRUSHLESS DC MOTORS

Motors, fans, blowers. Sub-FHP to ½ HP. To 20,000 rpm. With or without electronic drive circuits.

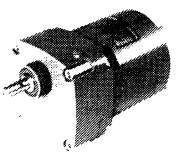
INSTRUMENT MOTORS AND GEAR MOTORS

Holtzer Cabot Model M instrument motors with ratings up to 1/20 HP. Available as induction, torque, and synchronous motors in either face or foot mount. Only 2 7/8" sq. Popular for floppy disk drive applications.



Holtzer Cabot Model L & S instrument motors with ratings up to 1/100 HP. Available as servo, polarized synchronous, synchronous, torque, induction, and DC motors. Only 2 9/16" square.

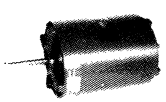
Holtzer Cabot Model L & S instrument gear motors with ratings through 150 oz. in. Available with gear reductions from 3:1 to 3600:1 in either spur or in helical gearing. Only 2 9/16" square.



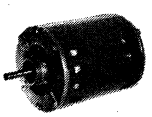
Size 34 (3 3/8" dia.) synchronous and non-synchronous gear motors. Speeds from 2 RPM to 150 RPM. Torque output up to 40 lb. in. For applications that require quiet operation and long life.

Holtzer Cabot right angle gear motors. Up to 1/8 HP in a variety of voltages, either AC or DC. Gear ratios from 6:1 to 1140:1 in either single or double reduction gear reducers.

SYNCHRONOUS AND INDUCTION MOTORS

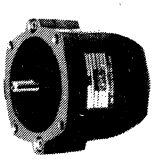


Size 34 (3 3/8" dia.) and 44 (4 3/8" dia.) synchronous and induction motors. 1/300 through ½ HP. 600 to 12,000 RPM. Single or dual speeds, single or dual voltage. 50/60 or 400 Hz.



Size 31 (3 1/8" dia.) and size 39 (3 7/8" dia.) synchronous and induction motors. 1/200 through ½ HP. 600 to 3600 RPM. Single or dual speeds. 50/60 Hz.

TACHOMETER ALTERNATOR

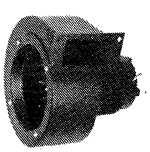


Model J15. Rugged PM design for maintenance free industrial applications. Output 5 volts/1000 RPM. 2.5% max. distortion, 0.1% linearity.

FANS AND BLOWERS

Propeller and Tubeaxial fans. Up to 12" dia. up to 1500 CFM. The EAD line of axial fans for cooling application is manufactured for continuous duty and efficient air circulation.

Vaneaxial fans. Available in 1½", 2", and 4¾" dia. from 3 to 500 CFM at high static pressures. EAD V-Line fans are small and powerful air moving devices particularly suited to high-density electronic packages.



Centrifugal blowers. From 3 to 2000 CFM, static pressures up to 5" of water. These centrifugal squirrel cage blowers have general-purpose performance characteristics for systems with medium back pressures.

EAD Motors

Holtzer Cabot Instrument Motors

Janette Gear Motors and Reducers

When quality and profit are the bottom line... Electro-Craft DC Servo Systems

To produce a quality, profitable product, you must design and engineer a system that performs. A system that is productive, fast, accurate, flexible and reliable. The fundamental basis for quality and profit.

Look to Electro-Craft for "System Solutions".

For more than two decades, Electro-Craft Corporation has set the standard of the industry for the design and production of precision DC Servo Systems. Offering an extensive line of DC Motors and Tachometers, Speed Control Systems, Servo Amplifiers, Digital Positioning Systems and Optical Encoders for the Office and industrial automation markets. Electro-Craft also sets a standard by being the only engineering and manufacturing company offering in-house research and development capabilities to provide "system solutions" for your specific manufacturing problems. System solutions, that when integrated into your engineering plans, provide you with the formula to exceed your bottom line--a quality product with built-in profits.

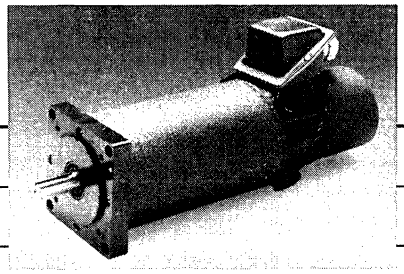
Electro-Craft Capabilities.

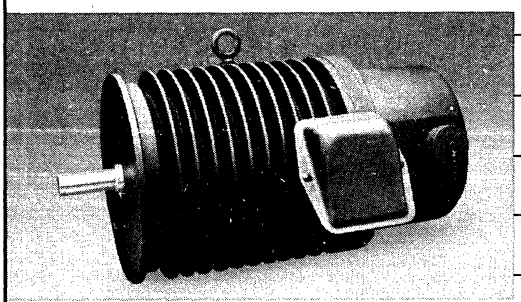
Electro-Craft is a major supplier of DC Servo Systems to the industrial automation market. A vast range of product type and size is demanded to successfully compete in this developing market.

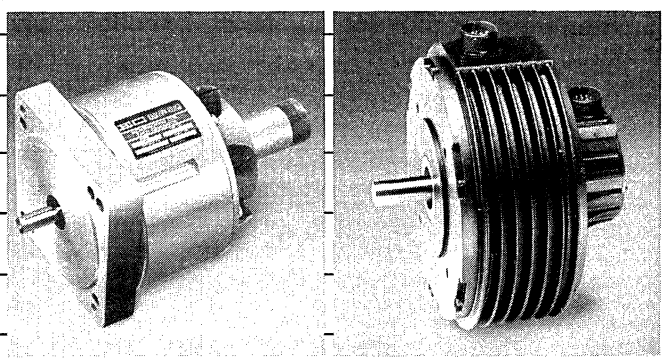
The scope of Electro-Craft's products include four types of motors--iron-core, moving coil, brushless DC and thin-ring brushless DC. This selection of motors ensures that each production application is given the ultimate solution. Every Electro-Craft-built motor has a compatible amplifier for optimum system performance.

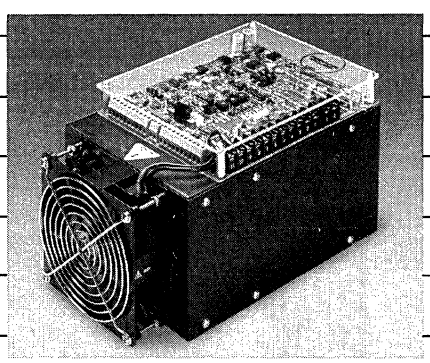
Set your design and manufacturing standard. Then look to Electro-Craft to provide you with precision engineered products for your manufacturing needs.

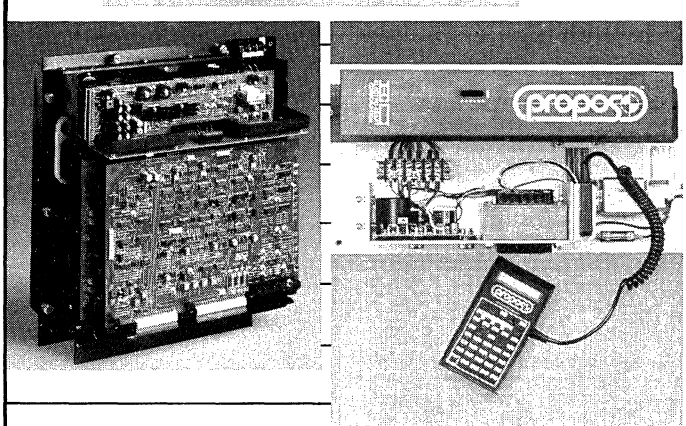
Quality, the ultimate economy.



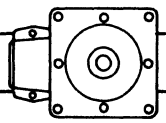








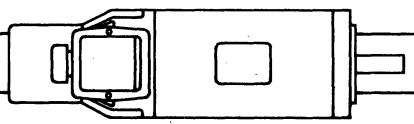
MOTORS



Iron Core Motors

Ceramic or Rare-Earth Magnet

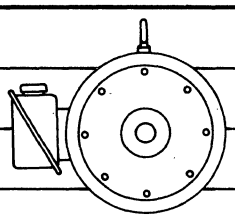
1.5 - 8 in Dia.



20 - 400 W

1 - 475 lb-in

0 - 5000 rpm

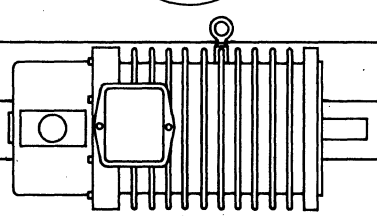


Brushless Motors

Rare-Earth Magnet

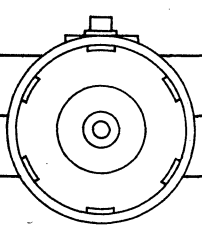
2.5 - 16 in Dia.

100 - 15,000 W



5 - 1000 lb-in

0 - 15,000 rpm

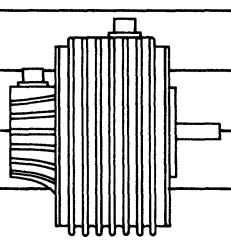


Thin Ring Brushless Motors

Rare-Earth Magnet

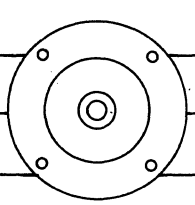
7 - 15 in Dia.

500 - 4000 W



12 - 450 lb-in

0 - 3000 rpm

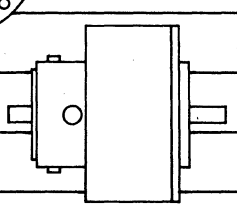


Moving Coil Motors

Alnico or Rare-Earth Magnet

2.5 - 5.5 in Dia.

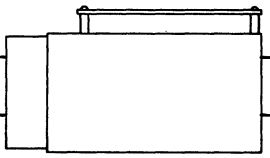
50 - 500 W



20 - 375 oz-in

0 - 5000 rpm

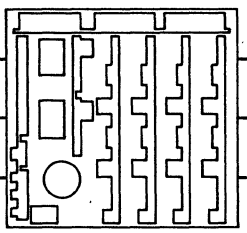
AMPLIFIERS



Linear or PWM

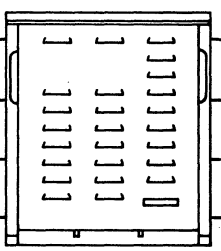
1 - 6 Axis

300 - 7000 W



4 - 48 A

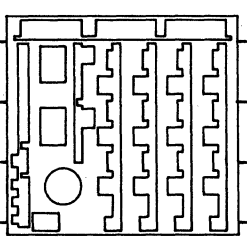
40 - 90 V



PWM

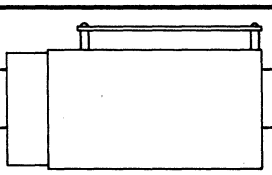
1 - 6 Axis

300 - 17,000 W



4 - 64 A

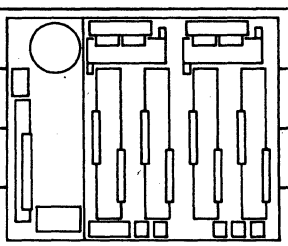
40 - 270 V



Linear or PWM

1 - 6 Axis

300 - 4000 W



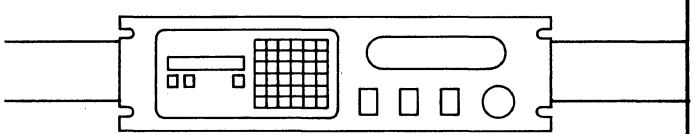
4 - 48 A

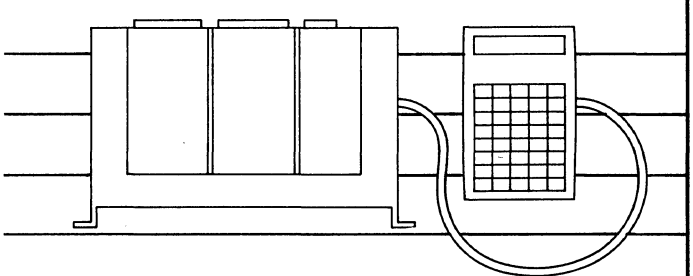
40 - 150 V

CONTROLLERS

Digital Motion Controller

With PC option





Electro-Craft for dependable Customer Sales and Service.

1-800-328-3983

Is your direct line to the Electro-Craft Customer Information Center.

For application assistance in sizing to optimally match your load, or comprehensive information on the complete line of Electro-Craft DC Servo Systems, call our toll-free number. Our staff is there to take your request, find a solution, and get back to you with the right answer.

For direct contact, there is an Electro-Craft Sales Representative in your area ready to help.

When Quality and Profit are your Bottom Line...

EC

ELECTRO-CRAFT CORPORATION

Standard Product Sales
1600 Second Street South
Hopkins, Minnesota 55343
Telephone - 612/931-2700
Toll-Free - 1-800-328-3983

Applications Assistance
ITT Telex-4310124 or call our sales office nearest you.

ETI SYSTEMS

MOTORIZED POTENTIOMETERS

DIRECT CURRENT SPECIFICATION CHART

D.C. MOTOR SPECIFICATIONS

D.C. Motor Specifications	ETM 6-1	ETM 6-2	ETM 12-1	ETM 12-2
Nominal Voltage (volts)	6	6	12	12
Power Output-Max (mW)	260	430	330	660
Stall Torque (oz. in.)	.078	.195	.083	.244
No Load Speed +15% (rpm)	18,800	11,900	19,200	14,700
Typical Motor Starting Voltage (mV)	220	130	250	230
Typical Motorpot Starting Voltage (volt)	.8	.8	1.5	1
Approx. Operating Current (mA)	12	11	8	8
Approx. Clutching Current (mA)	20	20	16	20
Armature Inductance (mHENRIES)	250	350	1,200	850
Armature Resistance (ohms)	30	20	109	52
Mechanical Time Constant (millisec)	70	39	75	35

CHART FOR HEAVY DUTY 6, 12, OR 24 VDC MOTOR AND GEAR

Voltage	RPM AT POT CHART									
6 VDC	81	46	26	14	8.2	4.6	2.6	1.5	.82	.46
12 VDC	86	49	27	15	8.7	4.9	2.5	1.55	.86	.48
24 VDC	85	48	27	15	8	4.5	2.7	1.5	.8	.5

RPM AVAILABITY CHART (D.C. MOTORPOTS)

Gear Chart, Gear Ratio & Matching Motor	Potentiometer Drive (RPM) ±15%			
	ETM 6-1	ETM 6-2	ETM 12-1	ETM 12-2
ETG 76	222	140	227	174
ETG 141	120	75	122	94
ETG 262	65	40	65	50
ETG 485	34	22	35	27
ETG 900	19	12	19	14.7
ETG 1,670	10	6.3	10	8
ETG 3,120	5.5	3.3	5.5	4.25
ETG 5,750	3.0	1.8	3.0	2.31
ETG 10,600	1.6	1.0	1.63	1.25
ETG 19,800	.87	.55	.87	.67
ETG 37,000	.46	.29	.50	.36
ETG 68,200	.25	.16	.25	.19
ETG 128,000*	.13	.09	.14	.10
ETG 235,000*	.07	.04	.08	.06

*Gears noted are non-standard.

MODEL SELECTION GUIDE

FOR D.C. MOTORPOTS

Model No.	Size: Diameter By Length	Motor	Power	Gangs	Turns	Element	*POT
MC20-1	⅞″ x 3½″ ≈	6 or 12 VDC	3 watts	1	10	Wirewound	MW20-10
MC20-2	1 ¼″ x 4 15/16″ ≈	6 or 12 VDC	3 watts	2	10	Wirewound	MW20-10
MC20-3	1 ⅜″ x 4 ¾″ ≈	6 or 12 VDC	3 watts	1	10	Wirewound	MW20-10
MC20-4	1 ⅜″ x 5 ½″ ≈	6 or 12 VDC	3 watts	2	10	Wirewound	MW20-10
MC20-5**	1 ⅜″ x 6 ½″ ≈	6, 12 or 24 VDC	3 watts	1	10	Wirewound	MW20-10
MC22-3	1 ¼″ x 4 ¾″ ≈	6 or 12 VDC	1 watt	1	Single	Wirewound	SW22D
MC22-4	1 ¼″ x 4 ¾″ ≈	6 or 12 VDC	1 watt	1	Single	Conductive Plastic	SP22D
MC46-1	2″ sq. x 6 3/16″ ≈	6 or 12 VDC	10 watt	1	Multi	Wirewound	MW46
MC46-2	2″ sq. x 7 ⅓″ ≈	6 or 12 VDC	5 watts	1	Multi	Wirewound	SMR46
MC46-4**	2″ sq. x 7⅜″≈	6, 12 or 24 VDC	5 watts	2	Multi	Wirewound	SMR46
MC46-5**	2″ sq. x 9⅜″ ≈	6, 12 or 24 VDC	5 watts	1	Multi	Wirewound	SMR46

* Refer to Section 4750, (Potentiometers), for information on potentiometers and their resistance range. For R.P.M., see above chart.
** Heavy Duty Motor Chart applies. ≈ Actual length varies with R.P.M. selected.
Specifications subject to change without notice.

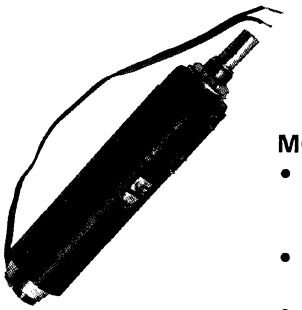
SEE SECTION 4750, POTENTIONMETERS, TRIMMERS, CONTROLS & RHEOSTATS, AND SECTION 2200, CONTROL SYSTEMS & COMPONENTS.

ETI SYSTEMS
DEPT EM, 215 VIA DEL NORTE • OCEANSIDE, CA 92054
TEL: (619) 757-7770 • TWX: 910-322-1396
DIV: POLARIS ENTERPRISES, INC.

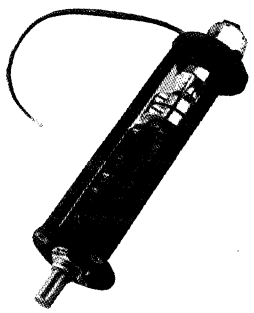
ETI SYSTEMS

MOTORIZED POTENTIOMETERS
DIRECT CURRENT

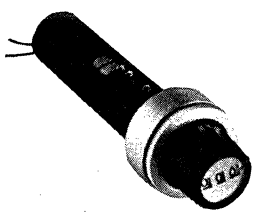
SEE CHARTS, PAGE 1150 FOR MOTOR AND RPM AVAILABILITY



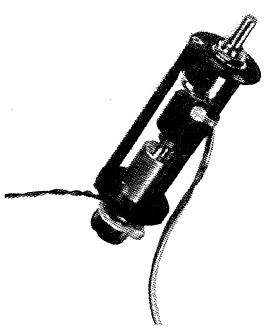
MC20-1
- 10 Turn Single Gang Potentiometer
- 3 or 5 Turn Pot's Available.
- Wirewound Element



MC20-2
- 10 Turn Multi-Ganged (2) Potentiometer
- 3 or 5 Turn Pot's Available.
- Wirewound Element



MC20-3
- Same as MC20-1 Except with Turns Counting Dial Assembled.
- 10 Turn.
- Dial: DA10 (See Pot Sec. 4750).



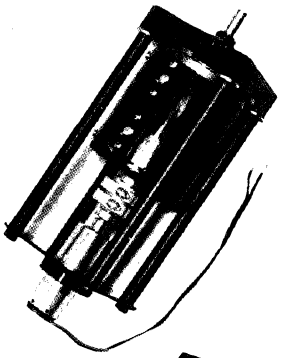
MC22-3/4

MC22-3
- Single Turn.
- Wirewound Element.

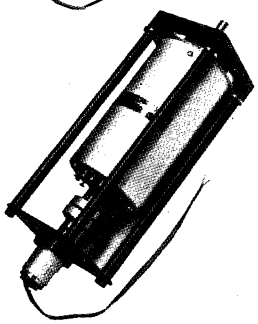
MC22-4
- Single Turn.
- Conductive Plastic.

See Section 4750, Potentiometers, Trimmers, Controls, & Rheostats, and Section 2200, Control Systems & Components.

SPECIAL APPLICATIONS



MC46-1
- Multi-Turn Potentiometer (3, 5 or 10 Turns).
- Wirewound Element.

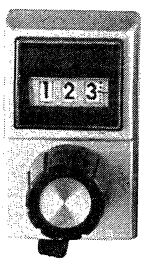


MC46-2
- 5 Amp. On-Off Switches Each End of Pot.
- Multi-Turn Potentiometer (3, 5, 10 or 20 Turns).

MC46-4
- Heavy Duty Motor Dual Gang Pot. (Not Pictured).
- Multi-Turn Potentiometer, 3, 5, 10 or 20 Turns.
- Wirewound Element

MC46-5
- Heavy Duty Motor Single Gang Pot. (Not Pictured).
- Multi-Turn Potentiometer, 3, 5, 10 or 20 Turns.
- Wirewound Element

MOTORPOT FEATURES
- Many Variations and Specials Can Be Supplied with Low Engineering Cost Because of the Versatile Designs.
- All Motorpots are Manually Adjustable.
- We Use Flexible Friction Clutches in All Units.



RECOMMENDED TURNS COUNTING DIAL
DB10 (1" x 1.75")
- Counts up to 10 turns. Precision gear-driven numbers. Clear plastic window over the numbers protects the mechanism. Rugged, heavy-duty construction. (See Pot. Section 4750).

ALL MOTORPOTS MAY BE PANEL MOUNTED AND MANUALLY ROTATED.

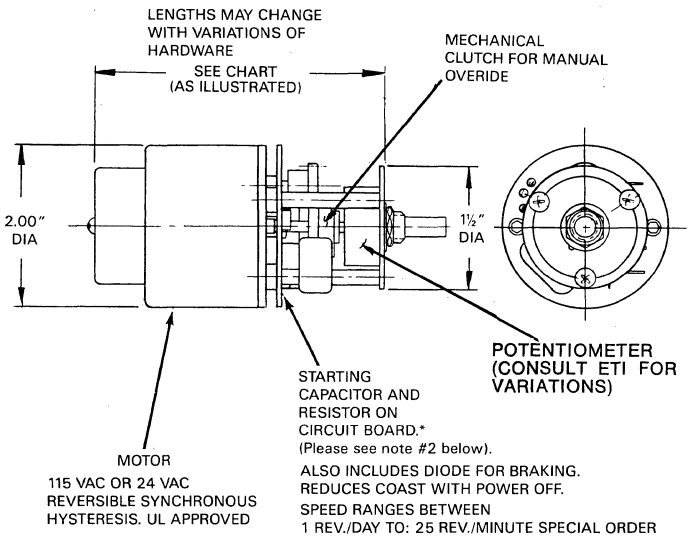
ETI SYSTEMS
DEPT EM, 215 VIA DEL NORTE • OCEANSIDE, CA 92054
TEL: (619) 757-7770 • TWX: 910-322-1396
DIV: POLARIS ENTERPRISES, INC.

ETI SYSTEMS

MOTORIZED POTENTIOMETERS

AC MOTORPOT-REVERSIBLE

AC MOTORPOT



OPTIONS AVAILABLE:

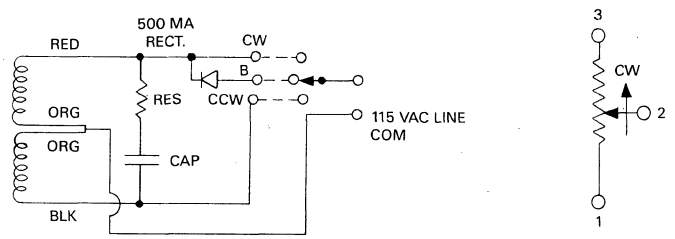
Single or multi-turn potentiometers. Film or wirewound elements. Multi section potentiometers.

Snap action limit switches. Special shaft lengths and modifications.

Special circuit modifications.

MOTOR SCHEMATIC **POT SCHEMATIC**

SUGGESTED 3 POSITION SWITCH (Not furnished by ETI)



STANDARD RPM'S AVAILABLE

115 VAC	½	1	2	3	5	8	10	15
24VAC	½	1		3		8		15

MODELS

Model No.	SIZE: Dia. x Length	Watts Of Pot.	** # Of Turns	Pot. Travel	* Pot. Type	Element	Special Features & Applications
MAC2W	2″ × 3 3/4″ ≈	2	10	3600	MW22	Wirewound	Includes starting capacitor.
MAC2WC	2″ × 3 3/4″ ≈	2	10	3600	MW22	Wirewound	With circuit board.
MAC22C	2″ × 3 1/2″ ≈	1	1	320	SW22	Wirewound	Works well with pointer knob.
MAC28C	2″ × 3 1/2″ ≈	1	1	320	SP22	Conductive Plastic	Long life element.
MAC4RC	2″ × 3 1/2″ ≈	5	10	3600	SMR46	Wirewound	Snap action limit switches.

MOTOR VOLTAGE: 24 or 115 for all models. For R.P.M.'S, see chart on this page.

* Refer to Section 4750, (Potentiometers), for information on potentiometers and their resistance range.

** Please see note number 1 below.

Units may be purchased with or without circuit board. Board contains capacitor, resistor, and braking diode which prevents coasting.

NOTES: (1) Multi-turns may be mounted with all ETI digital or concentric turns counting dials.

(2) If capacitor is mounted by customer elsewhere, then circuit board will be deleted and price reduced. Specifications subject to change without notice.

SEE SECTION 4750, POTENTIOMETERS, TRIMMERS, CONTROLS, & RHEOSTATS, AND SECTION 2200, CONTROL SYSTEMS & COMPONENTS.

ETI SYSTEMS
DEPT EM, 215 VIA DEL NORTE • OCEANSIDE, CA 92054
TEL: (619) 757-7770 • TWX: 910-322-1396
DIV: POLARIS ENTERPRISES, INC.

MINIGLOSSARY SERVO COMPONENTS

SPECIFICATIONS

Excitation: The input voltage and frequency.

Transformation Ratio: The ratio of the output voltage, at maximum coupling, to the input voltage.

Phase Shift: The lead or lag of the output voltage with respect to the input voltage. For most synchros and resolvers, the phase shift can be approximated by the angle whose tangent is the ratio of the primary winding's DC resistance to its reactive component.

Impedance: Specified as R + jX, where R is the AC resistive component and X is the reactive component. Important impedances are: (a) Z_{po} (or Z_{ro} for rotor primary units), which is the impedance of the primary winding with the secondary open; (b) Z_{so}, which is the impedance of the secondary winding with the primary open; and (c) Z_{ss}, which is the impedance of the secondary with the primry shorted (essentially when driven by a low impedance).

Null Voltage: The voltage remaining when the unit is at electrical zero or in the minimum coupling position.

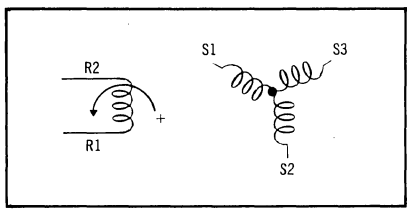
Accuracy: The error of the position of the rotor with respect to the electrical angle. It is defined as the output voltage driven by the "speed" (pole pairs) of the unit, referenced to the starting point of the calibration (usually the electrical zero position). Error is commonly expressed in minutes of arc (1/60 of a degree) or in seconds of arc.

Loads: For a transmitting unit, the impedance that the output voltage signal faces. This can be a receiver, a differential with its load, a control transformer, an A/D converter, etc.

Operation Temperature: The ambient temperature range over which the unit performs its primary function.

FUNCTIONS

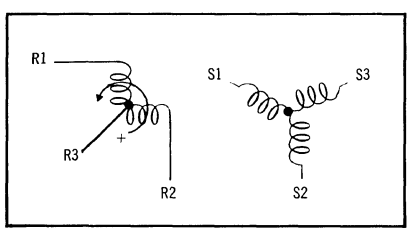
Transmitter: A unit with a Y-connected stator that outputs a signal proportional to the position of its single-phase excited rotor. High power units, called "torque transmitters," are used to drive one or more receivers. Low power transmitters are used to drive control transformers.



Receiver: A unit with a three-phase stator excited by the input, usually from a torque transmitter, and a single-phase rotor that follows the resulting stator field. Usually used to drive a position pointer.

Control Transformer: A unit with a three-phase stator excited by the input from a transmitter and a single-phase rotor mechanically driven to the null position by an external motor or other device.

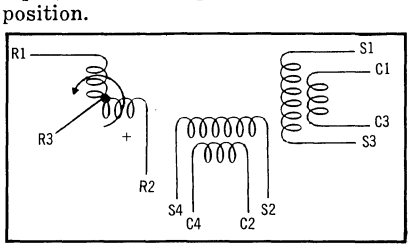
Differential: A unit with a three-phase stator and a three-phase rotor. It is usually connected between a transmitter, which excites its stator, and a receiver or control transformer. It can be used to "dial in" correction factors for the synchro chain.



Transolver: A unit with a three-phase stator and a two-phase rotor that can be used either as a control transmitter (with one rotor phase excited and the other shorted), or as a control transformer with the signal obtained from one phase of the rotor—making sure the other phase is equally loaded to prevent unbalances.

Differential Resolver: A unit with a two-phase stator and a three-phase rotor that is used as a transolver with the advantage that when connected as a control transformer, the signal does not travel through slip rings.

Resolver: A unit with a two-phase rotor and a two-phase stator that is used to create or receive SIN-COS signals such as vector resolutions for solving inertial platform coordinate transformations, unknowns of right triangles, etc. Resolvers can also be used as transmitting, differential, or receiving elements by proper choice of impedances. It is also possible to use resolvers as phase shifters where, in one mode, one rotor phase is excited and the two stator windings are feeding an appropriate RC network and indicating a phase shift, referred to the input, that corresponds to the rotor position.



Compensated Resolver: A unit with a "2×2" phase stator and a two-phase rotor used as a resolver with the added benefit of feedback windings in parallel with the stator windings that increase the useful accuracy over a wide range of environmental operating conditions.

Linear Transformer: A unit with a single-phase stator and single-phase rotor designed to provide a linear output voltage that is directly proportional to the rotor input angle. It operates over a range of less than ±90°, and is analogous to a potentiometer providing infinite resolution, but without contact between the elements. It can be used only with AC voltages.

Brushless Synchro: Available in two types—hairspring and bobbin. Hairspring synchros use spiral wound conductor springs to pick off the rotor signal, and are generally limited to a ±165° rotation. Most have mechanical stops to prevent damage due to overrotation. Bobbin synchros pick off the rotor signal with rotary transformers inside the unit, allowing the rotor unlimited motion.

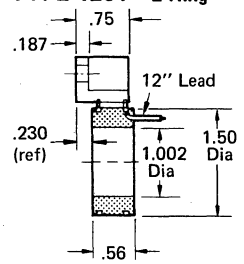
Pancake Unit: A name derived from the physical dimensions of the unit, which has a diameter that exceeds axial length. Sizes range from under 1" to 20" or more. The unit is frequently used as a gimbal pickoff element and is designed to fit a particular application envelope. It can be supplied as a rotor and stator only.

SLIP RING ASSEMBLIES

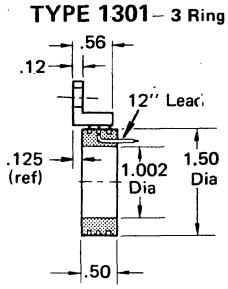
BEST DELIVERY **1**

SEPARATE ROTOR AND BRUSH BLOCK ASSEMBLY — STOCK DELIVERY

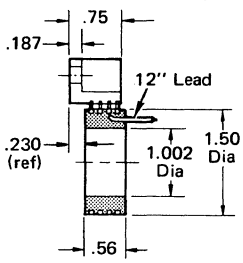
TYPE 1201 – 2 Ring



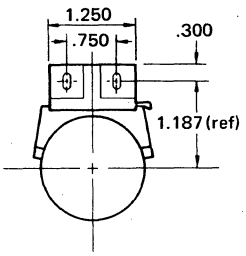
TYPE 1301 – 3 Ring



TYPE 1401 – 4 Ring

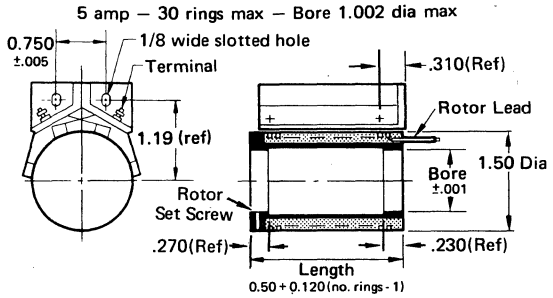


TYPICAL END VIEW



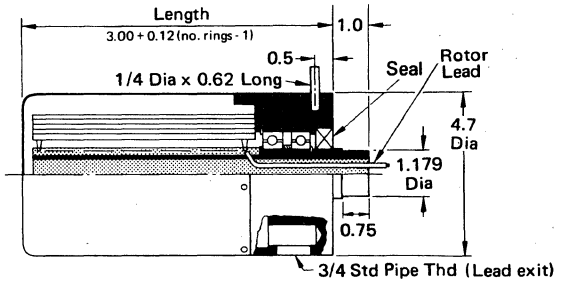
Slip Ring Assembly Type **1057**
Separate Rotor and Brush Block

5 amp – 30 rings max – Bore 1.002 dia max



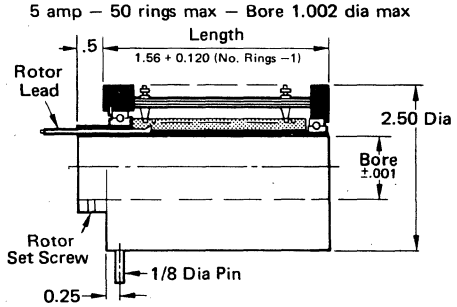
Slip Ring Assembly Type **1302**
Sealed Housing

5 amp – 50 rings max – Solid Bore



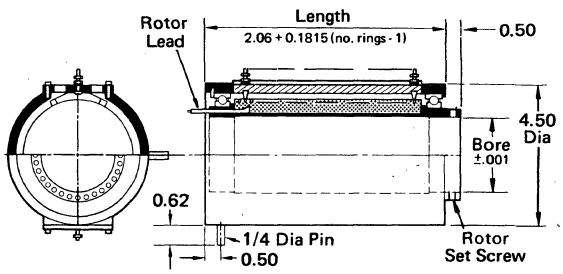
Slip Ring Assembly Type **1186**
Rigid Tube Housing – Exposed Stator Terminals

5 amp – 50 rings max – Bore 1.002 dia max



Slip Ring Assembly Type **1067**
Rigid Tube Housing – Exposed Stator Terminals

5 amp – 100 rings max – Bore 2.252 dia max



CHARACTERISTICS

RPM: Rigid one piece housing eliminates bearing alignment problems

RINGS: Coin Silver 5 AMP Rings

BRUSHES: Silver Graphite
Fabricast Grade FAG 180 (80% AG – 20% C)
Two brushes per ring
Brushes individually removable and replaceable

NOISE: 10 Milliohms dynamic resistance MAX
5 Milliohms MAX with 4 brushes per CKT

HI-POT: 1000 VAC 60 CYCLE for 15 seconds.

ROTOR: One piece steel sleeve
Ring complement vacuum cast on sleeve as unit with epoxy dielectric

COVER: Easily removable for brush and ring inspection

BEARINGS: Shielded or sealed ball bearings

PART NUMBER CODING – Specify fully when ordering

Type	Bore (Inches)	No. Rings	Lead Length (Inches)	Lead Type (Shielded - S / Unshielded - U)
X	X	X	X	X

WRITE OR PHONE FOR THE FABRICAST CATALOG

Fabricast, Inc. *CUSTOM MANUFACTURERS OF SLIP RING ASSEMBLIES*

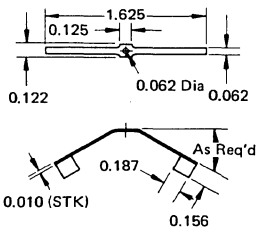
P.O. BOX 3176, 2517 SEAMAN AVENUE, SOUTH EL MONTE, CALIF. 91733 Phone (818) 443-3247 (S. El Monte/Los Angeles)

BRUSH ASSEMBLIES

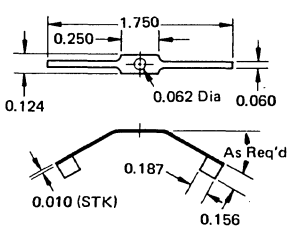
2

LEAF TYPE (BRUSH MATERIAL - FAG 180 LEAF MATERIAL - BeCu) STOCK DELIVERY

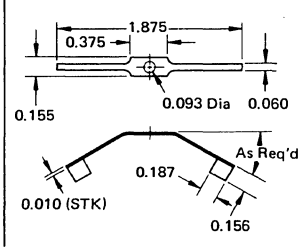
5.0 AMP DOUBLE BRUSH
P/N 1103004 BRUSH .040 WIDE



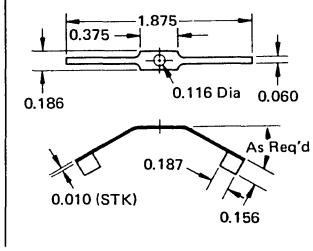
5.0 AMP DOUBLE BRUSH
P/N 1050006-13 BRUSH .040 WIDE



5.0 AMP DOUBLE BRUSH
P/N 1050006-5 BRUSH .040 WIDE

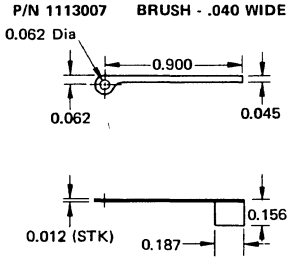


5.0 AMP DOUBLE BRUSH
P/N 1050006-2 BRUSH .040 WIDE

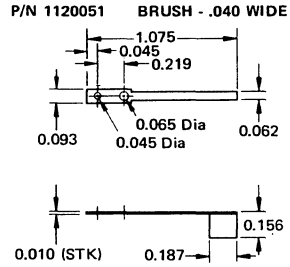


"AS REQ'D" ANGLE IN FREE STATE – LEAF WITHOUT BRUSH WOULD TOUCH RING SURFACE

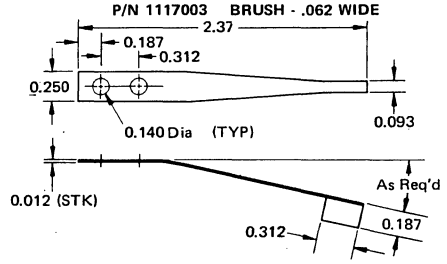
2.0 AMP SINGLE BRUSH
P/N 1113007 BRUSH - .040 WIDE



2.0 AMP SINGLE BRUSH
P/N 1120051 BRUSH - .040 WIDE

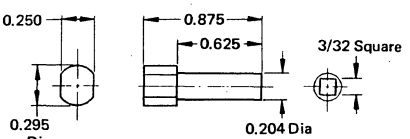


5.0 AMP SINGLE BRUSH
P/N 1117003 BRUSH - .062 WIDE

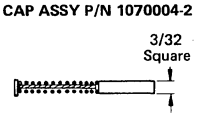


PLUNGER TYPE (BRUSH MATERIAL - FAG 180 HOLDER - BRASS) STOCK DELIVERY

2.5 AMP CAPACITY
3/32" SQUARE BRUSH

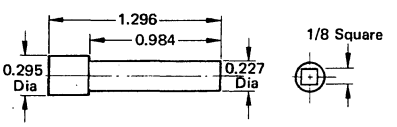


HOLDER ASSY P/N 1070004-1
CAP ASSY P/N 1070004-2

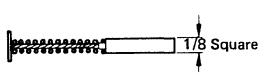


BRUSH ASSY P/N 1072-1

4.0 AMP CAPACITY
1/8" SQUARE BRUSH

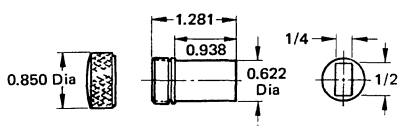


HOLDER ASSY P/N 1051032-1
CAP ASSY P/N 1051032-2

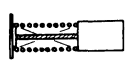


BRUSH ASSY P/N 1072-2

25 AMP CAPACITY
1/4" x 1/2" RECTANGULAR BRUSH



HOLDER ASSY P/N 1092006-1
CAP ASSY P/N 1092006-2



BRUSH ASSY P/N 1092003

BRUSH MATERIAL

- Fabricast grade Fag 180, the universal low noise level grade used for all standard brush assembles.
- Fabricast grade FAG 193, the lowest noise level grade, however, the ring surface speed is limited to 250 SFM.
- Fabricast grade FAG 150, the highest surface speed grade, however, noise levels are compromised.

Grade No.	Composition	Recommended Surface Speed	Carrying Capacity
FAG150	50% silver, 50% graphite	Over 3500 ft. per min.	100 Amps per sq. in.
FAG180	80% silver, 20% graphite	Up to 3500 ft. per min.	250 Amps per sq. in.
FAG193	93% silver, 7% graphite	Up to 250 ft. per min.	300 Amps per sq. in.

WRITE OR PHONE FOR THE FABRICAST CATALOG

Fabricast, Inc. *CUSTOM MANUFACTURERS OF SLIP RING ASSEMBLIES*

P.O. BOX 3176. 2517 SEAMAN AVENUE, SOUTH EL MONTE, CALIF. 91733 Phone (818) 443-3247 (S. El Monte/Los Angeles)

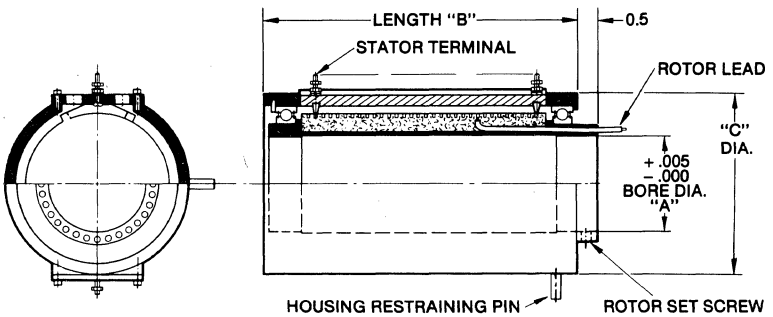
SLIP RING ASSEMBLIES

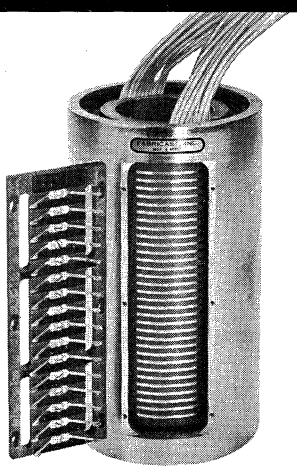
SELF—CONTAINED RIGID TUBE HOUSING

3

DISTINGUISHING CHARACTERISTICS

Rigid one piece housing eliminates bearing alignment problems. Larger section bearings are generally used in these units for a more rugged unit.





TYPE	BORE DIA "A" INCHES		NO. RINGS MAX.	CURRENT AMPS	LENGTH "B" INCHES	HOUSING DIA "C"
	NOMINAL	RANGE				
1230	Solid	—	100	5 amp std 2 brushes per ring	3.50 + .120 (no. rings -1)	2.50
1186	1.000	0 - 1.002	100		1.56 + .120 (no. rings -1)	2.50
1197	1.250	1.0 - 1.252	70		1.56 + .130 (no. rings -1)	3.50
1289	1.500	1.25 - 1.502	100		1.56 + .150 (no. rings -1)	4.00
1067	2.000	1.5 - 2.252	100	10 amp std or lo noise 4 brushes per ring	2.06 + .181 (no. rings -1)	4.50
1420	3.000	2.25 - 3.002	100		1.38 + .181 (no. rings -1)	4.75
1506	3.500	3.0 - 3.502	100		2.88 + .200 (no. rings -1)	6.50
1390	4.000	3.5 - 4.252	100		2.00 + .187 (no. rings -1)	5.75

* RING COMPLEMENT MAY BE LIMITED BY ABILITY TO PASS ROTOR LEADS UNDER BEARINGS.
* FOR 50 AMP STANDARD POWER ASSEMBLIES SEE POWER ASSEMBLY SECTION.
* INSTRUMENT AND 50 AMP POWER CIRCUITS MAY BE CAST ON COMMON SLEEVE.

CHARACTERISTICS

RPM: Rigid one piece housing eliminates bearing alignment problems

RINGS: Coin Silver 5 AMP Rings

BRUSHES: Silver Graphite
Fabricast Grade FAG 180 (80% AG — 20% C)
Two brushes per ring
Brushes individually removable and replaceable

NOISE: 10 Milliohms dynamic resistance MAX
5 Milliohms MAX with 4 brushes per CKT

CURRENT: Noted in tabulated block
Rating may be doubled with 4 brushes per CKT

HI-POT: 1000 VAC 60 CYCLE for 15 seconds

ROTOR: One piece steel sleeve
Ring complement vacuum cast on sleeve as unit with epoxy dielectric

ROTOR LEADS: 5 AMP Leads — 20 GA per MIL-W-16878 TYPE "E"
Lead exit as shown on most units. Maximum ring complement may require smaller wire or leads to exit both ends.

HOUSING: One piece tube construction

COVER: Easily removable for brush and ring inspection

BEARINGS: Shielded or sealed ball bearings

PART NUMBER CODING — Specify fully when ordering

Type	Bore (Inches)	No. Rings	Lead Length (Inches)	Lead Type (Shielded - S, Unshielded - U)
X	X	X	X	X

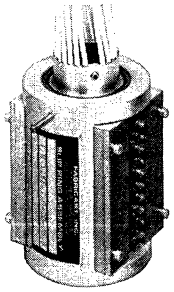
WRITE OR PHONE FOR THE FABRICAST CATALOG

Fabricast, Inc. *CUSTOM MANUFACTURERS OF SLIP RING ASSEMBLIES*

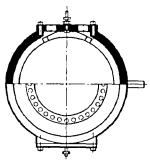
P.O. BOX 3176, 2517 SEAMAN AVENUE, SOUTH EL MONTE, CALIF. 91733 Phone (818) 443-3247 (S. El Monte/Los Angeles)

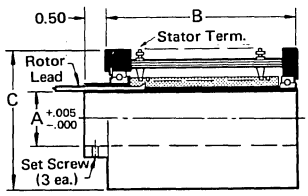
SLIP RING ASSEMBLIES SELF-CONTAINED 4

SELF CONTAINED RIGID HOUSING SLIP RING ASSEMBLIES



DISTINGUISHING CHARACTERISTICS
Rigid one piece housing eliminates bearing alignment problems. Bearings are thin section aircraft torque tube type or Kaydon KA series.





REPLACEABLE BRUSH ASSEMBLIES — 1000 VAC HYPOT

TYPE	BORE DIA "A", inches		NO. RINGS MAX	CURRENT	LENGTH "B", inches	Housing Dia "C"
	Nominal	Range				
4100	.500	.250 - .502	48		1.19 + .125 (no. rings - 1)	2.00
4150	1.000	.000 - 1.002	64	5 amp std	1.19 + .120 (no. rings - 1)	2.50
4200	1.312	1.000 - 1.312	100	2 brushes	1.19 + .125 (no. rings - 1)	3.00
4237	1.750	1.312 - 1.752	78	per ring	1.19 + .130 (no. rings - 1)	3.37
4268	2.000	1.750 - 2.002	100		1.28 + .150 (no. rings - 1)	3.62
4350	2.750	2.250 - 2.752	100	10 amp std	1.75 + .150 (no. rings - 1)	4.50
4400	3.250	2.750 - 3.252	100	or lo noise	1.75 + .160 (no. rings - 1)	5.00
4462	3.750	3.250 - 3.752	100	4 brushes	1.75 + .160 (no. rings - 1)	5.50
4500	4.250	3.750 - 4.252	100	per ring	1.75 + .187 (no. rings - 1)	6.00
4600	5.250	4.250 - 5.252	79		1.75 + .186 (no. rings - 1)	7.00
4700	6.250	5.250 - 6.252	63		1.75 + .186 (no. rings - 1)	8.00
4800	7.250	6.250 - 7.252	58		1.75 + .187 (no. rings - 1)	9.00
4900	8.750	7.250 - 8.750	58		1.75 + .187 (no. rings - 1)	11.00
1271	1.000	.000 - 2.000	15	50 amp std	3.50 + 1.050 (no. rings - 1)	4.50
1291	3.000	2.000 - 3.252	9	50 amp std	4.50 + 1.120 (no. rings - 1)	6.50

NON-REPLACEABLE BRUSH ASSEMBLIES — 500 VAC HYPOT

4087	.250	.250 - .502	50	3 amp std	.875 + .080 (no. rings - 1)	1.56
4125	.500	.250 - .752	50	2 brushes	.875 + .100 (no. rings - 1)	2.00
4230	2.000	1.500 - 2.002	50	per ring	.875 + .080 (no. rings - 1)	3.50

PART NUMBER CODING — Specify fully when ordering

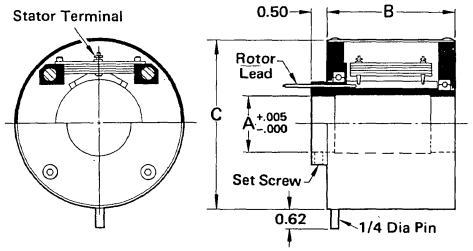
Type	Bore (inches)	No. Rings	Lead Length (inches)	Lead Type (Shielded - S, Unshielded - U)
X	X	X	X	X

CHARACTERISTICS

RPM: Rigid one piece housing eliminates bearing alignment problems.
RINGS: Coin Silver 5 amp rings. Copper 50 amp rings.
BRUSHES: Silver Graphite. Fabricast Grade FAG 180 (80% AG — 20% C). Two brushes per ring. Brushes individually removable and replaceable.
NOISE: 10 Milliohms dynamic resistance max. 5 Milliohms max with 4 brushes per ckt.
CURRENT: Noted in tabulated block. Rating may be doubled with 4 brushes per ckt.
HI-POT: See table on left.
ROTOR: One piece steel sleeve. Ring complement vacuum cast on sleeve as unit with epoxy dielectric.
ROTOR LEADS: 5 amp Leads — 20 ga per MIL-W-16878 type "E". 50 amp Leads — 8 ga — Teflon.
HOUSING: One piece tube construction.
COVER: Easily removable for brush and ring inspection.
BEARINGS: Shielded or sealed ball bearings.

SELF CONTAINED COVERED STATOR TERMINAL SLIP RING ASSEMBLIES

DISTINGUISHING CHARACTERISTICS
Bearing Bell and space bar type units best suited for larger bore assemblies.



TYPE	BORE DIA "A", inches		NO. RINGS MAX	CURRENT	LENGTH "B", inches	Housing Dia "C"
	Nominal	Range				
1296	.250	.250 - .377	48		1.25 + .110 (no. rings -1)	2.25
1297	.500	.378 - .565	100	5 amp std	1.25 + .120 (no. rings -1)	2.75
1298	1.000	.566 - 1.002	100	2 brushes	1.25 + .120 (no. rings -1)	3.00
1272	1.000	1.000 - 1.750	100	per ring	2.00 + .150 (no. rings -1)	5.25
1273	2.000	1.750 - 2.625	100		2.00 + .150 (no. rings -1)	6.25
1274	3.000	2.625 - 3.750	100	10 amp or	2.00 + .160 (no. rings -1)	7.50
1275	4.000	3.750 - 4.750	48	lo noise	2.00 + .186 (no. rings -1)	9.00
1276	5.000	4.750 - 5.750	63	4 brushes	2.00 + .186 (no. rings -1)	10.50
1277	6.000	5.750 - 6.750	58	per ring	2.00 + .187 (no. rings -1)	12.00
1278	8.000	6.750 - 8.750	58		2.00 + .187 (no. rings -1)	15.00
1282	1.000	1.000 - 1.250	16		3.00 + 1.050 (no. rings -1)	8.00
1283	2.000	1.250 - 2.000	16	50 amp std	3.00 + 1.050 (no. rings -1)	9.00
1284	3.000	2.000 - 3.125	9	100 amp	3.00 + 1.120 (no. rings -1)	10.00
1285	4.000	3.125 - 4.375	8	4 brushes	3.00 + 1.116 (no. rings -1)	11.50
1286	5.000	4.375 - 5.375	10	per ring	3.00 + 1.116 (no. rings -1)	12.50
1287	6.000	5.375 - 6.375	10		3.00 + 1.125 (no. rings -1)	13.50
1288	8.000	6.375 - 8.375	10		3.00 + 1.125 (no. rings -1)	16.00

* RING COMPLEMENT MAY BE LIMITED BY ABILITY TO PASS ROTOR LEADS UNDER BEARINGS.
* 10 AMP OR LOW NOISE CKT ON TYPES 1296, 1297, 1298, REQUIRE 2 PARALLEL RINGS PER CIRCUIT.
* INSTRUMENT AND 50 AMP POWER CIRCUITS MAY BE CAST ON COMMON SLEEVE.

PART NUMBER CODING — Specify fully when ordering

Type	Bore (inches)	No. Rings	Lead Length (inches)	Lead Type (Shielded - S, Unshielded - U)
X	X	X	X	X

CHARACTERISTICS **HOUSING:** Bell, Bell Spacer and Cover type construction. All other characteristics same as for Self Contained Rigid Housing Slip Ring Assembly.

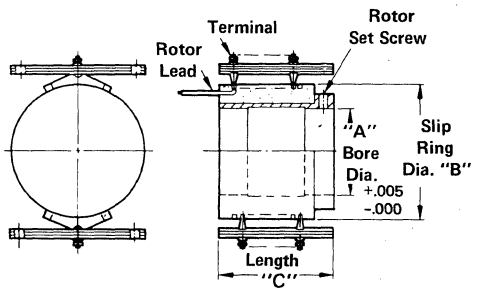
WRITE OR PHONE FOR THE FABRICAST CATALOG

Fabricast, Inc. CUSTOM MANUFACTURERS OF SLIP RING ASSEMBLIES

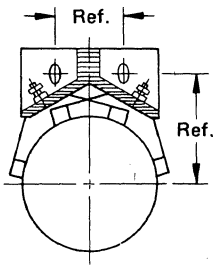
P.O. BOX 3176, 2517 SEAMAN AVENUE, SOUTH EL MONTE, CALIF. 91733 Phone (818) 443-3247 (S. El Monte/Los Angeles)

SLIP RING ASSEMBLIES — SEPARATE ROTOR & BRUSH BLOCK — 5

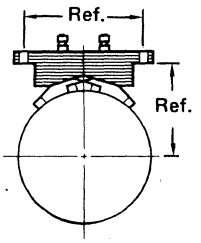
Brush Block Assy
5 AMP STD



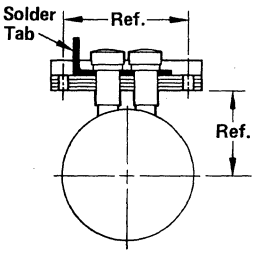
Brush Block Assy
TYPE "A"



Brush Block Assy
TYPE "E"



Brush Block Assy
50 AMP STD



TYPE	BORE DIA "A" INCHES		NO. RINGS MAX.	CURRENT AMPS	SLIP RING DIA "B"	LENGTH "C" INCHES
	NOMINAL	RANGE				
2050	SOLID	000 - .127	18	5 amp std 2 brushes per ring	.500	.625 + .125 (no. rings -1)
2087	SOLID	000 - .377	48		.875	.625 + .110 (no. rings -1)
2112	.375	000 - .627	52		1.125	.625 + .125 (no. rings -1)
2150	.750	.625 - 1.002	52		1.500	.625 + .120 (no. rings -1)
2187	1.000	.750 - 1.250	48		1.875	.625 + .125 (no. rings -1)
2200	1.125	.750 - 1.375	80		2.000	.750 + .125 (no. rings -1)
2237	1.250	1.000 - 1.502	78		2.375	.750 + .130 (no. rings -1)
2268	1.500	1.250 - 1.752	107		2.687	1.000 + .150 (no. rings -1)
2350	2.000	1.750 - 2.502	78		3.500	1.000 + .181 (no. rings -1)
2375	2.500	2.370 - 2.875	48	10 amp std or lo noise 4 brushes per ring	3.750	1.000 + .200 (no. rings -1)
2462	3.000	2.750 - 3.752	100		4.652	1.250 + .160 (no. rings -1)
2500	4.000	3.250 - 4.002	40		5.000	1.250 + .250 (no. rings -1)
2600	5.000	4.000 - 5.002	80		6.000	1.250 + .186 (no. rings -1)
2700	6.000	5.000 - 6.002	63		7.000	1.250 + .186 (no. rings -1)
2800	7.000	6.000 - 7.002	58		8.000	1.250 + .187 (no. rings -1)
2900	8.000	7.000 - 9.002	58		10.000	1.250 + .187 (no. rings -1)
3268	1.000	.750 - 1.187	16	50 amp std 2 brushes per ring	2.687	2.000 + 1.050 (no. rings -1)
3300	1.500	1.187 - 1.500	6		3.000	2.000 + 1.000 (no. rings -1)
3350	2.000	1.500 - 2.000	16		3.500	2.000 + 1.050 (no. rings -1)
3462	3.000	2.000 - 3.125	9		4.625	2.000 + 1.120 (no. rings -1)
3600	4.000	3.125 - 4.500	8		6.000	2.000 + 1.116 (no. rings -1)
3700	5.000	4.500 - 5.500	10		7.000	2.000 + 1.116 (no. rings -1)
3800	6.000	5.500 - 6.500	10		8.000	2.000 + 1.125 (no. rings -1)
3900	7.000	6.500 - 8.500	10		10.000	2.000 + 1.125 (no. rings -1)

CHARACTERISTICS

RINGS: Coin Silver AMP Rings.
Copper 50 AMP Rings.

BRUSHES: Silver Graphite.
Fabricast Grade FAG 180 (80% AG — 20% C)
Two brushes per ring
Brushes individually removable and replaceable.

NOISE: 10 Milliohms dynamic resistance MAX.
5 Milliohms max with 4 brushes per CKT.

CURRENT: Noted in tabulated block.
Rating may be doubled with 4 brushes per ckt.

HI-POT: 1000 VAC 60 cycle for 15 seconds.

ROTOR: One piece steel sleeve.
Ring complement vacuum cast on sleeve as unit with epoxy dielectric.

ROTOR LEADS: 5 AMP Leads — 20 GA per MIL-W-16878 TYPE "E"
50 AMP Leads — 8 GA — Teflon
Lead exit as shown on most units. Maximum ring complement may require smaller wire or leads to exit both ends.

BRUSH BLOCK: Glass epoxy laminate.
Optional mounting methods shown.

PART NUMBER CODING — Specify fully when ordering.

Type	Bore (inches)	No. Rings	Lead Length (inches)	Lead Type (Shielded - S, Unshielded - U)
X	X	X	X	X

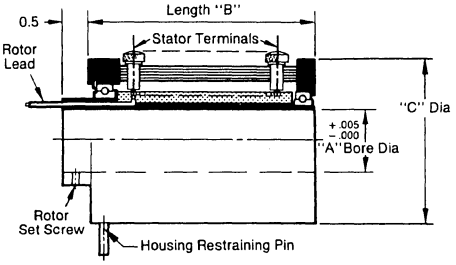
WRITE OR PHONE FOR THE FABRICAST CATALOG

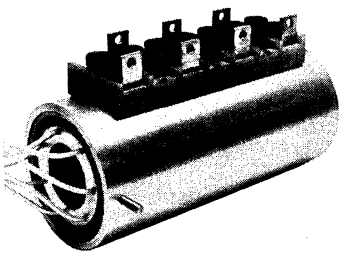
Fabricast, Inc. *CUSTOM MANUFACTURERS OF SLIP RING ASSEMBLIES*

P.O. BOX 3176, 2517 SEAMAN AVENUE, SOUTH EL MONTE, CALIF. 91733 Phone (818) 443-3247 (S. El Monte/Los Angeles)

SLIP RING ASSEMBLIES 6

POWER ASSEMBLIES





CHARACTERISTICS

RPM: Rigid one piece housing eliminates bearing alignment problems

RINGS: Copper 50 AMP Rings

BRUSHES: Silver Graphite
Fabricast Grade FAG 180 (80% AG—20% C)
Two brushes per ring
Brushes individually removable and replaceable

CURRENT: Noted in tabulated block
Rating may be doubled with 4 brushes per CKT

HI-POT: 1000 VAC 60 CYCLE for 15 seconds

ROTOR: One piece steel sleeve
Ring complement vacuum cast on sleeve as unit with epoxy dielectric

ROTOR LEADS: 50 AMP Leads — 8 GA — Teflon
Lead exit as shown on most units. Maximum ring complement may require smaller wire or leads to exit both ends

BEARINGS: Shielded or sealed ball bearings

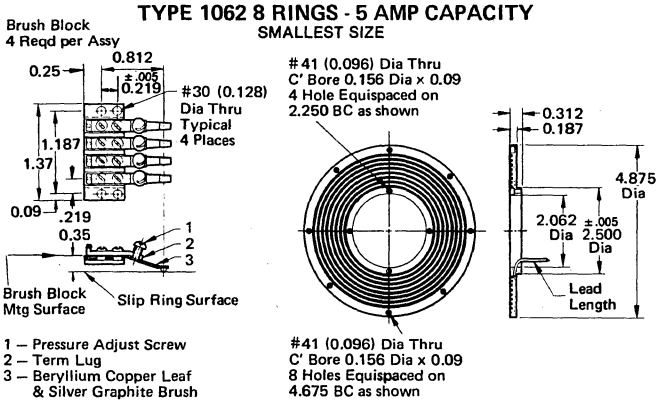
TYPE	BORE DIA "A" INCHES		NO. RINGS MAX	CURRENT	LENGTH "B" INCHES	HOUSING DIA "C"
	NOMINAL	RANGE				
5035	1.625	1.125 - 2.125	15	50 amp std	3.25 + 1.089 (no. rings-1)	4.50
5043	2.625	2.000 - 3.250	8	2 brushes	3.25 + 1.100 (no. rings-1)	5.50
5050	3.375	2.750 - 4.000	10	per	3.25 + 1.125 (no. rings-1)	6.12
5060	4.062	3.125 - 5.000	10	ring	3.25 + 1.116 (no. rings-1)	7.25
5070	5.250	4.500 - 6.000	8	100 amp	3.25 + 1.116 (no. rings-1)	8.00
5080	6.000	5.500 - 6.500	8	4 brushes	3.25 + 1.125 (no. rings-1)	9.00
5100	7.625	6.750 - 8.500	8	per	3.25 + 1.125 (no. rings-1)	11.00
5140	9.500	8.500 - 10.500	6	ring	3.75 + 1.250 (no. rings-1)	15.75

PART NUMBER CODING — Specify fully when ordering

Type	Bore (Inches)	No. Rings	Lead Length (Inches)
X	X	X	X

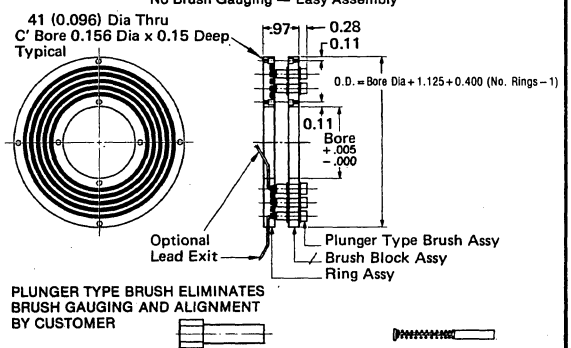
PANCAKE TYPE SLIP RING ASSEMBLIES

TYPE 1062 8 RINGS - 5 AMP CAPACITY
SMALLEST SIZE

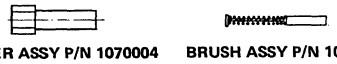


1 — Pressure Adjust Screw
2 — Term Lug
3 — Beryllium Copper Leaf & Silver Graphite Brush

TYPE 1650 - 5 AMP CAPACITY
NO. OF RINGS PER CUSTOMER REQ'TS
No Brush Gauging — Easy Assembly

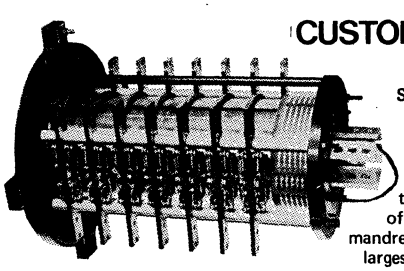


PLUNGER TYPE BRUSH ELIMINATES BRUSH GAUGING AND ALIGNMENT BY CUSTOMER



HOLDER ASSY P/N 1070004 **BRUSH ASSY P/N 1072-1**

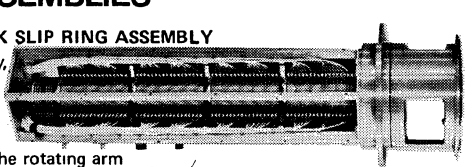
CUSTOM DESIGNED SLIP RING ASSEMBLIES



CUSTOM 7000 AMP SLIP RING ASSEMBLY

This slip ring assembly, as designed and manufactured by Fabricast, Inc., is used to supply 7000 amperes of current to the rotating mandrel of the world's second largest spin forging machine.

CUSTOM 222 TRACK SLIP RING ASSEMBLY



This slip ring assembly, as designed and manufactured by Fabricast, Inc. was used to complete the electrical circuits to the rotating arm of an astronaut carrying centrifuge.

The unit consists of 50 amp. power, 5 amp. instrumentation and 50 megacycle coaxial modules.

WRITE OR PHONE FOR THE FABRICAST CATALOG

Fabricast, Inc. *CUSTOM MANUFACTURERS OF SLIP RING ASSEMBLIES*

P.O. BOX 3176, 2517 SEAMAN AVENUE, SOUTH EL MONTE, CALIF. 91733 Phone (818) 443-3247 (S. El Monte/Los Angeles)

GRAPHALLOY® SILVER GRAPHALLOY BRUSHES and BRUSH & SLIP-RING ASSEMBLIES...

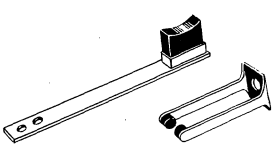
USED IN **MICROWAVE EQUIPMENT • SERVO SYSTEMS • SYNCHROS • INVERTERS • THERMOCOUPLE and STRAIN GAGE CIRCUITS • PULSE SYSTEMS • COMPUTER GROUNDING CONTACTS • TORQUE INDICATORS • MEDICAL EQUIPMENT • PACKING MACHINERY**

GRAPHALLOY® BRUSHES

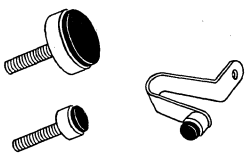
Silver-Graphalloy Brushes have been widely used because of low *and* constant contact drop, extremely low electrical noise, *and* long life. Over 100 grades are now serving in a wide variety of applications. Silver-Graphalloy Brushes on ½-inch-diameter coin silver slip rings have operated successfully in highly critical electrical circuits at speeds up to 100,000 r.p.m.

Standard sizes from ⅛"-square to ¾"-square. Many sizes in stock.

Our Engineering Department will assist you in determining the exact grade of GRAPHALLOY for your needs. *Ask for our Brush Inquiry Form 109.*



LEAF SPRINGS



CUP CONTACTS

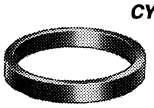
GRAPHALLOY® SLIP RINGS

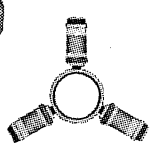
We supply Coin Silver and Bronze Slip Rings, both *cylindrical* and *flat* types ...and recommend three brushes per ring...spaced at 120°...for best contact. The cylindrical type are designed for press fitting over standard steel shafting. The flat type rings are designed for nesting either on an insulated plate or for molding into insulation. Insulated slip rings of either type, or slip-ring assemblies, can be furnished with leads attached.

No. 168 Series FLAT TYPE to 20" O.D.

Standard FLAT Rings have ¼" radial contact surface and ⅛" radial spacing between adjacent rings.

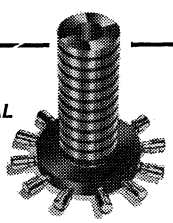
No. 116 Series CYLINDRICAL TYPE to 36" O.D.





Typical Layout

Model 319 CYLINDRICAL SLIP-RING Assembly

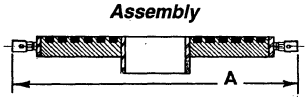


SOLID COIN SILVER RINGS

Model	Rings	Length
319-4	4	2 9/16"
319-6	6	3 5/16"
319-10	10	4 13/16"
319-14	14	6 5/16"

O.D. Slip Ring 1⅝"
Terminal 4"
Assembly I.D. .814/.813"

Model 409 FLAT SLIP-RING Assembly

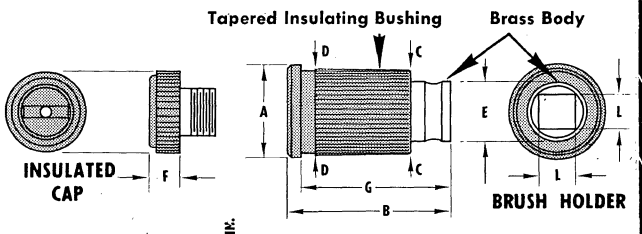


SOLID COIN SILVER RINGS

Model	Rings	O.D. "A"
409-2	2	5½"
409-4	4	7"
409-6	6	8½"
409-10	10	11½"

Hub O.D. 2" I.D. 1.753/1.751"
Length 1⅛" To 5 Amps., 125 V.
More rings on application.

GRAPHALLOY BRUSH HOLDERS



BRUSH HOLDER & CAP NO.	BRUSH SIZE	SUGGESTED MIN. SLIP-RING WIDTH	**MOUNTING HOLE DIAMETER	BRUSH HOLDER TO SLIP RING—MIN.	A	B	F	C	D	E	G	L
						OVERALL LENGTH		Other Sizes Available				BROACHED HOLE
14326	⅛" sq.	3/16"	13/92"	1/16"	.437"	⅞"	3/16"	.404"	.418"	.281"	25/32"	.129"
11509†	5/32" sq.	¼"	13/32"	1/16"	.437"	⅞"	3/16"	.404"	.418"	.281"	25/32"	.160"
11570†	3/16" sq.	¼"	7/16"	1/16"	.484"	⅞"	3/16"	.441"	.451"	.313"	25/32"	.193"
19011†	¼" x 3/16"	5/16"	9/16"	⅛"	.616"	1 5/16"	3/16"	.561"	.573"	.438"	1 3/16"	.256 x .193"
11527†	¼" sq.	5/16"	9/16"	⅛"	.616"	1 5/16"	3/16"	.561"	.573"	.438"	1 3/16"	.256"
14292†	⅜" x ¼"	7/16"	43/64"	⅛"	.718"	1 7/16"	¼"	.672"	.682"	.533"	1 5/16"	.382 x .256"
12166†	⅜" sq.	7/16"	13/16"	⅛"	.921"	1 13/16"	¼"	.813"	.828"	.628"	1⅝"	.382"
31392†	½" sq.	9/16"	1⅛"	⅛"	1.237"	1 13/16"	¼"	1.126"	1.141"	.878"	1 9/16"	.503"
35439†	¾" x ½"	⅞"	1 33/64"	⅛"	1.661"	2 1/32"	5/16"	1.508"	1.528"	1.253"	1 25/32"	.753"
35440†	¾" sq.	⅞"	1 33/64"	⅛"	1.661"	2 1/32"	5/16"	1.508"	1.528"	1.253"	1 25/32"	.753"

†Shunts are provided. **Mounting hole diameter for brush holder dimension D.

GRAPHALLOY BUSHINGS and PILLOW BLOCKS

Survive unlubricated! Replace oil-lubricated bushings in synchros, instruments, timers and missiles. Advantages:

(1) Lower friction at room temperatures;
(2) No oil to solidify at low temperatures;
(3) No oil to carbonize at prolonged elevated temperatures.
(4) No oil or grease drag.

Ask for Data Sheets 270 and 277 on Miniature Bronze-Graphalloy Bushings.

Ask for the following Data Sheets

GRAPHALLOY BRUSHES, SLIP RINGS & ASSEMBLIES...DS-218
GRAPHALLOY BUSHINGS, PILLOW BLOCKS...DS-117 and DS-1001

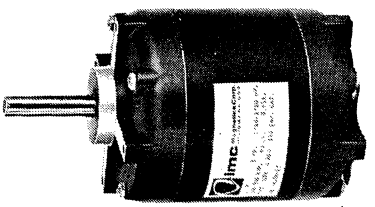
We can solve your unique electrical or mechanical problems. Phone or write us today!

Standard and Custom-designed GRAPHALLOY® products since 1913

GRAPHITE METALLIZING Corporation
1036 Nepperhan Ave., P.O. Box 110
Yonkers, NY 10702 Tel. 914 968-8400

© Graphite Metallizing Corporation 1985

FHP motors... precision, power, performance



Whatever your motor requirements, chances are IMC Eastern Division has a pre-engineered design to meet them. If not, we will custom engineer to your exact specifications.

IMC offers a complete range of motor types, sizes and performance characteristics.

Hysteresis synchronous, polarized and reluctance synchronous, induction, torque, and servo motors. 50, 60 400, 800 and 1000 Hz, multi-Hz and variable frequency types. Standard voltages from 13 to 230 V, single, 2 and 3-phase. Models include totally enclosed and open frame designs with or without internal cooling. Base, face, flange and servo mountings. Shafts offset, double-ended, with slots, keyways, tapers, etc. at customer option.

The tables below provide a few typical examples of IMC Eastern Division motor capability. For additional data on these designs, information on your individual requirements, or application engineering assistance, contact us at

IMC MAGNETICS CORP.
EASTERN DIVISION
570 MAIN STREET, WESTBURY, NEW YORK 11590

Tel. (516) 334-7070, TWX 510-222-4469

INDUCTION MOTORS

Motor No. Size	Type	Voltage (VAC)	Frequency (Hz)	Current (A)	Rated Torque (oz-in)	Speed (rpm)	Poles (No.)	H.P. Rated	Power Input (Watts)	Dimensions (Typ.) (inches) Housing O.D.	Housing length
BC905	804	115	400	.075	.18	18000	2	1/350	8	.937	1.178
BC1307	1330	115	400	.16	1.0	10500	4	1/90	17	1.500	1.468
BT1310	1972	200	400	.07	.25	20000	2	1/200	10	1.500	1.768
BC1507	520	115	60	.06	.10	3000	2	1/3000	6.5	1.700	1.703
BC1511	338	115	60	.095	.90	1400	4	1/800	12	1.700	2.103
FBC1615	101	115	400	.70	3.8	8500	4	1/30	75	2.000	3.000
BC2210	1246	115	60	.31	5.0	3300	2	1/60	35	2.750	2.437
BC2210	1382	115	60	.45	7.5	3300	2	1/40	44	2.750	2.437
BC2305	2151	115	60	.065	0.75	1200	4	1/1100	7	2.500	1.500
BC2910	2030	115	60	.28	9.0	1600	4	1/70	30	3.312	3.187
FBC2922	507	115	400	2.6	28.5	7000	6	1/5	300	3.312	5.312
FBC3815	1392	220	60	1.4	64.0	2600	2	1/6	300	4.375	5.718
FBT4525	1635	208	60	4.5	375.0	3400	2	1-1/4	1400	5.375	7.062
FBT4530	1095	208	400	12.0	510.0	5800	8	3	2700	5.375	7.281
FBT4625	1820	208	60	5.0	500.0	3400	2	1.7	1600	5.375	7.062

HYSTERESIS & RELUCTANCE SYNCHRONOUS MOTORS

Motor No. Size	Type	Volts (V)	Frequency (Hz)	Current (Amps)	Rated Torque (oz-in)	Start Torque (oz-in)	Speed (rpm)	Poles (No.)	H. P. Rated	Input Power (Watts)	Dimensions (Typ.) (inches) Housing O.D.	Housing length
BC703H	1787	26	400	.27	.025	.022	24000	2	1/1700	6.9	0.750	0.865
BC905H	1032	26	400	.210	.070	.10	8000	6	1/1800	4.7	0.937	1.178
BC100TH	1316	26	400	.23	.055	.027	8000	6	1/2270	4.7	1.062	1.375
BT1210H	1272	26	60	.28	.38	.59	3600	2	1/730	10.0	1.300	1.707
BC130TH	4.9	115	400	.11	.36	.360	12000	4	1/230	11.0	1.500	1.468
BC1404H	1549	115	400	.05	.16	.11	8000	6	1/780	5.7	1.437	1.363
BC1510H	1954	115	400	.21	.40	.45	8000	6	1/300	15.0	1.700	2.003
FBC1610H	1832	115	400	.24	.90	.6	6000	8	1/350	26.0	2.000	2.500
FBC1615H	633	115	400	1.20	1.9	2.3	12000	4	1/44	98.0	2.000	3.000
BC230TH	1900	115	60	.25	1.5	3.0	3600	2	1/180	28.0	2.500	1.750
FBC2922H	2049	115	60	1.8	35.0	44.0	1800	4	1/16	150.0	3.312	5.312
FBC3825H	2095	115	50	1.9	60.0	86.0	1500	4	1/11	160.0	4.375	6.718
FBC3830H	749	115	60	2.41	74.0	72.0	1800	4	1/8	214.0	4.375	7.218
FBC4530H	2147	115	60	2.8	100.0	150.0	1200	6	1/8	210.0	5.375	7.562
FBT4545H	1691	208	60	3.6	180.0	432.0	1800	4	1/3	430.0	5.375	9.062

TORQUE MOTORS

Motor No. Size	Type	Volts (V)	Frequency (Hz)	Stall Current (Amps)	Stall Torque (oz-in)	No Load Speed (rpm)	Poles (No.)	Stall Watts	No Load Watts	Duty Cycle Class H%	Dimensions (Typ.) (inches) Housing O.D.	Housing length
BT703T	903	18/18	400	.12/.12	.15	6300	6	1.6/1.7	1.3/1.4	cont.	0.750	0.765
BT707T	948	115/33	400	.05/.14	.26	5900	6	3.4/3.0	3.0/2.5	cont.	0.750	1.165
BC907T	1835	115	400	.05	.27	7000	6	5.0	3.6	cont.	1.000	1.496
BT1005T	1687	115/36	400	.05/.16	.66	6200	6	3.4/3.5	1.6/1.5	cont.	1.062	1.175
BT1210T	1273	26	60	.35	1.9	3300	2	15.0	7.9	50	1.300	1.707
BC1307T	162	115	400	.17	1.25	5000	8	19.0	18.0	40	1.500	1.468
BC1311T	330	115	400	.45	3.8	5500	8	60.0	60.0	15	1.500	1.868
BT1406T	599	24/24	60	.24/.24	1.7	1600	4	4.6/4.4	4.7/4.5	cont.	1.437	1.563
BC1507T	96	115	60	.105	2.7	1650	4	12.5	13.0	cont.	1.700	1.703
BC1511T	338	115	60	.088	2.6	1600	4	10.7	10.5	cont.	1.700	2.103
BC1615T	347	115	400	1.4	9.0	10000	4	140.0	92.0	12	1.750	2.703
BT1615T	629	200	400	1.26	19.0	7300	6	290.0	64.0	7	1.750	2.703
BC2210T	1197	24	60	0.67	3.4	725	8	16.0	15.0	cont.	2.750	2.437
BC2929T	440	115	60	1.36	72.0	1100	6	145.0	120.0	30	3.312	5.125
FBC3825T	1208	115	60	1.3	110.0	830	8	142.0	100.0	55	4.375	6.718
FBC3830T	881	115	50	1.8	156.0	900	6	204.0	140.0	40	4.375	7.218
BC4520T	1718	115	60	2.7	250.0	810	8	305.0	220.0	35	5.375	6.562
BC4530T	1777	115	50	4.0	320.0	900	6	370.0	255.0	30	5.375	7.562

SERVO MOTORS

Motor-generators, motor-tachometers in BuOrd sizes 5-18. All available with precision gearheads.

BRUSHLESS DC MOTORS

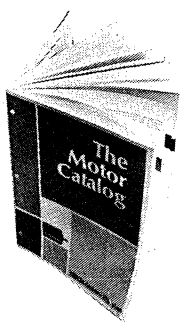
Newly developed IMCom Brushless DC Motor meets maximum power output requirements — up to two horsepower.

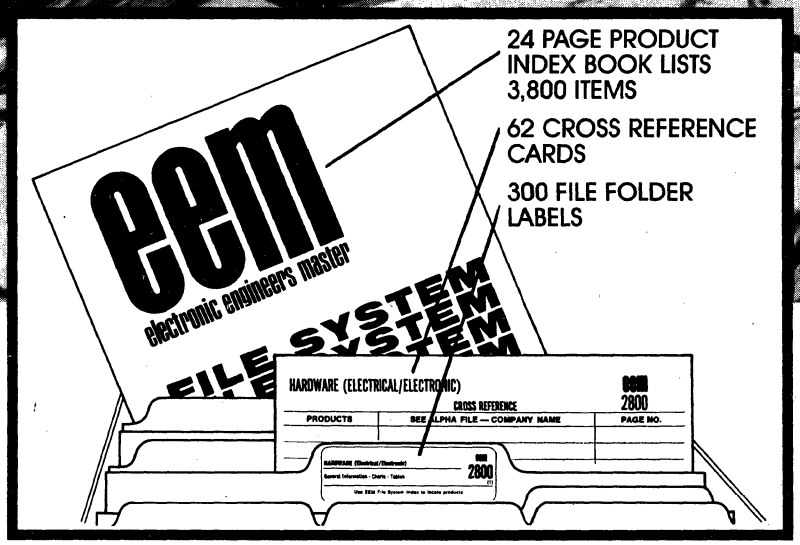
DC MOTORS

IMC has introduced a new line of DC Motors for aerospace, military and high performance applications.

FREE

Our Driver Manual. It's your license to control all driving situations, free for the asking. 100 pages of detailed motor specifications, comprehensive theory and applications information (ref. cat. #EM4). From IMC Eastern Division.





24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS

62 CROSS REFERENCE CARDS

300 FILE FOLDER LABELS

ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

KOLLMORGEN INDUSTRIAL DRIVES

Make the most productive choice in precision motion control with Kollmorgen Industrial Drives' servo systems. Our product alternatives and engineering expertise are solving the most demanding applications.

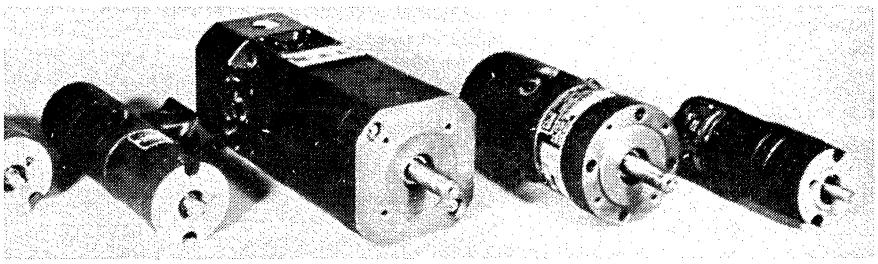
A multitude of motor choices allows you to simplify your design decision. Our motors, with torque ratings from 35 oz-in to 500 lb-ft, offer you an array of performance alternatives. We have a broad range of motor configurations including conventional DC brush, DC brushless, and variable frequency AC servos. Use of rare earth samarium cobalt, ceramic, and neodymium magnet materials broadens our range of applications.

Our servo drives are designed to fully complement all of our motors. Employing PWM and SCR technology, Kollmorgen Industrial Drives' amplifier line includes brush and brushless DC and variable frequency AC drives with continuous current levels from 6 to 200 amps. We also offer a microprocessor based positioning system that allows digital control of system dynamics and provides a link between the analog servo amplifier and a digital controller.

Engineering support is an important part of the product package at Kollmorgen Industrial Drives Division. Our applications engineers evaluate your needs and pinpoint the optimum solution. Our research and engineering teams are committed to meeting your motion control needs with standard or customized products.

Our broad-based product lines and engineering expertise offer you the best moves in the motion control industry.

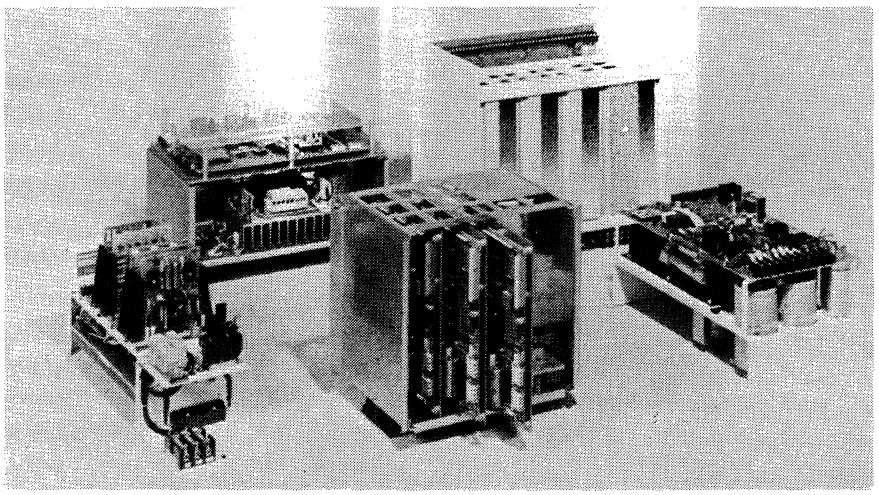
AC and DC Servo Motors



Motor Options: Integral Brake • Resolver • Encoder • Connectors • Shaft Seal • Thermostat • Shaft Extension • Air Through Cooling • Air Over Cooling • Liquid Cooling • Environmental Sealing • Housed & Unhoused Tach Generator • MIL I 45208 • Custom Options

MOTOR SERIES	MAX OPERATING SPEED (Krpm)	TENV CONTINUOUS STALL TORQUE (lb-ft.) @ 40°C	CURRENT AT CONT. TORQUE (amps)	PEAK TORQUE (lb-ft.)	PEAK HP UP TO	ROTOR INERTIA × 10^{-2} (lb-ft-sec²)	FRAME DIAMETER (inches)	OVERALL LENGTH (inches)
TT (Torquer-Tach)								
203X	6.0	0.18-0.5	4.4-4.8	0.7-2.1	0.93	0.008-0.02	3.1	5.7-7.0
204X	1.4-5.5	0.36-1.8	2.29-7.9	0.8-7.1	2.0	0.012-0.024	3.00	6.7-10.5
293X	1.4-5.0	1.7-8.7	5.8-27.6	5.7-45.0	4.7	0.07-0.25	4.85	8.4-14.2
295X	1.3-5.0	1.3-8.2	2.9-37.0	1.45-40.0	4.4	0.07-0.25	4.25	8.25-14.1
296X	2.5-5.0	5.6-6.7	15.2-34.3	14.8-32.7	8.7	0.24	5.25	15.4
297X	2.5-5.0	5.9-7.1	15.2-34.3	15.7-37.6	11.7	0.24	5.25	15.4
298X	0.6-5.0	1.3-7.7	5.9-36.1	5.0-38.0	4.5	0.07-0.25	6.00	8.25-14.1
420X	0.9-3.6	5.4-22.0	10.3-46.7	11.4-119.0	6.6	0.45-1.8	5.25	10.36-17.36
423X	0.9-3.2	11.1-24.5	21.7-50.0	32.4-112.0	8.6	0.82-1.7	6.5	12.4-17.4
428X	0.7-4.0	5.9-20.6	11.7-47.0	20.0-95.0	6.6	0.63-1.95	7.90	11.36-18.36
450X	0.6-3.0	12.0-40.0	13.7-62.0	42.0-240.0	10.0	0.80-2.1	7.40	14.0-19.5
5326	0.63-1.25	60.0	36.0-73.0	164.0-312.0	15.0	8.5	9.0	31.1
538X	0.6-2.8	15.0-35.0	20.0-85.0	66.0-160.0	12.0	2.2-4.7	9.40	13.2-19.4
5801	1.0-2.0	45.0-60.0	30.0-118.0	188.0-250.0	10.0	9.5	10.0	29.0
4503	0.62-1.0	90.0-110.0	20.0-76.0	500.0-600.0	10.0	65.0	12.0	27.8
ECM (Electronically Commutated Motor)								
210X	1.8-6.0	0.9-12.0	3.7-27.7	1.8-24.0	14.0	0.02-0.2	5.6	4.5-14.5
BRT (Brushless DC Motor-Resolver-Tach								
210X	2.5-7.5	2.2-10.4	6.5-85.0	4.6-32.0	10.0	0.02-0.06	5.50	7.1-12.6
310X	2.1-5.0	6.5-16.0	7.9-22.7	25-75	7.1	0.13-0.34	5.75	10.3-15.9
45XX	1.6-4.8	12.0-36.0	7.3-58.5	60.0-180.0	16.5	0.8-2.1	7.40	12.8-18.6
VRT (Variable Frequency AC Motor-Resolver-Tach.) (Ventilated)								
25406	6.0	82.0	–	82.0	28.0	6.3	13.5	21.9
25606	6.0	85.0	–	85	23.0	6.3	14.4	32.5
25612	6.0	150.0	–	150	44.0	12.6	14.4	38.5

Drives



Drive Features and Options: Tach Loss • Overload • Commutation Limit • Dynamic Braking • Regeneration • Overspeed • Direction Limits • Ramp Generator • Master Slave • Electronic Anti-Backlash • Thermal I^2 + Limits

AMPLIFIER MODEL	NUMBER OF AXES	VOLT OUTPUT (volts)	CONT. OUTPUT CURRENT (amps)	PEAK OUTPUT CURRENT (amps)	BAND WIDTH (Hz)	FORM FACTOR °15 A	DIMENSIONS (inches)
SCR-Three Phase Half Wave Servo Drives							**L W H**
TPA/X	1-3	120-160	25-85	250	30	1.2	24 × 6.5 × 11.25
SCR-Three Phase Half Wave Spindle Drive							
DCSD	1	240	110-173	300	30	1.2	19 × 31 × 8.88
SCR-Six Phase Half Wave Servo Drive							
HPA	1	160	45-100	300	50	1.05	24 × 6.5 × 10.75
SBD2*	1	80-225	6-20	12-50	200	1.01	9.5 × 2 × 12.2
SBD4	1	80-225	30-60	60-120	200	1.01	9.5 × 4 or 6 × 12.2
PWM-Brushless DC Servo Drive (Sine Wave) /∅				/∅			
BDS2	1	200	25-130	53-105	100	–	12 × 19 × 11.7
BDS3	1	200	10-40	20-70	100	–	11.75 × 4.13 × 15.4
PWM-Brushless DC Servo Drives (Six Step) /∅				/∅			
ECC 120/30	1	120	18	30	–	–	8.5 × 5.2 × 16.5
ECC 120/100	1	120	54	100	–	–	8.75 × 12 × 19
ECC 208/75	1	208	75	150	–	–	24.3 × 18.75 × 11.9
PWM-Variable Frequency AC Spindle Drive /∅				/∅			
VFS2	1	220	90-130	90-130	100	–	31 × 19 × 12
VFS3	1	220	10-40	20-70	100	–	11.75 × 4.13 × 15.4

* Voltage and current ratings are for standard models available at date of printing. Consult factory for availability of either lower voltage or higher current models.

Motor/Controller

We also offer a high efficiency integral system; an amplifier and motor packaged together into one extremely small housing that can withstand hazardous environments.

MOTOR SERIES	MAX OPERATING SPEED (Krpm)	CONTINUOUS STALL TORQUE (lb - ft.) @ 40°C	CURRENT AT CONT. TORQUE (amps)	PEAK TORQUE	PEAK HP UP TO	ROTOR INERTIA × 10^2 (lb-ft-sec^2)	FRAME DIAMETER (inches)	OVERALL LENGTH (inches)
ECCM (Electronically Commutated Motor/Controller)								
1402	0.8-1.25	1.54-2.25	3.0	3.0	0.42	0.007	3.0	12.4

KOLLMORGEN INDUSTRIAL DRIVES

MOTOR SIZING EQUATIONS

$$\omega = \frac{N}{9.55} = \frac{2\,\Pi\,N}{60}$$

$$GR_{opt} = \left(\frac{J_L}{J_M \times \eta_N}\right)^{1/2}$$

$$J_{sys} = \frac{J_L}{(n^2 \times \eta_N)}$$

$$T_{sys} = \frac{T_L}{(n \times \eta_N)}$$

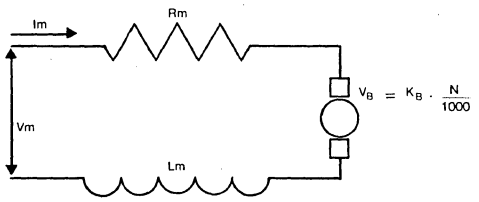
$$T_{RMS} = \left(\frac{T_1^2 t_1 + T_2^2 t_2 + \cdots T_K{}^2 t_K}{t_1 + t_2 + \cdots t_K}\right)^{1/2}$$

$$I_m = \frac{T_F + T_{sys}}{K_T} + \frac{F_I \times N_m}{K_T\,(1000)}$$

$$Hp = \frac{N \times T_{TF}}{5252} = \frac{T_{TF}\,\omega}{550}\ ;\ 1\ Hp = 746\ watts$$

$$V_m = I_m\,R_m\ (1.52) + \frac{N\,K_B}{1000} + BD$$

* BD included in R_m for TT-45XX motors

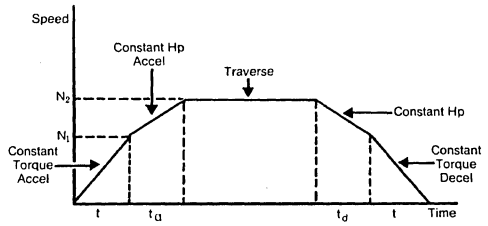


CONSTANT TORQUE

$$t = \frac{J_T\,(N_1)}{9.55\,(T_p \pm T_{TF})}$$

$$\Theta = \frac{N\,(t)}{19.10}$$

$$T_A = \frac{J_T \times (N_1) \times \Pi}{30 \times t_F} + T_F$$



LEAD SCREW APPLICATIONS

$$\text{Torque} = \frac{\text{Force (lb)} \times \text{Lead (IN./REV.)}}{24 \times \Pi \times \eta_s}$$

$$\text{Load Inertia} = \frac{W\,(\text{Lead (IN./REV.)})^2}{1.8 \times 10^5 \times \eta_s} + \text{J screw}$$

$$J_{screw\ (steel)} = (\text{Dia. (in.)})^4 \times \text{Length(in.)} \times 6.0 \times 10^{-6}$$

CONSTANT HORSEPOWER

ACCEL:

$$t_a = \frac{J_T}{T_{TF}} \left[\frac{N_1 - N_2}{9.55} + \frac{550\,Hp}{T_{TF}}\ \ln\left(\frac{5252\,(Hp/T_{TF}) - N_1}{5252\,(Hp/T_{TF}) - N_2}\right)\right] \text{sec}$$

$$\Theta_a = \frac{550\,(Hp)\,t_a}{T_{TF}} + \frac{J_T}{182.4\,(T_{TF})}\,(N_1^2 - N_2^2)\ \text{rad}$$

$$T_{RMS\,a} = \left[\frac{550\,(Hp)\,J_T}{t_a}\ \ln\left(\frac{5252\,(Hp/N_1) - T_{TF}}{5252\,(Hp/N_2) - T_{TF}}\right)\right]^{1/2} \text{lb.ft.}$$

DECEL:

$$t_d = \frac{J_T}{T_{TF}} \left[\frac{N_2 - N_1}{9.55} + \frac{550\,Hp}{T_{TF}}\ \ln\left(\frac{5252\,(Hp/T_{TF}) + N_1}{5252\,(Hp/T_{TF}) + N_2}\right)\right] \text{sec}$$

$$\Theta_d = \frac{-550\,(Hp)\,t_d}{T_{TF}} + \frac{J_T}{182.4\,(T_{TF})}\,(N_2^2 - N_1^2)\ \text{rad}$$

$$T_{RMS\,d} = \left[\frac{-550\,(Hp)\,J_T}{t_d}\ \ln\left(\frac{5252\,(Hp/N_1) + T_{TF}}{5252\,(Hp/N_2) + T_{TF}}\right)\right]^{1/2} \text{lb.ft.}$$

DEFINITION OF TERMS

BD = Brush Voltage Drop (Standard Drop = 2.0 Volts)

F_I = Viscous Damping (lb-ft/krpm)

GR_{opt} = Optimum gear ratio

Hp = Horsepower

I_m = Motor Current (amps)

J_L = Inertia at Load (lb-ft-sec²)

R_m = Motor Resistance at 25°c (ohms)

t = Time (seconds) (+TF for Deceleration −TF for Acceleration)

t_a = Time during constant hp acceleration (sec)

t_d = Time during constant hp deceleration (sec)

T_F = Static Friction of motor (lb-ft)

J_M = Motor Inertia (lb-ft-sec²)

J_{sys} = Inertia reflected through a gear box to motor shaft (lb-ft-sec²)

J_T = Total Inertia (lb-ft-sec²)

K_B = Back EMF Constant (v/krpm)

K_T = Torque Constant (lb-ft-/amp)

N = Speed (rpm); N_m = Motor Speed

T_L = Output Torque; before gear reduction (lb-ft)

T_p = Peak Torque (lb-ft)

$T_{RMS\,a}$ = RMS Torque to constant Hp, acceleration (lb-ft)

$T_{RMS\,d}$ = RMS Torque to constant Hp, deceleration (lb-ft)

T_{sys} = Friction torque reflected through a gear box to motor shaft (lb-ft)

T_{TF} = Total Friction Torque (including F_I, T_{sys}, and T_F) (lb-ft)

V_m = Motor Terminal Voltage (volts)

W = Weight (lbs)

η = Gear Ratio $\left(\frac{\text{Motor Speed}}{\text{Screw Speed}}\right)$

η_N = Efficiency of Gear Ratio

η_s Efficiency of Lead Screw

Θ_a = Angular Distance (radians), acceleration

Θ_d = Angular Distance (radians), deceleration (lb-ft)

ω = Speed (radians/sec)

RATINGS: A FINAL NOTE

Comparisons of similar products where no industry standard exists can be confusing: no DC servo motor builders, for example, establish the same ratings. Consequently, direct comparisons of motors from different manufacturers are difficult at best.

Industrial Drives Division's testing and rating standards are conservative in the industry, thus assuring that our performance meets or exceeds our published specifications under all operating conditions. In fact, many original equipment manufacturers consider our rating standards to be the most realistic for heavy duty industrial applications.

It's just one more of the many things that keep us ahead of the pack.

We're working today to meet your challenge of tomorrow.

KOLLMORGEN INDUSTRIAL DRIVES

201 Rock Road • Radford, Virginia 24141 • IDD84 - 01A

EEM PRODUCT SELECTION GUIDES

Use the EEM Product Selection Guides. There are 34 Guides in this edition of EEM. See page 2 (A•2, B•2, C•2, D•2) of each volume to locate the Product Selection Guides that pertain to your needs.

Cost Effective

We're the world's largest manufacturer of DC mini-motors — producing over *1.5 million per day!* So wide is our range of standard models, it's virtually certain there's one to fit your needs perfectly.

Shown here are a variety of standard motors with average performance characteristics at indicated voltage. They are also available with a variety of other armature windings for use at specific voltages to achieve different desired performances.

Please request or fill out a questionnaire and/or indicate your desired performance: we'll suggest the motors most suited to your needs. Power curves and 3-view drawings with production tolerances available upon request.

Mabuchi small DC motors are used for machine worlds such as tape recorders and audio equipment, home appliances, personal care, cameras, peripherals, automotives, garden/hand tools, etc.

Call or write MABUCHI MOTOR AMERICA CORP., 475 Park Avenue South, New York, NY 10016 • Dept. EEM85 • 212-686-3622 • Intl. Telex: 23-4374 Mabu Domestic Telex: R.C.A.: 23-4374, FAX: GIII 212-532-4263.

THE BIGGEST NAME IN SMALL DC MOTORS

MABUCHI DC MOTORS. SMALL. LIGHT. RELIABLE. EFFICIENT. BETTER THAN EVER.

MOTOR				SIZE			Operating	TYPICAL CHARACTERISTICS										Stall
										NO LOAD		AT MAXIMUM EFFICIENCY					
Series	Group	Type	Model	Outside Diameter (Inch)	Housing Length (Inch)	Typical Power Source	Voltage Range V	Winding Code Number	Voltage V	Speed RPM	Current AMP	Speed RPM	Current AMP	Torque OZ-IN	Output W	Eff. %	Torque OZ-IN
ECONOMY	STANDARD	RE	RE-140	.827	.984	DRY CELL	1.5-3.0	2270	1.5	8,200	0.190	6,250	0.62	0.089	0.40	44.2	0.375
			RE-260	.937	1.059		1.5-4.5	2670	3.0	12,500	0.230	10,250	1.03	0.222	1.68	54.1	1.222
			RE-280	.953	1.201		1.5-6.0	2865	3.0	9,200	0.155	7,800	0.85	0.278	1.60	62.3	1.81
		SU	SU-020	.709x.374	.744		1.0-3.0	09170	3.0	11,800	0.080	8,150	0.18	0.022	0.132	24.6	0.071
	CARBON	RC	RC-280S	.953	1.201		4.5-12.0	20120	6.0	7,800	0.125	6,450	0.60	0.417	2.00	56.0	2.430
		FK	FK-130S	.791x.594	.988		4.5-20.0	07500	12.0	7,200	0.030	5,350	0.09	0.108	0.43	40.8	0.424
			FK-260S	.953x.720	1.059		4.5-15.0	10350	12.0	7,300	0.036	5,950	0.16	0.244	1.07	56.3	1.32
			FK-280S	.953x.720	1.201		4.5-20.0	10350	12.0	5,700	0.028	4,650	0.13	0.253	0.87	57.5	1.39
		SH	SH-020S	.709x.374	.744		4.5-12.0	09170	6.0	19,000	0.110	13,600	0.28	0.061	0.608	36.8	0.213
			SH-050S	.709x.374	.866		4.5-12.0	09170	9.0	23,400	0.105	17,350	0.30	0.090	1.151	42.6	0.347
LOW NOISE	STANDARD	RF	RF-260T	.953	1.059	DRY CELL BATTERY RECTIFIED A.C.	1.0-9.0	3255	1.2	5,700	0.160	4,750	0.800	0.164	0.575	59.9	0.986
			RF-280	.953	1.201		1.5-12.0	2485	3.0	7,300	0.115	6,130	0.602	0.236	1.069	59.2	1.472
			RF-500T	1.260	.768		1.5-9.0	14430	6.0	3,650	0.024	3,050	0.122	0.196	0.441	60.0	1.194
			RF-520T	1.260	.846		1.5-12.0	12580	12.0	4,550	0.018	3,890	0.106	0.278	0.799	62.8	1.917
		RD	RD-050T	.673	9.13		1.5-6.0	09220	4.5	7,600	0.039	5,710	0.118	0.054	0.23	43.5	0.222
			RD-180S	.839	1.142		1.2-12.0	2085	2.4	5,310	0.052	4,530	0.304	0.142	0.476	65.2	0.972
		FF	FF-180S	.803x.606	1.264		1.0-6.0	3534	1.2	7,550	0.220	6,250	1.08	0.179	0.83	63.7	1.06
	CARBON	RK	RK-260S	.953	1.059		5.0-15.0	12250	12.0	10,900	0.056	9,030	0.27	0.289	1.925	59.5	1.681
		FK	FK-180S	.803x.606	1.264		4.5-15.0	14150	6.0	7,050	0.060	5,700	0.26	0.197	0.83	53.6	1.04
HEAVY DUTY	CARBON	RS	RS-360S	1.091	1.283	BATTERY RECTIFIED A.C.	4.5-26.0	14250	12.0	7,300	0.090	5,850	0.36	0.556	2.40	55.6	2.81
			RS-365S	1.091	1.283		6.0-26.0	1885	18.0	20,800	0.220	17,000	0.99	0.897	11.3	63.3	4.93
			RS-375S	1.091	1.488		12.0-26.0	2073	24.0	25,800	0.230	21,700	1.21	1.19	19.1	65.8	7.50
			RS-385S	1.091	1.488		12.0-26.0	2073	24.0	22,000	0.180	18,800	1.05	1.27	17.6	69.7	8.68
			RS-395S	1.091	1.831		6.0-26.0	2455	12.0	10,000	0.190	8,400	1.00	1.36	8.4	69.6	8.61
			RS-540	1.406	1.969		3.0-12.0	7516	3.6	19,100	2.85	15,700	13.1	2.19	25.4	53.8	12.3
			RS-545S	1.406	1.969		6.0-26.0	5016	6.0	15,000	1.20	12,600	6.35	2.87	26.8	70.3	18.1
			RS-550S	1.406	2.244		3.6-15.0	7522	6.0	12,400	0.70	11,300	7.34	3.87	32.3	73.3	44.4
			RS-750S	1.661	2.362		4.5-18.0	8027	9.6	18,400	1.8	15,800	11.10	6.76	79.1	73.9	48.6
ELECTRONIC GOVERNOR		EG	EG-500AD-6F	1.429	984	DRY CELL RECTIFIED A.C.	4.2-7.5	18290	6.0	2,400 RPM at 8 G-CM load							
			EG-500AD-9F	1.429	984		6.0-11.0	14430	9.0								
			EG-500AD-2F	1.429	.984		8.4-15.0	12580	12.0								
			EG-520AD-6F	1.429	1.063		4.2-7.5	16340	6.0								
			EG-520AD-9F	1.429	1.063		6.0-11.0	14470	9.0								
			EG-520AD-2F	1.429	1.063		8.4-15.0	12580	12.0								

Magnetic Technology®

Since 1961, Magnetic Technology has been designing and building MAGTECH® DC torque motors, tachometers, brushless motors, servo motors and motion control packages. These products have common characteristics:

- They provide higher than ordinary ratios of torque to weight and torque to input power.
- They are developed from experience that has taught us to design for the very best performance and reliability, experience that has taught us to keep costs down by using the least exotic materials necessary for the application.
- They are produced by computer-aided design technology that optimizes the magnetic circuitry, and reduces the design cycle time.

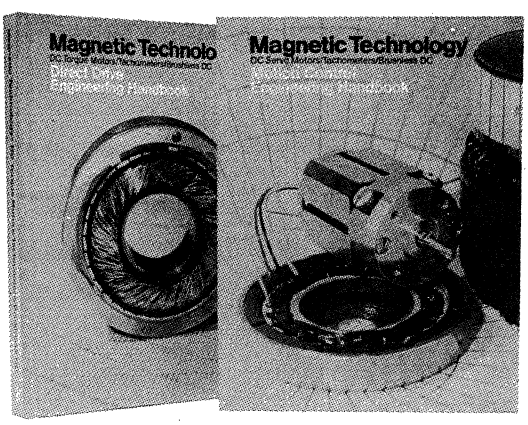
We produce more than 1000 different motors and tachometers, as small as 3/8" in length and as large as 40 inches in diameter. Either standard or custom designs are available for the most demanding applications.

With over 60,000 square feet, our facilities meet the most demanding standards of quality control.

We provide the technical support you need with extensive, detailed engineering information—in a timely manner.

Consequently, over the spectrum of products that we build and the range of applications for which we build: no one builds better motors than Magnetic Technology. Neither chance nor accident is responsible for this declaration. We are quite simply dedicated to quality. Quality...by design.

Engineering Handbooks



Magnetic Technology engineering handbooks present motor control theory and pertinent engineering information to assist in the design of direct drive systems. Featured are permanent magnet DC servo motors, tachometers, torque motors, and brushless DC motors. Numerous application studies are included. Product data is presented for all types with dimensional drawings, performance data, and winding constants.

Ask for the "Motion Control Engineering Handbook" for systems that require the highest performance consistent with a volume production rate; usually used for velocity servos. 176 pages.

Request the "Direct Drive Engineering Handbook" for systems that require precision components with maximum performance, and minimum size and weight; usually used for position servos and/or low rate velocity servos.

Direct Drive

The direct drive DC motor is equivalent to a conventional motor-gearhead except for the direct drive motor's improved response characteristics. By mounting the motor directly to the load, increased coupling stiffness is achieved. Gearing is eliminated, and higher acceleration by a factor equal to the gear ratio, is achieved. Therefore, the gearless DC motor is ideally suited to applications with rapid starts and stops.

The absence of gearing also eliminates errors caused by friction, backlash, and other inaccuracies.

Direct drive systems also feature smooth following and freedom from noise caused by a gear train. For practical purposes, the performance-limiting residual non-linerarities, so common in geared servomechanisms, are almost absent when a direct drive motor is used. Similar advantages are provided when applying a DC tachometer in a direct drive mode.

Typical high performance torque motors used in pointing and tracking applications.

DC Servo Motors

One of the most useful rotating components available to the control system engineering is the direct drive DC servo motor. This versatile control element is a permanent-magnet, armature-excited continuous rotation motor.

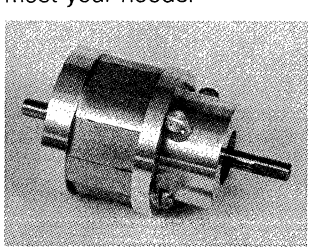
The features of these motors include: fast response, high torque, precise positioning, high tracking accuracy, smooth, quiet operation and low ripple torque. Moreover, permanent magnet fields and moving iron design result in higher thermal inertia and efficiency.

Compare Magtech® direct drive DC servo motor with other types for size, weight and power. They are in a class by themselves. Magtech® servo motors are designed to provide the best combination of performance, quality and low cost to move your load.

Magtech®servo motors have desirable design features such as rugged commutators with welded connections, high temperature insulation systems, and complete impregnation of the windings.

These and other uncommon manufacturing procedures make them ideal choices for demanding industrial applications such as robot manipulator joints, high speed "daisy wheels," tape capstans, film tensioning, and X-Y table drives.

If your servo application requires the rapid, incremental movement of a large load under servo control, or precise velocity or torque control, there is a Magtech® direct drive servo motor to meet your needs.



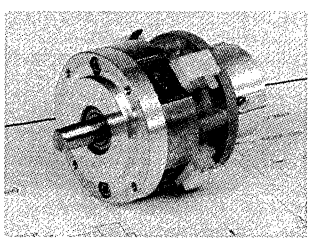
Lightweight servo motor used for manipulator joint.

DC Tachometers

Magtech® direct drive DC tachometers generate a low ripple output voltage that is directly proportional to speed. These devices are generally used by the servo designer in speed control systems and as velocity damping in position systems.

Magtech® tachometers satisfy diverse application needs: The 2000 and 3069C series, which are favored by the numerical control machine tool industry because of their stable, wide dynamic range cartridge brush assemblies, and excellent low speed signal-noise ratios; The 15000-248C series, with noble metal brushes, which is used in gyroscope test equipment as a rate reference at speeds below one revolution per day.

Special tachometer applications which require a wide dynamic range, very low speed operation, or wide temperature range can usually be satisfied by a precision Magtech® tachometer.



Rugged servo motor used in the numerical control and robotics industries.

Brushless DC Motors

Brushless motors eliminate the use of brushes and commutators to properly distribute the current in the windings. This mechanical switching is replaced with electronic commutation. Feedback is required so that the input waveforms are kept in proper timing with the rotor position. Switching is necessary for brushless motors except where only small angular travel is needed.

Continuous rotation brushless motors provide solutions to demanding application requirements. They may be operated at much higher speeds, temperature rise is reduced since the stator is easily heat sunk, brush wear particles are non-existent and system life expectancy is increased to that of the bearings.

Medical science uses our motors for ultrasonic scanners and computer aided tomography. The defense industry employs them for cryogenic compressors and stabilization of space satellite systems. Disk drive manufacturers use our motors to drive the disk spindle.

We can supply the brushless motor, rotor position sensor, logic and electronics.

Magtech® is your one source for brushless DC motor systems.

Brushless cryogenic cooler motor shown with its drive electronics.

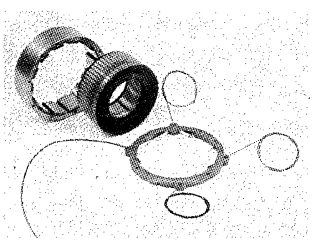
DC Torque Motors

Because of its smooth linear characteristics, the direct-drive DC torque motor is recommended where accurate tracking over speed ranges of several thousand-to-one are required. Torque motors are capable of speed ranges of 0.1 to 600 degrees per second with a uniformity within ±0.1%. Some units go down to 0.001 degree per second with better than 0.5% uniformity.

DC torque motors for most applications have a space-saving "pancake" shape; i.e. they are axially short compared to diameter. They are conveniently mounted directly around the driven load and are usually supplied in a frameless configuration. Custom housed motor assemblies are available from Magnetic Technology to satisfy unique interface requirements.

Magtech® direct-drive DC torque motors set the industry standard for high performance and fine quality. Torque motors that advance technology can be counted on for the most reliable systems.

Magtech® direct drive DC torque motors can solve your most demanding problems. Put Magtech® motor quality in your design today.



Rare earth magnet torque motor used in ball screw actuator for rocket engine nozzle control.

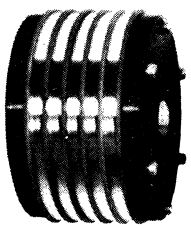
Magnetic Technology®

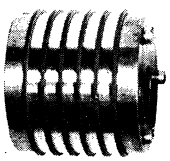
A Division of Vernitron Corp.
21001 Kittridge Street
Canoga Park, California 91303-2870
Telephone (818) 887-7700, TWX: 910-494-1217

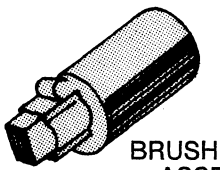
MAUREY
INSTRUMENT CORP.

POWER SLIP RINGS — SR2035

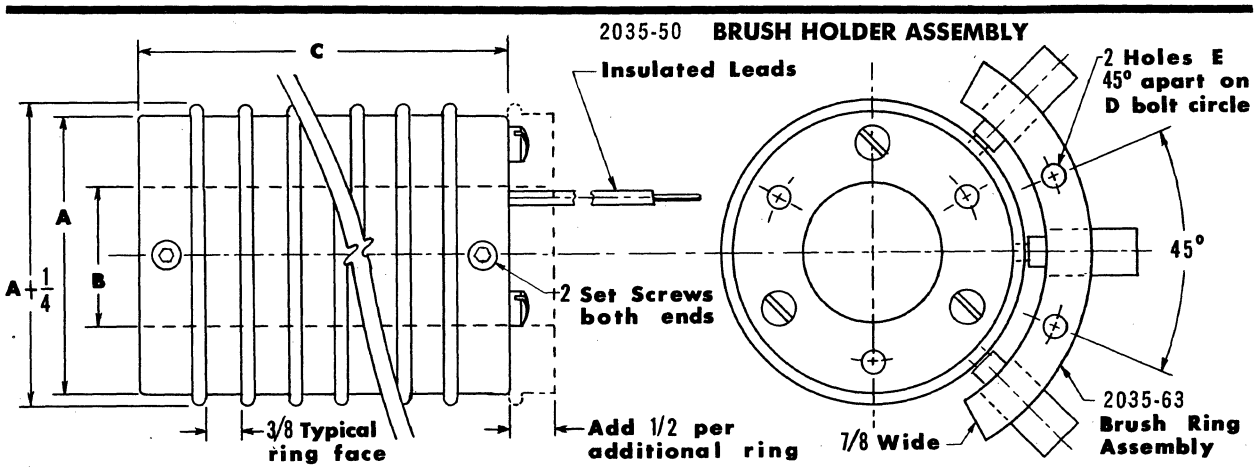
Maurey SR2035 standard power slip rings are designed and built for rugged industrial applications. They are being used in wind power generators, packing machinery, chemical processing equipment and in automated applications. They are available in eight standard diameters with suitable bores to fit most equipment. The larger units are available with up to 50 rings. All parts are precision machined or molded. Variation of design and enclosed assemblies with bearings are available upon request.







BRUSH HOLDER ASSEMBLY



SPECIFICATIONS:

1. Number of Conductors: Specify
2. Bore Size: Specify (See Chart I)
3. Ring Diameter: Specify (See Chart I)
4. Leads: Specify length (See Chart III)
5. Current capacity per brush: 7 Amperes
6. Units of similar construction to the SR2035 are available to 75 amps per ring and 10 conductors.

TOTAL AMPERES PER RING	WIRE SIZE	NUMBER OF BRUSHES
30	AWG 8	6
20	AWG 12	3
10	AWG 14	2

CHART III

SLIP RING PART NO.
SR2035-4-7-1.50
- BORE DIAMETER
- NO. OF RINGS
- RING DIAMETER
- MODEL NUMBER

BRUSH RING ASSEMBLY PART NO.
2035-63-4-3
- NO. OF BRUSHES
- RING DIAMETER
- BASIC PART NO.

A RING O.D.	B BORE MIN. TO MAX. +.002/−.000	BRUSH RING ASSEMBLY PART NO.	D BOLT CIRCLE	E HOLE
8.00	1.00 to 6.50	2035-63-8	9.50	.312
7.00	1.00 to 5.50	2035-63-7	9.50	.312
6.00	1.00 to 4.50	2035-63-6	7.50	.312
5.00	1.00 to 3.50	2035-63-5	6.50	.312
4.00	.75 to 2.50	2035-63-4	5.50	.250
3.00	.50 to 1.50	2035-63-3	4.25	.250
2.50	.50 to 1.00	2035-63-2.5	4.25	.250
2.00	.50	2035-63-2	4.25	.250

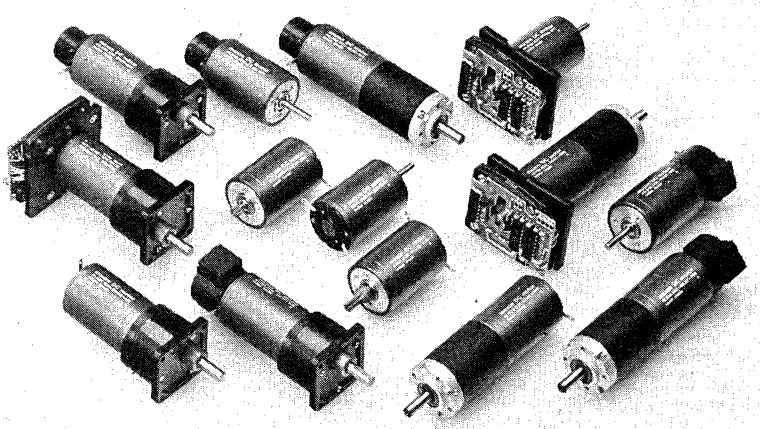
NO. RINGS	C LENGTH
20	11.25
19	10.75
18	10.25
17	9.75
16	9.25
15	8.75
14	8.25
13	7.75
12	7.25
11	6.75
10	6.25
9	5.75
8	5.25
7	4.75
6	4.25
5	3.75
4	3.25
3	2.75
2	2.25

MAUREY
INSTRUMENT CORPORATION
4555 West 60th Street, Chicago, IL 60629 · PHONE (312) 581-4555 · TWX 910-221-6025

maxon DC motor

first class

maxon, the leader in low inertia miniature DC servo motors, offers the widest selection of ironless DC motors. **maxon's** patented rhombic winding provides maximum response, high efficiency, long life and no cogging.



maxon S-series and SmCobolt motors — when you need maximum performance.

maxon F-series with Ferrite magnets when cost is a major concern.

maxon A-series with Alnico magnets when performance and low cost is required.

Frame sizes from tiny 12 mm to our powerful 70 watt 34 mm.

Gear Motors

maxon offers a wide range of high efficiency spur gear boxes from 16 to 44 mm and a high torque planetary gear-boxes with up to 640 oz. in continuous torque.

Encoders/Tachometers

maxon motors are supported by a range of optical encoders and DC tachometers.

maxon DC motor maxon DC motor maxon DC motor maxon DC motor

Complete catalogue available upon request.

maxon precision motors, 838 Mitten Rd., Burlingame, CA 94010, (415) 697-9614

Micro Mo™ TM Pending

MINIATURE ELECTRIC DRIVE SYSTEMS AND ROTARY POWER TRANSMISSION COMPONENTS UP TO 1 H.P.

- Originators of Skew-Wound Coreless Micromotors.
- Patented and Licensed the World Over.

MOTOR STYLE SELECTOR

STYLE	SERIES	CASE DIAMETER (mm)	CASE DIAMETER (in)	OVERALL LENGTH (mm)	OVERALL LENGTH (in)	CONT. MECH. POWER OUTPUT (W)	MAX. CONT. TORQUE (oz-in)	RECOMMENDED MAX. SPEED (RPM)
MOTORS								
	1212	12	(.47)	12.2	(.48)	0.1	.01	15,000
		FITS GEARHEAD SERIES 12/1 & 12/3						
	1219	12	(.47)	18.7	(.74)	0.45	.11	12,000
		FITS GEARHEAD SERIES 12/1 & 12/3						
	1331	13	(.51)	31.2	(1.23)	2.0	.36	12,000
		FITS GEARHEAD SERIES 15/5 & 16/5						
	1516	15	(.59)	15.8	(.62)	0.3	.07	12,000
		FITS GEARHEAD SERIES 15/1, 15/2, 15/3, & 15/5						
	1524	15	(.59)	23.8	(.94)	0.6	.14	12,000
		FITS GEARHEAD SERIES 15/1, 15/2, 15/3, & 15/5						
	1616	16	(.63)	15.8	(.62)	0.45	.11	12,000
		FITS GEARHEAD SERIES 16/1, 16/2, 16/3, & 16/5						
	1624	16	(.63)	23.8	(.94)	0.9	.21	12,000
		FITS GEARHEAD SERIES 16/1, 16/2, 16/3, & 16/5						
	2017	20	(.79)	17.2	(.68)	0.45	.11	12,000
	2025	20	(.79)	24.8	(.98)	0.9	.21	8,000
	2225	22	(.87)	24.8	(.98)	1.0	.28	8,000
		FITS GEARHEAD SERIES 22/2						
	2230	22	(.87)	30.0	(1.18)	2.0	.36	8,000
		FITS GEARHEAD SERIES 22/2 & 34PG						
	2233	22	(.87)	32.8	(1.29)	2.0	.43	8,000
		FITS GEARHEAD SERIES 22/2 & 34PG						
	2338	23	(.91)	37.6	(1.48)	3.5	.85	8,000
		FITS GEARHEAD SERIES 34PG						
	3540	35	(1.38)	40.0	(1.57)	10.0	3.55	5,000
		FITS GEARHEAD SERIES 34PG						
	3557	35	(1.38)	57.0	(2.24)	15.0	6.38	5,000
		FITS GEARHEAD SERIES 34PG						
	3557K. . .S	35	(1.38)	57.0	(2.24)	20.0	7.09	5,000
		FITS GEARHEAD SERIES 34PG						
GEARMOTORS								
	2020	20	(.79)	20.0	(.79)	0.4	.21 to 1.42	200 to 3,000
	2034	20	(.79)	33.3	(1.31)	0.8	.43 to 1.42	500 to 2,000

Micro Mo ELECTRONICS INC.
742-2nd Avenue South / St. Petersburg, Florida 33701 / Phone: 813/822-2529 / Telex: 807-982

Micro Mo

TM Pending

MINIATURE ELECTRIC DRIVE SYSTEMS AND ROTARY POWER TRANSMISSION COMPONENTS UP TO 1 H.P.

ALSO AVAILABLE:

- Tacho-Generators
- Optical Encoders
- Control Systems
- Shaft Couplings
- Precision Gearheads
- Motor-Tachometers

MOTOR STYLE SELECTOR

STYLE	SERIES	CASE DIAMETER (mm)	CASE DIAMETER (in)	OVERALL LENGTH (mm)	OVERALL LENGTH (in)	CONT. MAX. POWER OUTPUT (W)	MAX. CONT. TORQUE (oz-in)	RECOMMENDED MAX. SPEED (RPM)
MOTORS								
	GNM 2115	34	(1.34)	79	(3.11)	4.0	0.91	6,000
	FITS GEARHEAD SERIES G1.1, G4, G4A, G4B, & G5							
	GNM 2130	34	(1.34)	94	(3.70)	8.0	1.81	6,000
	FITS GEARHEAD SERIES G1.1, G4, G4A, G4B, & G5							
	GNM 2145	34	(1.34)	110	(4.33)	12.0	2.70	6,000
	FITS GEARHEAD SERIES G1.1, G4, G4A, G4B, & G5							
	GNM 2175	34	(1.34)	140	(5.51)	20.0	4.52	6,000
	FITS GEARHEAD SERIES G1.1, G4, G4A, G4B, & G5							
	GNM 2636	45	(1.77)	98	(3.86)	22.0	13.14	4,000
	FITS GEARHEAD SERIES G1.2 & G12.1							
	GNM 2670	45	(1.77)	142	(5.59)	40.0	21.72	4,000
	FITS GEARHEAD SERIES G1.2 & G12.1							
	GNM 3125	55	(2.17)	126.5	(4.98)	30.0	15.07	4,000
	FITS GEARHEAD SERIES G2.6, G11.1, & G24							
	GNM 3150	55	(2.17)	126.5	(4.98)	55.0	27.65	4,000
	FITS GEARHEAD SERIES G2.6, G11.1, & G24							
	GNM 3175	55	(2.17)	126.5	(4.98)	75.0	37.74	4,000
	FITS GEARHEAD SERIES G2.6, G11.1, & G24							
	GNM 4125	70	(2.76)	118	(4.65)	45.0	32.71	3,000
	FITS GEARHEAD SERIES G2.1, G2.2, G2.3, G11.2, & G24							
	GNM 4150	70	(2.76)	143	(5.63)	75.0	52.67	3,000
	FITS GEARHEAD SERIES G2.1, G2.2, G2.3, G11.2, & G24							
	GNM 4175	70	(2.76)	168	(6.61)	100	79.01	3,000
	FITS GEARHEAD SERIES G2.1, G2.2, G2.3, G11.2, & G24							
	GNM 5440	83	(3.27)	166.5	(6.56)	125	79.37	3,000
	FITS GEARHEAD SERIES G3.1, G3.5, G6.1, G8N, G40.1, GC10, & GC20							
	GNM 5480	83	(3.27)	206.5	(8.13)	210	149.53	3,000
	FITS GEARHEAD SERIES G3.1, G3.5, G6.1, G8N, G40.1, GC10, & GC20							
	GNM 7045	120	(4.72)	202	(7.95)	175	177.87	3,000
	FITS GEARHEAD SERIES G50.1, GC10, GC20, & GC30							
	GNM 7085	120	(4.72)	256	(10.08)	300	295.16	3,000
	FITS GEARHEAD SERIES G50.1, GC10, GC20, & GC30							
	GNM 70130	120	(4.72)	313	(12.32)	430	414.88	3,000
	FITS GEARHEAD SERIES G50.1, GC10, GC20, & GC30							

- Available with Integral Brakes, AC/DC Tachs, and Optical Encoders.
- High Voltage Versions Available Upon Request (to 180 VDC).
- Single Piece Prototypes Available.
- Complete Applications Liaison — Prototype Through Production.

Micro Mo ELECTRONICS INC.
742-2nd Avenue South / St. Petersburg, Florida 33701 / Phone: 813/822-2529 / Telex: 807-982

Micro Mo

TM Pending

MINIATURE ELECTRIC DRIVE SYSTEMS AND ROTARY POWER TRANSMISSION COMPONENTS UP TO 1 H.P.

- Diameters from 12 mm - 120 mm (0.47 - 4.72 in.)
- Continuous Output Torque to 96 ft.-lb.

GEARHEAD STYLE SELECTOR

STYLE	SERIES	OUTSIDE DIAMETER (mm)	OUTSIDE DIAMETER (in)	SHAFT DIAMETER (mm)	SHAFT DIAMETER (in)	RATIOS FROM	RATIOS TO	MAX.CONT. TORQUE (oz-in)	INTER-MITTENT TORQUE (oz-in)
	12/3	12	(.472)	2	(.079)	9.17:1	154,368:1	≤ 5.6	≤ 14.1
	FITS MOTOR SERIES 1212 & 1219								
	15/1	17	(.669)	2	(.079)	11.8:1	5752:1	≤ 2.8	≤ 7.1
	FITS MOTOR SERIES 1516 & 1524								
	15/2	16	(.630)	2	(.079)	3.45:1	235,067:1	≤ 4.3	≤ 14.2
	FITS MOTOR SERIES 1516 & 1524								
	15/3	16	(.630)	2	(.079)	6.3:1	235,067:1	≤ 4.3	≤ 14.2
	FITS MOTOR SERIES 1516 & 1524								
	15/5	16	(.630)	3	(.118)	6.3:1	235,067:1	≤ 14.2	≤ 42.6
	FITS MOTOR SERIES 1516, 1524, & 1331								
	16/1	17	(.669)	2	(.079)	11.8:1	5752:1	≤ 2.8	≤ 7.1
	FITS MOTOR SERIES 1616 & 1624								
	16/2	17	(.669)	2	(.079)	3.45:1	235,067:1	≤ 4.3	≤ 14.2
	FITS MOTOR SERIES 1616 & 1624								
	16/3	17	(.669)	2	(.079)	6.3:1	235,067:1	≤ 4.3	≤ 14.2
	FITS MOTOR SERIES 1616 & 1624								
	16/5	17	(.669)	3	(.118)	6.3:1	235,067:1	≤ 14.2	≤ 42.6
	FITS MOTOR SERIES 1616, 1624, & 1331								
	22/2	23.8	(.937)	4	(.157)	3.1:1	983,447:1	≤ 14.2	≤ 56.7
	FITS MOTOR SERIES 2225, 2230, & 2233								
	38/1	38	(1.60)	8	(.315)	14:1	1526:1	≤ 1,418	≤ 2,127
	FITS MOTOR SERIES 3540 & 3557								
	G1.1	–		6	(.236)	7.3:1	38:1	≤ 92	≤ 283.2
	FITS MOTOR SERIES GNM 2115, 2130, & 2145								
	G1.2	–		8	(.315)	7.3:1	38:1	≤ 155.7	≤ 283.2
	FITS MOTOR SERIES GNM 2636 & 2670								
	G2.6	–		10	(.394)	4.8:1	36:1	≤ 424.8	≤ 1132.8
	FITS MOTOR SERIES GNM 3125 & 3150								

Micro Mo ELECTRONICS INC.
742-2nd Avenue South / St. Petersburg, Florida 33701 / Phone: 813/822-2529 / Telex: 807-982

Micro Mo

TM Pending

MINIATURE ELECTRIC DRIVE SYSTEMS AND ROTARY POWER TRANSMISSION COMPONENTS UP TO 1 H.P.

- Full-Line Stocking Distributors Worldwide.
- ϕ Back-Lash Gearing on Selected Models.

GEARHEAD STYLE SELECTOR

STYLE	SERIES	OUTSIDE DIAMETER (mm)	OUTSIDE DIAMETER (in)	SHAFT DIAMETER (mm)	SHAFT DIAMETER (in)	RATIOS FROM	RATIOS TO	MAX.CONT. TORQUE (oz-in)	INTER-MITTENT TORQUE (oz-in)
	G3.1	–		12	(.472)	5.6:1	35:1	⩽ 877.9	⩽ 1,840.8
	FITS MOTOR SERIES GNM 5440C, 5440E, 5480C, GNHM 4240 & 4260								
	G4	–		8	(.315)	15:1	43740:1	⩽ 339.8	⩽ 424.8
	FITS MOTOR SERIES GNM 2115, 2145, & 2175								
	G4A	–		8	(.315)	60:1	9720:1	⩽ 453.1	⩽ 566.4
	FITS MOTOR SERIES GNM 2115, 2130, & 2145								
	G4B	–		8	(.315)	15:1	180:1	⩽ 354	⩽ 637.2
	FITS MOTOR SERIES GNM 2115, 2130, 2145, & 2175								
	G5	34	(1.34)	8	(.315)	30:1	54880:1	⩽ 710	⩽ 710
	FITS MOTOR SERIES GNM 2130, 2145, 2145B, & 2160								
	G6.1	83	(3.27)	20	(.787)	8:1	185.7:1	⩽ 7,080	⩽ 18,408
	FITS MOTOR SERIES GNM 5440 & 5480								
	G8N	–		12	(.472)	15:1	405:1	⩽ 2,832	⩽ 2,832
	FITS MOTOR SERIES GNM 5440								
	G11.1	56	(2.21)	14	(.551)	8.3:1	242.9:1	⩽ 3,115	⩽ 4,248
	FITS MOTOR SERIES GNM 3150 & 3175								
	G11.2	56	(2.21)	14	(.551)	8.3:1	242.9:1	⩽ 3,115	⩽ 4,248
	FITS MOTOR SERIES GNM 4150								
	G12.1	–		10	(.394)	10:1	810:1	⩽ 708	⩽ 1,133
	FITS MOTOR SERIES GNM 2636								
	G24	–		10	(.394)	15:1	540:1	⩽ 1,416	⩽ 1,699
	FITS MOTOR SERIES GNM 3125 & 3150								
	G40.1	–		15	(.591)	10:1	56:1	⩽ 3,540	⩽ 9,912
	G50.1	–		20	(.787)	10:1	40:1	⩽ 5,310	⩽ 14,160
	FITS MOTOR SERIES GNM 70130								
	GC10	–		19-24	(.748-.945)	3.38:1	44.42:1	⩽ 21,240	⩽ 299,916
	FITS MOTOR SERIES GNM 5480 & 70130								
	GC20	(same as above)							
	GC30	–		28	(1.102)	60.19:1	129.50:1	⩽ 45,314	⩽ 94,876
	FITS MOTOR SERIES GNM 70130								

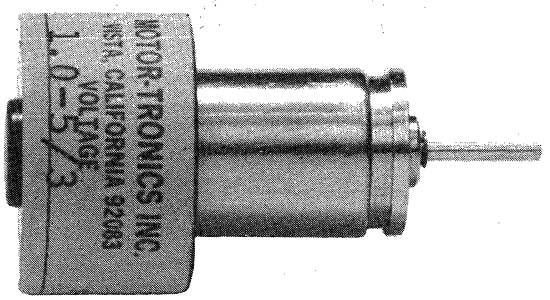
- Ask about our "Guaranteed Stock Program" with next-day sample delivery.
- Ship-from-Stock Program for OEM Blanket Orders.

Micro Mo ELECTRONICS INC.
742-2nd Avenue South / St. Petersburg, Florida 33701 / Phone: 813/822-2529 / Telex: 807-982

MOTOR-TRONICS, INC.

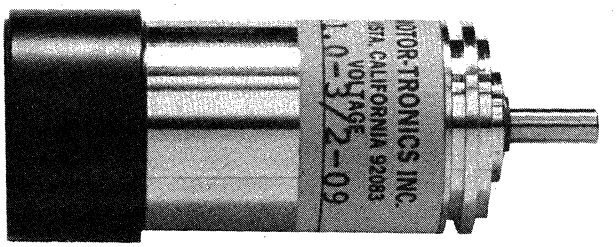
BRUSHLESS DC MOTORS AND ASSEMBLIES

MODEL 1.0-5/3



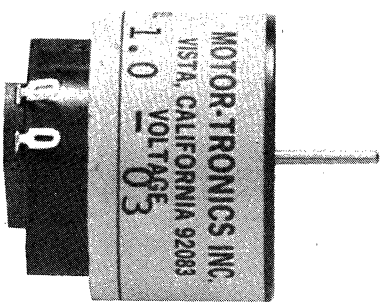
MOTOR-GEAR HEADS

MODEL 1.0-3/2



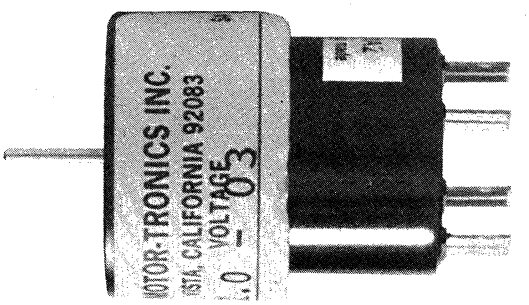
MOTOR-GEAR HEADS

MODEL 1.0-03



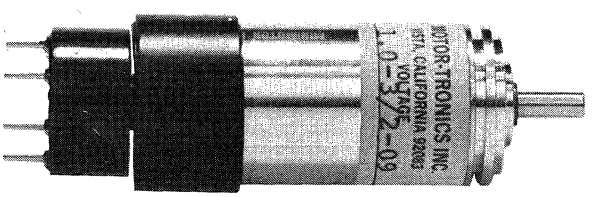
MOTOR-TACHS

MODEL 1.0-09



MOTOR-ENCODERS

MODEL 1.0-3/2-09



MOTOR-GEAR HEAD-ENCODERS

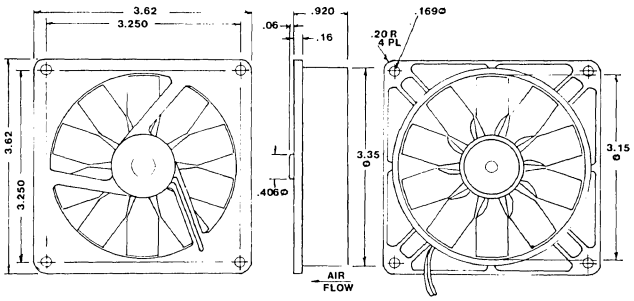
*** Also Available — Model 12V-2A Hybrid Servo Electronics**

MOTOR-TRONICS INC. — 2142 INDUSTRIAL COURT — BLDG. F2, VISTA, CA 92083 • 619-727-7430

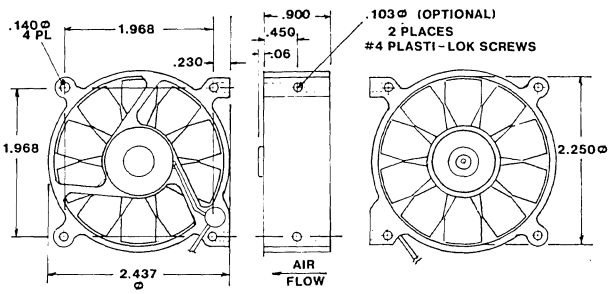
MOTOR-TRONICS, INC.

BRUSHLESS DC MOTORS AND ASSEMBLIES

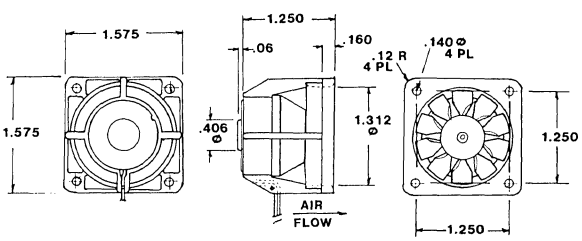
STANDARD-BRUSHLESS FAN
MF-3.15X0.9-25



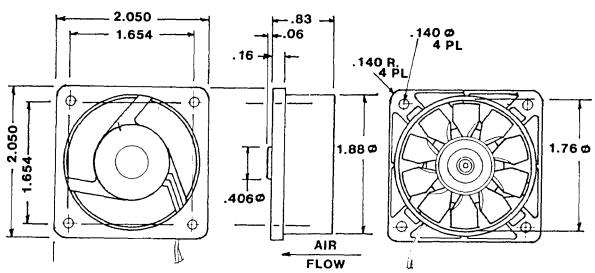
SMALL-ULTRA-THIN FAN
MF-2.4X0.9-15



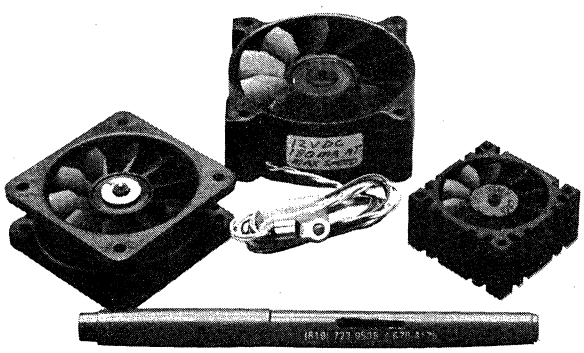
MINIATURE-BRUSHLESS FAN
MF-2.0X0.9-9



MICRO-BRUSHLESS FAN
MF-1.6X1.2-6



TEMPERATURE CONTROLLED FANS
CFM-0.35T-2 20°C<T<50°C



Motor-Tronics line of brushless D.C. fans utilize a true three phase electronic design for maximum efficiency and low noise generation. All rotating assemblies are precision balanced to minimize vibration and extend bearing life. The precision bearing structure contains a lubrication reservoir to extend operational life. Motor-Tronics fans and subassemblies can be specifically designed to meet your requirements.

MOTOR-TRONICS INC. — 2142 INDUSTRIAL COURT — BLDG. F2, VISTA, CA 92083 • 619-727-7430

PERFORMANCE CONTROLS INC.

High Performance Pulse Width Modulated DC Servo Amplifiers...

. . . designed and manufactured for packaging with DC brush and brushless servo motors to provide a high reliability drive-motor assembly serving the robotic, CAD/CAM, machine tool, computer peripheral, aerospace and military systems market. All models feature:

- 20-60 KHz PWM (no series inductance required)
- 6-20 Amp continuous output
- 5-225 VDC input bus
- 500 W-5 KW output power available
- EMI/RFI protection
- 4 quadrant current or velocity loop w/5 KHz bandwidth
- Adjustable current limit
- Optional remote current programming available
- Greater than 90% efficiency
- Full short circuit protection
- Current output monitor
- Intelligent digital front-end available
- High temperature versions available

BLM Series

The BLM brushless series is integrated with the necessary commutation and switching arrangement to support a 3 ϕ PM brushless DC motor. The 3 ϕ commutation inputs are decoded to drive appropriate phases for torque generation and continuous output power up to 5 KW. Additional features and options of this series include:

- No deadband
- $\pm$10V differential input command range
- Accepts 3 ϕ, 60° or 120° phase shift motor encoder inputs
- EMI/RFI DC Input and output filtering
- Isolated internal power supplies
- External amplifier enable signal
- Velocity loop with brushless tach and frequency locked loop available
- Separate power and signal connectors
- 0-60°C w/derating above 60°C
- 8" x 4" x 2.5" modular packaging (up to 1.5 KW)
- 2.6 lbs weight

DCM Series

The DCM brush series offers 400 W-5 KW continuous output power, up to 40 amp per axis peak current, input bus voltage up to 225 VDC, velocity servo feedback, adjustable command gain, AC-DC gain, tachometer scaling and velocity loop offset. Additional features include:

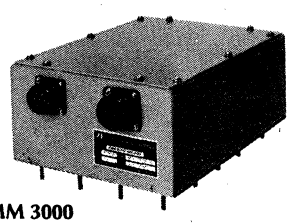
- Latched overcurrent protection
- Latched short-to-ground
- Latched armature short
- Open collector fault monitor output
- Input line filtering
- Separate signal connector and power terminal strip
- Standard mating connector for signal
- Base plate conduction cooling
- Scaling/Isolation options available
- 0-85°C w/derating above 60°C operating temperature
- 8" x 4" x 1.75" modular packaging (up to 2 KW)
- 2.25 lbs weight

Power Supplies

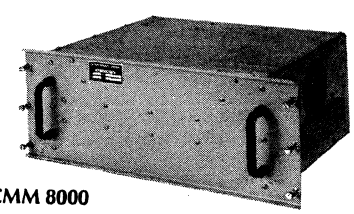
Our capabilities also include high frequency DC to DC converters.
Call for specific details.

Military BLMM/DCMM Series

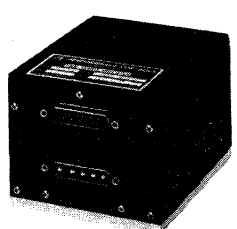
The BLMM brushless and DCMM brush series is designed specifically to support military and aerospace systems applications. These motor drives provide high reliability within a small, lightweight package and use MIL qualified components. They are designed to meet specifications such as MIL STD 461B for EMI/RFI integrity and to utilize forced-air or liquid cooling techniques, while maintaining high efficiency. The newest addition to this family of amplifiers utilizes hybrid technology. Our manufacturing facility has been approved for MIL-Q-9858A levels.



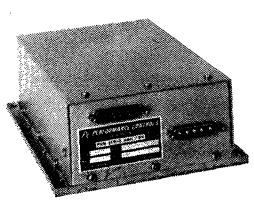
DCMM 3000



DCMM 8000



BLMM HYBRID



DCMM 2000

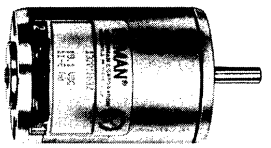
DCMM HYBRID

PERFORMANCE CONTROLS INC. 333E BYBERRY ROAD, HATBORO, PA. 19040 • (215) 675-6500 • TLX 881478

Computer tested

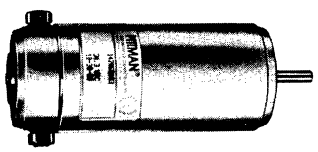
Series 8000 LO-COG® Servo Motors. 7-slot armatures. Voltage inputs to about 40 VDC. Nominal O.D. 1.2 in.; 3 lengths to 2.4 in. overall. Stall torques to 12 oz.-in. Mechanical time constants about 21 ms.

Series 9000 LO-COG® Servo Motors. 7-slot armatures. Voltage inputs to about 40 VDC. Nominal O.D. 1.6 in.; 3 lengths to 2.5 in. overall. Stall torques to 41 oz.-in. Mechanical time constants as low as 9.2 ms. (some models).

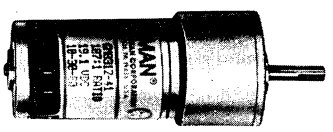


Series 13000 LO-COG® Servo Motors. 7-slot armatures. Voltage inputs to about 40 VDC. Nominal O.D. 2.05 in.; 4 lengths to 4.2 in. overall. Stall torques to 126 oz.-in. Mechanical time constants as low as 13.1 ms. (some models).

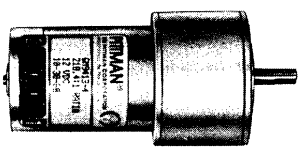
brush-commutated



Series 14000 Servo Motors. 11-slot armatures. Voltage inputs to about 40 VDC. Nominal O.D. 2.13 in.; 4 lengths to 5.2 in. overall. Stall torques to 286 oz.-in. Mechanical time constants as low as 6.2 ms (some models).

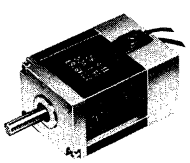


Series GM8700 Gearmotors. Torque to 100 oz.-in. with standard gearing. Uses selected 8000 series servo motor plus spur gearbox. 1.37 in. O.D.; lengths depending on motor and gearbox specification to 3.61 in. overall. Optional torques to 160 oz.-in.



Series GM9400 Gearmotors. Torque to 175 oz.-in. with standard gearing. Uses selected 9000 series servo motor plus spur gearbox. 2.00 in. O.D.; lengths depending on motor and gearbox specification to 3.96 in. overall. Optional torques to 500 oz.-in.

D-C motors



Series 7000 Servo Motors. 13-slot armatures. 4 pole, samarium cobalt fields. Voltage inputs to about 40 VDC. 1 in. x 1.25 in. cross section; 3 lengths to 1.85 in. overall. Stall torques to 24-oz.-in. Mechanical time constants as low as 4.8 ms.

Every Pittman® motor is thoroughly tested by a sophisticated computer-controlled instrument array that checks eight vital performance parameters and records the measured values. And every unit is composed of standardized sub-components pre-assembled to extremely demanding specifications. That's Pittman, applying the latest in mass production techniques to reliable, precision motion control products to assure you of a welcome combination of performance and economy. Choose the motor type you need. Then contact us for complete data and application assistance. **Call (215) 256-6601. (TWX: 510-661-8696.)**

PITTMAN
HARLEYSVILLE, PA 19438-0003 USA
A DIVISION OF PENN ENGINEERING & MANUFACTURING CORP.

CANADA:
Brian Engineering Ltd.
Montreal
Tel.: 514-735-1671

ISRAEL:
Sherman Eng. Co. Ltd.
Herzliya
Tel.: 052-542 853/541319

ITALY:
SGE-Syscom s.p.a.
Milano
Tel.: (02) 6120551/2/3/4

THE NETHERLANDS
Nijkerk Elektronika B.V.
Amsterdam
Tel.: (020) 46 22 21

SWEDEN:
L. Östergren EL-AB
Solna
Tel.: 08-734 06 10

UNITED KINGDOM:
Servodata Ltd.
Newbury, Berks.
Tel.: 0635-45373

WEST GERMANY:
Servotex Vertriebs-GmbH
Wiesbaden
Tel.: (0 61 21) 56 20 01

© Pittman 1985

25-C

ecm

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M

MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O

OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P

PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

WPS word processing software

Y

YIG yttrium iron garnet

Z

ZIF zero insertion force

Portescap U.S.

escap® rare earth magnet-based components for the creation and control of electronic motion

The source of the technology is also your source for the products!

The business of Portescap U.S. is putting great ideas in motion with great precision. Our escap line represents a wide selection of electronic drive and motion system components for applications ranging from relatively simple incremental motion systems, to such high-tech uses as robotics, computer peripherals, and medical implants. It incorporates steppers and micro-steppers with integrated velocity sensors in quadrature, based on samarium cobalt thin layer disk rotor technology—a technology we developed—plus ironless DC micromotors, and a full line of integral and discrete accessories including optical encoders and torque multipliers. Many models are available for immediate delivery at volume discount. New technology components are available in sample quantities from stock. Come to the source.

Stepper Motors & Micro-Steppers—rare earth permanent magnet design; integral velocity coils; single and two-phase designs; micro-stepping to 6,400 steps/revolution.

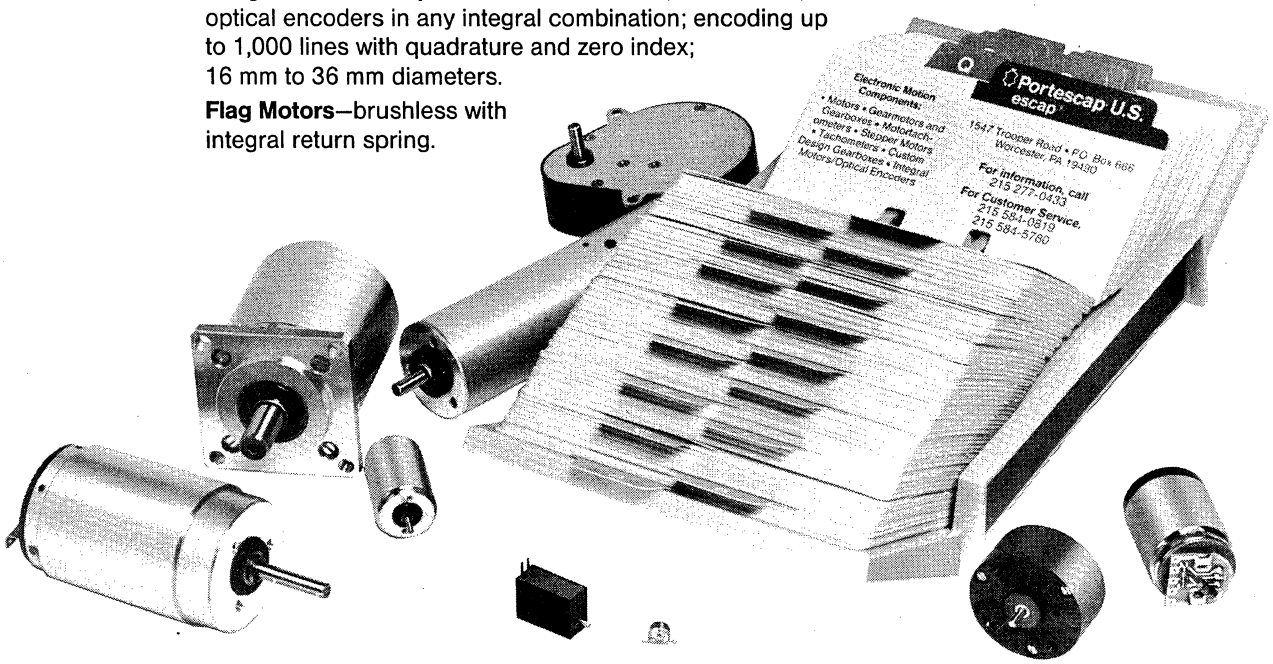
DC Micromotors & Servomotors—ironless design; low inertia; 7 x 12 mm motors to 36 mm diameters.

Gearmotors & Gearboxes—spur and planetary designs; torques up to 350 lb/in; 9 x 12 mm to 42 mm diameters.

Motortachometers & Tachometers—ironless design with precious metal commutation; 23 mm to 36 mm diameters.

Integral Motors & Optical Encoders—motor, tachometer, and optical encoders in any integral combination; encoding up to 1,000 lines with quadrature and zero index; 16 mm to 36 mm diameters.

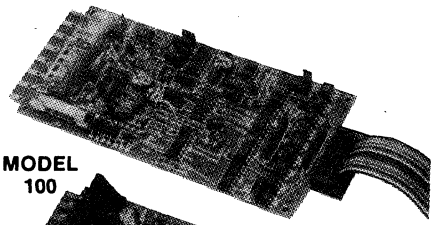
Flag Motors—brushless with integral return spring.



Portescap U.S.
escap®

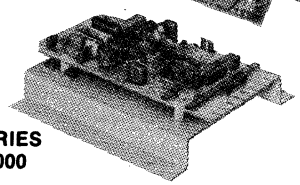
2550 Eisenhower Avenue • P.O. Box 756
Valley Forge, PA 19482
(215) 277-0433

ISOLATED INPUT DC MOTOR CONTROLS

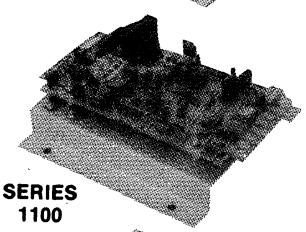


MODEL 100

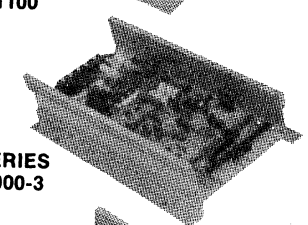
MODEL 110



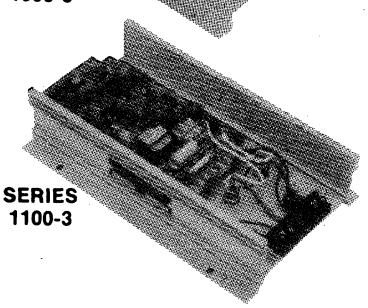
SERIES 1000



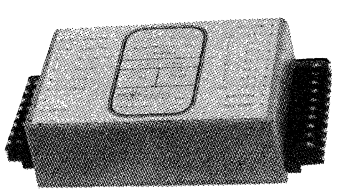
SERIES 1100



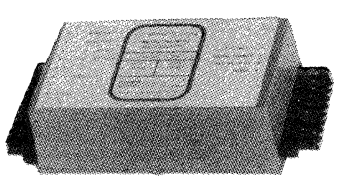
SERIES 1000-3



SERIES 1100-3



SERIES 10,000



SERIES 11,000

MILLIWATTS → ISOLATED MOTION CONTROL → KILOWATTS

8 Bit Parallel Microprocessor/TTL Compatible
1500 volt isolation ..... or -
Isolated Analog Inputs
1500 volt isolation, voltage or current inputs
Bi-Directional, Regenerative (4 Quadrant) Operation
Controls large inertial loads with fast response
Output Horsepower
3 power ranges control motors from 1/50 HP to 3 HP
Motor Armature Voltage
90, 130 and 180 VDC full scale outputs; 24 VDC also available
Motor Field Voltage
For all PM motors as well as 50 and 100 VDC fields
AC Input Voltage
Nominal 115 VAC or 230 VAC, 47-63 Hz
Isolation Voltage
1500 VDC standard; up to 5000 VDC available
Speed Range
50:1 standard or wider with tach feedback
Adjustments
Full speed, IR comp, torque limit, offset adjust
Ambient Operating Temperature
—20°C to +70°C
Input/Output Connections
Plug removable connectors, solder lugs or ribbon cable, inputs and outputs physically separated
Failsafe Protection
Motor is de-energized if control is not powered
Torque Limiting
Adjustable torque limits, CW and CCW

MODEL NUMBER	INPUT VOLTAGE	HP RANGE	NOTES
100	115 VAC 60 Hz	1/30 HP-1/8 HP	TTL/Microprocessor Compatible; Board level; low cost for OEM applications
110	115 VAC 60 Hz	1/30 HP-1/8 HP	Isolated Analog Input; Board level; low cost for OEM applications
100-24	115 VAC 60 Hz	1/30 HP-1/8 HP	TTL/Microprocessor Compatible; Board level; low cost for OEM applications; 24 VDC output
110-24	115 VAC 60 Hz	1/30 HP-1/8 HP	Isolated Analog Input; Board level; low cost for OEM applications; 24 VDC output
1000	115/230 60 Hz	1/6 HP-1 HP	TTL/Microprocessor Compatible; Open Frame Construction
1100	115/230 60 Hz	1/6 HP-1 HP	Isolated Analog Input; User may select ±100 mv, ±5 VDC, 4-20 ma or 10-50 ma inputs. Open Frame Construction
1000-3	115/230 60 Hz	1 HP-3 HP	TTL/Microprocessor Compatible; Open Frame Construction
1100-3	115/230 60 Hz	1 HP-3 HP	Isolated Analog Input; User may select ±100 mv, ±5 VDC, 4-20 ma or 10-50 ma inputs. Open Frame Construction.
10,000	115/230 60 Hz	1/6 HP-1 HP	TTL/Microprocessor Compatible; Die Cast Case Construction
11,000	115/230 60 Hz	1/6 HP-1 HP	Isolated Analog Input; User may select ±100 mv, ±5 VDC, 4-20 ma or 10-50 ma inputs. Die Cast Case Construction

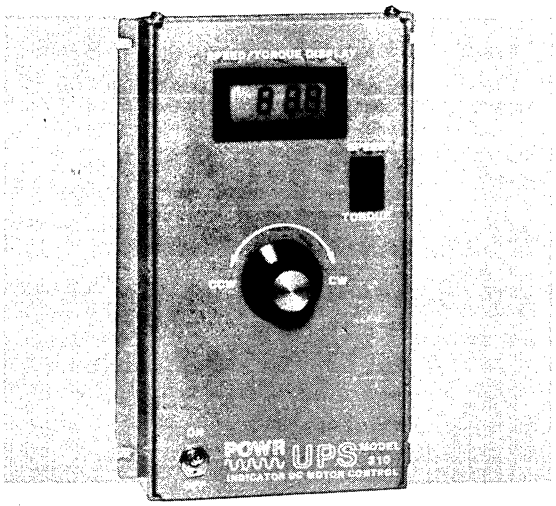
POWR UPS CORP
50 Orville Drive Bohemia, New York 11716 (516) 589-3602

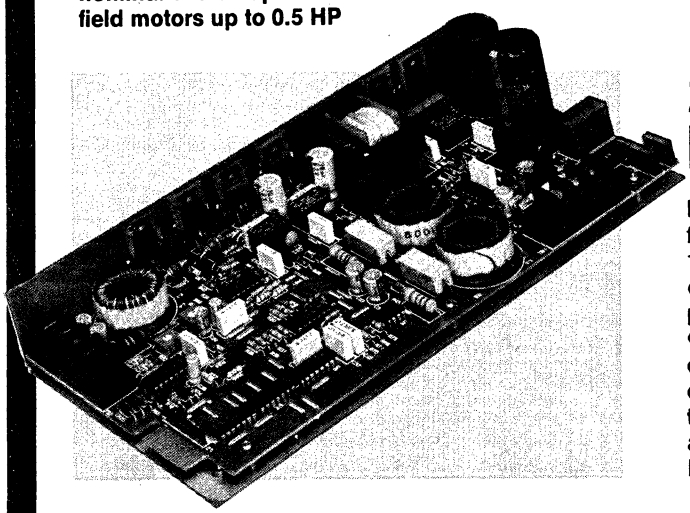
MOTOR CONTROLS
for Industrial and Robotics Applications

INTEGRAL LCD SPEED/TORQUE DISPLAY

POWR-UPS Model 310 DC Motor Control is a half-wave, regenerative unit that controls the speed and direction of motor torque of motors with outputs from 1/30 to 0.5 HP. The integral front panel 10 turn potentiometer permits repeatable setting of motor speed. Model 310 features:

• 10 turn precision speed control potentiometer • LCD readout of speed/torque analog • Bi-directional, regenerative (four quadrant) action • Operates from nominal 115 VACpower lines • Controls PM or Shunt field motors up to 0.5 HP





24 VDC OUTPUT MOTOR CONTROLS

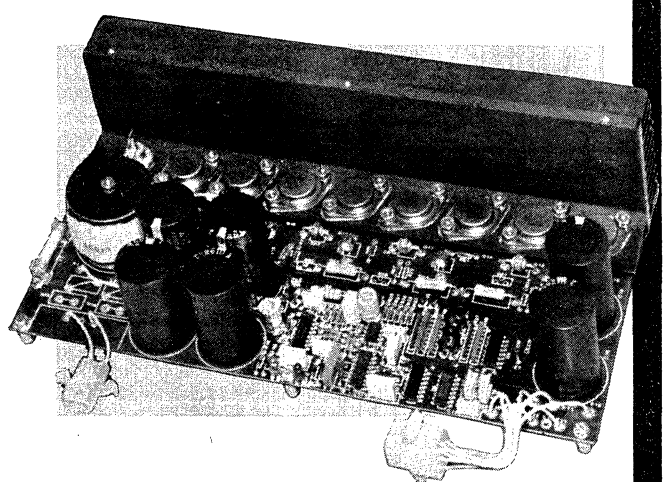
POWR-UPS Model 124 DC motor controls are high frequency power FET units that operate from standard 115 or 230 VAC power sources. These units are completely self contained and require no additional power supplies. Model 124 features:

• Compatible with virtually all PM DC motors • Bipolar outputs up to +24 VDC • Four quadrant, regenerative operation • Output to 2 amperes • Armature or tachometer feedback • Wide bandwidth for servo applications • High frequency PWM filtered output • Isolated analog or digital interfaces

BRUSHLESS DC MOTOR DRIVES

POWR-UPS drives for brushless DC motors are available in many standard configurations and also for a wide range of custom requirements. POWR-UPS drives are compatible with virtually all manufacturer's brushless DC motors and have these options:

• Precision regulated speeds to 20,000 RPM • Output power from 20W to 5KW • DC inputs from 12 to 320 VDC • AC inputs of 115 or 230 VAC • Two or four quadrant operation • Isolated analog or digital interfaces available



POWR UPS CORP

50 ORVILLE DRIVE
BOHEMIA, NEW YORK 11716
(516) 589-3602

Fast prototypes: AC and brushless DC motors, parts sets and gearmotors.

Get fast sample response from Robbins & Myers on any 3″ to 5″ diameter motor package. Computer optimized design procedures match AC or brushless DC technology to your performance requirements quickly and exactly.

Our wide standard selection of mechanical components and electrical features offers you versatility and easy application without long lead times, or unnecessary cost.

Take advantage of our long OEM experience in specialty motor development for computer peripherals, business machines, light industrial and commercial products. Call us to discuss your requirements, and get fast response. For AC motors, and all gearmotors, ask for Catalog D-1130; for brushless DC, request D-1165.

- AC motors from 1/150 to 1/3 hp
- Brushless DC motors in standard frame sizes and mounting configurations
- Compact brushless DC motor parts sets
- AC & DC gearmotors from 0.2 to 848 RPM, run torques to 176 in. lb.

Robbins & Myers, Inc., Motor Product Division, Route #4, Bob McCormick Road, Gallipolis, Ohio 45631 U.S.A. Tel.: (614) 446-4012, Telex: 241-353.

ROBBINS MYERS

Tachs, Servomotors, Motor-Generators.

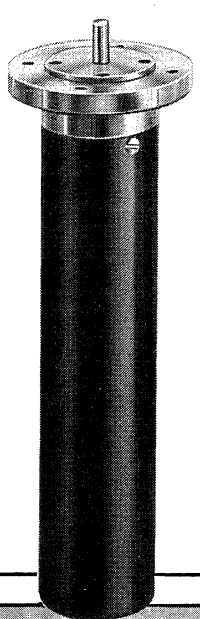
dc tach generators

Servo-Tek tachometer generators are built to last. With silver-alloy commutators, stainless-steel shafts and bearings, brushes designed for 100,000-hour life, temperature compensation, and full factory run-in, our tachs deliver stable, long-term performance. A complete line, encompassing a variety of mechanical and electrical characteristics, is available in regularly-stocked units. Output ratings from 1 to 45 V/1000 rpm.

dc servomotors

Permanent-magnet Servo-Tek servomotors give you maximum performance with minimum maintenance. With silver-alloy commutators, stainless-steel shafts and bearings, heavy Isomid magnet wire on Teflon-insulated armature, extended-life brushes, and aluminum housings, our servomotors are highly reliable and long-lasting. Standard units are available in a wide range of speed, torque (up to 2 oz/in. ungeared, 300 oz/in. with integral gearing), and voltage combinations to suit the individual application.

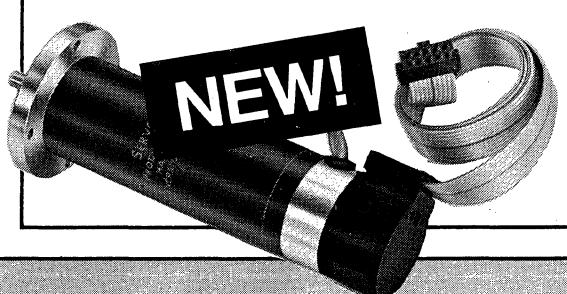
dc motor-generators



Our dc motor-generators combine high-performance Servo-Tek servomotors with our long-life tachometer generators—both mounted on a common shaft. (Integral spur-type gear reducers are added where required.) Motors are available in any specified voltage, tachs with outputs up to 10 V/1000 rpm, and gear reducers in ratios from 4.3:1 to 7,200:1.

incremental encoder option

The incremental encoder option, available on any Servo-Tek 1.135"-diameter dc tach generator, servomotor, or motor-generator, provides a 3-channel (2 in quadrature and 1 index) LSTTL logic output—adding digital position and direction feedback. Supplied in various incremental outputs from 100 to 512 pulses per revolution, this low-cost option operates on a 5Vdc supply. Comes complete with 2-foot, 10-conductor ribbon cable and polarized connector.



SERVO-TEK®
PRODUCTS COMPANY

1086 Goffle Road, Hawthorne, NJ 07506 • (201) 427-3100

7822

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

★ SKC ELECTRIC MOTORS ★

SKC ELECTRIC MOTORS

SKC ELECTRIC MOTORS

SHINANO KENSHI CORP.
MANUFACTURES

VALUE ENGINEERED ELECTRIC MOTORS

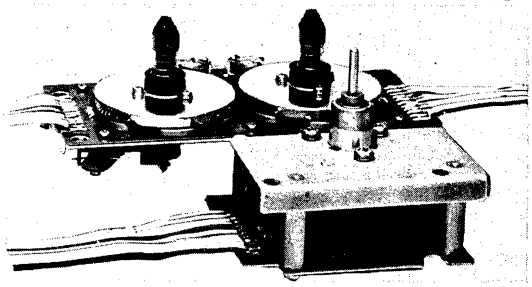
DESIGNED TO MAINTAIN QUALITY AND CONTROL COSTS!

★ SKC ELECTRIC MOTORS ★

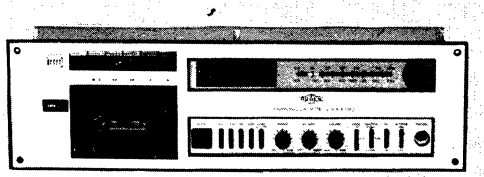
NEWLY DEVELOPED 3DD's

DIRECT DRIVE MECHANISM

WITH **3** BRUSHLESS **DC** MOTORS



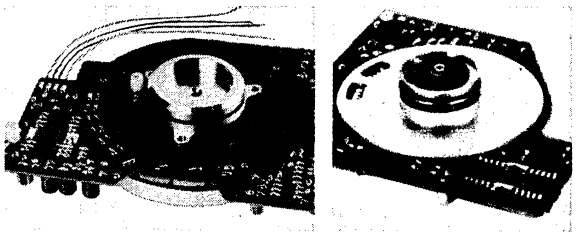
IDEAL TAPE TRANSPORTS FOR
Background Music Players,
Security Devices, Voice Loggers,
Duplicators, Message Repeaters,
Multi-Channel Aircraft Stereos . . .



• 5-10 Watt Audio Output • Endless Tape Function
• Remote Control Function • Monitors Speakers
• Sequential Timer • Easy to Install • Continuous Play
• Mike-Line in • Diagonal Out

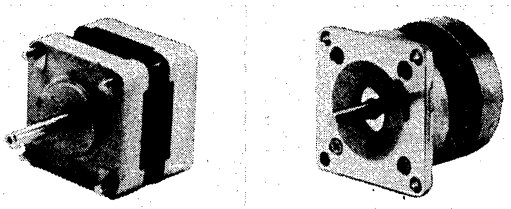
Shinano Kenshi Corporation specializes in the manufacture of customized audio systems, utilizing three direct drive brushless DC motors. (3DD's) Of excellent quality . . . they are virtually maintenance free! For the best results . . . send us your most demanding specifications.

BRUSHLESS MOTORS



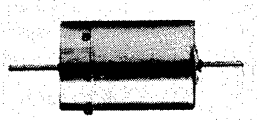
Inner or outer rotor, 40 mm to 90 mm dia., super precision spindle, integral electronics (optional), hall generator, tach phase winding. 25,000 hours life. **Applications:** Optical disc drives, video recorders, Winchester disk drives, streamers, floppy disk drives and data recorders.

STEPPING MOTORS



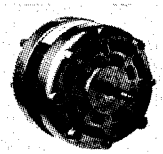
Newly developed 35mm 1.8°, industry standard 39 mm (size 17) 57 mm (size 23) frames. Popular step angles, 0.9°, 1.8°, 3.6°, 3.75°. Hybrid, bifilar, 3% accuracy, precision ball bearings, state of the art performance. **Applications:** Floppy disk drives, rigid disk drives, printers, plotters, medical equipment, office automation machine.

CORELESS DC MOTORS

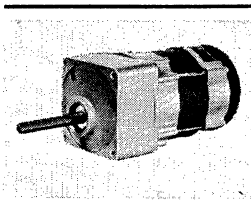


Low cost, high speed and acceleration, low inertia, frame sizes 12 mm to 50 mm. Starting torque 8.5 to 1400 g-cm. Frequency generator, 5, 6, 12, 24 or 48 pulse/Rev (optional). **Applications:** Cassette recorders, office equipment, medical equipment and small plotters.

HYSTERISIS SYNCHRONOUS MOTOR



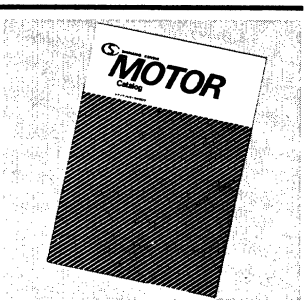
100 VAC or 115 VAC, 50 HZ and 60 HZ, 78 mm and 85 mm dia., 900, 1800 or 3600 RPM, pullout torque to 800 gm cm, with or without cooling fan. **Applications:** Capstan drive, tape deck, video disk drive, medical equipment, turntables.



INDUCTION MOTORS

Shaded pole, capacitor-run, with and without gearhead, 50 HZ and 60 HZ, 115 VAC, 60, 70, 80, 90, and 120 mm dia., starting torque 300 to 2000 g-cm gearheads for all sizes. **Applications:** Copy machines, fan and blower drive, space heater, water pump, typewriter.

FREE MOTOR CATALOG...



SKC SHINANO KENSHI CORP.

7525 Ethel Avenue, Suite I
North Hollywood, CA 91605

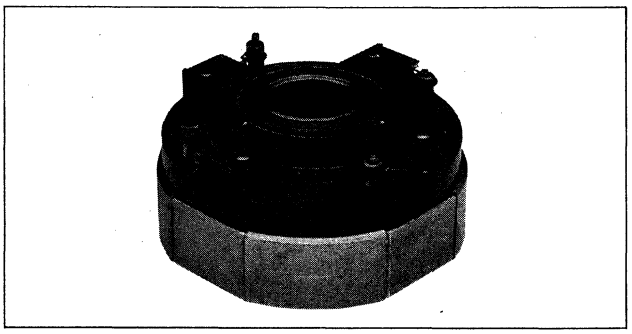
Tel: (818) 764-4266
FAX (818) 764-6845

For immediate delivery of standard steppers—CALL STOCKING DISTRIBUTOR • DIGILOG DEVICES INC. (DDI) (818) 764-9777

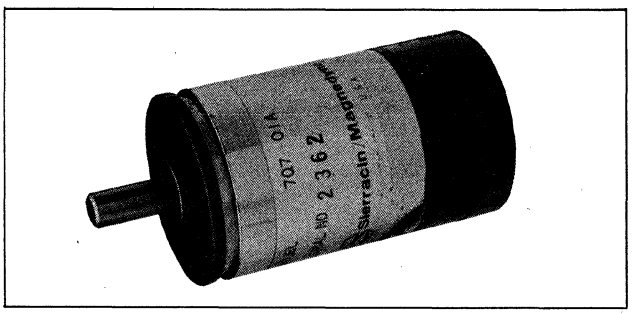
Sierracin/Magnedyne

Dept. EM, 2258 Rutherford Road, Carlsbad, Calif. 92008 • (619) 438-3321

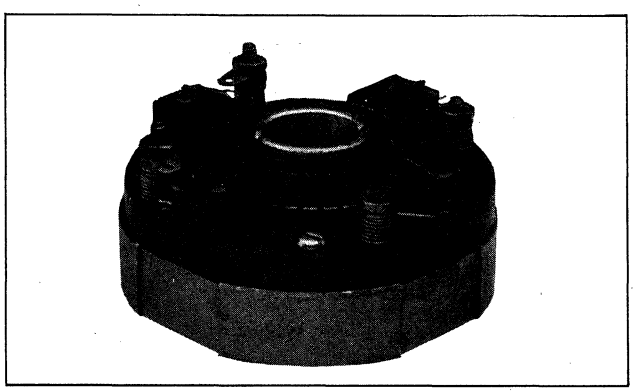
D.C. TACHOMETER GENERATORS



SERIES 402



SERIES 707-01



SERIES 435

The D.C. tachometer generator is a servo control device which converts mechanical rotation into an electrical signal. Attached directly to the driving shaft, eliminating the need for gearing, the tachometer functions as a rate reference in rate servo systems and for velocity damping in position servo systems. The high voltage gradient available from these tachometers significantly reduces signal to noise and drift problems and allows higher gain systems providing more precise servo control. The extremely low ripple and high linearity of Sierracin/Magnedyne tachometers have made them the standard of the industry for machine tool control. Frameless units, requiring very little space, offer great flexibility and adaptability in application. Housed models, as well as housed D.C. torque motor/tachometer combinations coupled on a common shaft are also available.

The illustrated frameless models are representative industrial/commercial tachometers. They are supplied with cartridge type brushes for long life and with air stabilized permanent magnet fields which minimizes assembly and disassembly problems.

The center illustration, 707-01, is a separate moving coil tachometer designed for use in applications requiring high quality velocity feedback with minimum system inertia load. Available in 3 volts/1,000 rpm output, inertia is $9X16^{-5}$ oz-in/sec^2 and ripple is 1.5% max (peak to peak). Normally available for delivery from stock.

Larger sizes, up to 12.5" O.D., with reduced ripple are available for precision applications. Special encapsulated designs to full MIL-SPEC requirements are available in equivalent O.D.'s but with reduced axial length resulting in lighter weight units for aerospace applications.

The basic simplicity of our designs and our production experience have put Sierracin/Magnedyne tachometers in major defense programs, in addition to the many industrial and process control applications.

Rapid prototype deliveries on illustrated models.

TACHOMETERS (FRAMELESS)

MODEL	Kg. (volts/ rad./sec.)	Ripple % Avg. to Pk.	Max. Output Volts	O.D. (in.)	I.D. (in.)	Width (in.)	Weight (lb.)	Inertia (oz.-in.-sec^2)	% Linearity
402-49	0.3	2.0	90	3.070	.625	1.750	1.44	.011	1.0
*435-07	0.1	1.0	36.6	2.000	.5005	1.000	0.44	.0012	1.0
*435-75	0.2	1.0	36.6	2.000	.5005	1.300	0.50	.0017	1.0
256-04	4.0	1.0	210	4.950	1.375	2.000	5	.18	<1.0
224-100	23.4	0.1	200	9.375	5.000	2.937	15	4.2	<0.2
453-01	9.5	0.1	210	7.900	3.500	2.800	12	0.56	<1.0
461-05	38	0.5	380	12.500	10.000	1.966	11.25	6.5	1.0
443-05	0.5	5.0	75	1.937	.6247	.625	0.34	.0011	1.0

*Available in premimum versions with coin silver commutators.

Sierracin/Magnedyne

Dept. EM, 2258 Rutherford Road, Carlsbad, Calif. 92008 • (619) 438-3321

D.C. TORQUE MOTORS

For accurate high torque positioning and speed control.

D.C. BRUSHLESS MOTORS

For unsurpassed reliability, acceleration, and power output capability.

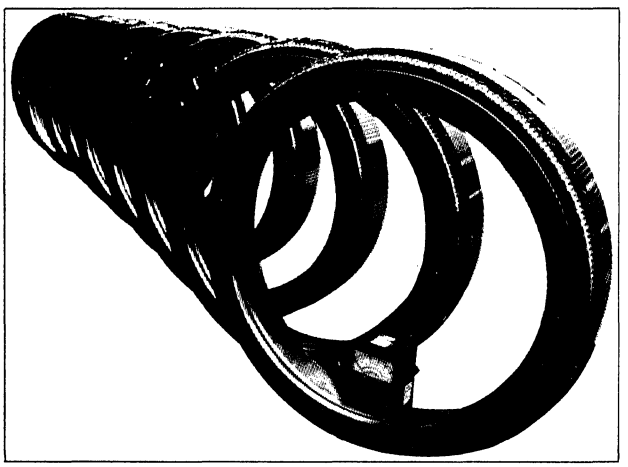
YOUR MOST COMPREHENSIVE AND RELIABLE SOURCE.

Sizes: .750 O.D. to 58″ O.D.

Ratings: 15 oz-in to 6,000 lb-ft Torque

BRUSHLESS MOTOR CONTROLS

Electronic communication and full closed loop speed controls.



SIERRACIN/MAGNEDYNE's standard line of Alnico permanent magnet brush-type D.C. torquers offers over 100 proven designs in an unusually large range of sizes and ratings. High energy, permanent magnets in a unique field structure and an efficient multi-pole armature produce high torque to power and torque to weight ratios.

SEND FOR OUR NEW MOTOR SELECTION CHART TODAY

Sierracin/Magnedyne has always used state-of-the-art technology to meet more demanding performance requirements. Samarium Cobalt magnets, with an energy product over three times that of Alnico, further advances the technical superiority of D.C. torquers and D.C. brushless motors. Overcurrent conditions will not demagnetize SmCo magnets and these motors do not require keepers, simplifying installation procedures. Further advantages are higher torque to power ratios and higher peak torque for equivalent size and weight.

Representative models of Samarium Cobalt torque motors and D.C. brushless motors are listed below.

We can assist with your specific design problems and goals. Our computerized design programs enable rapid response and optimization of your desired parameters. CALL US TODAY (619) 438-3321.

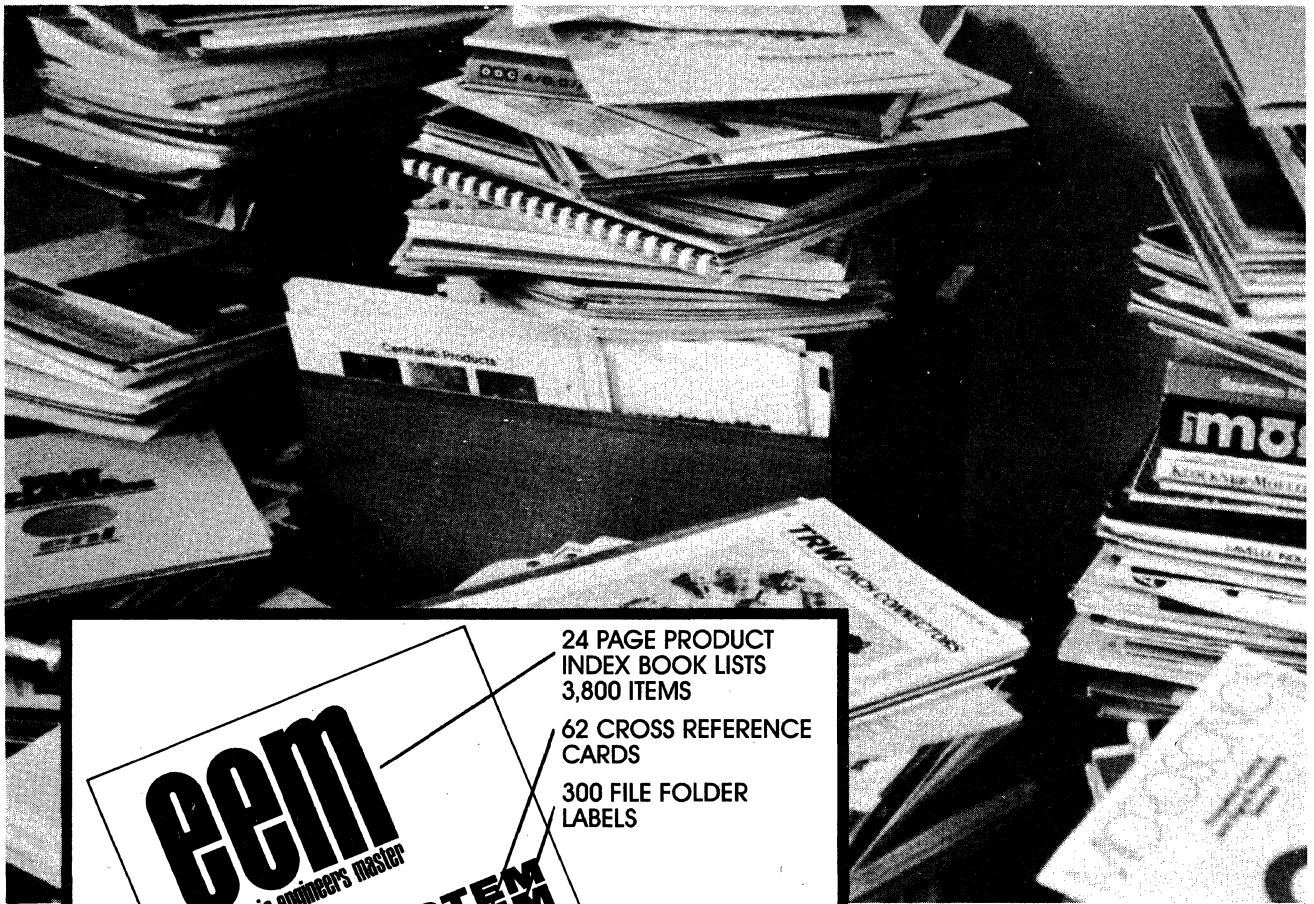
SAMARIUM COBALT TORQUERS

Model	Peak Torque	Power (Watts)	No Load Speed (rad./sec.)	O.D. (in.)	I.D. (in.)	Width (in.)	Weight	Inertia
482-05	30 oz.-in.	53	250	2.780	1.300	.450	3.85 oz.	.006 oz.-in./sec.^{2}
464-01	10.5 lb.-ft.	330	22.4	6.5	3.250	3.780	9.0 lb.	.0056 lb.-ft./sec.^{2}
471-05	30 lb.-ft.	870	20.3	10.000	6.9	2.500	20.3 lb.	.009
490-05	40 lb.-ft.	400	6.9	9.750	5.500	2.425	20.0 lb.	.038
223-17	100 lb.-ft.	2248	15.7	10.625	4.250	6.70	48.0 lb.	.045
476-05	150 lb.-ft.	2082	9.68	13.15	8.850	3.211	29.5 lb.	0.102
232-15	225 lb.-ft.	1600	5.0	26.625	10.350	6.540	200.0 lb.	1.3
232-16	600 lb.-ft.	4200	4.9	20.500	6.562	6.29	130.0 lb.	1.0
491-05	750 lb.-ft.	1254	1.17	29.50	22.000	5.550	200.0 lb.	4.48
244-15	1850 lb.-ft.	8130	3.0	41.000	28.250	6.575	300.0 lb.	9.0

D.C. BRUSHLESS MOTORS (FRAMELESS)

Model	Torque oz.-in.	Power Watts	Phases	O.D.	I.D.	Width
544-01	15	80	2	1.05	.187	.75
561-01	15	74	3	1.05	.156	.9
551-05	20	80	3	1.6	.25	.6
566-05	25	90	3	1.05	.156	1.05
558-05	30	90	3	1.6	.36	.6
563-05	75	144	3	1.8	.9	.8
538-02	100	136	3	2.99	.625	1.1
539-02	120	95	3	2.99	.375	.775
559-01	300	75	3	3.35	1.83	1.3
548-01	300	518	3	1.72	.465	2.75
*564-05	400	220	3	3.5	½″ Shaft	2.74
552-01	800	146	2	5.125	2.99	1.46
549-01	3456	170	3	12.7	7.0	4.5

*Housed motor complete with Hall effect sensors. Other housed versions available, contact the factory.



ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

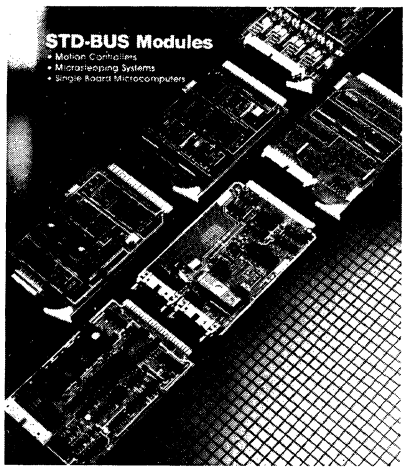
Stock Drive Products DIVISION OF DESIGNATRONICS

2101 JERICHO TURNPIKE, NEW HYDE PARK, NY 11040 • TWX: 510-223-0642
PHONE: (516) 328-3300/328-0200 • FAX: 516-326-8827

Stock Drive Products—founded by engineers provides unique application assistance in the form of detailed handbooks and catalogs. In keeping with SDP traditions, this material provides very complete details on SDP products to help design engineers choose the products most applicable to their needs. It is an accepted industry fact that SDP product quality is of the highest order as is SDP engineering assistance. Wherever possible, SDP encourages the use of standard products detailed in the catalogs. However, expert advice is available for your special or custom requirements by calling 516/328-0200. Ask for Application Engineering.

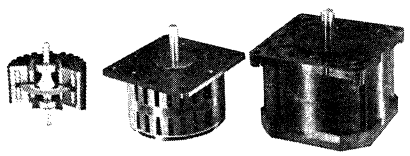
Send for your free copy of the extensive catalog of over 1,000 standard motion control products including DC and AC motors (both direct and reduction drive), steppers, tachometers, gearheads and fans and off-the-shelf STD-BUS cards and motion control modules. Call 516/328-0200 or 328-3300.

STD-BUS MOTION CONTROL MODULES



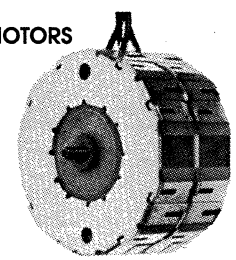
Control motor position, velocity or torque via RS-232, STD-BUS or local switch. Digital filtering. Ideal for robotics/automation. Commands in ASCII. Stepper control, linear or circular interpolation. Microstep to 12,800 steps/rev. 8031 microprocessors. Microstep DAC controls 4 dc motors. A complete family of control modules, cards and boards available off-the-shelf. Catalog TI-822.

THIN DISC PM STEPPER MOTORS



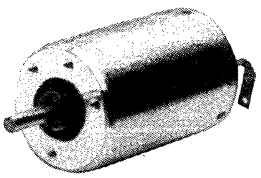
New technology stepper motors with samarium/cobalt permanent disc rotors. Up to 100KW/S power rate in 30, 50 & 70 mm diam. and step angles of 1.8° & 3.6° with peak holding torque up to 90 oz. in. Superior power rate to weight ratio. Weigh 50% less than comparable motors.

"TIN-CAN" PM STEPPER MOTORS



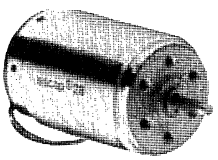
Permanent magnet motors for two and four phase operation. Step angles 7.5° & 15°. Holding torque from 1.0 up to 7.7 Ncm. Operate at 6, 12 or 24 Vdc and from −15°C to +55°C. Mount in any fixed position by means of expandable snap-on clip or screw clip. Available with a wide range of gearheads.

IRONLESS ROTOR DC MOTORS



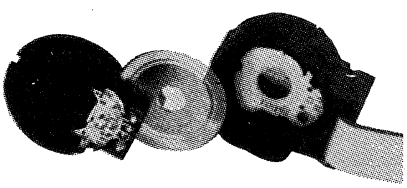
Permanent magnet ironless rotors provide up to 90% efficiency and high power/volume ratios. Many standard models from 16 to 36 mm diam. for 1.2 to 36 Vdc and up to 25.5 oz. in.

DC TACHOMETERS & MOTORS/TACHOMETERS



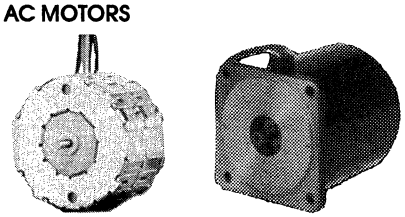
Ironless rotor construction ensures maximum reliability and performance. EMF constant 0.84 to 13.5 V/1000 rpm. Typ. ripple (pk-pk): 6–10%. Linearity & reversion error ±0.1%. Motor/tachs available with speed reducers.

OPTICAL ENCODERS



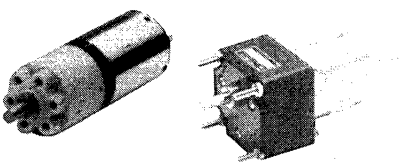
Available in two standard sizes: 28 mm O.D. with 100–512 cycles/rev.; 56 mm O.D. with 192–1024 cycles/rev. Digital output compatible with LSTTL logic, two and three channels. Also available with integral motor.

AC MOTORS



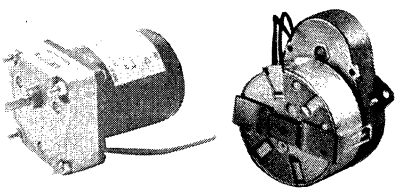
Available as synchronous reversing or unidirectional types. Also hysteresis or induction types. A wide variety of standard sizes and torques up to 1600 Ncm are available. For either 50 or 60 Hz operation and with UL, VDE and CSA approval.

DC GEARMOTORS



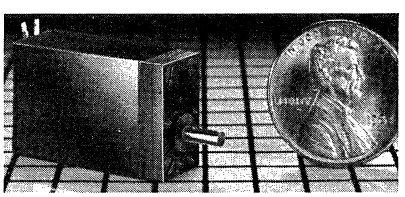
Supplied in either of two basic styles either with integral ironless rotor dc motors and gearheads or as assembled motors and gearbox components. A very wide range of torque and gear ratios.

AC GEARMOTORS



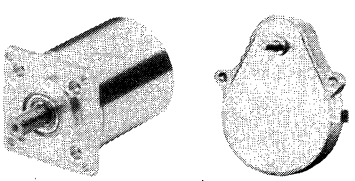
Available in wide range of reduction ratios to fit all standard AC motors and with precision gears and permanently lubricated bearings to ensure quiet long life. With or without one or two way slipping clutches.

MINIATURE DC GEARMOTORS



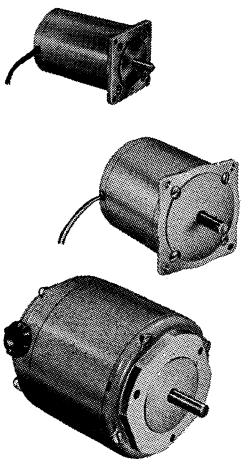
Tiny precision ironless rotor dc motors with an integral gearbox with a choice of reduction of 3.67 to 2430; 1 of the 7200 rpm 2 or 4 Vdc motors. Motor torque is 0.072 oz. in. @ 2V (0.068 @ 4V). Max. size is 9 mm wide × 15 mm high × 21.8 to 34.7 long. Wt.: 10 to 13 grams.

GEARHEADS/SPEED REDUCERS



Precision construction in a variety of styles and ratios to fit most standard ac or dc motors. Ratios range from as little as 4.0625:1 up to 360,000:1. A wide range of output torques are available. See catalog SDP-823.

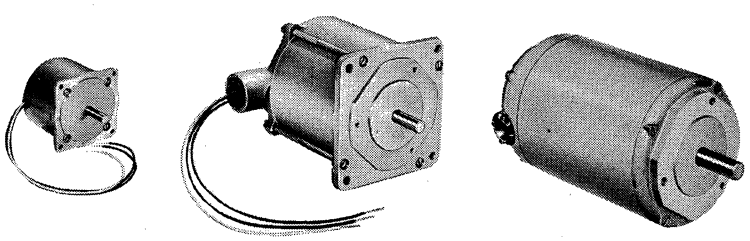
SLO-SYN® *Synchronous / Stepping Motors*



M SERIES SLO-SYN STEPPING MOTORS – Permanent magnet stepping motors that provide high torque-per-pound and torque-to-inertia ratios and can be driven at rates above 20,000 steps per second with low power input. Standard drives available for rates to 10,000 steps per second with higher rates available on special order. Motors have Class B insulation and can be operated at ambient temperature range of -40°C to +65°C. Continuous duty temperature rise is 65°C. Standard M Series SLO-SYN motors are offered in step angles of 0.72°, 1.8°, 2.5°, 5° and 15° with choice of either ±5% or precision ±3% accuracies noncumulative. The step angles can be electronically halved using appropriate half step drives. Holding torque ratings from 53 to 3000 oz-in are available. The motors have no brushes, ratchets or gears and use shielded ball bearings to insure reliability and long life.

DAMPED MOTORS – Standard viscous damped motors and special order motors having integrally mounted Lanchester dampers are available.

SPECIAL DUTY TYPES – For special duty applications, inquire for available double-end shaft, high temperature, vacuum, radiation resistant, militarized, 8-lead/terminal, and encoder stepping motors.



SLO-SYN SYNCHRONOUS MOTORS – Permanent magnet a-c motors having extremely rapid starting, stopping and reversing characteristics and a slow basic shaft speed of 72 rpm synchronous with a line frequency of 60 hertz. These types need only a single-pole, three-position switch for complete forward, reverse and "off" control. No excessive inrush current when energized because starting and operating current are nearly identical. Can be completely stalled without overheating and with no harmful effects on components. Start or stop in less than 5° of shaft rotation; no need for mechanical or electrical braking. When used with an auxiliary high speed motor, the SLO-SYN motor can remain coupled to the load and safely overdriven. Phase shifting resistor and capacitor must be used when operating from a single-phase source but not from two-phase. All standard motors are rated for continuous duty at maximum ambient temperature of 65°C. All models have Class B insulation.

REPRESENTATIVE AC MOTORS

TYPE	MAXIMUM AMPERES	TORQUE (Oz-in)	MAXIMUM MOMENT OF INERTIA OF A RIGIDLY ATTACHED LOAD (Lb-in²)
120 Volts, 50/60 hertz, 1 Phase, 28.8 RPM at 60 hertz			
LS50	0.2	40	0.5
120 Volts, 50/60 hertz, 1 Phase, 200 RPM at 60 hertz			
• TS25	0.2	25	0.12
• TS50	0.3	50	0.25
120 Volts, 50/60 hertz, 1 Phase, 72 RPM at 60 hertz			
• SS25	0.1	25	0.15
• SS50	0.3	50	0.5
• SS150	0.4	150	1.5
SS150M†	0.4	150	1.5
• SS250	0.6	250	3
• X250‡	0.6	250	3
• SS400	0.6	400	4.5
X1000‡	3.0	1000	9
X1500	3.0	1500	12
240 Volts, 50/60 hertz, 1 Phase, 200 RPM at 60 hertz			
TS52	0.2	50	0.25
240 Volts, 50/60 hertz, 1 Phase, 72 RPM at 60 hertz			
SS52	0.2	50	0.5
SS152	0.2	150	1.5
SS252	0.4	250	3
X252‡	0.4	250	3
SS402	0.4	400	4.5
X1002‡	1.5	1000	9

† Militarized.

‡ Explosion-proof.

• Available off-the-shelf from distributor stock

THE SUPERIOR ELECTRIC COMPANY

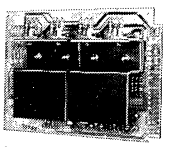
1000 Middle Street / Bristol, Connecticut 06010 / Telephone: (203) 582-9561

SLO-SYN® Stepping Motor Controls

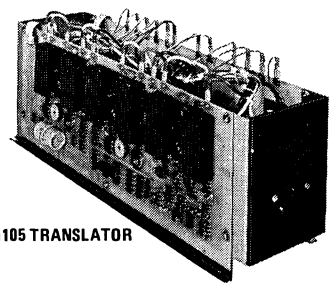
SLO-SYN Stepping Motor Controls meet the need for controls that are easily interfaced with minicomputers and microprocessors and allow system design flexibility.

NEW MODULYNX™ MOTION CONTROLS — *Offer a modular, building block approach to step motor control system design. Each system function is on a separate circuit card to permit selection of only the cards necessary to provide features required. Some available cards include a 200 W driver, 1/10 and 1/16 microstep, digital indexer, and an IEEE 488 interface. Inquire about complete offering.*

SLO-SYN® TRANSLATORS — Convert pulses from a minicomputer, microprocessor or other pulse source into the switching sequence needed for bidirectional control of SLO-SYN Stepping Motors. Stepping rate, direction and number of steps taken are controlled by external logic. The translator will drive the motor one step for each pulse received from the external source. **Translator Modules** are printed circuit boards which contain the sequencing and switching logic for stepping motor control and are used where the control must be installed on a circuit card rack in the users equipment. The STM101 Translator Module will drive a SLO-SYN motor at rates to 1000 full steps per second and the STM103 provides rates to 3000 full steps or 6000 half steps per second. Both types require a separate power supply. The SLO-SYN Power Supplies listed on this page are recommended. **Open-Chassis Translator** type TB105 includes the power supply as well as sequencing and switching logic and will drive a SLO-SYN motor at rates to 5000 full steps or 10,000 half steps per second. **Packaged Translator** types ST101, ST103 and ST105 contain all needed power supply, sequencing and switching circuits and are mounted in attractive, sturdy cabinets. Maximum speed is 1000 full steps per second for the ST101, 3000 full steps or 6000 half steps per second for the ST103, and 5000 full steps or 10,000 half steps per second for the ST105. **High Power Translators** types TC600 and TM600 provide rates to 10,000 full steps or 20,000 half steps per second. The TC600 consists of three printed circuit boards and requires an external power supply. The TM600 is an open chassis unit with an integral power supply.

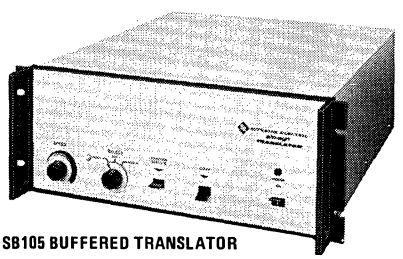


STM101 TRANSLATOR MODULE



TBM105 TRANSLATOR

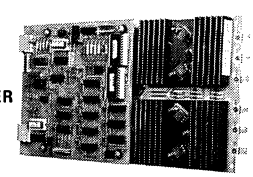
SLO-SYN® BUFFERED TRANSLATORS — Accept pulses from a fixed high rate or a random rate pulse source and automatically ramp the pulse rate to accelerate and decelerate the motor. A buffered translator will drive a motor one step for each pulse received from the external source. **Type BUF105** is an open chassis model which will operate a SLO-SYN Stepping Motor at rates to 5000 full steps or 10,000 half steps per second. **The SB105** is similar, but is installed in a cabinet designed for bench, shelf or 19-inch (483mm) rack.



SB105 BUFFERED TRANSLATOR

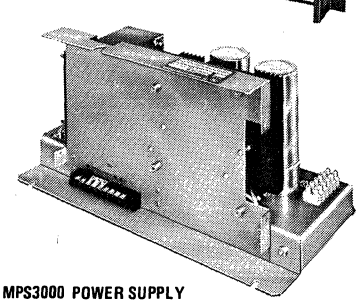
SLO-SYN® PRESET INDEXERS — Provide control of step rate, direction and distance without external logic. They incorporate oscillators and counting circuits to provide the pulses and keep track of the number of pulses given to the motor. **SLO-SYN Preset Indexer Modules** are printed circuit boards containing the needed logic but not including the power supply. These units are used where the control is to be mounted in a circuit card rack in the users equipment. A SLO-SYN Power Supply is recommended, but other supplies which meet the power specifications of the specific Preset Indexer Module can be used. The PIM151 Preset Indexer Module provides stepping rates to 1000 full steps per second and the PIM153 offers stepping rates to 3000 full steps or 6000 half steps per second. Both types are directed by external switches. The PIM153 also permits count selection using voltage levels. **Open-Chassis Type TBM155** will drive a SLO-SYN Motor at rates to 5000 full steps or 10,000 half steps per second. Index count and other control functions can be generated using external switches or voltage levels. Acceleration and deceleration can be adjusted to match the characteristics of the motor and load. **Packaged Types ST151, SP153A, and SP155A** are mounted in attractive cabinets which allow mounting on a bench or shelf or in a 19-inch (483mm) rack. All three can be directed from switches on their front panels. The SP153A and SP155A can also be controlled from external switches or voltage levels. Speed capabilities range up to 5000 full steps or 10,000 half steps per second. **A Switch Kit** is available which provides the BCD logic switch and other switches needed for controlling modular and open-chassis preset indexers. Can also provide external control of packaged models.

PIM153 PRESET INDEXER MODULE



SP153A PRESET INDEXER

SLO-SYN® POWER SUPPLIES — Open-chassis, base-mounting power supplies for use with SLO-SYN Translator Modules and Preset Indexer Modules. The module can be installed remote from the power supply or can be mounted on the power supply chassis to form a single unit. Models are available for operation from 120 VAC or from 220/240 VAC power.

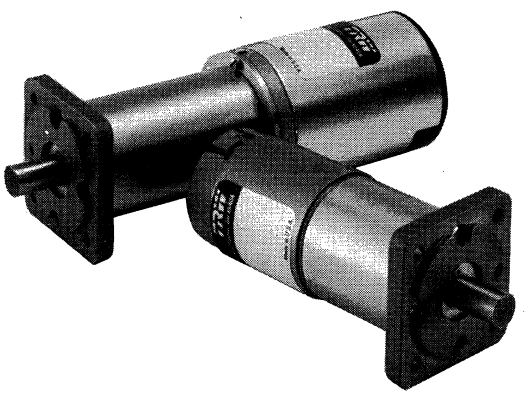


MPS3000 POWER SUPPLY

MOTORS FOR INDUSTRIAL APPLICATIONS.

Motor Division
TRW Electronic Components Group

For industrial applications including computer peripherals, machine tools, instrumentation, robotics, office equipment and medical equipment.

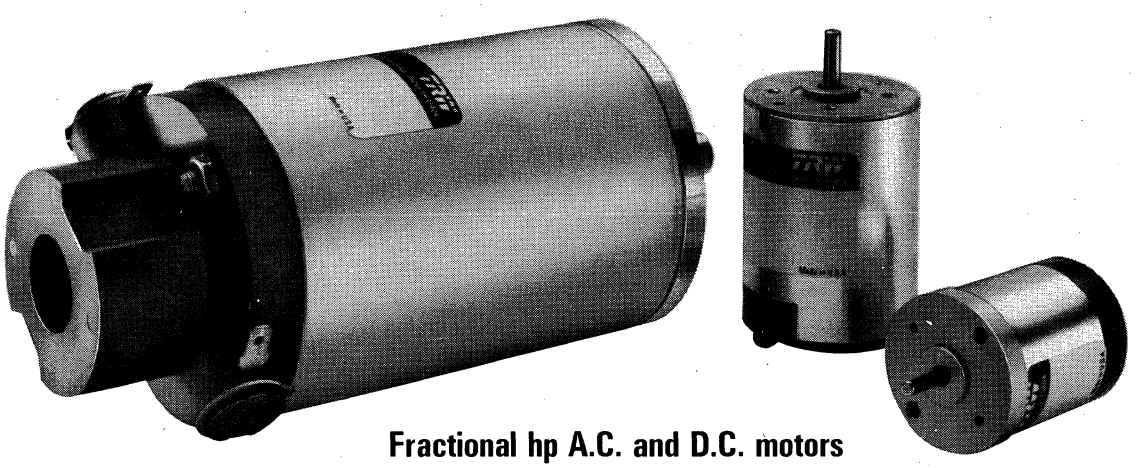


Fractional hp A.C. and D.C. gearmotors

Standard gear ratios: from 4:1 to 46,656:1
Continuous torque: from .75 oz. in. to 1,250 oz. in.

IM-13 Spur gearmotors

Standard gear reduction: from 3.97:1 to 1,276.09:1
Continuous torque: from 3.0 oz. in. to 60.0 oz. in.



Fractional hp A.C. and D.C. motors

Continuous torque: from .25 oz. in. to 43.0 oz. in.
Diameter: from 1.3" to 2.6"
V.D.C.: 4, 6, 12, 24, 50, 115

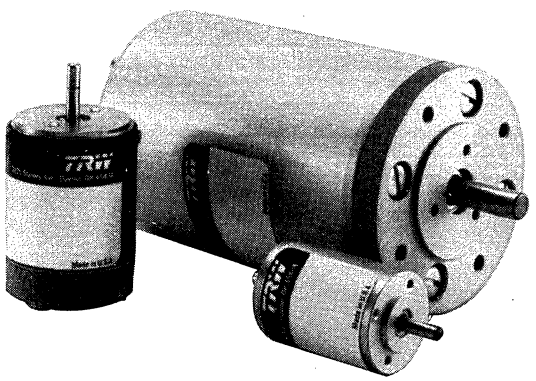
Miniature fans and blowers

A.C. and D.C. open fans, tubeaxial and vaneaxial blowers. 6 CFM to 200 CFM. Custom capability available.

MOTORS FOR MILITARY APPLICATIONS.

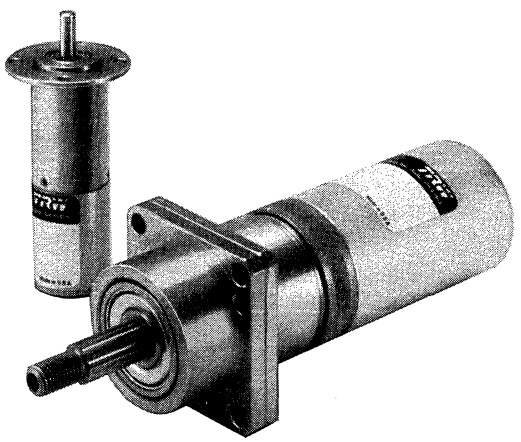
Motor Division
TRW Electronic Components Group

For military applications including missile guidance and control systems, missile fin actuation, aircraft instruments-control systems, aircraft actuation systems, land track vehicles-in-line fuel pumps — transfer pumps — bilge pumps, cabin ventilation.



Fractional hp D.C. pm motors

Continuous torque: from 0.20 oz. in. to 16.0 oz. in.
Diameter: from .75" to 2.25"
V.D.C.: 6, 12, 27, 50, 115

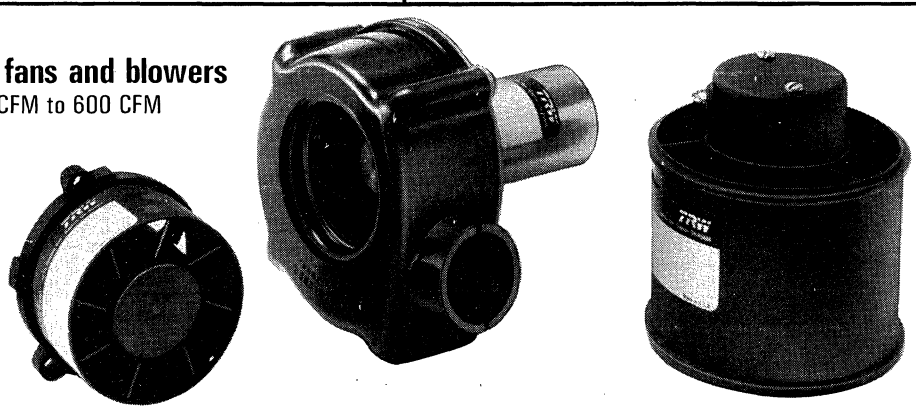


Fractional hp D.C. pm gearmotors

Standard gear ratios: from 3.82:1 to 36,873:1
Continuous torque: from 1.0 oz. in. to 550 lb. in.

Miniature fans and blowers

CFM: from 6 CFM to 600 CFM



Custom capabilities and options
Customized devices include actuators (linear and rotary), pumps with leakproof magnetic couplings, torquers, blowers.

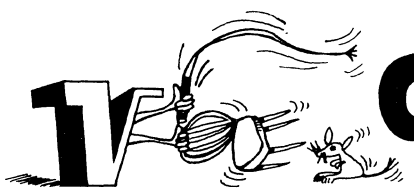
Options:
• EMI filters • Brakes • Special mounting • Tachometers
• Special couplings • Special gear ratios

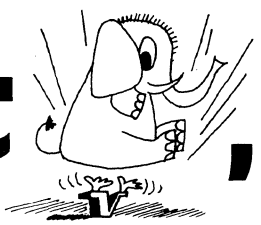
Modification Centers
We have seven distribution modification/assembly centers that can make thousands of variations from our basic motor modules. With 48 hour delivery from distributor on standard units.

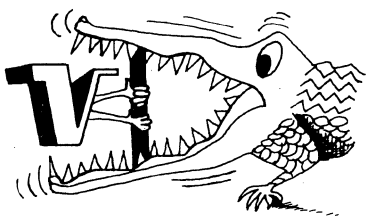
For more information on industrial or military motors contact your local TRW distributor or Motor Division, 2275 Stanley Ave., Dayton, OH 45404. 513.228.3171

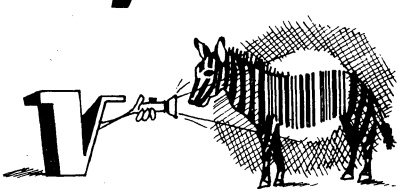
© TRW Inc. 1985 M-85-1 Distributed by Arrow · Hall-Mark · Hamilton/Avnet · Jaco · Pioneer

If you want to move it, control it, sense it, stop it, or scan it, call Vernitech.



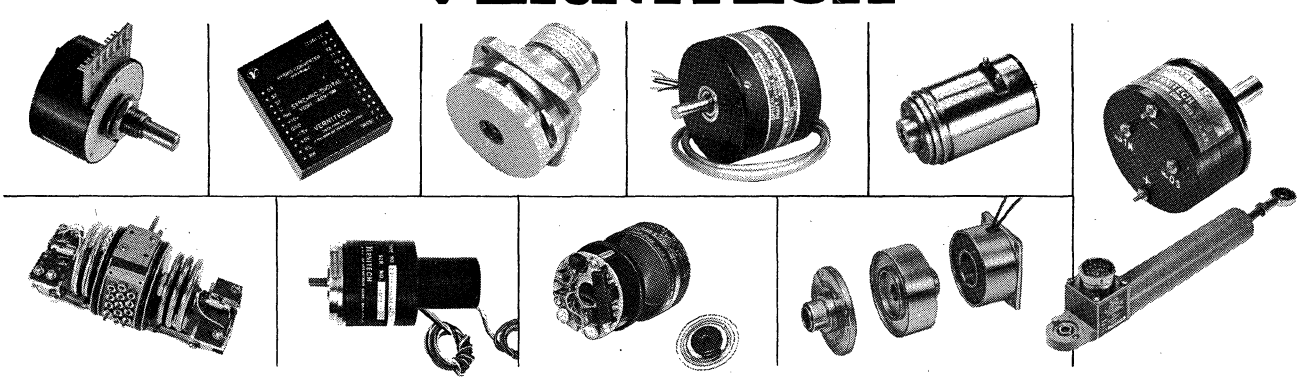






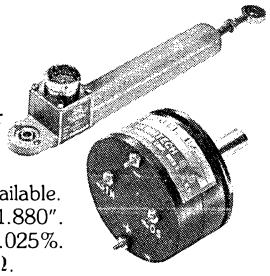
That is, if you're looking for instrument motors, optical and contacting shaft angle encoders, rotary and linear potentiometers, potentiometric pressure transducers, industrial precision brakes or clutches, or laser scanning motors, we'll probably have just what you're looking for. Just look on the opposite page. And if you *don't* find what you want, call Vernitech, give us the particulars, and we'll make it for you.

VERNITECH



VERNITECH, a division of Vernitron Corp., 300 Marcus Blvd., Deer Park, NY 11729 • 516-586-5100 • TWX 510-227-6089

POTENTIOMETERS



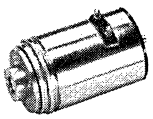
employing Vernitech's unique conductive film and precious metal wipers...respond to wiper motions as small as .000005".

Rotary Single Turn
Linear, non-linear, sine/cosine available.
Sizes 0.5", L 0.5" to Dia 5.0", L 1.880".
Linearity or conformity ±2% to 0.025%.
Resistance range 1KΩ to −250KΩ.

Rotary Multi-Turn
10 to 100 turns available.
Sizes Dia 0.5", L 1.5" to Dia 2.0", L 2.625".
Linearity or conformity ±0.5% to 0.015%.
Resistance range 1KΩ to 500KΩ.

Linear Motion
Electrical stroke lengths 1" to 60".
Linearity or conformity ±0.2% to 0.01%.
Resistance range 250Ω/in to 250KΩ/in.

CLUTCHES AND BRAKES
(electromagnetic)



hundreds of models and sizes available from stock.

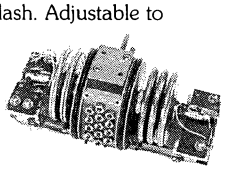
Precision Instrument Type
Sizes 5, 8, 11, 13, 15, and 18.
Standard length and wafer types. Spring and magnetic.
Meet MIL-E-5272C. Zero backlash.
Torque 5 to 150 oz. in. Response time 5 to 142 ms.

Industrial Types — open frame
Sizes 8, 12, 17, 22, 26. Torque to 75 in. lb.
Response time 6-30 ms at rated voltage.

Industrial Types — enclosed frame
Hybrid or special units designed for particular applications when MIL-SPECS and close tolerances are not essential, but where having a complete "self-contained" unit is desirable: cassette tape decks, analog devices actuators, etc.

Fail Safe
Braking action occurs 10 ms after coil is de-energized or power fails. Sizes 8, 17, 30, and 45.
Torque up to 50 in. lb. Zero backlash. Adjustable to compensate for wear.

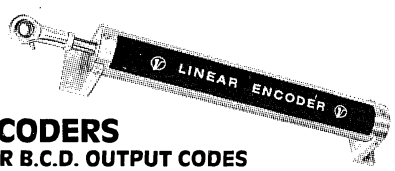
PRESSURE TRANSDUCERS
potentiometer type,



featuring infinite resolution, long life, and high reliability through the use of conductive film resistance elements, multiple wipers, and direct coupling of pressure sensing element to potentiometer wipers.

Pressure ranges from 0.1 to 10,000 psi in gage, absolute and differential types.

Linearity to ±0.3%. Air speed, altitude and low cost types available.



LINEAR ENCODERS
BINARY, GRAY OR B.C.D. OUTPUT CODES
1", 2", 4", 8", 12", 24", 36" and 48" STROKE LENGTHS
RESOLUTIONS TO 12 BITS.

VERNITECH

MOTORS

Over 1500 Standard Designs or Custom Designed to your requirements.

Synchronous — for laser scanning
Sizes 5, 8, 11, 15, 18, 20, 25, 35.
Speeds 100 to 48,000 rpm.
5 through 1600 Hz. 2, 4, 8, 12 poles.

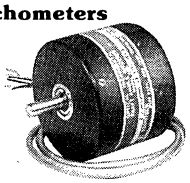
Servo
Viscous damped — sizes 8, 10, 11, 15, 18.
Speeds 3000 to 10,000 rpm.
Inertially damped — sizes 8, 11, 15, 18.
Speeds 3000 to 9500 rpm.

Stepper
Sizes 5, 8, 11, 15. Stepping angles 7.5°, 15°, 45°, 90°.
Stepping rates 100, 110, 125, 130, 175, 180, 225, 240, 260, 400, 725, 800, 1000 pps.

Precision Motor Generators Sizes 8, 10, 11, 15, 18, 23.

Integrating and Computer Motor Tachometers
Sizes 8, 10, 11, 15, 18, 23.

SHAFT ANGLE ENCODERS



featuring precision chrome on glass discs for highest accuracy.

Optical Incremental
VOE 005 — Dia. 0.500", 0.510" L. To 256 pulses (modular)
VOE 05 — Dia. 0.500", 0.820" L. To 256 pulses
VOE 11 — Dia. 1.062", L. 1.80". To 1024 pulses
VOE 015 — Dia. 1.510", L. 0.88". To 1024 pulses (modular)
VOE M15 "Dial Coder" — panel mounted, 1.500" dia., L. 1.08" 127-256 pulses
VOE 023 — Dia. 2.25", L. 80". To 1250 pulses (modular)
VOE 23 — Dia. 2.250", L. 1.875". To 1250 pulses (available sealed)
VOE L23 "Thrift-Line" Dia. 2.250" L. 1.875". To 600 pulses
VOE 25 — Dia. 2.500", L. 2.500". To 3000 pulses (available sealed)

Optical Absolute
VOE 23: Binary, Gray or BCD to 512 counts per turn. Counting speed: 3000 rpm.
VOE 30: Single or multi-turn; Binary, Gray or BCD. To 1024 counts per turn. Max count (2^{19}) in 512 turns. Counting Speed: 30KHz.

Contacting Absolute
Sizes 11, 18, 23, & 31. Binary, Gray, and BCD. Single or multi-turn. Max count (2^{19}) in 2048 turns. 64 to 1024 counts per turn. Operating speed 200 rpm max.

SYNCHRO CONVERTER MODULES

Tracking Synchro-to-Digital and Resolver-to-Digital Converters
Economy Series VSD/VRD. Precision Series VSDH/VRDH Compact, solid state, high performance converters employing type 11 servo loops for lag free tracking at rates to 3600°/sec. Resolution 10 bits, 12 bits, or 14 bits.

Digital-to-Synchro and Digital-to-Resolver Converters Series VDS/VDR:Accept shaft angle data in digital form for conversion to analog at accuracies up to ±4'.

Tracking Synchro-to-Linear DC Converter Module
Series VSDCH/VRDCH:Accept 3-wire synchro or 4-wire resolver input data, convert it to DC analog voltage proportional to synchro angle of input. Accuracy ±6' (typ.).

Tracking Angle Position Indicator
VNST-104: Tracking Synchro-to-Digital Converter, can also be used as a control element. Four decade 0.8" red LED display. Display accuracy ±6' arc (typical). Tracking rate 3600°/sec max. Parallel binary or BDC output. Self contained line operated power supply.

Custom designs available to your specifications.

VERNITECH, a division of Vernitron Corp., 300 Marcus Blvd., Deer Park, NY 11729 • 516-586-5100 • TWX 510-227-6089

EEM PRODUCT SELECTION GUIDES

Use the EEM Product Selection Guides. There are 34 Guides in this edition of EEM. See page 2 (A•2, B•2, C•2, D•2) of each volume to locate the Product Selection Guides that pertain to your needs.

VERNITRON CONTROL COMPONENTS
a Division of Vernitron Corporation

1601 Precision Park Lane ▪ San Diego, California 92073 ▪ (619) 428-5581 TWX: 910-322-1862

vernitorq™ BRUSHLESS DC TORQUE MOTORS

VERNITORQ™ BRUSHLESS DC TORQUE MOTORS

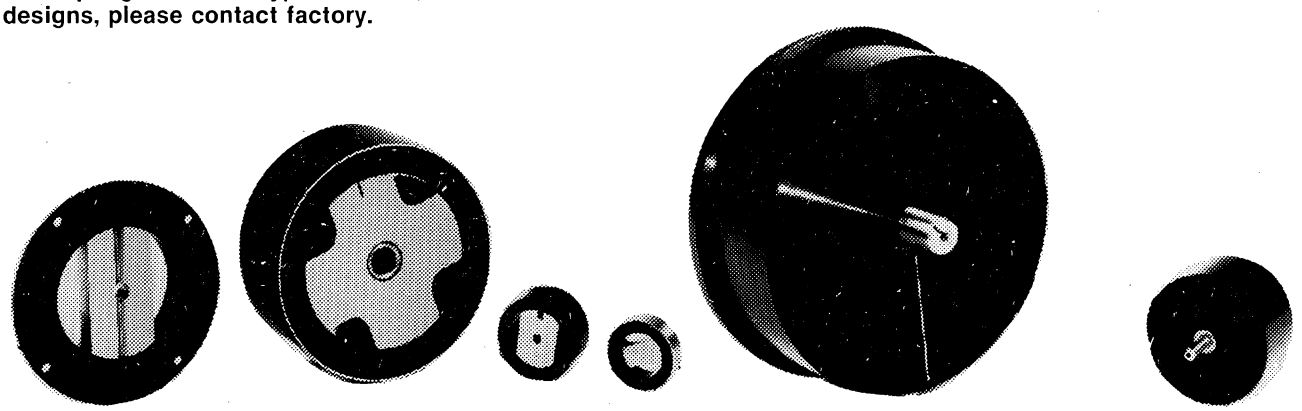
Brushless, direct drive, limited rotation motors available in two and four pole configurations, frameless or housed, for precise positioning, actuation and infinite control. Available with Alnico or air stabilized samarium cobalt magnets for ease of handling and assembly. All units are toroidally wound and encapsulated in a high temperature medium through a precision transfer molding process.

Vernitorq motors feature:
- Quick response
- Wide angular excursion
- Hi torque, lo input power
- Infinite resolution
- No slot effect

In addition to the above features, Vernitorq motors are friction free, explosion-proof, and offer no electrical or mechanical noise. They are ideally suited for such typical applications as:
- Mirror positioning in infra-red/thermal imaging systems
- Tension control on hi speed printers
- Missile safe/arm actuation systems
- Disc drive head positioners
- Open/close valve actuators
- Medical scanning equipment
- Camera control mechanisms

Vernitorq motors are optimally designed to enhance system performance.

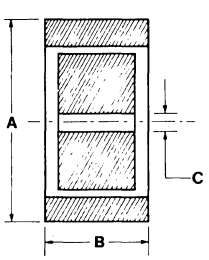
A sampling of all unit types follows; for additional designs, please contact factory.



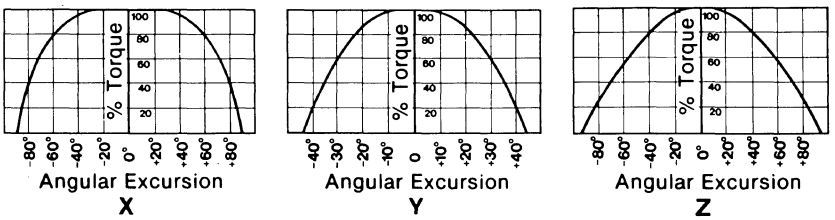
Brushless DC Tachometers

Vernitron Type Number	Output Sensitivity (V/rad/sec)	DC Resistance (Ohms)	Angular Excursion (Deg.)	Rotor Inertia (Oz-in-sec^2)	Dimensions (Inches) A	B	C	Weight (Oz)
VBTG15-A-1	0.028 cos θ	45	±65	0.08×10^{-3}	1.500	0.750	0.1875	3.7
VBTG17-A	0.39	980	±25	0.67×10^{-3}	1.634	0.700	0.250	4
VBTG18-A-1	0.25	945	±25	0.69×10^{-3}	1.719	0.710	0.187	4.5
VBTG23-A	0.4	340	±25	1.76×10^{-3}	2.270	0.720	0.250	8
①VBTG32-A	0.5	2500	±50	2.2×10^{-3}	3.125	0.500	0.250	6

① Flanged O.D.



TYPICAL PERFORMANCE CURVES



VERNITRON CONTROL COMPONENTS

a Division of Vernitron Corporation

1601 Precision Park Lane ▪ San Diego, California 92073 ▪ (619) 428·5581 TWX: 910·322·1862

vernitorq™ BRUSHLESS DC TORQUE MOTORS

Vernitron Type Number	Peak Torque (Oz-in)	Power @ Peak Torque (Watts)	Continuous Torque (Oz-in)	Power @ Continuous Torque (Watts)	Input @ Continuous Torque (Volts)	Torque Sensitivity (Oz-in/amp)	DC Resistance (Ohms)	Angular Excursion (Degrees)	Back EMF (Volt/rad/sec)	Elect Time Constant (mSec)
VBTM9-C	2.9	25	1.3	5.0	8.0	2.1	12.8	±45	0.015	—
VBTM10-A	1.3	16	0.5	2.4	12.0	2.5	60.0	±60	0.018	0.3
VBTM10-A-1	1.3	12	0.5	1.8	11.0	3.0	65.0	±60	0.021	0.3
VBTM10-B	6.0	175	1.5	11.0	44.0	6.0	175.0	±60	0.055	0.4
VBTM10-D	1.3	16	0.5	2.4	11.7	2.4	56.0	±60	0.017	0.3
VBTM10-E	1.3	17	0.3	0.9	4.7	1.6	25.0	±60	0.011	0.4
VBTM10-G	6.0	115	1.4	6.3	5.4	1.2	4.6	±35	0.008	0.26
VBTM10-K	1.8	9	1.2	4.0	5.3	1.6	7.0	±40	0.011	0.12
VBTM10-L ①	14.5	420	1.7	6.0	10.0	2.9	16.7	±40	0.020	0.13
VBTM10-M	1.8	9	1.2	3.7	6.7	2.14	11.9	±40	0.015	0.1
VBTM10-N	1.8	21	0.6	2.3	9.6	2.5	40.0	±20	0.018	0.3
VBTM10-R	1.8	20	0.6	2.1	11.8	3.3	65.0	±60	0.023	0.3
VBTM10-S	6.0	85	1.5	5.3	5.6	1.6	6.0	±60	0.011	0.2
VBTM12-B	4.5	37	0.9	1.5	3.7	2.25	9.2	±60	0.016	0.3
VBTM12-C ②	2.5	26	1.2	6.0	19.5	4.0	65.0	±60	0.028	0.1
VBTM15-A	5.0	28	2.8	9.0	23.6	7.5	62.0	±12	0.053	0.22
VBTM17-A	18.0	70	8.0	14.0	12.8	7.5	12.0	±25	0.053	0.2
VBTM17-B	6.7	69	2.8	12.0	24.6	5.7	50.0	±60	0.040	0.6
VBTM17-C	18.0	55	8.0	11.0	11.5	8.4	12.0	±25	0.059	0.16
VBTM18-A	12.0	68	4.0	7.5	15.0	8.0	30.0	±60	0.056	1.1
VBTM18-C	18.0	83	6.5	11.0	8.2	5.0	6.3	±25	0.035	0.6
VBTM18-D	20.0	131	7.0	16.0	13.3	5.8	11.0	±60	0.041	0.6
VBTM23-B	25.0	63	7.0	4.9	7.0	10.0	10.0	±30	0.071	1.2
VBTM23-D	25.0	73	5.0	2.9	6.8	11.7	16.0	±30	0.082	1.85
VBTM23-E	13.0	20	8.6	8.7	6.0	5.9	4.1	±45	0.042	1.54
VBTM23-E-1	13.5	19	8.1	6.8	9.0	10.8	12.0	±50	0.076	1.58
VBTM23-G	37.0	36	24.0	15.1	12.6	20.0	10.5	±13	0.141	1.0
VBTM33-A	80.0	210	26.0	22.3	23.1	27.0	24.0	±60	0.191	1.8
VBTM33-B	55.0	60	27.0	14.6	10.8	20.0	8.0	±60	0.141	2.0
VBTM34-B	130.0	279	40.0	26.4	15.8	24.0	9.5	±60	0.169	3.2
VBTM34-C	130.0	32.8	40.0	31.0	6.6	8.5	1.4	±60	0.060	1.1
VBTM34-D	83.0	80	40.0	18.5	11.4	24.6	7.0	±25	0.174	1.0
VBTM34-E-1	250.0	281	70.0	22.0	5.4	17.0	1.3	±15	0.120	0.9
VBTM34-G	250.0	305	67.0	22.0	10.5	32.0	5.0	±15	0.226	0.95
VBTM34-H	80.0	98	60.0	55.4	12.0	13.0	2.6	±30	0.092	3.0
VBTM34-J	80.0	132	45.0	41.6	20.8	22.5	10.4	±60	0.157	2.0
VBTM34-K	250.0	281	80.0	28.8	12.2	34.0	5.2	±15	0.240	0.9
VBTM34-L	75.0	211	20.0	18.0	18.0	20.0	18.0	±60	0.141	1.8
VBTM34-M	100.0	242	40.0	39.0	18.9	19.5	9.2	±50	0.138	3.3
VBTM39-A ③	40.0	65	30.0	36.7	25.7	21.0	18.0	±40	0.148	3.0
VBTM40-A	160.0	144	57.0	18.3	12.8	40.0	9.0	±10	0.282	1.08
VBTM52-B	708.0	502	148.0	22.0	10.0	67.0	4.5	±25	0.473	3.0
VBTM52-B-1	708.0	394	148.0	17.2	7.5	64.8	3.3	±25	0.457	4.0
HOUSED MOTORS (Diameters are: A = Housing OD; B = Housing Length; C = Shaft Diameter)										
VBTMH14-B-1	4.5	26.5	0.15	0.03	1.4	7.0	64.0	±45	0.049	0.5
VBTMH15-A	6.0	65.4	0.9	1.5	3.7	2.25	9.2	±60	0.016	0.3
VBTMH18-A	10.0	14.8	8.5	10.7	9.3	7.4	8.1	±23	0.052	0.5
VBTMH38-B-1	80.0	210	26.0	22.3	23.1	27.0	24.0	±60	0.191	1.8

① Check with factory regarding duty cycle. ② Performance between center tap to line. Can be operated between line to line for double torque sensitivity and resistance.
③ Flanged O.D.

VERNITRON CONTROL COMPONENTS

a Division of Vernitron Corporation

1601 Precision Park Lane ▪ San Diego, California 92073 ▪ (619) 428·5581 TWX: 910·322·1862

vernitorq™ BRUSHLESS DC TORQUE MOTORS

Rotor Inertia (Oz-in/sec^2)	Viscous Damping Zero Source Impedance (Oz-in/rad/sec^2)	Dimensions (Inches) A	B	C	Motor Constant (Oz-in/$\sqrt{W}$)	Weight (Oz)	Typical Performance Curve	Vernitron Type Number
0.024×10^{-3}	0.25×10^{-2}	0.870	0.700	0.125	0.58	1.0	X	VBTM9-C
0.018×10^{-3}	0.075×10^{-2}	1.000	0.350	0.125	0.32	0.8	X	VBTM10-A
0.018×10^{-3}	0.075×10^{-2}	1.000	0.350	0.000	0.37	0.8	X	VBTM10-A-1
0.04×10^{-3}	0.245×10^{-2}	1.000	0.700	0.125	0.59	1.4	X	VBTM10-B
0.018×10^{-3}	0.73×10^{-2}	0.962	0.350	0.125	0.32	0.8	X	VBTM10-D
0.018×10^{-3}	0.70×10^{-2}	0.962	0.350	0.125	0.32	0.8	X	VBTM10-E
0.052×10^{-3}	0.21×10^{-2}	0.962	0.700	0.125	0.56	1.6	Z	VBTM10-G
0.079×10^{-3}	0.25×10^{-2}	1.000	0.700	0.125	0.60	1.6	X	VBTM10-K
0.115×10^{-3}	0.35×10^{-2}	1.000	1.000	0.125	0.71	2.3	X	VBTM10-L ①
0.079×10^{-3}	0.27×10^{-2}	1.000	0.700	0.125	0.62	1.6	X	VBTM10-M
0.018×10^{-3}	0.11×10^{-2}	1.000	0.350	0.125	0.40	0.8	Z	VBTM10-N
0.018×10^{-3}	0.12×10^{-2}	1.000	0.350	0.125	0.41	0.8	X	VBTM10-R
0.04×10^{-3}	0.30×10^{-2}	0.960	0.700	0.125	0.65	1.1	X	VBTM10-S
0.17×10^{-3}	0.40×10^{-2}	1.178	0.610	0.125	0.74	2.2	X	VBTM12-B
0.17×10^{-3}	0.17×10^{-2}	1.178	0.610	0.125	0.50	2.2	X	VBTM12-C ②
0.37×10^{-3}	0.64×10^{-2}	1.500	0.500	0.125	0.95	3.0	Y	VBTM15-A
0.67×10^{-3}	3.31×10^{-2}	1.634	0.700	0.250	2.16	4.8	Y	VBTM17-A
0.55×10^{-3}	0.46×10^{-2}	1.632	0.700	0.187	0.81	4.0	X	VBTM17-B
0.84×10^{-3}	4.10×10^{-2}	1.634	0.700	0.250	2.42	4.8	Y	VBTM17-C
0.69×10^{-3}	1.49×10^{-2}	1.719	0.939	0.187	0.73	3.9	X	VBTM18-A
0.884×10^{-3}	2.78×10^{-2}	1.718	0.700	0.250	2.00	5.0	Y	VBTM18-C
0.76×10^{-3}	2.16×10^{-2}	1.719	0.943	0.187	1.75	5.6	X	VBTM18-D
1.76×10^{-3}	7.06×10^{-2}	2.270	0.720	0.250	3.16	8.0	X	VBTM23-B
1.33×10^{-3}	6.0×10^{-2}	2.270	0.720	0.250	2.92	8.0	X	VBTM23-D
1.33×10^{-3}	6.0×10^{-2}	2.270	0.720	0.250	2.91	8.0	X	VBTM23-E
1.33×10^{-3}	6.86×10^{-2}	2.270	0.720	0.250	3.11	8.0	X	VBTM23-E-1
2.5×10^{-3}	26.86×10^{-2}	2.270	0.900	0.250	6.17	9.0	Y	VBTM23-G
8×10^{-3}	21.5×10^{-2}	3.250	1.025	0.376	5.51	24.0	X	VBTM33-A
6.2×10^{-3}	35.25×10^{-2}	3.300	0.850	0.250	7.07	22.0	X	VBTM33-B
22×10^{-3}	42.7×10^{-2}	3.400	1.510	0.250	7.79	28.8	X	VBTM34-B
22×10^{-3}	36.43×10^{-2}	3.400	1.510	0.250	7.18	38.0	X	VBTM34-C
13×10^{-3}	61.15×10^{-2}	3.375	0.725	0.375	9.30	16.0	Y	VBTM34-D
40×10^{-3}	157×10^{-2}	3.400	1.510	0.375	14.90	42.0	Y	VBTM34-E-1
40×10^{-3}	144.6×10^{-2}	3.400	1.510	0.375	14.30	42.0	Y	VBTM34-G
8.4×10^{-3}	45.9×10^{-2}	3.312	1.126	0.472	8.06	21.5	Z	VBTM34-H
8.4×10^{-3}	33.91×10^{-2}	3.375	1.125	0.627	6.97	21.5	X	VBTM34-J
40×10^{-3}	156.92×10^{-2}	3.400	1.510	0.375	14.91	42.0	Y	VBTM34-K
6.7×10^{-3}	15.67×10^{-2}	3.313	0.625	0.250	4.71	12.0	X	VBTM34-L
13.8×10^{-3}	29.25×10^{-2}	3.400	1.125	0.700	6.43	24.0	X	VBTM34-M
5.6×10^{-3}	17.3×10^{-2}	3.812	0.630	0.250	4.95	14.0	X	VBTM39-A ③
44×10^{-3}	125.53×10^{-2}	4.000	0.850	0.875	13.33	30.9	Y	VBTM40-A
120×10^{-3}	704.2×10^{-2}	5.250	1.700	0.700	31.58	88.0	Y	VBTM52-B
120×10^{-3}	898.4×10^{-2}	5.250	1.700	0.700	35.67	88.0	Y	VBTM52-B-1
0.15×10^{-3}	0.536×10^{-2}	1.343	0.940	0.1247	0.875	2.7	Z	VBTMH14-B-1
0.17×10^{-3}	0.391×10^{-2}	1.500	1.077	0.1248	0.742	3.0	Z	VBTMH15-A
0.453×10^{-3}	4.75×10^{-2}	1.750	1.393	0.2497	2.60	6.6	Y	VBTMH18-A
8×10^{-3}	21.48×10^{-2}	3.750	1.500	0.373	5.51	30.0	X	VBTMH38-B-1

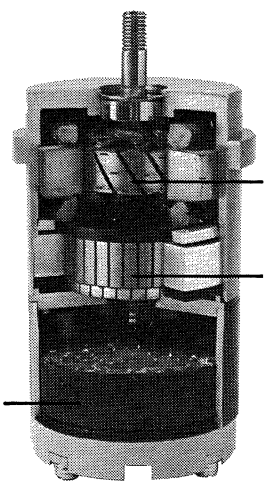
① Check with factory regarding duty cycle. ② Performance between center tap to line. Can be operated between line to line for double torque sensitivity and resistance.
③ Flanged O.D.

VERNITRON CONTROL COMPONENTS
a Division of Vernitron Corporation

1601 Precision Park Lane ▪ San Diego, California 92073 ▪ (619) 428-5581 TWX: 910-322-1862

Torqsyn® REMOTE POSITIONER

The patented Torqsyn Remote Positioner® — the first integrated servo system — represents a unique concept in synchro actuated direct-drive servomechanisms. Functionally, it is a remote angular positioning and tracking device that converts synchro data into accurate shaft position. It is self-contained and easy to install. You can replace an angular positioning repeater or instrument servomechanism consisting of a motor, amplifier, feedback compensation or damping device, power supply, feedback transducer, precision gearing, and miscellaneous electromechanical hardware with one single Torqsyn package, and yet perform with better results the same function as the more complicated assembly.



The Torqsyn incorporates a high efficiency, continuous rotation DC torque motor (prime mover) and a synchro control transformer (feedback transducer) mounted on a single shaft, with all necessary electronics in a reliable, compact package. There are no internal gears to cause backlash and compliance that lead to oscillations or jitter. Consequently, tracking is smooth and free of "cogging." The absence of reduction gear clusters and their associated bearings also yields increased reliability, lower motor speeds and excellent acceleration capability.

Performance characteristics of Torqsyn Remote Positioners make them ideal for a wide variety of instrument servo applications. With a torque gradient (loop stiffness) more than 100 times that of an equivalent size torque receiver, the Torqsyn offers precise angular positioning with friction loads that preclude the use of standard torque receivers.

Moreover, the high stator impedance minimizes transmitter loading and facilitates applications using more than one Torqsyn.

In limited instances where gearing to the load is required, it is considerably simplified over that of the conventional servo system. Compatibility of electrical and mechanical components, loop stabilization, and the time consuming "debugging" and optimizing the servo design will no longer plague the designer who chooses the Torqsyn. Additional economies are possible in engineering time allocated to system specification and in-house component test and inspection.

The Digital Torqsyn Remote Positioner, Model VTSND23-P2, offers both 8- and 16-bit microprocessor compatibility. Packaged in a size 23 synchro housing, the assembly requires only ± 15 VDC power supplies. The inputs are double-buffered, and the assembly is TTL or CMOS compatible.

Analog Inputs			
Unit Type	Input	Ref. Volts	Stall Torque (oz.-in.) min.
VTSN15-4A2-1	90V Synchro 400 Hz	115V 400 Hz	2.0
VTSN23-4A2	11.8V Synchro 400 Hz	26V 400 Hz	3.0
VTSN23-64NHR2	90V Synchro 50 to 400 Hz	115V 50 to 400 Hz	5.0
VTSNR23-4C2	11.8V Resolver 400 Hz	26V 400 Hz	7.5
VTSN37-64C1	90V Synchro 50 to 400 Hz	115V 50 to 400 Hz	50.0

Digital Inputs				
Unit Type	Input 16-bit Parallel Natural Binary	Ref. Volts	External Supply	Stall Torque (oz.-in.) min.
VTSND15-A1	✓	± 15V D.C.	—	2.0
VTSND23-P1	✓	± 15V D.C.	—	5.0
VTSND31-P1	✓	± 15V D.C.	48V D.C.	50.0
VTSND37-P1	✓	± 15V D.C.	48V D.C.	100.0
VTSND37-R1	✓	± 15V D.C.	48V D.C.	50.0

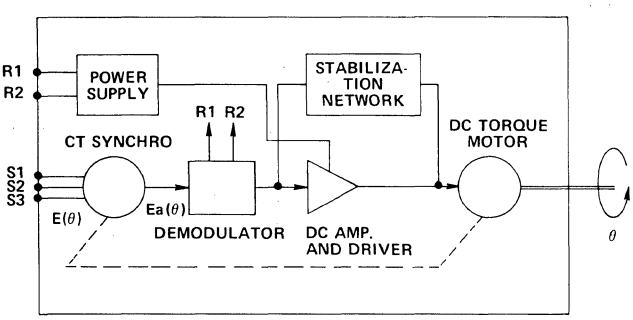
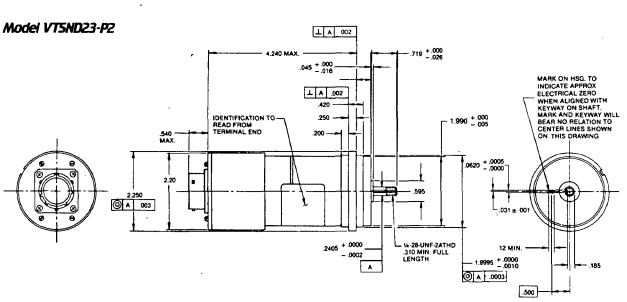


Figure 1. Size 23 Torqsyn Remote Positioner Functional Block Diagram

Model VTSND23-P2



ADVANCED DETECTOR CORP.

DIVISION OF
APPLIED SOLAR
ENERGY CORPORATION

PHOTOSENSORS • PHOTODIODES

LOW NOISE, RED-ENHANCED, SILICON PLANAR DIFFUSED PHOTODIODES

From the world leader in Photodiodes, the PH Series. Designed for optimized performance in the red region of the spectrum. Provide linear response over 7 decades of incident power range. In 5 standard sizes. Hermetic packaging in TO cans.

Type No.	Outlines	Effective Photosensor Surface cm²	Dark Rev Current I_{DR} @ −1V nA	Dark Rev Current I_{DR} @ −10V* nA	Reverse Brk Voltage V_{BR} Typ Volts	Reverse Brk Voltage V_{BR} Min Volts	Source Impedance R_{SO} Typ MΩ	Source Impedance R_{SO} Min MΩ	Junction Capacitance C_J @ 0 Volts nf	Typ RC Rise Time 10-90%(ns) 50 ohm load @ −10V	Spectral Response
11PH18M	TO18	.0094	.5	2.0	100	80	1000	400	.10	11.0	Curve III†
22PH18M	TO18	.0230	1.0	4.0	50	40	400	200	.23	30.0	Curve III†
33PH05M	TO5	.0510	2.0	8.0	20	15	175	100	.48	55.0	Curve III†
44PH05M	TO5	.1700	5.0	10.0	10	8	60	30	1.60	175.0	Curve III†
68PH08M	TO8	.5400	50.0	100.0	7	5	20	10	4.20	460.0	Curve III†

FAST RESPONSE SILICON PLANAR DIFFUSED PHOTODIODES

Designed for fast risetime applications, the PS Series provide optimized response with linearity over a wide incident power range. Applications include photovoltaic and photoconductive use as in fiber optics, optical encoders, process control, photocopiers and flash detection. Call ASEC for special requirements. All PS Series are supplied in hermetically sealed TO packages for maximum reliability.

Type No.	Outlines	Effective Photosensor Surface cm²	Dark Rev Current I_{DR} @ −1V nA	Dark Rev Current I_{DR} @ −10V* nA	Reverse Brk Voltage V_{BR} Typ Volts	Reverse Brk Voltage V_{BR} Min Volts	Source Impedance R_{SO} Typ MΩ	Source Impedance R_{SO} Min MΩ	Junction Capacitance C_J −10V nf	Typ RC Rise Time 10-90% (ns) 50 ohm load @ 0V	Spectral Response
11PS18M	TO18	.0094	.5	1.0	160	125	200	100	8.00	7.5	Curve III‡
22PS18M	TO18	.0230	.9	2.5	120	80	100	50	20.00	8.0	Curve III‡
33PS05M	TO5	.0510	3.0	7.0	70	50	60	30	30.00	10.0	Curve III‡
44PS05M	TO5	.1700	8.0	18.0	30	20	30	15	150.00	11.0	Curve III‡
68PS08M	TO8	.4090	35.0	70.0	15	10	10	4	360.00	40.0	Curve III‡

HIGH SPEED, BLUE-ENHANCED SILICON PLANAR DIFFUSED PHOTODIODES

Designed for maximum response in the blue portion of the spectrum. For currency changers, pollution control and similar applications.

Type No.	Outlines	Effective Photosensor Surface cm²	Dark Rev Current I_{DR} @ −1V nA	Dark Rev Current I_{DR} @ −10V* nA	Reverse Brk Voltage V_{BR} Typ Volts	Reverse Brk Voltage V_{BR} Min Volts	Source Impedance R_{SO} Typ MΩ	Source Impedance R_{SO} Min MΩ	Junction Capacitance C_J @ 0 Volts pf	Typ RC Rise Time 10-90% (ns) 50 ohm load @ 0V	Spectral Response
22BH18M	TO18	.023	5.0	20.0	120	80	100	50	50.00	5.5	Curve I**
33BH05M	TO5	.051	8.0	20.0	60	40	60	30	95.00	10.5	Curve I**
44BH05M	TO5	.170	20.0	40.0	30	15	30	15	270.00	30.0	Curve I**

SPECIAL HIGH SPEED SILICON PIN PHOTODIODES

For use in the 600-900 nm range of the spectrum where minimum risetime and maximum response are needed. For use in telecommunications links. Supplied in a sealed TO5 can. Available without seal when fiberoptic must be butted against active area.

Type No.	Outlines	Effective Photosensor Surface cm²	Max Dark Rev Current I_{DR} @ −50V	Reverse Brk Voltage V_{BR} Volts	Source Impedance R_{SO} Meg-Ohm	Junction Capacitance C_J @ −50V pf	Rise Time 10-90% 50 ohm load @ −50V ns
AS101	TO5	.036	10na	100	250	16	1.0

DUAL & QUAD ELEMENT SILICON PHOTOSENSORS

Unique devices designed for use in Laser positioning and other null applications which require detection of the relative position of a light spot. Supplied in TO5 packages. See terminal arrangements in drawing below.

25 PDU

45 PQU

Parameter	25 PDU Dual (TO5) Min.	25 PDU Dual (TO5) Typ	25 PDU Dual (TO5) Max	45 PQU QUAD (TO5) Min.	45 PQU QUAD (TO5) Typ	45 PQU QUAD (TO5) Max
Responsivity @ 632.8 nm(AW)	0.35	0.4		0.35	0.4	
Responsivity @ 890 nm (A/W)	0.45	0.5		0.45	0.5	
Dark Reverse @ 1V (nA)		1 nA	10 nA		1 nA	10 nA
Dark Reverse @ 10V (nA)		5 nA	100 nA		2 nA	50 nA
Source Resistance Mohm (per element)	30	50		45	80	
Capacitance @ OV (pf per element)	60		100	30		50
NEP @ 900 nm, 1 KHz, 10V (W/Hz½)		8×10^{-14}			5×10^{-14}	
Uniformity (1 mm Spot Diameter)		±2%	±5%		±2%	±5%
Interelement leakage @ 1V (na)		1 nA	5 nA		1 nA	5 nA
Risetime @ 0V, 50 ohm load		11 ns			11 ns	

MULTI-ELEMENT SILICON PHOTOSENSORS

ASEC supplies a wide variety of custom multi-element photodiode arrays in both chip form or mounted in DIP packages.

Reference Number	Chip Size cm²	Active Area cm²	No. of Elements	Pitch cm	Gap cm	R_{SH} Mohm	Capacitance nf	Dark Current @ −10 mV pA
ASE 1000	1.26 x .24	.259	8	.159	.025	100	.2	100
ASE 1050	2.52 x .24	.0259	16	.159	.025	100	.2	100
ASE 2000	2.53 x .45	.024	16	.158	.038	50	.1	200
ASE 2050	3.77 x .424	.047	16	.235	.039	150	.1	33
ASE 3000	4.02 x .427	.052	16	.254	.058	200	.125	50
ASE 3050	5.04 x .24	.0259	32	.159	.025	100	.2	100
ASE 4000	2.15 x .762	.034	32	.063	.008	1000	.5	10
ASE 4050	2.21 x 1.14	.021	3 x 5	.241	.038	2	.2	500

MECHANICAL DATA (MM)

DIM.	TO18	TO5	TO8
W	4.1	6.7	10.9
FD	5.4	9.1	14.0
D	4.7	8.3	12.4
H	5.1	4.6	5.6
S	2.5	5.1	7.5

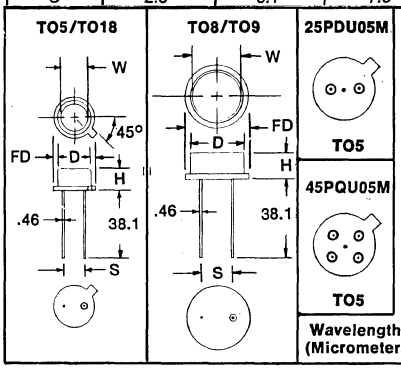
NOTES:

** Minimum Spectral Responsivity at 550 nm = .33 A/W. Allow 8% reduction in responsivity for transmission through glass.

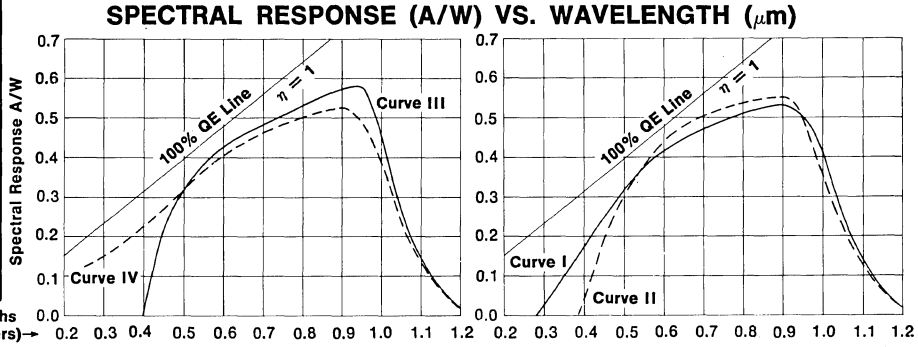
‡ Minimum responsivity at 950 nm = .56 A/W. Allow 8% reduction for transmission through glass.

† Minimum spectral response @ 950 nm = .53 A/W. Allow 8% reduction for transmission through glass window.

* Dark Reverse Current: Use −10V or $V_{BR/2}$ where applicable.



SPECTRAL RESPONSE (A/W) VS. WAVELENGTH (μm)



15251 E. Don Julian Road, P.O. Box 1212, City of Industry, CA 91749 • (818) 369-6886 • TWX 910-584-4890

CENTRONIC

Optoelectronic Devices

The Centronic line of optoelectronic components is one of the most complete—if not the most complete—in the industry today.

Whatever your requirements . . . high performance or economy . . . single or multiple element . . . quadrant or dual . . . LED's . . . photointerrupters . . . optocouplers . . . etc, or if you need a custom design, you can depend on Centronic for performance-rated products, quick delivery and very competitive pricing.

Ask your local Centronic representative to quote your next requirement, or CALL **(201) 233-7200** and ask for an applications engineer.

SINGLE ELEMENT, HIGH PERFORMANCE PHOTODIODES

Type No.	Active Area mm² (Circ.)	Dark Current (nA) @30V	Pkg. (Fig. #)
OSD 1	1	5	TO-18(1)
OSD 5	5	30	TO-5 (5)
OSD 50	50	350	TO-8 (4)
OSD 100	100	800	(11)

ADD THE FOLLOWING SUFFIX TO TYPE NO. FOR SELECTED OPTIMIZED WAVELENGTH RESPONSE.

Suffix	Optimized Wave-length	nm	Typ. Resp. A/W	Vop Max. Volts	Rise Time Vmax
-0	General Purpose	900	0.52	30	15ns
-1	UV/Blue	250	0.08	10	20ns
-2	Red	630	0.38	60	10ns
-3	IR	900	0.62	100	10ns
-4	Yag Laser	1064	0.55	180	20ns
-5	Blue	400	0.15	10	—

HIGH SPEED, HIGH PERFORMANCE PHOTODIODES

Type No.	Cap pF @ Vop Max.	Vop Max. Volts	Typical Dark Current nA	Rise Time ns	Typical Resp. @ Opt. Wave-length	Opt. Wave-length μm	Pkg. Fig. #
OSD† 1-3 HSA	8.5	80	5	1	0.40 A/W	0.9	TO-18(1‡)
OSD† 1-4 HSA *	3.0	100	10	10	0.25	1.06	TO-18(1‡)
OSD† 1-4 HSA **	2.5	180	10	15	0.38	1.06	TO-18(1‡)
BPX-65	3.5	50	1(<5)	1(<5)	0.55	0.85	TO-18(1)
BPX-66	3.5	50	0.15(<0.3)	0.5(<1)	0.55	0.85	TO-18(1)

† Isolated version available (suffix R2) * 35% Q.E. at 1064 μm ** 50% Q.E. at 1064 μm
‡ Package dimensions vary from standard. Contact Centronic for exact specifications.

HIGH SPEED, FIBER OPTIC DETECTORS

Type No.	Cap pF @ Vop Max.	Vop Max. Volts	Typical Dark Current nA	Rise Time ns	Typical Resp. @ Opt. Wave-length	Opt. Wave-length nm	Pkg. (Fig. #)
AX65-R2F	3.5	50	1(<5)	1(<5)	0.55	850	TO-18(1*)
AEPX65-R2F	5	5	1(<10)	2 Typ.	0.55	850	TO-18(1*)

* Package dimensions vary from standard. Contact Centronic for exact specifications.

HYBRIDS (Detector & Amplifier Combinations)

Type No.	Active Area mm²	Rise Time μs	Typical NEP (Noise Equiv. Power) @ Wave-length μm	W.Hz-½	Minimum Responsivity mV/μW/cm² @ Wavelength μm 0.25	0.43	0.63	0.9	1.06	Pkg. (Fig. #)
GENERAL PURPOSE										
OSI-5J	5	30	0.25	4 x 10-11	15	60	—	—	—	TO-5(5*)
OSI-5K	5	30	0.9	2 x 10-12	—	30	160	250	—	TO-5(5*)
OSI-5L	5	30	1.06	4 x 10-12	—	—	—	220	130	TO-5(5*)
HIGH SPEED										
OSI-1J HSA	1	.05	0.25	3 x 15-11	0.06	0.24	—	—	—	TO-5(5*)
OSI-1K HSA	1	.05	0.9	2.5 x 10-12	—	0.1	0.6	1.0	—	TO-5(5*)
OSI-1L HSA	1	.05	1.06	1.7 x 10-12	—	—	—	1.0	0.7	TO-5(5*)

Spectral Responses J — UV and Blue Optimized L — 1.06 μm optimized
K — General Purpose 350-1150 nm
* Package dimensions vary from standard. Contact Centronic for exact specifications.

QUADRANTS & BI-CELLS

Type No.	Nom. Active Area (Total) mm²	Dia. Active Area mm	Metal-lurgical Sep. of Elements†† mm	Typ. Dark Cur. Per Element nA @ Vop 30V	Typical NEP (Noise Equiv. Power) @ 0.9 μm W.Hz-½	Pkg. (Fig. #)
QD7-0	7	3	0.2	10	1.0 x 10-13	TO-5(5*)
QD50-0	50	8	0.2	100	3.3 x 10-13	TO-8(15)
QD100-0	100	11	0.2	300	5.0 x 10-13	(12)
QD320-0	320	20	0.3	1000	1.0 x 10-12	(13)

-0 is General Purpose Response.
Also available in -1, -2, -3, -4 and -5 (photovoltaic) responses.
†† Optical separation is typically 50% of metallurgical = 1.06 μm.
* Package dimensions vary from standard. Contact Centronic for exact specifications.

Type No.	Vop (V) Typ.	Ish (μA) Typ.	Ev (Lux)	λp (mm)	No. of Elements	Total Active Area mm²	Pkg. (Fig. #)
CD-1515H-4D	—	2.2	1000	930	4	1.5 x 1.5	TO-18(1*)
CD-33H-2D	0.4	55	1000	930	2	6 x 3	TO-5 (6)
CD-33H-4D	0.4	12	1000	930	4	2.5 x 2.5	TO-5 (6)
CD-5116H-2D	0.4	15	1000	930	2	5.1 x 1.6	TO-5 (6)

* Package dimensions vary from standard. Contact Centronic for exact specifications. (Ta = 25°C)

EYE RESPONSE DETECTORS, HYBRID & PHOTODIODES

EYE RESPONSE DETECTORS

Type No.	Active Area mm²	Typ. Cap. @ 0V pF	Min. Dyn. Imped. @ 0V MΩ	Min. Break-down Volts (10 μA)	Resp. Time @ 0V μs	Min. Respon-sivity (Tungsten 2856 K) nA Lux-1	Typ. Equiv. Noise Illum. @ 0V Lux Hz-½	Pkg. (Fig. #)
OSD 1-E	1	50	100	10	1	0.3	4 x 10-5	TO-18(1)
OSD 5-E	5	200	40	10	1	1.5	1.2 x 10-5	TO-5 (5)
BPW-21	7.5	490	10	10	3.5	7	1 x 10-5	TO-5 (5)
OSD 50-E	50	2000	1	10	1	15	8 x 10-6	TO-8 (14)
OSD 100-E	100	4000	0.5	10	1	30	6 x 10-6	(11)

EYE RESPONSE HYBRID

Type No.	Ma-terial	Active Area mm²	Typ. Resp. Time μs	Max. Output Noise mV rms	Typical NEP Lux Hz-½	Min. Re-sponsivity (Tungsten 2856 K) mV Lux -1	Pkg. (Fig. #)
OSI-5E	Si	5	30	1	7 x 10-4	15	TO-5(5*)
CHA-200	GaAsP	2	—	—	—	—	(19)

* Package dimensions vary from standard. Contact Centronic for exact specifications.

LOW COST EYE RESPONSE PHOTODIODES

Type No.	Vop (V) Typ.	Ish (nA) Typ.	Ev (Lux)	I_D (pA) Typ.	V_R (V)	Ct (pF) Typ.	Topr (°C)	Area mm²	Pkg. (Fig. #)
CBC-2014CF	.35	170	100	1	10	250	−20∼+60	2.8	(9)
CBC-3026CF	.35	600	100	3	10	800	−20∼+60	7.8	(10)

λ = 500-600 nm, λp = 560 nm, Ta = 25°C

PARALLEL & SCANNED ARRAYS (High Performance Multi-Element)

PARALLEL

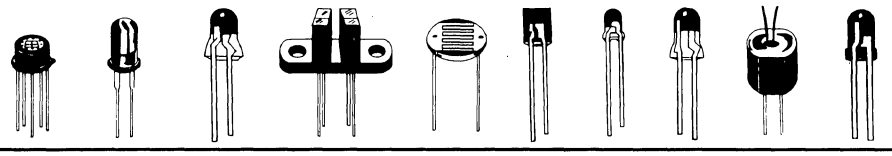
Type No.	Active Elements No.	Format	Lgth. mm	Width mm	Sep (Met.) mm	Typ. Dark Cur. Per Element @ Vop 10V (nA)	Typ. NEP @ 0.9 μm (W.Hz-½)	Pkg. (Fig. #)
LD2-5	2	2 x 1	2	0.5	0.05	5	7x10-14	TO-5 (5)
LD2-5B	2	2 x 1	1.422	1.422	0.45	11	—	TO-5 (5)
LD2-5C	2	2 x 1	1.27	0.38	0.05	3	—	TO-18(1*)
LD3-5A	3	3 x 1	2.0	1.07	0.45	7	—	TO-5 (5*)
LD4-5A	4	4 x 1	0.03	0.95	0.05	1	—	TO-5 (5*)
LD4-5B	4	4 x 1	3.0	5.0	0.05	85	—	(16)
LD4-5C	4	4 x 1	0.8	0.8	0.3	4	—	TO-5 (5*)
LD4-5D	4	4 x 1	0.125	0.5	0.05	1	—	TO-5 (5*)
LD5-5A	5	5 x 1	0.125	0.8	0.05	1	—	TO-5 (5*)
LD5-5B	5	5 x 1	0.3	0.8	0.2	2	—	TO-5 (5*)
LD12-5A	12	12 x 1	0.5	0.5	0.05	2	—	14 Lead Flat Pkg.
LD16-5A	16	16 x 1	0.2	0.5	0.5	1	—	(16)
LD16-5C	16	16 x 1	0.2	0.175	0.025	1	—	24 Lead Flat Pkg.
LD20-5A	20	20 x 1	4.0	0.9	0.05	20	1.4 x 10-13	(16)
LD50-5	50	50 x 1	0.6	0.6	0.1	2	—	Ceramic Flat Pkg.
MD25-5	25	5 x 5	3	3	0.1	70	2.6 x 10-13	(18)
MD100-5	100	10 x 10	1.4	1.4	0.1	20	1.4 x 10-13	(17)

Some Array Types also available in -0, -1, -2, -3, -4 Responses.
* Package dimensions vary from standard. Contact Centronic for exact specifications.

SELF SCANNED

Type No.	No. of Elements	Spacing μm	Notes	Pkg. (Fig. #)
4000 Series	50 to 256	100	Voltage or Recharge	(16*)
7000 Series	50 to 256	100	OCR Type	(16*)
M Series	256 to 1024	25	Recharge Only	(16*)

* Package dimensions vary from standard. Contact Centronic for exact specifications.



CENTRONIC

BLUE ENHANCED PHOTODIODES

Type No.	Min. Responsivity 0.45 μm @ A/W	Max. Resp. Time (@ 0V) μs	Min. Dyn. Resistance MΩ	Typ. Cap. (@ 0V) pF	Min. Breakdown Volts (10 μA)	Typ. I_D @ 0V (nA)	Typ. NEP (Noise (Equiv. Power) @ 450 nm (W.Hz-½)	Pkg. (Fig. #)
OSD 1-5	0.15	1	100	40	10	0.2	6 x 10-14	TO-18(1)
OSD 3-5T	0.15	1	—	60	12	0.2	—	TO-18(1)
OSD 5-5	0.15	1	40	150	10	0.5	7 x 10-14	TO-5 (5)
OSD 7.5-5T	0.15	1	—	180	12	0.2	—	TO-5 (5)
OSD 15-5T	0.15	1	190	280	12	0.16	2 x 10-14	TO-5 (5)
OSD 50-5	0.15	1	1.5	1500	10	1	2 x 10-13	TO-8 (14)
OSD 60-5T	0.15	1	50	1200	12	1	5 x 10-14	TO-8 (14)
OSD 100-5T	0.15	1	1	2500	10	2	2 x 10-13	(11)

HIGH SPEED, LOW COST PHOTODIODES

Type No.	Ish (μA) Typ.	I_D (nA) Typ.	C_T (pF) Typ.	Δθ (deg) Typ.	t Rise Time ns	Topr (°C)	Active Area mm²	Pg. (Fig. #)
CD-11H	8	1	4	±45	50	−20∼+80	1	TO-18(1*) Hermetic Seal
CD-11HL	70	1	4	±30	50	−20∼+80	1	TO-18(2*) With Lens
CD-33H	55	30	40	±45	300	−20∼+80	9	TO-5 (6) Hermetic Seal
CD-33HF†	25	50	40	±45	300	−20∼+70	9	TO-5 (6) Hermetic Seal
CD-33HL	200	50	40	±30	300	−20∼+80	9	TO-5 (7) With Lens
CD-33HLF†	90	50	40	±30	300	−20∼+70	9	TO-5 (7) With Lens
CD-2014C	20	50	50	±45	300	−20∼+60	2.8	(9) Ceramic Epoxy
CEN-1210	35	50	140	±15	—	−25∼+100	1	TO-18(2) Hermetic Seal
CEN-1211	12	50	140	±60	—	−20∼+80	1	TO-18(3) Epoxy Resin
CEN-1220	10	50	140	±50	—	−25∼+80	1	(4) Ceramic Epoxy
HP-3K	65	100	175	±55	150	−25∼+100	7.2	TO-5 (6) Hermetic Seal

† Ev = 1000 Lux, V_R = 10V, λ = 500−1000 nm, λp = 830 nm, Ta = 25°C.
λ = 700−1000 nm, λ = 900 nm.
* Package dimensions vary from standard. Contact Centronic for exact specifications.

LOW COST PHOTODIODES

Type No.	Vop (V) Typ.	Ish (μA) Typ.	I_D (μA) Typ.	C_J (pF) Typ.	Δθ (deg) Typ.	t Rise Time μsec	Topr (°C)	Active Area mm²	Pkg. (Fig. #)
SP-2ML	0.38	25	1.0	230	±70	0.2	−20∼+80	2.8	TO-18(3) Epoxy Resin
SP-45ML	0.38	160	2.0	1000	±70	2.0	−20∼+80	15.5	TO-5 Epoxy Resin
SP-2K	0.38	20	1.0	230	±50	0.2	−25∼+100	2.8	TO-18(1*) Hermetic Seal
SP-8K	0.40	300	5.0	3900	±60	10	−25∼+100	47.1	TO-18(14*) Hermetic Seal
SP-3MHL	0.39	150	1.0	600	±58	0.6	−20∼+80	7.2	TO-5 Epoxy Resin

Ev = 1000 Lux, V_R = 10V, λ = 500-1000 nm, λp = 830 nm, Ta = 25°C.
* Package dimensions vary from standard. Contact Centronic for exact specifications.

LOW COST PHOTOVOLTAIC DIODES

Type No.	Ish (μA) Typ.	I_D (μA) Max.	C_J (pF) Typ.	Active Area (mm²)	Outside Dimension (mm)	Notes
SP-15S	32	1.0	320	4.4	1.5 x 5.7	Tin Coated Cu Wire 0.18φ x 50mm
SP-19S	25	1.0	300	3.5	1.9 x 4.0	Tin Coated Cu Wire 0.18φ x 50mm
SP-27S	80	1.0	750	10.78	2.7 x 6.0	Tin Coated Cu Wire 0.18φ x 50mm
SP-26S	92	1.0	1200	10.65	2.6 x 7.6	Tin Coated Cu Wire 0.18φ x 50mm
SP-550S	130	1.5	1600	15.75	5.0 x 5.0	Tin Coated Cu Wire 0.18φ x 50mm
SP-652S	670	1.5	9400	103.25	6.5 x 20.0	Tin Coated Cu Wire 0.18φ x 50mm
SP-60H	400	2.0	5500	61.25	6.0 x 13.0	Polyurethane Coated Cu Wire
SP-651V	330	2.0	4500	50.35	6.5 x 10.0	Vinyl Tube Coated Wire (7/0, 12φ)
SP-113V	1300	2.0	17,000	196.95	11.3 x 20.0	Vinyl Tube Coated Wire (7/0, 12φ)
HP-10S	590	10	1800	90.16	9.97 x 9.97	Tin Coated Cu Wire 0.18φ x 26mm
CP-55	150	.02	—	25	5 x 5	Tin Coated Cu Wire..
CP-1010B	650	.05	—	100	12 x 13.5	Mounted on PC Board

Ev = 1000 Lux, V_R = 1V, λ = 830 nm (typ.), Ta = 25°C.

PHOTOTRANSISTORS (NPN)

Type No.	Absolute Maximum Ratings V_{CEO} (V)	P_C (mW)	Topr (°C)	I_{CEL} (mA) Min.	I_{CEL} (mA) Max.	EV (Lux)	I_{CEO} (μA) Max.	V_{CE} (V)	Δθ (Deg) Typ.	λp (nm) Typ.	λ (nm) Typ.	Pkg. (Fig. #)
CEN-810	40	150	−35∼+125	2	15	200	.2	10	±18	800	500-1000	(2)
CEN-811	40	100	−25∼+90	0.5	5	200	.2	10	±70	800	500-1000	(3)
CEN-820	20	75	−20∼+90	0.5	3	1000	.1	10	±50	800	500-1000	(4)
ST-1MLAR1	40	100	−25∼+100	2.0	—	500	1.0	10	±70	900	700-1000	(3)
ST-1MLBR1	40	100	−25∼+100	2.0	—	500	1.0	10	±70	900	700-1000	(3*)
ST-23F	30	150	−40∼+100	0.5	—	1000	1.0	25	±35	830	500-1000	Epoxy

* Package dimensions vary from standard. Contact Centronic for exact specifications. (Ta = 25°C)

PHOTODARLINGTONS

Type No.	Absolute Maximum Ratings V_{CEO} (V)	P_C (mW)	Topr (°C)	I_{CEL} (mA) Min.	I_{CEL} (mA) Max.	V_{CE} (V)	Ev (Lux)	I_{CEO} (μA) Max.	V_{CE} (V)	Δθ (Deg) Typ.	λp (nm) Typ.	λ (nm) Typ.	Pkg. (Fig. #)
PTR-1ML	25	300	−25∼+100	5	—	5	20	1.0	5	±70	830	500-1000	(3)
PTR-1F	25	100	−30∼+85	5	—	5	20	1.0	5	±80	830	500-1000	*
PT-7L	25	150	−20∼+65	5	—	5	200	1.0	10	±18	830	500-1000	*
PT-23F	30	150	−40∼+100	5	—	5	200	1.0	25	±35	830	500-1000	*

* Clear Epoxy (Ta = 25°C)

GaAsP PHOTODIODES

Type No.	Ish (nA) Typ.	I_D (pA) Typ.	t Rise Time (μs)	Topr (°C)	Active Area mm²	Pkg. (Fig. #)
CP-1812	130	5	250	−20∼+60	2.1	Ceramic (9)
CP-1511	90	2	250	−20∼+60	1.6	Ceramic (9)
CP-151C	110	2	250	−20∼+60	1.6	Epoxy (8)

GERMANIUM IR PHOTODETECTORS

Type No.	Active Area mm2	I_D μA	C_J pF	Responsivity A/W	Peak Response nm	Response Range nm	Pkg. (Fig. #)
CGP-0.3	0.3	1	6	.70	1500	500-1800	TO-18(1)
CGP-1.0	1.0	5	50	.70	1500	500-1800	TO-18(1)
CGP-3.0	3.0	30	450	.70	1500	500-1800	TO-8 (14)
CGP-5.0	5.0	60	1500	.70	1500	500-1800	TO-8 (14)

INFRARED LED'S

Type No.	Absolute Maximum Ratings I_F (mA)	V_R (V)	P (mW)	Topr (°C)	P_O (mW) Typ.	I_F (mA)	V_F (V) Max.	λ (nm) Typ.	Δθ (deg) Typ.	Pkg. (Fig. #)
CEN-2010	100	6	150	−40∼+100	6	100	1.4	940	±15	TO-18(2) Hermetic Seal
CEN-2020	40	4	70	−20∼+65	3	40	1.2	940	±50	(4) Ceramic Epoxy
CEN-2040	100	5	100	−30∼+70	5	100	1.4	940	±25	T 1¾ Epoxy
EL-1ML2	100	6	170	−25∼+100	2.7	50	1.5	940	±32	(3) Epoxy Resin
EL-1K3	100	6	200	−40∼+100	4.0	100	1.7	940	±36	TO-18(1) Hermetic Seal
EL-1L1	100	5	100	−30∼+100	10.0	100	1.7	940	±10	T 1¾ Epoxy Resin

PHOTO INTERRUPTERS & PHOTOREFLECTORS

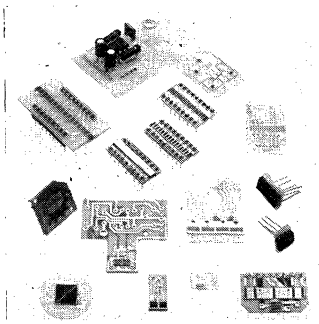
Type No.	I_F (mA)	Absolute Maximum Ratings V_R (V)	P_D (mW)	V_{CEO} (V)	I_C (mA)	P_C (mW)	Topr (°C)	V_F (V) Max. I_F = 20mA	I_R (μA) Max. V_R = 5V	I_{CEO} (μA) Max. V_{CE} = 10V
CEN-710	50	6	80	35	20	80	−25∼+85	1.4	10	.1
CEN-720	50	6	75	35	20	100	−25∼+85	1.4	10	.1
CEN-730	65	6	100	35	45	100	−25∼+85	1.4	10	.1
SG-23FT	60	5	100	30	40	100	−25∼+85	1.5	10	.1
SG-23FI	60	5	100	30	40	100	−25∼+85	1.5	10	.1

(Ta = 25°C)

CUSTOM-MADE DETECTORS

If your detector needs cannot be fulfilled by any of the products listed here, Centronic Engineers are ready to discuss your specific application and provide a cost effectively designed product. We will review:

- Package
- Active area design
- Number of active elements
- Speed of response
- Wavelength of measurement
- Environment
- Commercial or MIL-SPEC
- Integrated electronics



Complete product specifications are also available for CaS and CdSe detectors, Opto-couplers and Photomultipliers.

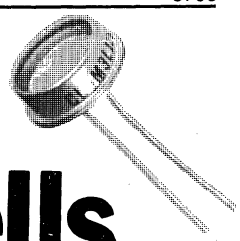
Product specifications and product availability subject to change without prior notice.

1101 Bristol Road
Mountainside, NJ 07092

Telephone: (201) 233-7200
Telex 9103503290

CENTRONIC

Clairex Photoconductive Cells



Part No.	Diam. X Length (inches)	Resistance @ 2 ftc ± 33-1/3%	Minimum resistance ratio from 2 ftc to Dark within 5 sec.	Maximum voltage	Power Dissipation @ 25°C (mw)
CL5M9M	.55 X .18	11K	1:1000	250	2000-500[1]
CL709L	.36 X .18	28K		100	125
CL909L	.21 X .15	100K		100	50

Type 9 CdS, peak spectral response 5500 angstroms combines high speed with extreme temperature stability and high linearity.

CL5M3	.55 X .18	7.2K	1:10,000	250	2000 500[1]
CL603	.25 X .5	133K		300	75
CL603A	.25 X .5	75K		300	75
CL603AL	.25 X .5	3.5K		170	75
CL703	.36 X .18	133K		300	125
CL703A	.36 X .18	67K		300	125
CL703L	.36 X .18	2.7K		100	125
CL903	.21 X .15	133K		250	50
CL903A	.21 X .15	67K		250	50
CL903L	.21 X .15	6.0K		100	50

Type 3 CdSe, peak spectral response 7350 angstroms, fast response, and very high light-to-dark resistance ratio. Can be used for high speed switching or counting. Sensitive to near infra red. For use with incandescent or neon lamps.

CL5M4	.55 X .18	1.5K	1:400	250	2000 500[1]
CL5M4L	.55 X .18	0.25K		170	2000 500[1]
CL604	.25 X .5	30K		300	75
CL604L	.25 X .5	1.5K		170	75
CL704	.36 X .18	30K		300	125
CL704L	.36 X .18	0.6K		100	125
CL904	.21 X .15	30K		250	50
CL904L	.21 X .15	2K		100	50

Type 4 CdSe, peak spectral response 6900 angstroms, lowest resistance photocells available. Can be used for "on-off" applications when low resistance is desired. For use with incandescent or neon lamps.

CL5M5	.55 X .18	9K	1:100	250	2000-500[1]
CL5M5L	.55 X .18	1.5K		170	2000-500[1]
CL605	.25 X .5	166K		300	75
CL605L	.25 X .5	7.5K		170	75
CL705	.36 X .18	166K		300	125
CL705L	.36 X .18	3.3K		100	125
CL905	.21 X .15	166K		250	50
CL905L	.21 X .15	10K		100	50

Type 5 CdS, peak spectral response 5500 angstroms (closely matches the human eye), most stable, lowest memory photocell available. Can be used in light measuring applications and precision low speed switching. For use with incandescent, fluorescent or neon lamps.

CL705HL	.36 X .18	28K	1:1000	100	125
CL905HLL	.21 X .15	15K		60	50
CL905HL	.21 X .15	100K		100	50
CL905HN	.21 X .15	700K		100	50

Type 5H CdS, peak spectral response 5500 angstroms (closely matches the human eye). Combines high speed, stability, linearity, and uniform color temperature response. Footnote 1. with and without heat sink.

Part No.	Diam. X Length (inches)	Resistance @ 2 ftc ± 33-1/3%	Minimum resistance ratio from 2 ftc to Dark within 5 sec.	Maximum voltage	Power Dissipation @ 25°C (mw)
CL707H	.36 X .18	500K	1:1000	300	125
CL707HM	.36 X .18	100K		250	125
CL907H	.21 X .15	600K		250	50
CL907HN	.21 X .15	300K		100	50
CL907HL	.21 X .15	24K		100	50

Type 7H CdS peak Spectral response 6200 angstroms. Very fast decay time coupled with low resistance and high linearity. Ideal for beam breaking applications.

CL5M7	.55 X .18	7.2K	1:300	250	2000-500[1]
CL607	.25 X .5	133K		300	75
CL707	.36 X .18	133K		300	125
CL707L	.36 X .18	2.7K		100	125
CL907	.21 X .15	133K		250	50
CL907N	.21 X .15	66K		100	50

Type 7 CdS, peak spectral response 6150 angstroms, moderate speed and ratio. Can be used in general beam breaking applications. For use with incandescent, neon or fluorescent lamps.

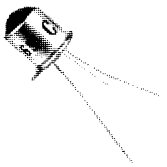
Part No.	Diam. X Length (inches)	Resistance @ 2 fc ± 33-1/3%	Minimum resistance ratio from 2 ftc to Dark within 5 sec.	Maximum voltage	Power Dissipation @ 25°C (mw)	Type
CL703L/2	.36 X .18	6.5K	1:10,000	100	125	3 CdSe
CL704L/2	.36 X .18	1.5K	1:400	100	125	4 CdSe
CL705/2	.36 X .18	166K	1:100	300	125	5 CdS
CL705L/2	.36 X .18	7.5K	1:100	100	125	5 CdS
CL705HL/2	.36 X .18	6.7K	1:1000	100	125	5H CdS
CL709L/2	.36 X .18	6.7K	1:1000	100	125	9 CdS

Plastic Encapsulated Photoconductive Cells

CL5P4	.430 X .130	2.7K	1:400	250	250	Type 4 CdSe
CL5P4L	.430 X .130	0.45K		170	250	
CL7P4	.283 X .075	54K		300	125	
CL7P4L	.283 X .075	1K		170	125	
CL9P4L	.180 X .065	2K		100	50	
CL5P5	.430 X .130	9K	1:100	250	250	Type 5 CdS
CL5P5M	.430 X .130	6K		250	250	
CL5P5L	.430 X .130	1.5K		170	250	
CL7P5	.283 X .075	166K		300	125	
CL7P5L	.283 X .075	3.3K		170	125	
CL9P5	.180 X .065	166K		250	50	
CL9P5L	.180 X .065	10K		100	50	
CL7P5HL	.283 X .075	28K	1:1000	170	125	Type 5H CdS
CL9P5HL	.180 X .065	100K		100	50	
CL7P7HL	.283 X .075	10K	1:1000	170	125	Type 7H CdS
CL7P7HM	.283 X .075	30K		400	125	
CL9P7HL	.180 X .065	24K		100	50	
CL9P7HLL	.180 X .065	4.5K		70	50	
CL5P9M	.430 X .130	9K	1:1000	250	250	Type 9 CdS
CL7P9L	.283 X .075	28K		170	125	
CL9P9L	.180 X .065	100K		100	50	
CL9P9LL	.180 X .065	15K		70	50	

CLAIREX ELECTRONICS
A DIVISION OF CLAIREX® CORPORATION
560 South Third Avenue, Mount Vernon, N.Y. 10550 (914) 664-6602
WRITE FOR NAME OF YOUR NEAREST CLAIREX REPRESENTATIVE OR DISTRIBUTOR

Clairex



Phototransistors • Darlingtons • Diodes • Infrared Emitters

TO 18 FLAT WINDOW

Part No.	I_L (ma) V_{CE} = 5V Min	Max	H (Note 1) mw/cm²	BV_{CEO} Volts	I_{CEO} (na) V_{CE} = 10V	P_T (mw) 25°C
CLT 2065	7.0	—	5.0	40	50	250
CLT 2064	3.0	7.0	5.0	50	50	250
CLT 2030	1.0	3.0	5.0	30	25	250
CLT 2020	0.4	1.2	5.0	30	25	250
CLT 2010	0.2	0.6	5.0	50	25	250
CLR 2060	1.4 14.0	6.0 —	0.2 2.0	40	100	250
CLR 2050	0.6 6.0	1.8 —	0.2 2.0	40	100	250
CLR 2049	0.2	1.0	0.2	40	100	250

TO 18 LENS.

Part No.	I_L (ma) V_{CE} = 5V Min	Max	H (Note 1) mw/cm²	BV_{CEO} Volts	I_{CEO} (na) V_{CE} = 10V	P_T (mw) 25°C
CLT 2165	15.0	—	5.0	40	50	250
CLT 2164	7.0	—	5.0	40	50	250
CLT 2160	4.0	12.0	5.0	30	25	250
CLT 2150	2.4	7.2	5.0	40	25	250
CLT 2140	1.2	3.6	5.0	40	25	250
CLT 2130	0.6	1.8	5.0	50	25	250
CLR 2180	0.6 4.0	— —	0.02 0.20	40	100	250
CLR 2170	0.2 2.0	0.8 —	0.02 0.20	40	100	250

WINDOW LENS .115 LENGTH X .077 DIAMETER

Part No.	Lens	I_L (ma) V_{CE}=5V Min	Max	H (Note 1) mw/cm²	BV_{CEO} Volts	I_{CEO} (na) V_{CE}=10V	P_T (mw) 25°C
CLT 5170	L	1.4 6.0	— —	5 20	40	25	50
CLT 5160	L	0.5 2.0	— 7.0	5 20	40	25	50
CLR 5101	L	2.0 20.0	— —	0.2 2.0	40	100	50

-2 Designation is with second lead welded to the header

PLASTIC ENCAPSULATED SIDE VIEW

Part No.	I_L (ma) V_{CE}=5V Min	Max	H (Note 1) mw/cm²	BV_{CEO} Volts	I_{CEO} (na) V_{CE}=10V	P_T(mw) 25°C
CLT 4000	.3	—	5	30	50	75
CLT 4140	.5	—	5	40	50	75
CLT 4150	1.0	3.0	5	40	50	75
CLT 4160	2.0	—	5	40	50	75
CLR 4180	.1	—	.1	40	200	75
CLR 4185	.6	—	.1	40	200	75

Note 1: The light source is a frosted tungsten incandescent lamp at 2854°K.

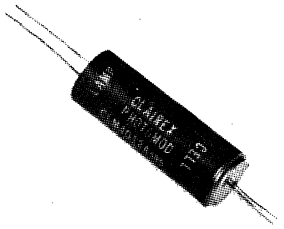
PHOTO DIODES

Part No.	Active Area Inches	Package	I_{SC} (ua) Min.	H mw/cm²	I_D(na) V=-.1V
CLD 31	.222 x .122	Plastic	150	5	100
CLD 41	.051 x .051	To 18	6	5	50
CLD 42	.051 x .051	To 18	35	5	50
CLD 56	.222 x .122	To 5	100	5	100
CLD 71	.125 x .125	Plastic	70	5	100
CLD 72	.051 x .051	Plastic	17	5	10

INFRARED EMITTERS

Part No.	Package	Material	Power Out (mw)	Vf (Volts)	Pt 25°C	Peak Wave Length nm
CLED-1	T046 lens	GaAs	3.0 @ 50 ma	1.8 @ 60 ma	200 mw	930
CLED-1F	T046 Window	GaAs	3.0 @ 50 ma	1.8 @ 60 ma	200 mw	930
CLED-3	Pill-lens	GaAs	1.5 @ 50 ma	1.6 @ 50 ma	75 mw	930
CLED-5	Post lens	GaAs	1.0 @ 50 ma	1.6 @ 50 ma	75 mw	930
CLED-400	Plastic	GaAs	0.50 @ 50 ma	1.6 @ 50 ma	100 mw	930
CLED-155	T046 lens	GaAlAs	3.0 @ 50 ma	1.8 @ 50 ma	200 mw	880
CLED-155F	T046 Window	GaAlAs	3.0 @ 50 ma	1.8 @ 50 ma	200 mw	880
CLED-305	Pill-lens	GaAlAs	2.0 @ 50 ma	1.7 @ 40 ma	75 mw	880
CLED-405	Plastic	GaAlAs	2.0 @ 50 ma	1.7 @ 40 ma	100 mw	880
CLED-505	Post-lens	GaAlAs	2.0 @ 50 ma	1.7 @ 40 ma	75 mw	880

CLAIREX ELECTRONICS
A DIVISION OF CLAIREX CORPORATION
560 South Third Avenue, Mount Vernon, N.Y. 10550 (914) 664-6602
WRITE FOR NAME OF YOUR NEAREST CLAIREX REPRESENTATIVE OR DISTRIBUTOR



Clairex Opto-Isolators

LED PHOTOCONDUCTIVE CELL ISOLATORS

Part No.	Package	R "ON" Ohms Max	10 SEC R "OFF" Ohms Min	Cell Volts PAC	Isol. Volts
CLM6000	Axial	500@ 20ma	500K	60	2000
CLM6200	Axial	10K@ 10ma	10Meg	60	2000
CLM6500	Axial	400@ 20ma	10Meg	100	2000
CLM8000	Axial	400@ 40ma	500K	220	2500
CLM8200 Ⓤ	Axial	2.8K@ 16ma	10Meg	220	2500
CLM8200/2	Axial	5.0K@ 16ma	10Meg	100	2500
CLM8500	Axial	2.0K@ 16ma	10Meg	220	2000
CLM8500/2	Axial	1.0K@ 16ma	1Meg	100	2000
CLM8500HV	Axial	5K@ 16ma	10Meg	400	2000
CLM8600 Ⓤ	Axial	2K@ 16ma	10Meg	500	3000
CLM9000	Axial	1.2Meg@ 16ma	1000Meg	3500	7000

Part No.	Package	R "ON" Ohms Max	10 SEC R "OFF" Ohms Min	Cell Volts PAC	Isol. Volts
CLM50 Ⓤ	DIP	2.5K@ 16ma	1Meg	250	2500
CLM51 Ⓤ	DIP	4.5K@ 1ma	1Meg	250	2500
CLM60 Ⓤ	DIP	4K@ ±16ma	1Meg	250	2500
CLM61 Ⓤ	DIP	7K@ ±1ma	1Meg	250	2500
CLM7000	Radial	3.5K@ 2ma	5Meg	100	750
CLM7100	Radial	11K@ 2ma	10Meg	100	750
CLM7200	Radial	36K@ 2ma	10Meg	100	750

Ⓤ IRED – PHOTOTRANSISTOR AXIAL ISOLATOR

Part No.	C.T.R. V_{CE}=10V % Min	I_F ma	Isolation Volts PAC	BV_{CEO} I_C=1ma Volts	I_{CEO} @V_{CE}=10V na
CLA7	20	10	7000	40	50
CLA7AA	10	10	7000	40	100

Ⓤ IRED – PHOTODARLINGTON AXIAL ISOLATOR

Part No.	C.T.R. V_{CE}=10V % Min	I_F ma	Isolation Volts PAC	BV_{CEO} I_C=.1ma Volts	I_{CEO} @V_{CE}=10V na
CLA7D	400	10	7000	40	100
CLA7DA	200	10	7000	40	100

Ⓤ THE SURVIVOR® – HERMETICALLY SEALED COMPONENTS – AXIAL ISOLATOR

Part No.	C.T.R. V_{CE}=10V % Min	I_F ma	Isolation Volts PAC	BV_{CEO} I_C=1ma Volts	I_{CEO} @V_{CE}=10V na	Type of Units
CLA60	40	10	10,000	55	50	IRED — PHOTOTRANSISTOR
CLA60AA	20	10	10,000	55	50	IRED — PHOTOTRANSISTOR
CLA60AB	10	10	10,000	40	100	IRED — PHOTOTRANSISTOR
CLA65	400	10	10,000	55	100	IRED — PHOTO DARLINGTON
CLA65AA	200@ V_{CE}= 5V	10	10,000	40	100	IRED — PHOTO DARLINGTON
CLA90	3.5 volts	1	10,000	—	4 volts	IRED — PHOTO INTEGRATED CIRCUIT
CLA90AA	3.5 volts	5	10,000	—	4 volts	IRED — PHOTO INTEGRATED CIRCUIT

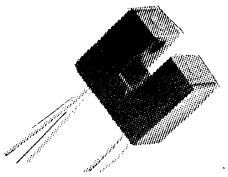
PHOTOMOD® PHOTOCONDUCTIVE CELL – LAMP ISOLATORS

Part No.	Dia. Inch	Length Inch	R "ON" Ohms Max	@ Lamp Rated Voltage Volts	10 SEC R "OFF" Ohms Min	Cell Volts PAC	Isolation Voltage PAC
CLM3006A	.415	1.125	160	6	10 Meg	200	2500
CLM4006A	.415	1.125	55	6	1 Meg	200	2500
CLM3012A	.415	1.125	160	12	100 Meg	200	2500
CLM4012A	.415	1.125	30	12	1 Meg	200	2500
CLM5H10A	.415	1.125	3000	10	10 Meg	200	2500
CLM7H16A	.415	1.125	550	16	10 Meg	200	2500
CLM3120A	.415	1.125	1150	120 *	100 Meg	200	2500
CLM4120A	.415	1.125	160	120 *	1 Meg	200	2500
CLM3500	.420 X .445 X .620		160	120 *	1 Meg	250	1600
CLM3500/2	.420 X .445 X..620		500	120 *	1 Meg	120	1600
CLM3700	.420 X .445 X .620		1000	120 *	1 Meg	250	1600

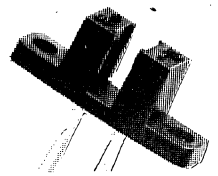
*Series resistor required.

Ⓤ U.L. RECOGNIZED COMPONENT

CLAIREX ELECTRONICS
A DIVISION OF CLAIREX® CORPORATION
560 South Third Avenue, Mount Vernon, N.Y. 10550 (914) 664-6602
WRITE FOR NAME OF YOUR NEAREST CLAIREX REPRESENTATIVE OR DISTRIBUTOR



Clairex



OPTICAL SWITCHES

HERMETICALLY SEALED EMITTERS AND SENSORS

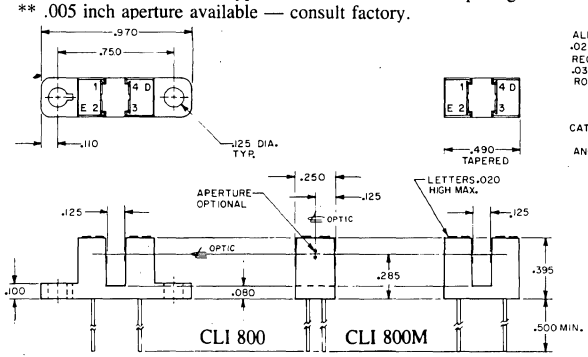
Part No.	Dimensions Height, Width, Thickness Inches	Gap Width Inches	Slit on Sensor	I_{CE} min (ma) V_{CE} = 5V	@ I_F ma	BV_{CEO} Volts	I_D max (na) V_{CE} = 10V	Internal R_L	Sensor Darlington	Sensor Transistor
CLI 200	.425 x .500 x .250	.100	—	1.0	20	40	50	No		✓
CLI 210	.425 x .500 x .250	.100	.005	0.1	20	40	50	No		✓
CLI 220	.425 x .500 x .250	.100	—	10.0	20	40	100	No	✓	
CLI 230	.425 x .500 x .250	.100	.005	2.0	20	40	100	No	✓	
CLI 305	1.312 x .950 x .500	.250	.005	.5V Max.	20	30	4.7V Min.	No	Emitter Follower	
CLI 325	1.312 x .950 x .500	.250	—	3.0	10	30	100	No	✓	
CLI 355	1.312 x .950 x .500	.250	—	12.0	10	30	100	Yes	✓	
CLI 375	1.312 x .950 x .500	.250	—	1.0	20	30	100	No		✓
CLI 385	1.312 x .950 x .500	.250	—	3.5 Volts	15	15	.4V Max.	No	Integrated Circuit	
CLI 395	1.312 x .950 x .500	.250	—	.5	10	30	100	No		✓

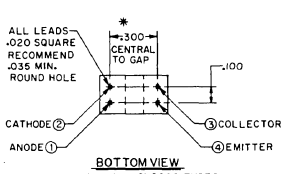
PLASTIC ENCAPSULATED EMITTERS AND SENSORS

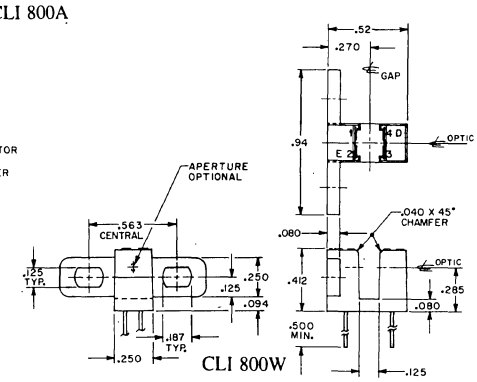
Part Numbers			Gap Width Inches	Slit** on Sensor	I_{CE} min ma	V_{CE} Volts	@I_F ma	BV_{CEO} Volts	I_D max (na) VCE=10V	Sensor Darlington	Sensor Transistor
CLI 800	CLI 800M	CLI 800W	.125	—	0.4	5	20	30	100		✓
CLI 810	CLI 810M	CLI 810W	.125	—	1.0	5	20	30	100		✓
CLI 820	CLI 820M	CLI 820W	.125	—	2.0	5	20	30	100		✓
CLI 830	CLI 830M	CLI 830W	.125	—	4.0	5	20	30	100		✓
CLI 835	CLI 835M	CLI 835W	.125	.010	0.4	5	20	30	100		✓
CLI 811	CLI 811M	CLI 811W	.125	—	1.0	5	20	50	50		✓
CLI 821	CLI 821M	CLI 821W	.125	—	2.0	5	20	50	50		✓
CLI 831	CLI 831M	CLI 831W	.125	—	4 0	5	20	50	50		✓
CLI 836	CLI 836M	CLI 836W	.125	.010	0.4	5	20	50	50		✓
CLI 840	CLI 840M	CLI 840W	.125	—	2.5	1.5	5	30	250	✓	
CLI 850	CLI 850M	CLI 850W	.125	—	5.0	1.5	5	30	250	✓	
CLI 860	CLI 860M	CLI 860W	.125	—	10.0	1.5	5	30	250	✓	
CLI 870	CLI 870M	CLI 870W	.125	.010	1.0	1.5	10	30	250	✓	
CLI 841	CLI 841M	CLI 841W	.125	—	2.5	1.5	5	55	100	✓	
CLI 851	CLI 851M	CLI 851W	.125	—	5.0	1.5	5	55	100	✓	
CLI 861	CLI 861M	CLI 861W	.125	—	10.0	1.5	5	55	100	✓	
CLI 871	CLI 871M	CLI 871W	.125	.010	1.0	1.5	10	55	100	✓	

* The respective CLI 800 types are available with lead spacing of .220 inches. Add the suffix A, ie. CLI 800A

** .005 inch aperture available — consult factory.







CLAIREX ELECTRONICS

A DIVISION OF CLAIREX® CORPORATION

560 South Third Avenue, Mount Vernon, N.Y. 10550 (914) 664-6602

WRITE FOR NAME OF YOUR NEAREST CLAIREX REPRESENTATIVE OR DISTRIBUTOR

- Photoconductive Cells
- Interrupter Switches
- Phototransistors and Photodarlingtons
- Retroreflective Switches
- Light Activated Switches

VACTEC

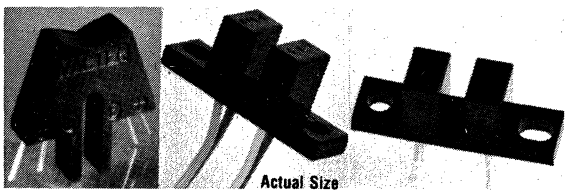
- Selenium Photovoltaic Cells
- Vactrols (Opto-Isolators)
- Infrared Emitters

INDUSTRY'S BROADEST OPTOELECTRONIC LINE

- Standard Silicon and Blue-Enhanced Photovoltaic Cells, Blue-Enhanced Photodiodes, and PIN Photodiodes

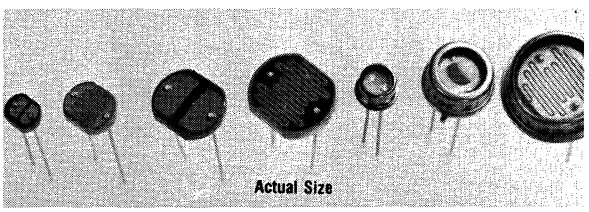
RETROREFLECTIVE & INTERRUPTER SWITCHES (Slotted)

Standard and custom optical switches—infrared GaAs LED and silicon phototransistor in an I-R transmitting housing. No openings or seams to collect dirt—available completely sealed for submersion during board cleaning—interchangeable with industry standard sizes. Request bulletins RPS-1 and SPS-1. New slotted switch with Schmitt Trigger output, bulletin SPS-2.



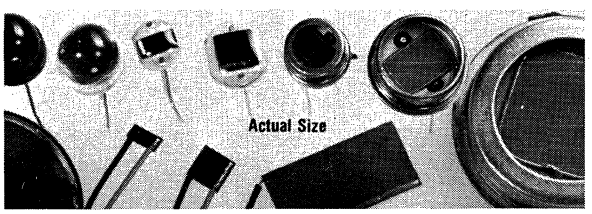
PHOTOCONDUCTIVE CELLS

Vactec light dependent resistors (LDR's) are available in three hermetic enclosures (TO-18, TO-5, TO-8) and 4 ceramic types. Ceramic types have automatically inserted wires which insure perfect contact integrity. Six materials of CdS, CdSe and CdSeS-CdS mixtures with spectral response peaks from 565-735 nm. Each material has a variety of sensitivities to satisfy all requirements. Request bulletin PCD-6.



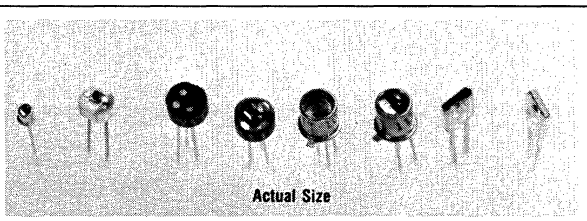
SILICON PHOTOVOLTAIC CELLS

Three processes: BLUE ENHANCED, LOW CAPACITANCE, STANDARD SOLAR. All available in a variety of hermetic, ceramic, as chips, or with flying leads. The BLUE ENHANCED cells are unique large area detectors with high U-V sensitivity to as low as 200 nm. Almost non-existent U-V enhancement effect with stability equivalent to high quality photodiodes. Request bulletin VTS3A. LOW CAPACITANCE cells have fast response less than 15μS with 10KΩ load. The high shunt impedance is desirable for driving amplifiers. Request bulletin VTS-2. SOLAR cells have high V_{oc} at low illumination (typ 200mV at .05mW/cm²). Linear over wide illumination range—request bulletin VTD-1.



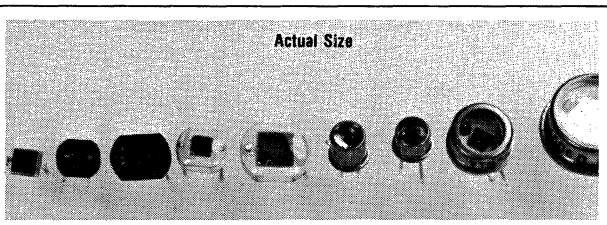
PHOTOTRANSISTORS — LED'S — PHOTODARLINGTONS — LIGHT ACTIVATED SWITCHES (LAS)

Phototransistors and photodarlingtons are NPN passivated—4 chip sizes of 25, 40, 50, and 60, mil square in TO-18, ceramic, coaxial, and lateral (side looking) packages. High light current at very low drive current ideal for instrumentation applications. Request bulletin VTTA-3A. GaAs I-R LED's with excellent stability in TO-18, T-1, T-1¾, lateral packages. Bulletin VTE-1. LAS (light activated switches) have high sensitivity with Schmitt Trigger output. Bulletin LAS-1, LAS-2.



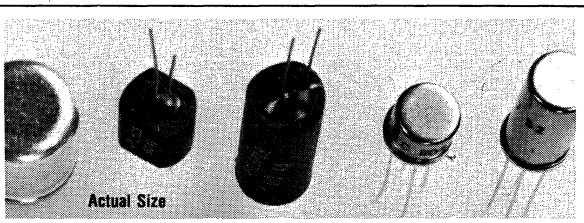
PHOTODIODES

BLUE ENHANCED photodiodes are extremely low dark current devices with excellent response in the U-V. Less than 10pA (I_D) for small chips. Large area diodes (VTB5051) 14.8mm² active area with 1.2A/(W/cm²) at 365nm and I_D of 250pA max. Request bulletin VTB-1B. FAST photodiodes have low capacitance. Use with reverse bias for fast response time and excellent linearity. Ideal for remote I-R sensor digital controls. Request bulletin VTD-1.



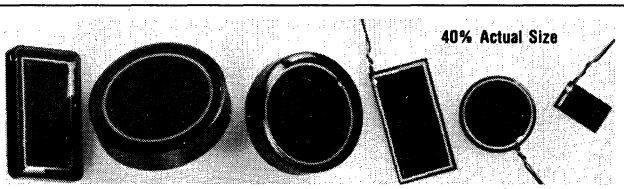
VACTROLS

Optical couplers using LED's, neons, or incandescent lamps as the emitter and Vactec photoconductive cells (LDR's) as the detector. For noiseless switching and signal monitors for audio. Neon types to sense telephone ring. LED types for triac gate control. Incandescent types for low cost true RMS sensor as voltage regulator or control of constant wattage heater. Five package types include 2 hermetic. Request bulletins VTL1, VTL2C, VTL3, VTL5CA, VTL5C8 and VTL9.



SELENIUM PHOTOVOLTAIC CELLS

Large area detectors for direct meter drive or in conjunction with amplifier. Spectral response peaks at 575 nm and is close to visible response. Available with integral #102 filter to match standard observer curve (CIE). Available in many flat or round cells with or without leads—also in 9 package styles including 2 hermetic. Request bulletin SPV-5A.



WRITE FOR CUSTOM DETECTORS OR ASSEMBLIES ALL PRODUCTS

EG&G VACTEC 10900 Page Blvd. • St. Louis, Mo. 63132 • (314) 423-4900 • TWX 910-764-0811

HEI OPTOELECTRONIC PRODUCTS

OPTICAL SWITCHES

HEI optical switches consist of an LED/photo-transistor pair operating across an air gap. Light beam interruption causes a change in output. Switches are contactless, highly reliable, and extremely long-lived. The LEDs operate in the infrared range.
Choose from 32 models, including some with integral hybrid amplifiers and Schmitt triggers. Both analog and digital models.

Two small packages available with either DIP pins or 12-in. leads. Most styles compatible with TTL/DTL/MOS circuits. OS-591S series have TTL/DTL square wave output. Switches are normally closed when uninterrupted. Precise alignment gives maximum output, and lens system reduces ambient light. HEI offers custom packaging, and can meet special performance requirements. Contact factory representative for specific information.

- **OS-521S-XXX** Contains LED and high-gain photo transistor. Medium speed, analog output.
- **OS-581-XXX** Contains LED and photo Darlington transistor. High gain, medium speed. Ideal for limit switching, presence detection. Analog output.
- **OS-561A-XXX** LED/photo transistor with integral hybrid amplifier for high speed, high output current. Used with TTL/DTL gates, analog output.
- **OS-591S-XXXL** Ultimate optical switch with hybrid amplifier and Schmitt trigger. Square wave output at TTL levels. Positive switching at all speeds.

PART NUMBER EXAMPLE:

OS - 5 6 2 A - 200 L W

- Optical Switch
- LED Series
- Sensor Series
- No. of LED/Sensor Pairs
- Optional Circuitry: Amplifier (A), Schmitt Trigger (S)
- Gap Dimension in mils: 060, 200
- Package Size: Small Housing (Blank), Large Housing (L)
- Wire Added Optional (W)

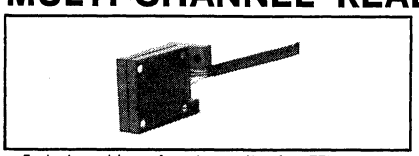
Absolute Maximum Ratings (25°C free air)

Single Channel — Part Number / Dual Channel — Part Number		OS-521-XXX OS-522-XXXL	OS-581-XXX OS-582-XXXL	OS-561A-XXX OS-562A-XXXL	OS-591S-XXXL OS-592S-XXXL
LED Side:					
Forward Current (mA)	$I_{F/LED}$	50	50	50	50
Reverse Voltage (V)	V_R	3	3	3	3
Power Dissipation (mW)	$P/_{LED}$	75	75	75	75
Sensor Side:					
Voltage Collector to Emitter (V)	V_{CEO}	20	20	25	5
Voltage Emitter to Collector (V)	V_{ECO}	5	5	5	5
Light Current (mA)	I_L	5	5	10	50
Power Dissipation (mW)	$P/_{Sensor}$	100	100	100	200

Electrical Characteristics (Typ.)

Light Current (I_F=35mA, V_{CC}=5V, R_L=1K) (mA)	I_L	1.0	2.0	4.7	4.9
Dark Current (I_F=0, V_{CE}=5V, H=0) (μA)	I_D	0.1	0.1	10	0.1
LED Forward Voltage (I_F=40mA) (V)	V_F	1.3	1.3	1.3	1.3
Sensor Saturation Voltage (I_F=35mA, R_L=10K, V_{CC}=5V) (V)	$V_{CE(SAT)}$	.35	.8	0.2	0.1
Switching Speeds (For .060 Gap)					
Rise Time (μsec)	t_r	25	150	15	.05
Fall Time (μsec)	t_f	30	170	20	.1
Frequency (KHz)	f	10	2.5	10	15

MULTI-CHANNEL READER



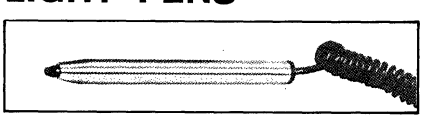
The 125-1 assembly contains infra-red LEDs which are spectrally matched with silicon photo transistors. Hybrid circuitry is included for TTL compatibility. Primarily designed as an 8 or 12 channel vertical format unit for line printers.
Number of channels and centerline spacing may be varied to suit assorted applications. Air gap may be specified, along with analog or digital output.
Using a data hole width of .030", an obstruction of ≤15% transmissivity will result in a low output. Obstruction of ≥40% transmissivity causes a high output. A glass wear plate provides self cleaning and dust elimination.

- Each channel has a fanout capacity of 10 TTL gates, with CMOS compatibility optionally available.
- Source and sensor sides electrically isolated to avoid ground loop.
- Non-standard data holes (less than .030" or greater than .073") available on request.
- Standard sensor spacing is .1094" for 12 channel unit, .100" for 8 channel unit (except for channels 6 and 7 which are .250").
- Supply voltage 4.5 to 5.5V. Output current 800 μA high, 16 mA low.
- Slot depth 1.725" standard, width 1.5", gap .020".

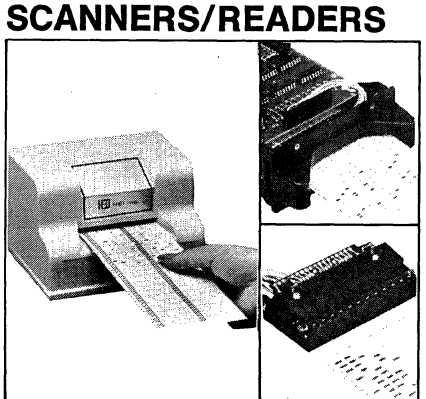
CHARACTERISTICS		MIN.	TYP.	MAX.
High Level Output Voltage (V_{CC}=4.75V, I_{OH}=-800 μA)	V_{OH}	4.5V	4.75V	
Low level Output Voltage (V_{CC}=4.75V, I_{OL}=16 mA)	V_{OL}		0.2V	0.4V
*Short Circuit Output Current (V_{CC}=5.25V)	I_{OS}	-1.8 mA		-2.5 mA
Supply Current (Per Channel)				
Source Side (V_{CC}=5.25V)	I_{CC}		21 mA	25 mA
Detector Side (V_{CC}=5.25V)	I_{CC}		3.6 mA	5.0 mA

*Not more than one output should be shorted at one time.

LIGHT PENS



SCANNERS/READERS



LIGHT PENS

HEI CRT light pens are solid-state assemblies designed for interactive graphic design and manipulation, cursor control, menu selection. Used for computer-aided instruction, medical instrumentation and other tasks. Provide TTL "hit" and "switch" signals. HEI Model 120-3 has black plastic barrel, 120-7 has slimmer stainless steel barrel. Lt. wt., meet mil stds for radiation susceptibility and vibration. HEI's IBM PC-compatible "Fast-Point" light pen is designed to work with PC, XT, and most compatibles. Supports standard MS-DOS pen software functions. Plugs into color or mono board. Supplied with programming assistance software. Available with aluminum or optional stainless steel body.

SPECIFICATIONS

Circuitry ..... HEI hybrid electronics
Input ..... +5VDC, 50 mA
Sensitivity ..... .3 foot lamberts at max. setting
Ambient Light Rejection ..... greater than 100 foot lamberts
Response Time ..... less than .5 microseconds at detectable levels of screen brightness (set at maximum sensitivity)
Field of View .... not greater than .2-inches at 30 foot lamberts screen brightness
(Sensitivity and field of view measurements conducted on an unblanked P4 phosphor screen at 60Hz refresh rate. Different values apply to HEI P39 phosphor monochrome light pen)
Material ..... plastic, anodized aluminum, or optional stainless-steel barrel
Weight ..... less than 100 grams (aluminum model)
Uncoiled Cable Length ..... 6-ft.

SCANNERS/READERS

HEI programmable scanners handle marked or punched cards from 2 through 12-inches long. Light paper or card stock. Simple and dependable — only 4 moving parts. Over 30 operating functions controlled by software, including communication protocol, data mark definition, sensitivity, feed control, output format, samples per mark. Forms fed through or returned to front. Read pencil, pen or marker, any color but red. Proven in manufacturing, educational, medical and lottery applications.

HEI offers several scanner and reader models for both end-user and OEM applications.

SPECIFICATIONS

Input Document ..... from 20-lb. paper to 100-lb. card stock
Width — Model 185 3.25-in.; Model 187 4.25-in
Length — 2-in. min. to 12-in. max.
Strobe — black ink
Response Blocks & Instructions — red ink
Marking Media ..... punched hole, or any dark mark from pencil, pen, ball point, felt-tip, in any color except red
Interface ..... Serial RS232C, baud rates 300 - 9600, 1 or 2 stop bits, 7 or 8 data bits
Input Power .. 115VAC (wall-mt. transformer included)
Dimensions ..... 4.39-in. H x 6.82-in. W x 5.17-in. D (11.15cm x 17.32cm x 13.13cm)
Feed Rate ..... 18 or 25-inches-per-second, selectable

The Optoelectronic Specialists

HEI inc. DEPT. EM • VICTORIA, MN 55386 • (612) 443-2500

Precision

It's a critical word in the optical coating industry. We thrive on words like that at Liberty Mirror, and have since 1914. With capabilities like our 22 Chambers, including large substrate coating up to 10 feet in diameter or 100″ × 100″ square, and fabrication from laminating through polishing, we're geared for precision.

Here are a few more words we like . . . Reliability, Experience and Service.

Liberty Mirror . . . We *know* we can help.

LIBERTY MIRROR®

LOF Glass
A Libbey-Owens-Ford Company

851 Third Avenue
Brackenridge, PA 15014
(412) 224-1800

© 1984 Libbey-Owens-Ford Company

ARehlander Associates

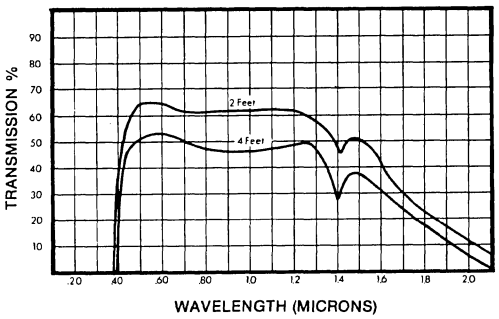
118A BRIDGE STREET
BEVERLY, MASSACHUSETTS 01915
(617) 922-5961

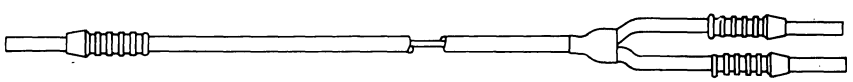
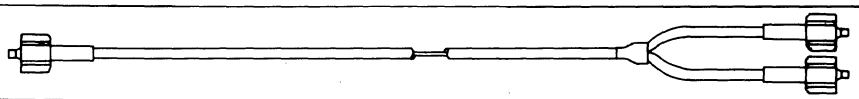
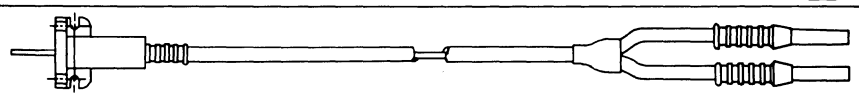
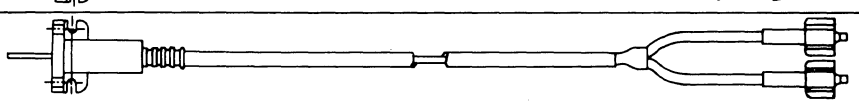
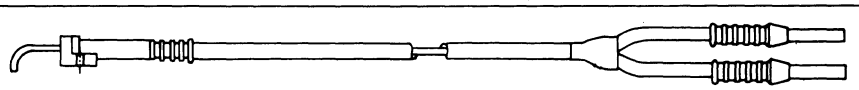
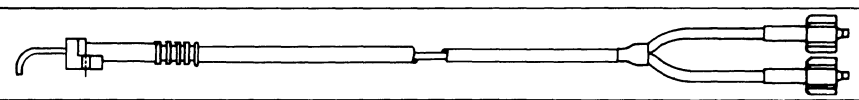
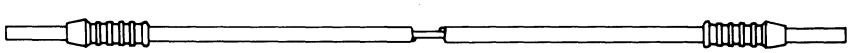
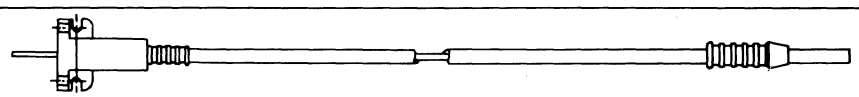
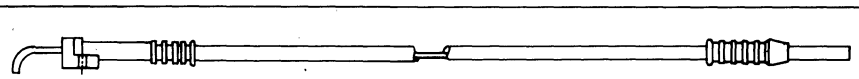
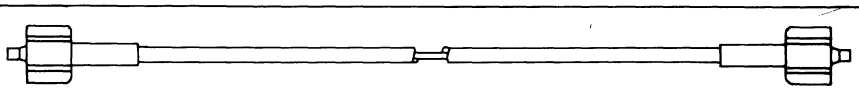
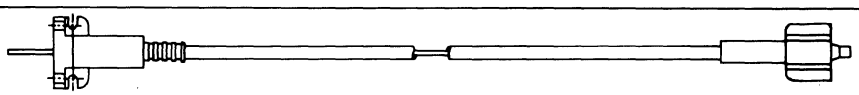
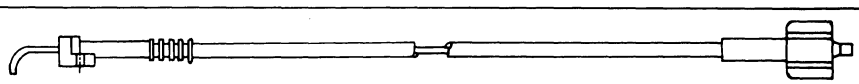
FIBER OPTIC PHOTOELECTRIC SENSOR CABLES

New line of fiber optic sensor cables allow photoelectric sensing in confined areas where space prohibits conventional emitters and detectors. Electrical isolation is provided for access into explosive or wet environments. Fiber optic sensor cables are compatible to standard PC board active device mounts and bulkhead receptacles allowing all electronic components to be mounted on the PC board. Proximity type sensors combine emitter and detector into a homogenous .032″ or .062″ active diameter.

Specifications:
Transmission: 600 to 700 dB/Km
Numerical Aperture: 0.56NA
Acceptance Angle: 68°
Operating Temperature: -40°F to +225°F
Outside Diameter of Cable: .125″
Minimum Bend Radius: .25″

TRANSMISSION VS WAVELENGTH



	Common Bundle Diameter	Part Number (length)
REFLECTIVE TYPE		
	.032	P032-XX-PSC
	.062	P062-XX-PSC
	.032	S032-XX-SASC
	.062	S062-XX-SASC
	.032	HM032-XX-PSC
	.062	HM062-XX-PSC
	.032	HM032-XX-SASC
	.062	HM062-XX-SASC
	.032	HLM032-XX-PSC
	.062	HLM062-XX-PSC
	.032	HLM032-XX-SASC
	.062	HLM062-XX-SASC
OPPOSED TYPE		
	.032	P032-XX-P
	.062	P062-XX-P
	.032	HM032-XX-P
	.062	HM062-XX-P
	.032	HLM032-XX-P
	.062	HLM062-XX-P
	.032	S032-XX-SA
	.062	S062-XX-SA
	.032	HM032-XX-SA
	.062	HM032-XX-SA
	.032	HLM032-XX-SA
	.062	HLM062-XX-SA

MINIGLOSSARY OPTO SEMICONDUCTORS

Avalanche Photodiode: A photodiode that takes advantage of avalanche multiplication of photocurrent. It is particularly suited to low noise and/or high speed applications.

Contrast: A noticeable difference in color, brightness, or other characteristics in a side-by-side comparison.

Chrominance Contrast: The color contrast between two adjacent surfaces of identical area, shape, texture, and luminance. The human eye is more sensitive to differences in color than it is to differences in brightness.

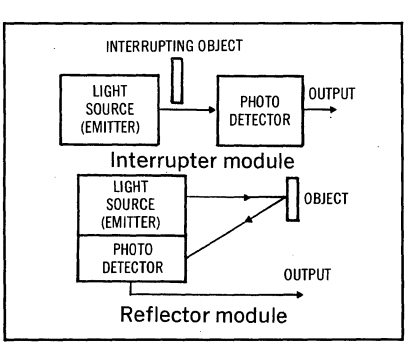
Current Transfer Ratio: The ratio of an optocoupler's output current to input current at a specified bias.

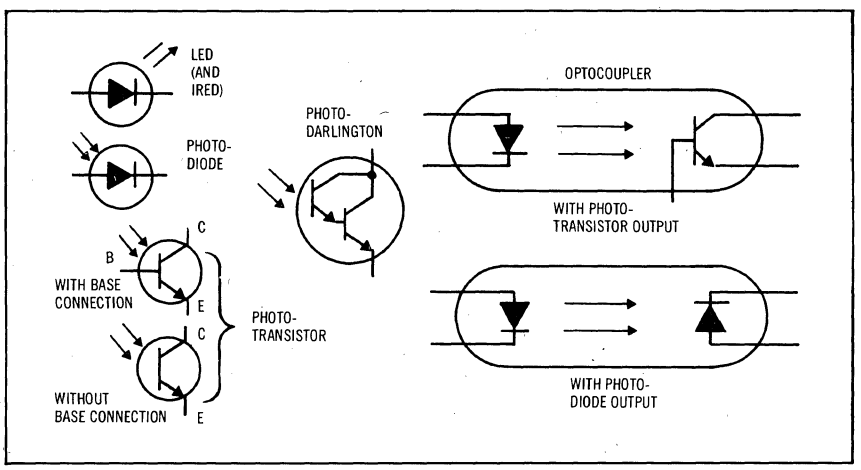
Dark Current: The leakage current of a photodetector with no incident light.

Dominant Wavelength: The wavelength that is a quantitative measure of apparent color of light as perceived by the human eye.

Infrared Radiation: The electromagnetic wavelength region between approximately 0.75 and 100 micrometers longer than the wavelength of visible light.

Interrupter (module): A device that produces an electrical output signal when an object breaks the light (visible or invisible) between a light source and a photodetector.





IRED: An infrared-emitting diode. See light-emitting diode.

Light Current: The current that flows through a photodetector when it is exposed to radiant energy.

Light-Emitting Diode (LED): A semiconductor diode that emits incoherent light at its PN junction when forward biased. The light can be in the visible or invisible (infrared) wavelength region.

Luminance Contrast: The observed brightness of a light-emitting element compared to the brightness of the "surround," an integral part of the device and inseparable from it.

Optocoupler: A device that transmits electrical signals, without electrical connection, between a light source (input) and the receiver (output). The input is generally an LED; the output might be a photodiode, phototransistor, a photo–Darlington, etc. Sometimes referred to as optoisolator.

Peak Wavelength: The wavelength at the peak of the radiated spectrum of an emitter.

Photo–Darlington: A light-sensitive Darlington-connected transistor pair. The photo–Darlington has a very high sensitivity to illumination or radiation.

Photodetector: A device that provides an electrical output signal when subjected to radiation in the visible, infrared, or ultraviolet regions of the electromagnetic spectrum. Photodiodes, phototransistors, and photo–Darlingtons are the most common type of photodetectors.

Photodiode: A junction diode that is responsive to radiant energy. Photodiodes have a high degree of linearity between the input radiation and the output current, and faster switching speeds than phototransistors.

Photothyristor: A thyristor whose switching action is controlled by light applied to the thyristor gate.

Phototransistor: A light-sensitive transister that delivers an electrical output proportional to the light intensity at its input. The low-level photocurrent that is generated is amplified by the current gain of the transistor. The base region (or gate in a FET) may or may not be brought out as an external terminal.

Point Source: A source with a maximum dimension less than one-tenth the distance between sources and detector.

Reflector (module): A device containing a light source and a photodetector that detects any object that reflects light produced by the source back to the detector.

SILONEX inc

CdS/CdSe PHOTOCONDUCTIVE CELLS • OPTICALLY COUPLED ISOLATORS • SILICON PHOTODIODES AND PHOTODIODE ARRAYS • CUSTOMIZED OPTOELECTRONIC ASSEMBLIES

CdS & CdSe PHOTOCELLS

Cell Type No.	Typical 1.0 Ftc Res. KΩ	Min. Dark Res. MΩ	Max. Peak Volt.	Max. Power MW.	Description
NSL-3120	75	100	70	50	CdSe Photoconductive Cell in Hermetic Glass and Metal TO-18. CdS versions also available.
NSL-3130	30	100	70	50	
NSL-3140	14	100	70	50	
NSL-3150	550	1000	250	50	
NSL-3160	260	1000	250	50	
NSL-3170	110	1000	250	50	
NSL-3180	50	500	120	50	
NSL-3812	43	10	80	100	CdSe Photoconductive cell in TO-5 plastic coated "open pill" package. Also available in CdS material.
NSL-3822	18.6	10	80	100	
NSL-3832	8	10	80	100	
NSL-3842	3.5	10	80	100	
NSL-3852	330	100	320	100	
NSL-3862	155	100	320	100	
NSL-3872	66	100	320	100	
NSL-4440	120	50	1000	1000	1" CdS Photoconductive Cell in Hermetic Glass and Metal case 1.25" diameter.
NSL-4450	26.0	15	1000	1000	
NSL-4460	11.4	5	1000	1000	
NSL-4470	5.5	0.5	1000	1000	
NSL-4442	120	10	1000	500	1" CdS Photoconductive Cell in plastic coated "open pill" package.
NSL-4452	26	1.5	1000	500	
NSL-4462	11.4	0.5	1000	500	
NSL-4472	5.5	0.2	1000	500	
NSL-4610	65	80	80	100	CdS Photoconductive Cell in Hermetic Glass and Metal ¼" dia. case. Hermetic CdSe versions also available.
NSL-4620	28	20	80	100	
NSL-4630	12	2.7	80	100	
NSL-4640	5.2	0.7	80	100	
NSL-4650	550	160	250	100	
NSL-4660	230	20	250	100	
NSL-4670	100	4	250	100	
NSL-4810	43.0	65	120	200	CdS Photoconductive Cell in Hermetic Glass and Metal TO-5. Plastic coated "open pill" versions also available.
NSL-4820	18.6	15	120	200	
NSL-4830	8	1.8	120	200	
NSL-4840	3.5	0.25	120	200	
NSL-4850	330	200	320	200	
NSL-4860	155	130	320	200	
NSL-4870	65	20	320	200	
NSL-2930	1.7	0.5	80	500	TO-8 Hermetic CdS/Se Photoconductive Cell.
NSL-2940	.75	0.1	80	500	
NSL-2970	7.5	5.0	250	500	
NSL-3921	4.0	2	80	200	TO-8 CdSe Photoconductive Cell in Plastic Case. Glass Lens and Plastic Coated "open pill" and CdS versions also available.
NSL-3931	1.7	2	80	200	
NSL-3941	0.75	2	80	200	
NSL-3951	40.0	5	320	200	
NSL-3961	17.0	5	320	200	
NSL-3971	7.5	5	320	200	
NSL-4920	4.0	2.0	80	500	CdS Photoconductive Cell in Hermetic Glass and Metal TO-8. Hermetic CdSe version also available.
NSL-4930	1.7	0.4	80	500	
NSL-4940	0.75	0.05	80	500	
NSL-4950	40	30	320	500	
NSL-4960	17	4.0	320	500	
NSL-4970	7.5	0.5	320	500	
NORP-11	20	2.5	320	250	CdS Photocell in 0.5" lensed Plastic case.
NORP-12	9	1	320	250	
NORP-13	4	0.5	320	250	
NSL-4512	43.0	5	120	100	CdS Photoconductive cell in Hermetic TO-5 package. Two plastic encapsulated versions also available.
NSL-4522	18.6	1.5	120	100	
NSL-4532	8	0.50	120	100	
NSL-4542	3.5	0.10	120	100	
NSL-4552	330	20	320	100	
NSL-4562	155	15	320	100	
NSL-4572	65	2	320	100	

UV SENSITIVE LDRs

Cell Type No.	Typical 1.0 Ftc Res. KΩ	Min. Dark Res. MΩ	Max. Peak Volt	Max. Power MW	Description
NSL-2129/3	1.7	0.2	80	200	0.5" Plastic Case with Phosphor-Coated Quartz Window
NSL-2129/6	17.0	1	320	200	

PIN PHOTODIODES

NSL Type No.	Light Current* MA	Dark Current nA	Rise Time nS	Fall Time nS	Description
NSL-530	0.3	10	3	6	TO-18 Package
NSL-580	1.5	30	5	8	TO-5

* At 500 Ftc (25 MW/cm²) 2870°K Source

PHOTODETECTOR LAMP/LED ASSEMBLIES

CdSe Photodetector

Module Type No.	Emitter Volts	Emitter Current MA	Detector Max. ON Res. Ω	Detector Min. OFF Res. MΩ	Detector Max. Volts	Detector Max. Power mW	Description
PL-1033-1	10	15	100	10	80	250	Phenolic .75" x .75" x 625" Pin Leads for P.C. Board Mounting, (Matched, Multi-Detector Configurations available.)
PL-1036-1	10	15	400	50	320	250	
PL-2H33-1	200	2	100	10	80	250	
PL-2H36-1	200	2	400	50	320	250	
PL-5S33-1		25	250	10	80	250	
PL-5S36-1		25	2000	100	320	250	
PLT-10384	10	15	250	10	80	100	Standard tube; Axial leads.
PLT-10387	10	15	3000	50	320	100	
PLT-2H384	200	2	500	10	80	100	
PLT-2H387	200	2	10000	50	320	100	
PLS-5S380		25	250	10	80	100	Small tube; Axial leads.
PLS-5S387		25	4000	100	320	100	
PLM-5S310		25	500	10	80	50	Miniature Tube; Axial leads.
PLM-5S317		25	5000	100	320	50	

SILICON PHOTODIODES

Cell Type No.	Min. Short Ct.* Curr. MA	Min. Open Ct.* Volt.	Dark Curr. μA @ 1V @ 25°C	Reverse Voltage Recom. Max.	Description
NSL-701-1	0.30	0.35	3	5	.1" x .2" Chip.
NSL-801-1	0.325	0.275	1.5	10	Wire Leads
NSL-701-9	0.30	0.35	3	5	9 Element Cell, 0.1" Spacing
NSL-702	0.6	0.35	5	5	.2" x .2" Chip.
NSL-802	0.65	0.275	2.5	10	Wire Leads
NSL-703	1.4	0.35	15	5	.2" x .4" Chip.
NSL-803	1.5	0.275	7.5	10	Wire Leads
NSL-705	4.5	0.35	25	5	.76" x .354" Chip. Wire Leads
NSL-805	4.77	0.275	12.5	10	
NSL-706	2.9	0.35	20	5	.4" x .4" Chip.
NSL-806	3.0	0.275	10	10	Wire Leads
NSL-707	3.3	0.35	25	5	.2" x 1" Chip.
NSL-807	3.5	0.275	12.5	10	Wire Leads
NSL-708	1.3	0.35	15	5	.1" x 1" Chip.
NSL-808	1.4	0.275	7.5	10	Wire Leads
NSL-710	0.125	0.4	1	5	TO-18 Package
NSL-810	0.150	0.275	0.5	10	
NSL-751	1.4	0.35	2.0	5	0.5" dia.
NSL-851	1.5	0.275	10	10	Epoxy Package
NSL-781	0.28	0.35	5	5	Hermetic TO-5
NSL-881	0.3	0.275	2.5	10	Case
NSL-782	0.42	0.35	5	5	
NSL-791	0.60	0.35	5	5	Hermetic TO-8
NSL-792	1.1	0.35	15	5	Case
NSL-8932	0.65	0.275	0.5	10	0.5" dia. Ceramic

* At 500 Ftc (25 MW/cm²) 2870°K Source

SILICON PLANAR PHOTODETECTORS

Cell Type No.	Min. Short Ct.* Curr. μA	Min. Open Ct.* Volt.	Dark Curr. NA @ 5V @ 25°C	Breakdown Voltage (V)	Description
NSL-811	100	0.4	5	40	TO-18, Flat Window
NSL-812	310	0.4	5	40	TO-18, Low Lens
NSL-813	220	0.4	5	40	TO-18, High Lens
NSL-814	90	0.4	5	40	TO-52, Flat Window
NSL-815	240	0.4	5	40	TO-52, Low Lens
NSL-883	360	0.4	10	20	TO-5, Flat Window
NSL-893	800	0.4	20	10	TO-8, Flat Window

* At 500 Ftc, 2870°K Source

SILICON BLUE SENSITIVE PHOTODIODES

Cell Type No.	Sensitivity @ 500 nM (A/W)	Min. Short Ct.* Curr. μA	Dark Curr. μA @ 1V @ 25°C	Breakdown Voltage	Description
NSL-710BG	0.17	18	1.0	5	TO-18, BG Filter
NSL-810BG	0.17	18	0.5	10	TO-18, BG Filter
NSL-811BG	0.20	18	0.005	40	TO-18, BG Filter
NSL-780BG	0.17	35	5.0	5	TO-5, BG Filter
NSL-880BG	0.17	35	2.5	10	TO-5, BG Filter
NSL-883BG	0.20	40	0.01	20	TO-5, BG Filter

* At 500 Ftc, 2870°K Source

SILONEX inc

TWX 610-421-3362
TLX 51 669 663

331 CORNELIA ST., PLATTSBURGH, NY 12901 TEL: (518) 561-3160
2150 WARD STREET, MONTREAL, QUE. H4M 1T7 TEL: (514) 744-5507
ALTRINCHAM, CHESHIRE, WA14 4NX TEL: (061) 928-3417

OPTO
INFRARED, IMAGING, and VISIBLE PRODUCTS

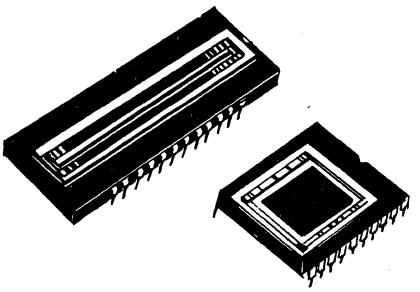
TI OPTOELECTRONICS

- CCD IMAGE SENSORS
- INTELLIGENT LED DISPLAYS
- OPTOCOUPLERS (ISOLATORS)
- SOURCE AND DETECTOR ASSEMBLIES (SDAs)
- INFRARED EMITTING DIODES (IREDs)
- PHOTODETECTORS (SENSORS)

TEXAS INSTRUMENTS
OPTO DEPARTMENT
P.O. BOX 225012, MS12
DALLAS, TEXAS 75265
214/995-3821

IMAGING PRODUCTS
CCD IMAGE SENSORS

Image sensors at sensible prices



- LINEAR IMAGE SENSORS
  - TC101 1728 X 1 Pixels
  - TC102 128 X 1 Pixels
  - TC103 2048 X 1 Pixels
  - TC104 3456 X 1 Pixels
- AREA IMAGE SENSORS
  - TC240C 754H X 488 V (Color)
  - TC210M 192H X 165 V

- All TI CCD IMAGE SENSORS FEATURE VIRTUAL PHASE TECHNOLOGY PROVIDING:
  - Single phase clocking for ease of use
  - Low noise/high dynamic range
  - High quantum efficiency
  - Low dark current
  - Improved blue response

Linear CCD Image Sensors

DEVICE NUMBER	DYNAMIC* RANGE	RESOLUTION 8.5" PAGE	PRNU** PEAK-TO-PEAK (TYP)	V_{SAT} (TYP)	SENSOR ELEMENT ORGANIZATION	MAX DATA RATE	CERAMIC PACKAGE
TC101	1000:1	200 lines/in	50 mV	1000 mV	1728X1	10 MHz	24 Pin DIP
TC102	1000:1	—	50 mV	1000 mV	128X1	10 MHz	10 Pin DIP
TC103	1000:1	240 lines/in	50 mV	1000 mV	2048X1	10 MHz	24 Pin DIP
TC104	1000:1	400 lines/in	30 mV	600 mV	3456X1	8 MHz	24 Pin DIP

*Measured as V_{SAT}/Peak-To-Peak Noise **Photo Response Non-Uniformity

CCD Image Sensor Evaluation Kits

KIT NUMBER	EVALUATION KIT CONSISTS OF
TCK101	TC101 plus PC401 Evaluation Board with complete operating instructions
TCK102	TC102 plus PC402 Evaluation Board with complete operating instructions
TCK103	TC103 plus PC401 Evaluation Board with complete operating instructions
TCK104	TC104 plus PC401 Evaluation Board with complete operating instructions

Area CCD Image Sensors

DEVICE	PIXEL FORMAT	PIXEL SIZE	ARCHITECTURE	ANTIBLOOM (MIN)	DYNAMIC RANGE (MIN)	DATA RATE/ CHANNEL	SENSITIVITY *(TYP)
TC210M	192 H x 165 V	13.75 x 16μ	Full Frame	10 X	60 dB	10 MHz	9.6 Lux
TC240C	754 H x 488 V	11.5 x 27μ	Frame Transfer	100 X	63 dB	4.77 MHz	9.6 Lux

*Measured with 6500Å Source and IR cutoff filter Fish/Shurman HA-11.

OPTO
INFRARED, IMAGING, and VISIBLE PRODUCTS

TI OPTOELECTRONICS

- CCD IMAGE SENSORS
- INTELLIGENT LED DISPLAYS
- OPTOCOUPLERS (ISOLATORS)
- SOURCE AND DETECTOR ASSEMBLIES (SDAs)
- INFRARED EMITTING DIODES (IREDs)
- PHOTODETECTORS (SENSORS)

TEXAS INSTRUMENTS
OPTO DEPARTMENT
P.O. BOX 225012, MS12
DALLAS, TEXAS 75265
214/995-3821

INFRARED PRODUCTS
OPTOCOUPLERS (ISOLATORS)

- High-Speed — 2 MHz Bandwidth
- High-Speed Logic Gates — 20 MHz Bandwidth
- High-Speed High-Gain — 600 KHz Bandwidth
- TRIAC Drivers
- High Reliability Hermetic Metal Cans — JAN, JANTX, JANTXV
- Industry Standards
- UL Approved and JEDEC Registered

6 Pin Dip

8 Pin Dip

TO-78

High-Speed (JEDEC Registered) 8 Pin DIP Plastic Couplers (T_A = 25°C unless otherwise noted)

TI PART NO.	CTR (MIN) @ I_F = 16 mA; V_O = 0.4 V	V_{OL} (MAX) @ I_F = 16 mA; T_A = 0°C to 70°C	V_F @ I_F = 16 mA	SWITCHING TIMES @ I_F = 16 mA		ISOLATION VOLTAGE
				t_{PHL} (MAX)	t_{PLH} (MAX)	
6N136	19%	0.4 V @ I_O = 2.4 mA	1.7 V (MAX)	0.8 μSEC @ 1.9KΩ	0.8μSEC @ 1.9KΩ	3 kV dc (MIN)
6N135	7%	0.4 V @ I_O = 1.1 mA	1.7 V (MAX)	1.5μSEC @ 4.1KΩ	1.5μSEC @ 4.1KΩ	

NOTE 1: Switching times measured at +25°C.

High-Speed Logic Gate (JEDEC Registered) 8 Pin DIP Plastic Couplers (T_A = 25°C unless otherwise noted)

TI PART NO.	LOW-LEVEL OUTPUT VOLTAGE V_{OL} (MAX) T_A = 0°C to 70°C	FORWARD VOLTAGE V_F (MAX)	SWITCHING TIMES		ISOLATION VOLTAGE
			t_{PLH} (MAX)	t_{PHL} (MAX)	
6N137	0.6 V @ I_F = 5 mA	1.75 V @ I_F = 10 mA	75 ns @ I_F = 7.5 mA R_L = 350Ω, C_L = 15 pF	75 ns @ I_F = 7.5 mA R_L = 350Ω, C_L = 15 pF	3 kV dc (MIN) @ humidity @ 45%, t = 5 s

High-Speed High-Gain (JEDEC Registered) 8 Pin DIP Plastic Coupler (T_A = 25°C unless otherwise noted)

TI PART NO.	CTR (MIN) @ V_O = 0.4 V T_A = 0°C TO 70°C	V_{OL} (MAX) T_A = 0°C TO 70°C	V_F (MAX)	SWITCHING SPEEDS		ISOLATION VOLTAGE
				t_{PHL} (MAX)	t_{PLH} (MAX)	
6N139	500% @ I_F = 1.6 mA	0.4 V @ I_F = 1.6 mA I_O = 6.4 mA	1.7 V @ I_F = 1.6 mA	25 μs @ I_F = 0.5 mA R_L = 4.7 KΩ	60 μs @ I_F = 0.5 mA R_L = 4.7 KΩ	3 kV dc (MIN)
		0.4 V @ I_F = 5 mA I_O = 15 mA				
	400% @ I_F = 0.5 ma	0.4 V @ I_F = 12 mA I_O = 24 mA		1 μs @ I_F = 12 mA R_L = 270Ω	7 μs @ I_F = 12 mA R_L = 270Ω	
6N138	300% @ I_F = 1.6 mA	0.4 V @ I_F = 1.6 mA I_O = 4.8 mA	1.7 V @ I_F = 1.6 mA	10 μs @ I_F = 1.6 mA R_L = 2.2 kΩ	35 μs @ I_F = 1.6 mA R_L = 2.2 kΩ	

TRIAC Driver 6 Pin DIP Plastic Couplers (T_A = 25°C unless otherwise noted)

TI PART NO. V_{DRM} (MIN) 250/400V	I_{FT} (MAX) @ V_{TM} = 3V	V_F (MAX) @ I_F = 10 mA	V_{TM} (MAX) @ I_{TM} = 100 mA	I_{DRM} (MAX) @ RATED V_{DRM}	dv/dt (TYP)	ISOLATION VOLTAGE
MOC3009/3020	30 mA	1.5 V	3 V	100 nA	12 V/μs	7.5 kV Peak
MOC3010/3021	15 mA	1.5 V	3 V	100 nA	12 V/μs	
MOC3011/3022	10 mA	1.5 V	3 V	100 nA	12 V/μs	
MOC3012/3023	5 mA	1.5 V	3 V	100 nA	12 V/μs	

High Reliability (JEDEC Registered) Hermetic Metal Can Couplers — Isolation Voltage Breakdown: 1 kV Peak (MIN) (T_A = 25°C)

TI PART NUMBER	CTR (MIN) @ RATED I_F & V_{CE}	OUTPUT	PACKAGE
4N49/JAN4N49/JANTX4N49/JANTXV4N49 (1)	200% 1 mA 5 V	transistor	TO-78
4N48/JAN4N48/JANTX4N48/JANTXV4N48 (1)	100% 1 mA 5 V		
4N47/JAN4N47/JANTX4N47/JANTXV4N47 (1)	50% 1 mA 5 V		
4N24/JAN4N24/JANTX4N24/JANTXV4N24 (2)	100% 10 mA 5 V	transistor	TO-78
4N23/JAN4N23/JANTX4N23/JANTXV4N23 (2)	60% 10 mA 5 V		
4N22/JAN4N22/JANTX4N22/JANTXV4N22 (2)	25% 10 mA 5 V		

NOTE 1: Per MIL-S-19500/548. NOTE 2: Per MIL-S-19500/485A.

UL Recognized and JEDEC Registered 6 Pin DIP Plastic Couplers (T_A = 25°C)

CTR (MIN) @ RATED I_F, V_{CE}	ISOLATION BREAKDOWN VOLTAGE				OUTPUT
	5 kV PEAK	2.5 kV RMS	2.5 kV PEAK	1.5 kV PEAK	
300% @ 10 mA, 2 V	TIL128/(UL)	TIL157/(UL)	—	TIL119/(UL)	darlington
	TIL128A(UL)	TIL157A(UL)	—	TIL119A(UL)	
300% @ 10 mA, 1 V	TIL127	TIL156(UL)	—	TIL113(UL)	
100% @ 10 mA, 10 V	—	4N35(UL)	4N36(UL)	4N37(UL)	transistor
50% @ 10 mA, 10 V	TIL126(UL)	TIL155(UL)	TIL117(UL)	—	
20% @ 10 mA, 10 V	TIL125(UL)	TIL154(UL)	TIL116(UL)		
20% @ 10 mA, 10 V			4N25(UL)	4N26(UL)	
12.5% @ 16 mA, 0.4 V	—	—	TIL114(UL)	TIL111(UL)	
10% @ 10 mA, 10 V	TIL124(UL)	TIL153(UL)	—	4N27(UL)	
10% @ 10 mA, 5 V				TIL118(UL)	
2% @ 10 mA, 5 V	—	—	TIL115(UL)	TIL112(UL)	

OPTO
INFRARED, IMAGING, and VISIBLE PRODUCTS

TI OPTOELECTRONICS

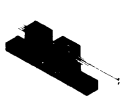
- CCD IMAGE SENSORS
- INTELLIGENT LED DISPLAYS
- OPTOCOUPLERS (ISOLATORS)
- SOURCE AND DETECTOR ASSEMBLIES (SDAs)
- INFRARED EMITTING DIODES (IREDs)
- PHOTODETECTORS (SENSORS)

TEXAS INSTRUMENTS
OPTO DEPARTMENT
P.O. BOX 225012, MS12
DALLAS, TEXAS 75265
214/995-3821

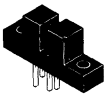
INFRARED PRODUCTS

SOURCE AND DETECTOR ASSEMBLIES/SDAs (SWITCHES)

- VARIOUS STYLES AND OUTPUTS
  - Phototransistor outputs
  - Photodarlington outputs
  - Reflective mode
  - Transmissive mode
  - Plastic components
  - Pill package (hermetic) components
  - Custom designs available upon request

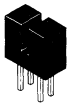

CL-28 PLASTIC

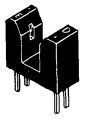
CL-29 PLASTIC


CL-31 PLASTIC

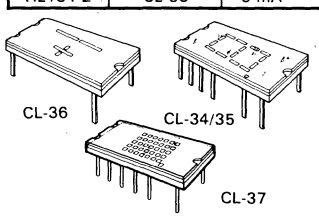
CL-32 HERMETIC

CL-33 PLASTIC


CL-81 PLASTIC


CL-86 PLASTIC

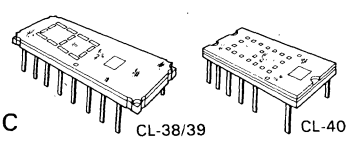
DEVICE	PACKAGE	ON-STATE COLLECTOR CURRENT MIN $I_{C(on)}$	@ I_F	@ V_{CE}	OFF-STATE COLLECTOR CURRENT MAX $I_{C(off)}$	@ V_{CE}	FORWARD VOLTAGE V_F @ I_F	OUTPUT	SLOT WIDTH mm (inches)	SENSOR APERTURE mm (inches)
TIL138	CL-28	1.6 mA 0.4 mA	35 mA 15 mA	0.5 V 0.5 V	100 nA	30 V	1.5 @ 15 mA	transistor	3.18 (0.125)	— —
TIL139	CL-29	10 μA 100 μA	40 mA 40 mA	5 V 5 V	100 nA	30 V	1.6 @ 40 mA	transistor	reflective	— —
TIL143	CL-31	600 μA	20 mA	5 V	100 nA	10 V	1.7 @ 50 mA	transistor	2.54 (0.100)	0.64 (0.025)
TIL144	CL-31	200 μA	20 mA	5 V	100 nA	10 V	1.7 @ 50 mA	transistor	2.54 (0.100)	0.64 (0.025)
TIL145	CL-31	2 mA	16 mA	1 V	100 nA	5 V	1.7 @ 50 mA	darlington	2.54 (0.100)	0.64 (0.025)
TIL146	CL-31	1.6 mA	50 mA	1 V	100 nA	5 V	1.7 @ 50 mA	darlington	2.54 (0.100)	0.64 (0.025)
TIL147A	CL-32	4 mA	20 mA	5 V	100 nA	10 V	1.7 @ 50 mA	transistor	2.54 (0.100)	0.64 (0.025)
TIL148A	CL-32	1 mA	20 mA	5 V	100 nA	10 V	1.7 @ 50 mA	transistor	2.54 (0.100)	0.64 (0.025)
TIL149	CL-33	25 μA	40 mA	5 V	100 nA	15 V	1.6 @ 40 mA	transistor	reflective	— —
TIL158	CL-81	600 μA	20 mA	5 V	100 nA	10 V	1.6 @ 20 mA	transistor	2.54 (0.100)	0.64 (0.025)
TIL159	CL-81	200 μA	20 mA	5 V	100 nA	10 V	1.6 @ 20 mA	transistor	2.54 (0.100)	0.64 (0.025)
TIL160	CL-81	2 mA	10 mA	2 V	100 nA	5 V	1.6 @ 20 mA	darlington	2.54 (0.100)	0.64 (0.025)
TIL161	CL-81	0.5 mA	10 mA	2 V	100 nA	5 V	1.6 @ 20 mA	darlington	2.54 (0.100)	0.64 (0.025)
TIL167-1	CL-31	200 μA	20 mA	5 V	100 nA	10 V	1.6 @ 20 mA	transistor	2.54 (0.100)	0.64 (0.025)
TIL167-2	CL-31	600 μA	20 mA	5 V	100 nA	10 V	1.6 @ 20 mA	transistor	2.54 (0.100)	0.64 (0.025)
TIL168-1	CL-31	0.5 mA	10 mA	2 V	100 nA	5 V	1.6 @ 20 mA	darlington	2.54 (0.100)	0.64 (0.025)
TIL168-2	CL-31	2 mA	10 mA	2 V	100 nA	5 V	1.6 @ 20 mA	darlington	2.54 (0.100)	0.64 (0.025)
TIL169-1	CL-81	200 μA	20 mA	5 V	100 nA	10 V	1.6 @ 20 mA	transistor	2.54 (0.100)	0.64 (0.025)
TIL169-2	CL-81	600 μA	20 mA	5 V	100 nA	10 V	1.6 @ 20 mA	transistor	2.54 (0.100)	0.64 (0.025)
TIL170-1	CL-81	0.5 mA	10 mA	2 V	100 nA	5 V	1.6 @ 20 mA	darlington	2.54 (0.100)	0.64 (0.025)
TIL170-2	CL-81	2 mA	10 mA	2 V	100 nA	5 V	1.6 @ 20 mA	darlington	2.54 (0.100)	0.64 (0.025)
TIL183-1	CL-86	1.2 mA	20 mA	5 V	100 nA	10 V	1.6 @ 20 mA	transistor	4.95 (0.195)	0.94 (0.037)
TIL183-2	CL-86	1.8 mA	20 mA	5 V	100 nA	10 V	1.6 @ 20 mA	transistor	4.95 (0.195)	0.94 (0.037)
TIL184-1	CL-86	1.5 mA	10 mA	2 V	100 nA	10 V	1.6 @ 20 mA	darlington	4.95 (0.195)	0.94 (0.037)
TIL184-2	CL-86	5 mA	10 mA	2 V	100 nA	10 V	1.6 @ 20 mA	darlington	4.95 (0.195)	0.94 (0.037)


CL-36 CL-34/35 CL-37

VISIBLE PRODUCTS

INTELLIGENT LED DISPLAYS

- HEXADECIMAL, SEVEN SEGMENT OR ALPHANUMERIC


CL-38/39 CL-40

DEVICE NUMBER	CHARACTER HEIGHT & COLOR	TYPE CHARACTERS	FEATURES	PACKAGE	RECOMMENDED DRIVERS
TIL302	0.27" Red	7-segment, LHDP	High performance	CL-34	SN7447
TIL303	0.27" Red	7-segment, RHDP	High performance	CL-35	SN7447
TIL304	0.27" Red	± 1, RHDP	High performance	CL-36	
TIL305	0.3" Red	5 x 7, LHDP	Alphanumeric	CL-37	
TIL306	0.27" Red	7-segment, LHDP	Logic with counter	CL-38	
TIL307	0.27" Red	7-segment, RHDP	Logic with counter	CL-39	
TIL308	0.27" Red	7-segment, LHDP	Logic with BCD input	CL-38	
TIL309	0.27" Red	7-segment, RHDP	Logic with BCD input	CL-39	
TIL311	0.27" Red	4 x 7, R & LHDP	Hexadecimal with logic	CL-40	

OPTO
INFRARED, IMAGING, and VISIBLE PRODUCTS

TI OPTOELECTRONICS

- CCD IMAGE SENSORS
- INTELLIGENT LED DISPLAYS
- OPTOCOUPLERS (ISOLATORS)
- SOURCE AND DETECTOR ASSEMBLIES (SDAs)
- INFRARED EMITTING DIODES (IREDs)
- PHOTODETECTORS (SENSORS)

TEXAS INSTRUMENTS
OPTO DEPARTMENT
P.O. BOX 225012, MS12
DALLAS, TEXAS 75265
214/995-3821

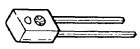
CL-1 and CL-2

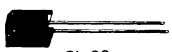
CL-9

CL-10

CL-18

INFRARED PRODUCTS
INFRARED EMITTERS AND PHOTODETECTORS


CL-67


CL-66

CL-68

- VARIOUS PACKAGES AND FUNCTIONS AVAILABLE
  - T-1, T-1¾, sidelookers, TO-18 and pill packages
  - Gallium Arsenide IREDS (λ = 940 nm)
  - Gallium Aluminum Arsenide IREDS (λ = 880 nm)
  - Photodiodes, phototransistors, or photodarlingtons

Infrared-emitting diodes (IREDs)

DEVICE NUMBER	PACKAGE	POWER OUTPUT mW (MIN)	POWER OUTPUT @I_F (mA)	BEAM ANGLE θ HI TYP	V_F V (MAX)	V_F @I_F (mA)	λTP TYP (NM)	FEATURES
TIL23	CL-1 PILL	0.4	50	35°	1.5	50	940	Pill package for mounting on double-sided circuit boards.
TIL24		1	50	35°	1.5	50	940	
TIL25		0.75	50	35°	1.5	50	940	
TIL24HR2		0.75	50	35°	1.5	50	940	High-reliability version of TIL24
TIL32	CL-9	0.5	20	35°	1.6	20	940	Plastic T-1 package
TIL902-1	T-1	1.5	20	35°	1.6	20	880	Plastic T-1 package
TIL902-2		2.5	20	35°	1.6	20	880	similar to TIL32
TIL31B	CL-18 Metal Can	3.3	100	10°	1.75	100	940	Hermetic TO-18
TIL31BHR2		3.3	100	10°	1.25	100	940	High-reliability version of TIL31B
TIL33B**		2.5	100	80°	1.75	100	940	Hermetic TO-18
TIL34B		2.0	100	10°	1.75	100	940	Hermetic TO-18
TIL903-1		6	100	10°	2.1	100	880	Hermetic TO-18
TIL903-2		9	100	10°	2.1	100	880	similar to TIL31B
TIL904-1**		5	100	80°	2.1	100	880	Hermetic TO-18
TIL904-2**		9	100	80°	2.1	100	880	similar to TIL33B
TIL40	CL-67 SL	0.05	20	30°	1.6	20	940	Plastic side-looker package
TIL38	CL-10 T-1¾	6	100	50°	1.75	100	940	Plastic T-1¾
TIL39		6	100	20°	1.75	100	940	Plastic T-1¾
TIL905-1		1.5	20	50°	1.6	20	880	Plastic T-1¾
TIL905-2		2.5	20	50°	1.6	20	880	similar to TIL38
TIL906-1		1.5	20	20°	1.6	20	880	Plastic T-1¾
TIL906-2		2.5	20	20°	1.6	20	880	similar to TIL39

Photodetectors (Sensors)

DEVICE NUMBER	PACKAGE	I_L LIGHT CURRENT @5V MIN (mA)	I_L LIGHT CURRENT @5V MAX (mA)	@ IRRADIANCE E_e (mW/cm²)	I_D DARK CURRENT MAX (nA) @ E_e = 0	OUTPUT	RECOMMENDED EMITTER
1N5722	CL-2 Pill	0.5	3.	20	25 @ V_{CE} = 30 V	transistor	TIL23 series
1N5723		2.	5.	20			TIL23 series
1N5724		4.	8.	20			TIL23 series
1N5725		7.	–	20			TIL23 series
LS600		0.8	–	20			TIL23 series
TIL601		0.5	3.	20			TIL23 series
TIL602		2.	5.	20			TIL23 series
TIL603		4.	8.	20			TIL23 series
TIL604		7.	–	20			TIL23 series
TIL604HR2		7.	–	20			TIL24HR2
TIL78	CL-9 T-1	1.	–	20	100 @ V_{CE} = 30 V		TIL32, 902
TIL414	CL-10 T-1¾	0.1	–	0.25			TIL38, 39, 905, 906
TIL81	CL-18 T-1¾	5.	–	5	100 @ V_{CE} = 10 V		TIL31BHR2
TIL81HR2		5.	–	5			TIL31B, 33B, 34B, TIL903, 904,
TIL99**		1.	–	20			TIL33B, 31B
TIL100***	CL-66 SL	0.01	–	0.25	50 @ V_R = 10 V	diode	TIL38, 39, 905, 906
TIL411	CL-67 SL	0.1	–	0.5	100 @ V_{CE} = 5 V	transistor	TIL40
TIL412		0.5	–	0.1	100 @ V_{CE} = 5 V	darlington	TIL40
TIL413	CL-68 SL	0.01	–	0.25	50 @ V_R = 10 V	diode	TIL38/39/905/906
TIL415	CL-67 SL	0.1	–	0.5	100 @ V_{CE} = 10 V	transistor	TIL40
TIL416		0.5	–	0.1	100 @ V_{CE} = 10 V	darlington	TIL40

Flat Lens *V_{CC} = 10 V

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C
CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J
JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K
kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L
LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P
PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

Infrared Emitters and Sensors

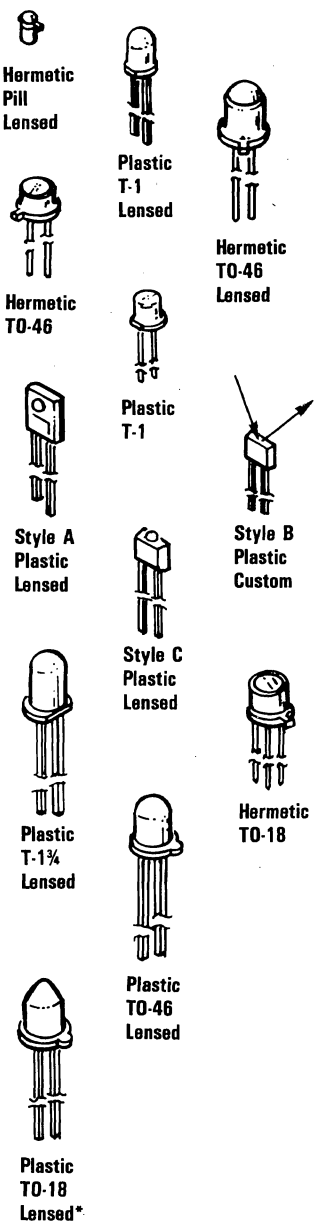
Infrared Emitters

Infrared emitters from the Optoelectronics Division of TRW are currently made of two basic materials, gallium arsenide (GaAs) and gallium aluminum arsenide (GaAlAs). These materials are cut into a variety of chip sizes and mounted into a much greater variety of package styles and lens configurations to suit almost any application requirement.

Part No.	Case Style	Beam Angle(1)
OP123	Hermetic Pill Lensed	35°
OP124	Hermetic Pill Lensed	35°
OP130	Hermetic TO-46 Lensed	18°
OP131	Hermetic TO-46 Lensed	18°
OP132	Hermetic TO-46 Lensed	18°
OP133	Hermetic TO-46 Lensed	18°
OP130W	Hermetic TO-46	50°
OP131W	Hermetic TO-46	50°
OP132W	Hermetic TO-46	50°
OP133W	Hermetic TO-46	50°
OP140	A	40°
OP140SL	A	40°
OP140SLD	A	40°
OP140SLC	A	40°
OP140SLB	A	40°
OP140SLA	A	40°
OP160	Plastic T-1 Lensed	16°
OP160SL	Plastic T-1 Lensed	16°
OP160SLD	Plastic T-1 Lensed	16°
OP160SLC	Plastic T-1 Lensed	16°
OP160SLB	Plastic T-1 Lensed	16°
OP160SLA	Plastic T-1 Lensed	16°
OP160W	Plastic T-1	65°
OP161	Plastic T-1 Lensed(2)	16°
OP161SL	Plastic T-1 Lensed(2)	16°
OP161SLD	Plastic T-1 Lensed(2)	16°
OP161SLC	Plastic T-1 Lensed(2)	16°
OP161SLB	Plastic T-1 Lensed(2)	16°
OP161SLA	Plastic T-1 Lensed(2)	16°
OP168F	B	100°
OP168FC	B	100°
OP168FB	B	100°
OP168FA	B	100°
OP169	C	46°
OP169SL	C	46°
OP169SLD	C	46°
OP169SLC	C	46°
OP223	Hermetic Pill Lensed	36°
OP224	Hermetic Pill Lensed	36°
OP231	Hermetic TO-46 Lensed	18°
OP232	Hermetic TO-46 Lensed	18°
OP233	Hermetic TO-46 Lensed	18°
OP230W	Hermetic TO-46	50°
OP231W	Hermetic TO-46	50°
OP232W	Hermetic TO-46	50°
OP233W	Hermetic TO-46	50°
OP240	A	40°
OP240SLC	A	40°
OP240SLB	A	40°
OP240SLA	A	40°
OP260	Plastic T-1 Lensed	16°
OP260SLC	Plastic T-1 Lensed	16°
OP260SLB	Plastic T-1 Lensed	16°
OP260SLA	Plastic T-1 Lensed	16°
OP268FC	B	100°
OP268FB	B	100°
OP268FA	B	100°
OP269C	B	46°
OP269B	B	46°
OP269C	B	46°
OP290C	Plastic T-1¾ Lensed	50°
OP290B	Plastic T-1¾ Lensed	50°
OP290A	Plastic T-1¾ Lensed	50°
OP291C	Plastic T-1¾ Lensed	50°
OP291B	Plastic T-1¾ Lensed	50°
OP291A	Plastic T-1¾ Lensed	50°
OP292C	Plastic T-1¾ Lensed	50°
OP292B	Plastic T-1¾ Lensed	50°
OP292A	Plastic T-1¾ Lensed	50°
OP293C	Plastic TO-46 Lensed	60°
OP293B	Plastic TO-46 Lensed	60°
OP293A	Plastic TO-46 Lensed	60°
OP295C	Plastic T-1¾ Lensed	15°
OP295B	Plastic T-1¾ Lensed	15°
OP295A	Plastic T-1¾ Lensed	15°
OP296C	Plastic T-1¾ Lensed	15°
OP296B	Plastic T-1¾ Lensed	15°
OP296A	Plastic T-1¾ Lensed	15°
OP297C	Plastic T-1¾ Lensed	15°
OP297B	Plastic T-1¾ Lensed	15°
OP297A	Plastic T-1¾ Lensed	15°
OP298C	Plastic TO-46 Lensed	25°
OP298B	Plastic TO-46 Lensed	25°
OP298A	Plastic TO-46 Lensed	25°

(1) "Beam Angle" refers to the solid beam angle measured at half power points

Case Styles



*(Narrow Reception)

Sensors

For every infrared emitter made by TRW, except the T-1¾ package, there is a spectrally and mechanically matched sensor. Though most are phototransistors, there are several package styles which allow a photodarlington or photodiode option.

Photodarlingtons are used when infrared signal levels are low and more current gain is needed than is possible with phototransistors. Photodiodes are used where high speed, low noise and linear output are needed.

Part No.	Case Style	Min. $I_{C(ON)}$	Min. $V_{(BR)CEO}$
OP300	Hermetic Pill Lensed(3)	0.8 mA	15 V
OP301	Hermetic Pill Lensed(3)	0.8 mA	15 V
OP302	Hermetic Pill Lensed(3)	1.8 mA	15 V
OP303	Hermetic Pill Lensed(3)	3.6 mA	15 V
OP304	Hermetic Pill Lensed(3)	7.0 mA	15 V
OP305	Hermetic Pill Lensed(3)	14.0 mA	15 V
OP500	Plastic T-1 Lensed(2)	4.0 mA	30 V
OP500SLD	Plastic T-1 Lensed(2)	10.0 mA	30 V
OP500SLC	Plastic T-1 Lensed(2)	17.0 mA	30 V
OP500SLB	Plastic T-1 Lensed(2)	25.0 mA	30 V
OP500SLA	Plastic T-1 Lensed(2)	40.0 mA	30 V
OP500W	Plastic T-1(2)	0.5 mA	30 V
OP501	Plastic T-1 Lensed	4.0 mA	30 V
OP501SLD	Plastic T-1 Lensed(2)	10.0 mA	30 V
OP501SLC	Plastic T-1 Lensed(2)	17.0 mA	30 V
OP501SLB	Plastic T-1 Lensed(2)	25.0 mA	30 V
OP501SLA	Plastic T-1 Lensed(2)	40.0 mA	30 V
OP508F	B(2)	0.5 mA	30 V
OP509	C(2)	0.50 mA	30 V
OP509SLD	C(2)	0.17 mA	30 V
OP509SLC	C(2)	0.30 mA	30 V
OP509SLB	C(2)	0.70 mA	30 V
OP509SLA	C(2)	1.20 mA	30 V
OP530	Plastic T-1 Lensed(3)	5.0 mA	15 V
OP538F	B(3)	1.0 mA	15 V
OP550	A(2)	0.5 mA	30 V
OP550SLD	A(2)	4.5 mA	30 V
OP550SLC	A(2)	12.0 mA	30 V
OP550SLB	A(2)	15.0 mA	30 V
OP550SLA	A(2)	22.0 mA	30 V
OP560	A(3)	0.5 mA	30 V
OP593C	Plastic TO-18 Lensed(2)	1.0 mA	30 V
OP593B	Plastic TO-18 Lensed(2)	2.0 mA	30 V
OP593A	Plastic TO-18 Lensed(2)	3.0 mA	30 V
OP598C	Plastic TO-18 Lensed(2)	2.5 mA	30 V
OP598B	Plastic TO-18 Lensed(2)	5.0 mA	30 V
OP598A	Plastic TO-18 Lensed(2)	7.5 mA	30 V
OP600	Hermetic Pill Lensed(2)	0.8 mA	50 V
OP601	Hermetic Pill Lensed(2)	0.5 mA	50 V
OP602	Hermetic Pill Lensed(2)	2.0 mA	50 V
OP603	Hermetic Pill Lensed(2)	4.0 mA	50 V
OP604	Hermetic Pill Lensed(2)	7.0 mA	50 V
OP640	Hermetic Pill Lensed(2)	0.8 mA	25 V
OP641	Hermetic Pill Lensed(2)	0.5 mA	25 V
OP642	Hermetic Pill Lensed(2)	2.0 mA	25 V
OP643	Hermetic Pill Lensed(2)	4.0 mA	25 V
OP644	Hermetic Pill Lensed(2)	7.0 mA	25 V
OP800	Hermetic TO-18 Lensed(2)	0.8 mA	30 V
OP801	Hermetic TO-18 Lensed(2)	0.5 mA	30 V
OP802	Hermetic TO-18 Lensed(2)	2.0 mA	30 V
OP803	Hermetic TO-18 Lensed(2)	4.0 mA	30 V
OP804	Hermetic TO-18 Lensed(2)	7.0 mA	30 V
OP805	Hermetic TO-18 Lensed(2)	15.0 mA	30 V
OP800W	Hermetic TO-18(2)	0.3 mA	30 V
OP801W	Hermetic TO-18(2)	0.5 mA	30 V
OP802W	Hermetic TO-18(2)	2.5 mA	30 V
OP830	Hermetic TO-18 Lensed(3)	15.0 mA	15 V
OP830W	Hermetic TO-18(3)	4.0 mA	15 V
OP841	Hermetic TO-18 Lensed(2)	0.5 mA	30 V
OP842	Hermetic TO-18 Lensed(2)	2.0 mA	30 V
OP843	Hermetic TO-18 Lensed(2)	5.0 mA	30 V
OP844	Hermetic TO-18 Lensed(2)	7.0 mA	30 V
OP845	Hermetic TO-18 Lensed(2)	15.0 mA	30 V
OP841W	Hermetic TO-18(2)	0.3 mA	30 V
OP842W	Hermetic TO-18(2)	1.0 mA	30 V
OP843W	Hermetic TO-18(2)	1.5 mA	30 V
OP844W	Hermetic TO-18(2)	2.0 mA	30 V
OP845W	Hermetic TO-18(2)	2.5 mA	30 V

(2) Phototransistor Output
(3) Photodarlington Output

TRW is the name and mark of TRW Inc.

Optoelectronics Division, TRW Electronic Components Group, 1207 Tappan Circle, Carrollton, TX 75006 (214) 323-2200 TWX-910-860-5958

Optically Coupled Isolators

TRW

Standard Couplers: 6-Pin P-DIP (T_A=25°C)

Part No.	Min. CTR	Min. Isolation Voltage
CNY17I[1]	40%	4000 VDC[3]
CNY17II[1]	63%	4000 VDC[3]
CNY17III[1]	100%	4000 VDC[3]
CNY17IV[1]	160%	4000 VDC[3]
OPI2100[1]	150%	4000 VDC[3]
OPI2150[1]	2.0%	1500 VDC[3]
OPI2250[1]	2.0%	2500 VDC[3]
OPI2151[1]	10%	1500 VDC[3]
OPI2251[1]	10%	2500 VDC[3]
OPI2152[1]	20%	1500 VDC[3]
OPI2252[1]	20%	2500 VDC[3]
OPI2153[1]	50%	1500 VDC[3]
OPI2253[1]	50%	2500 VDC[3]
OPI2154[1]	10%	1500 VDC[3]
OPI2155[1]	20%	1500 VDC[3]
OPI2254[1]	10%	2500 VDC[3]
OPI2255[1]	20%	2500 VDC[3]
OPI2500	12.5%	1500 VDC
OPI2501	20%	1500 VDC
OPI3150[2]	300%	1500 VDC[3]
OPI3250[2]	300%	2500 VDC[3]
OPI3151[2]	300%	1500 VDC[3]
OPI3251[2]	300%	2500 VDC[3]
OPI3152[2]	300%	1500 VDC[3]
OPI3252[2]	300%	2500 VDC[3]
OPI3153[2]	500%	1500 VDC[3]
OPI3253[2]	500%	2500 VDC[3]
OPI6000[1]	20%	1500 VDC[3]
OPI6100[1]	10%	1500 VDC[3]
4N25[1]	20%	2500 VDC[3]
4N26[1]	20%	1500 VDC[3]
4N27[1]	10%	1500 VDC[3]
4N28[1]	10%	500 VDC[3]
4N29[2]	100%	2500 VDC[3]
4N30[2]	100%	1500 VDC[3]
4N31[2]	50%	1500 VDC[3]
4N32[2]	500%	2500 VDC[3]
4N33[2]	500%	1500 VDC[3]
4N35[1]	100%	3500 VDC[3]
4N36[1]	100%	2500 VDC[3]
4N37[1]	100%	1500 VDC[3]
4N38[1]	20%	1500 VDC[3]
4N38A[1]	20%	2500 VDC[3]

(1) Phototransistor
(2) Photodarlington
(3) UL Recognized, File No. E-58730

Optically coupled isolators allow direct circuit control with complete electrical isolation of input from output and are currently the best, lowest cost way to eliminate ground loops and EMI/RFI problems associated with such control.

With one of the largest and most varied product lines in the industry, the Optoelectronics Division of TRW is able to offer the designer everything from standard 6 pin plastic P-DIP couplers, to 8 pin P-DIP high speed, high gain, "High Tech" couplers, specialty couplers, triac driver couplers, and photologic couplers. Most of TRW's optocouplers are UL recognized and several are VDE approved.

Plastic
6 Pin P-DIP

Style A
Plastic Custom

Hermetic
TO-72

Style C
Hermetic Custom

Hermetic
TO-5

Style B
Plastic Custom

Triac Driver Couplers: 6-Pin P-DIP (T_A=25°C, V_{ISO}=2500 V)

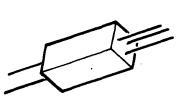
Part No.	Max. LED Trigger Current	Rated V_{DRM}
OPI3009[4]	30 mA	250 V[3]
OPI3010[4]	15 mA	250 V[3]
OPI3011[4]	10 mA	250 V[3]
OPI3012[4]	5 mA	250 V[3]
OPI3020[4]	30 mA	400 V[3]
OPI3021[4]	15 mA	400 V[3]
OPI3022[4]	10 mA	400 V[3]
OPI3023[4]	5 mA	400 V[3]
OPI3030[5]	30 mA	250 V[3]
OPI3031[5]	15 mA	250 V[3]
OPI3032[5]	10 mA	250 V[3]
OPI3033[5]	5 mA	250 V[3]
OPI3040[5]	30 mA	400 V[3]
OPI3041[5]	15 mA	400 V[3]
OPI3042[5]	10 mA	400 V[3]
OPI3043[5]	5 mA	400 V[3]

Specialty Couplers (T_A=25°C)

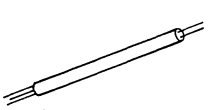
Part No.	Case Style	Min. CTR	Isolation Voltage
OPI102	Herm. TO-5[1]	25%	1000 VDC
OPI103	Herm. TO-5[1]	100%	1000 VDC
OPI110	C[1]	12.5%	10,000 VDC[3][6]
OPI113	C[2]	50%	10,000 VDC[3][6]
OPI120	D[1]	20%	15,000 VDC
OPI123	D[2]	50%	15,000 VDC
OPI1264A	B[1]	25%	10,000 VDC[3][6]
OPI1264B	B[1]	50%	10,000 VDC[3][6]
OPI1264C	B[1]	100%	10,000 VDC[3][6]
OPI130	Herm. TO-5[2]	100%	1000 VDC
OPI140	Herm. TO-72[1]	15%	1000 VDC
OPI150	E[1]	10%	50,000 VDC
OPI153	E[2]	25%	50,000 VDC
3N243	Herm. TO-72[1]	15%	1000 VDC
3N244	Herm. TO-72[1]	30%	1000 VDC
3N245	Herm. TO-72[1]	60%	1000 VDC
4N22A	Herm. TO-5[1]	25%	1000 VDC
4N23A	Herm. TO-5[1]	60%	1000 VDC
4N24A	Herm. TO-5[1]	100%	1000 VDC
OPI7002	A[1]	20%	6000 VDC[3][6]
OPI7010	A[1]	100%	6000 VDC[3][6]
OPI7320	A[2]	200%	6000 VDC[3][6]
OPI7340	A[2]	400%	6000 VDC[3][6]

Plastic
8 Pin P-DIP

Plastic
6 Pin P-DIP



Style D
Hermetic Custom



Style E
Hermetic Custom

(4) Zero Current
(5) Zero Voltage
(6) VDE Approved to STD 0883/6.80

High Technology Couplers (0°C to +70°C)

Part No.	Case Style	Output Type	Isolation Voltage	Min. CTR	Bandwidth
OPI125	D	Photologic	15,000 VDC	TTL	250 K-baud
OPI126	D	Photologic	15,000 VDC	TTL	250 K-baud
OPI127	D	Photologic	15,000 VDC	TTL	250 K-baud
OPI128	D	Photologic	15,000 VDC	TTL	250 K-baud
OPI2502	8 Pin P-DIP	Phototransistor	3000 VDC[3]	15%	2 MHz, R_L=100 Ω
OPI8012	6 Pin P-DIP	Photologic	1500 VDC[3]	TTL	250 K-baud
OPI8013	6 Pin P-DIP	Photologic	1500 VDC[3]	TTL	250 K-baud
OPI8014	6 Pin P-DIP	Photologic	1500 VDC[3]	TTL	250 K-baud
OPI8015	6 Pin P-DIP	Photologic	1500 VDC[3]	TTL	250 K-baud
4N45	6 Pin P-DIP	Photodarlington	3000 VDC[3]	200%	–
4N46	6 Pin P-DIP	Photodarlington	3000 VDC[3]	500%	–
6N135	8 Pin P-DIP	Phototransistor	3000 VDC[3]	7%	2 MHz, R_L=100 Ω
6N136	8 Pin P-DIP	Phototransistor	3000 VDC[3]	19%	2 MHz, R_L=100 Ω
6N137	8 Pin P-DIP	Logic Gate	3000 VDC[3]	TTL	5 MHz, R_L=100 Ω
6N138	8 Pin P-DIP	Phototransistor	3000 VDC[3]	300%	–
6N139	8 Pin P-DIP	Phototransistor	3000 VDC[3]	500%	–

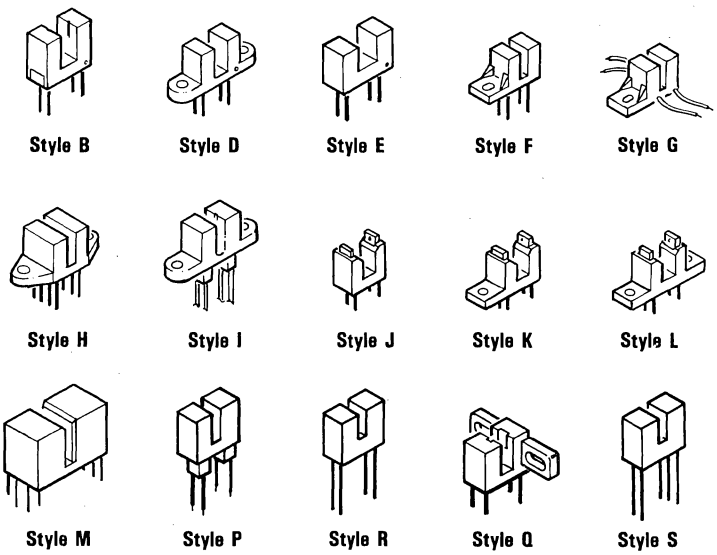
Optoelectronics Division, TRW Electronic Components Group, 1207 Tappan Circle, Carrollton, TX 75006 (214) 323-2200 TWX-910-860-5958

Optoelectronic Assemblies

Slotted Optical Switches

Part No.	Case Style	Slot Width Inches (mm)	Min. $I_{C(ON)}$ Slot Open
OPB804	B	0.155 (3.94)	500 μA
OPB813S7	D	0.125 (3.18)	350 μA
OPB813S5	D	0.125 (3.18)	250 μA
OPB813S3	D	0.125 (3.18)	75 μA
OPB818	E	0.20 (5.08)	100 μA
OPB819S10	D	0.125 (3.18)	200 μA
OPB820	F	0.08 (2.03)	500 μA
OPB820S12	F	0.08 (2.03)	400 μA
OPB820S7	F	0.08 (2.03)	300 μA
OPB820S5	F	0.08 (2.03)	170 μA
OPB821	G	0.08 (2.03)	500 μA
OPB821S12	G	0.08 (2.03)	400 μA
OPB821S7	G	0.08 (2.03)	300 μA
OPB821S5	G	0.08 (2.03)	170 μA
OPB822S	H	0.10 (2.54)	250 μA
OPB822SD	H	0.10 (2.54)	100 μA
OPB23A	I	0.125 (3.18)	200 μA
OPB824A	I	0.125 (3.18)	500 μA
OPB825	J	0.160 (4.06)	500 μA
OPB825A	K	0.160 (4.06)	500 μA
OPB825B	L	0.160 (4.06)	500 μA
OPB826S	M	0.10 (2.54)	250 μA
OPB826SD	M	0.10 (2.54)	100 μA
OPB836	P	0.20 (5.08)	1.0 mA
OPB837	R	0.125 (3.18)	500 μA
OPB847	Q	0.10 (2.54)	4.0 mA
OPB848	Q	0.10 (2.54)	1.0 mA
OPB947	S	0.10 (2.52)	TTL OUT
OPB948	S	0.10 (2.52)	TTL OUT

Slotted optical switches, also known as interrupter assemblies, are designed to provide non-contact sensing of linear or rotary motion as in optical encoders. Devices from the Optoelectronics Division of TRW consist of an infrared emitting diode and a silicon photosensor mounted on opposite sides of a slot in a molded plastic housing. Switching takes place whenever an opaque object passes through the slot.



Style B Style D Style E Style F Style G

Style H Style I Style J Style K Style L

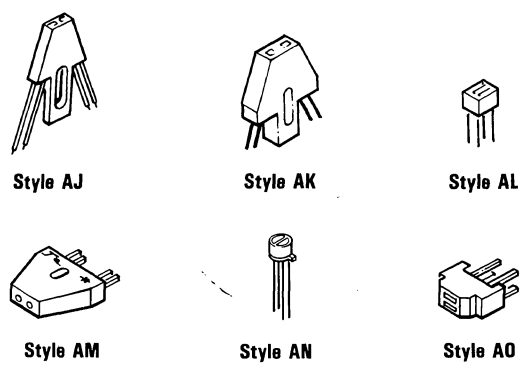
Style M Style P Style R Style Q Style S

Reflective Assemblies

Part No.	Case Style	Max. V_F at Rated I_F	Min. $V_{(BR)CEO}$	Min. $I_{C(ON)}$
OPB125A	AJ(2)	1.7 V @ 50 mA	25 V	2.0 mA
OPB253A	AJ(1)	1.7 V @ 50 mA	25 V	25 μA
OPB703A	AK(1)	1.7 V @ 40 mA	30 V	200 μA
OPB706A	AL(1)	1.7 V @ 20 mA	30 V	500 μA
OPB706B	AL(1)	1.7 V @ 20 mA	30 V	350 μA
OPB706C	AL(1)	1.7 V @ 20 mA	30 V	200 μA
OPB707A	AL(2)	1.7 V @ 20 mA	15 V	25 mA
OPB707B	AL(2)	1.7 V @ 20 mA	15 V	17 mA
OPB707C	AL(2)	1.7 V @ 20 mA	15 V	10 mA
OPB708	AM(1)	1.7 V @ 40 mA	30 V	10 μA
OPB709	AM(2)	1.7 V @ 40 mA	15 V	1.0 mA
OPB710	AN(1)	1.5 V @ 50 mA	30 V	150 μA
OPB730	AN(2)	1.5 V @ 50 mA	30 V	1.0 mA
OPB711	AO(1)	1.7 V @ 20 mA	30 V	350 μA
OPB712	AO(2)	1.7 V @ 20 mA	15 V	20 mA

(1) Phototransistor output
(2) Photodarlington output

Reflective assemblies are designed to provide non-contact sensing of the presence of a reflective surface, or a change in surface reflectivity. Unfocused types, where the emitter and sensor are mounted on parallel optical axes, are best suited for sensing diffuse or rough surfaces. Focused types, where the emitter and sensor are mounted on converging optical axes are best suited for sensing specular or polished surfaces.



Style AJ Style AK Style AL

Style AM Style AN Style AO

Custom Assemblies

Designed to meet your exact requirements.

In order to develop new state-of-the-art products, customers often require special optoelectronic devices. In these cases, TRW engineers can design a part to meet the toughest mounting or electrical requirements.

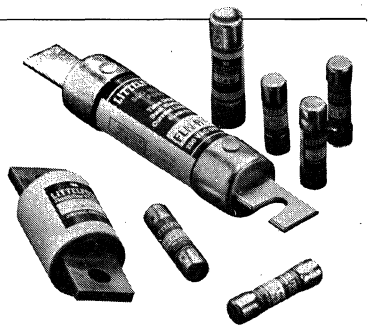
Helping customers meet special design objectives is a specialty at TRW.

Bring your ideas, design proposals and application problems to TRW's experienced design engineers. They will work with you to analyze your design objectives and develop a part that meets your needs. And, since TRW has manufacturing capability which extends from silicon chip to custom housings and circuit boards, you can be sure that TRW quality goes into every component and subassembly.

Optoelectronics Division, TRW Electronic Components Group, 1207 Tappan Circle, Carrollton, TX 75006 (214) 323-2200 TWX-910-860-5958

NEW FROM LITTELFUSE

The right industrial fuse for the right place. At the right price. Right on time.



We've been manufacturing small dimension fuses for over half a century, giving you state-of-the-art performance, reliability and service.

Now we can offer the same advantages in our new line of top quality industrial fuses: midget, semi-conductor rectifier, general purpose, hi-interrupting, one-time and renewable fuses. All backed by Littelfuse. And all available at competitive prices and ready for quick delivery. So when the time comes to replace your industrial fuses, we hope you'll save this handy guide and think of Littelfuse...the company that can meet all of your fuse requirements...big or small.

When Replacing These Series	Replace With Littelfuse Series
A2D-R	LLNRK
A4BT	KLP-C
A4J	JLS
A6D-R	LLSRK
A6Y TYPE 2	KLK
A13X	KLA
A13Z	KLA
A25X	KLB
A25Z	KLB
A50P	KLH
A60C	KLC
BAF	BLF
BAN	BLN
BBS	BLS
EBS	BLS
ECNR	FLNR
ECSR	FLSR
EON	NLN
EOS	NLS
ERN	RLN
ERS	RLS
FNA	FLA
FNM	FLM
FNQ	FLQ
FRNR	FLNR
FRSR	FLSR
JCL	JLS
JKS	JLS
KAA	KLA
KAB	KLB
KAC	KLC
KAW	KLW
KBH	KLH
KLU	KLLU
KRP-C	KLP-C
KTK	KLK
KTK-R	KLK-R
LCL	KLP-C
LENR	LLNRK
LESR	LLSRK
LOWR	LLNRK
LPNR	LLNRK
LPSR	LLSRK
MCL	KLK
MEN	FLM
MEQ	FLQ
MID	FLA
MOF	BLN
MOL	BLF
MRL	KLW
NON	NLN
NOS	NLS
OTM	BLF
OTN	NLN
OTS	NLS
RES	RLS
RF	RLN
RFA	KLA
RFC	KLC
RFN	KLB
RFV	KLH
TR-R	FLNR
TR-SR	FLSR
TRM	FLM

	Fuse Symbol	Ampere Rating	AC Volts	U.L. Class	Interrupting Rating	General Fuse Applications
MIDGET FUSES	BLF	1/2-30	250	"Micro miniature miscellaneous fuses"	10,000	• Electronic devices • Control circuit transformers • Motor controls • Switchboards • Panels
	BLN	1-30	250			
	BLS	2/10-10	600			
	FLA	1/10-30	250/125			
	FLM	1/10-30	250			
	FLQ	1/10-30	500			
MIDGET FUSES	KLK	1/10-30	600	Miscellaneous	200,000	• Pilot circuit wiring or switchboards • Electronic devices • Control circuitry • CT applications
	KLK-R	1/10-30	600		200,000	
SEMICONDUCTOR RECTIFIER FUSES	KLA	1/2-1000	130	"Special purpose fuses"	30,000	• Variable speed drives • Motor controllers for conveyers & rotative machines • U.P.S. systems • D.C. drives • AC or DC semiconductor rectifiers • S.C.R. drives • Inverters • Mine power supplies
	KLB	1/2-1000	250		200,000	
	KLC	1-1000	600		200,000	
	KLW	1-30	130		10,000	
	KLH	10-1000	500		200,000	
GENERAL PURPOSE FUSES	LLNRK	1/10-60	250	RK5	200,000	• Motor branch circuits • C/B back-up protection • Branch feeders • Transformers • Protection distribution
		70-600	250	RK1	200,000	
	LLSRK	1/10-60	600	RK5	200,000	
		70-600	600	RK1	200,000	
GENERAL PURPOSE FUSES	FLNR	1/10-600	250	K5 & RK5	200,000	• Motor controllers & overcurrent protection • Motor protection • Coordinated systems & thermal sensitivity • Protect mains & feeders • Heating & air conditioning coils & transformers • Thermal protection in panels & switches
	FLSR	1/10-600	600	K5 & RK5		
HI-INTERRUPTING FUSES	JLS	1-600	600	J	200,000	• Switchgear • Air circuit breakers • Safety switches • Bolted pressure switches • Service entrance equipment
	KLL-U	601-2000	600	L	200,000	
	KLP-C	601-6000	600	L	200,000	
ONE-TIME & RENEWABLE FUSE	NLN	1-600	250	H	10,000	• Service entrance equipment • Low cost circuit protection • Fusible equipment • Lighting & heating loads
	NLS	1-600	600	H	10,000	
	RLN	1-600	250	H	10,000	
	RLS	1-600	600	H	10,000	

© Littelfuse, Inc. 1983

Industrial, Electronic & Automotive Fuses . . .

We're ready to deliver.

LITTELFUSE® Tracor

800 E. Northwest Highway, Des Plaines, IL 60016 • (312) 824-1188

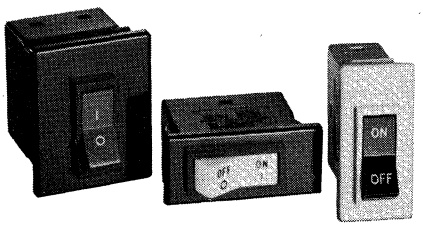
FUSES

Manufacturer	EEM Page No.	Normal Action	Slow Blowing	Fast Action	Failure Indicating	Rectifier	Miniature & Submin.	Clips & Holders	UL	CSA	SEMKO	MIL
Atlee	B•1229							•				•
Bel Fuse	B•1230-B•1232	•	•	•	•		•	•	•	•	•	
FIC Corporation	B•1235				•			•	•	•		•
Littelfuse	B•1240-B•1246	•	•	•	•	•	•	•	•	•	•	•
Panel Components	B•1254 B•1255	•	•	•			•				•	
Power Dynamics	B•1258 B•1259			•			•	•	•	•		•

CIRCUIT BREAKERS, LIMITERS, SUPPRESSORS

Manufacturer	EEM Page No.	Circuit Breakers	Limiters/ Protectors, Surge	Suppressors, Transient Voltage	Data Line Protectors	UL	CSA	SEMKO	MIL
Airpax	B•1226	•				•	•	•	•
Atlantic Scientific	B•1257		•		•	•			
Control Concepts	B•1233		•	•	•				
Heinemann Electric	B•1236 B•1237	•	•			•	•		
Hi Tech Components	B•1239			•		•			
MCG Electronics	B•1248-B•1253		•	•	•				
Perma Power	B•1256		•		•	•			
PolyPhaser	B•1257			•	•				

Circuit Breakers

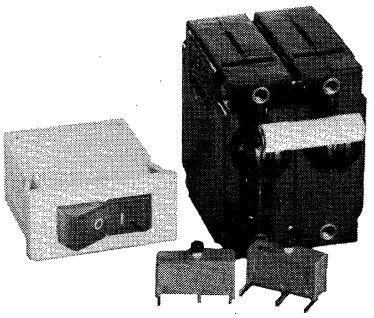


Model 203

Front panel mount device combines overcurrent protection, ON-OFF switching, pilot light. Series, shunt or relay trip.

Specifications: 1 to 3 poles. Ratings: 0.05-10A, 250Vac, 50Vdc, 10.1-20A, 120Vac, 32 Vdc. Interrupting capacity: 1000A.

Approval:



Models SNAPAK®, CARDGARD™, IPG

All conform to VDE and IEC spacing requirements. CARDGARD is pc board mountable.

Specifications: SNAPAK®: 1 or 2 pole ratings: 0.10 to 15A at 32Vdc/125Vac, 0.10 to 7.5A at 50Vdc/250Vac. 2 pole only (2 pole breaking) and ratings; 7.6 to 15A at 125/250Vac, 32/50Vdc. Interrupting capacity: 1000A at 125Vac, 32Vdc and 50Vdc.

Approval: IEC

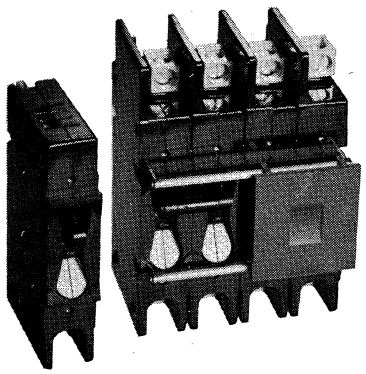
CARDGARD™: 1 pole. Ratings: 1.0 to 6.0A, 32Vdc, 250Vac. Interrupting capacity: 10 times rated current.

Approval:

IPG: 1 to 4 poles. Ratings: 0.02-30A, 250Vac, 65Vdc, 31-50A, 50Vdc. Interrupting capacity: 1000A, 250Vac, 65Vdc, and at 5000A, max. ratings of 30A at 120Vac, 20A at 250Vac, 10A at 250Vac.

Approval:

Q P L : MIL-C-55629

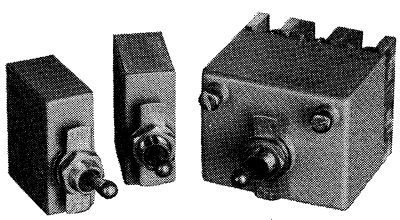


Model 209

Ideal for branch circuits. Mount in switch boards, panel enclosures, panel boards, junction boxes. Series includes 219 manual motor controller, 229 appliance controller, 249 marine power selector.

Specifications: 1 to 6 poles. Ratings: 0.10-100A, 125Vdc; 0.10-77A, 600Vac; 0.10-100A, 120, 240, 277 and 480 Vac. Interrupting capacity: 5000A.

Approval:



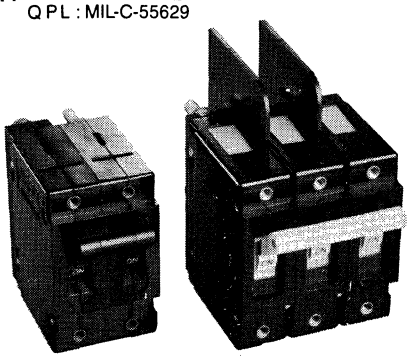
Models AP and UP

Hermetically sealed. DC, 50/60Hz or 400Hz versions. Various delays to meet your needs. UP version has wide glass terminals.

Specifications: 1 to 3 poles. Ratings: 0.05-20A, 240Vac, 50Vdc. Interrupting capacity: 1000A.

Approval:
(UP single pole series only)

Q P L : MIL-C-39019



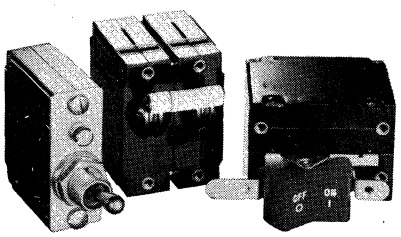
Models APL/UPL & 205

These breakers offer precision operation for critical service. Series, shunt and relay configuration options. Choice of delays, ratings. 205 dust-sealed for harsh environments.

Specifications: 1 to 9 poles. Ratings: 0.05-20A, 277Vac (Mod. 205, 277/480Vac); 0.05-50A, 250Vac, 65Vdc; 51-100A, 32Vdc. Interrupting capacity: 1000A, 65Vdc (Mod. 205 also 250Vac), 2000A, 32Vdc, 5000A, 120Vac (50A max. rating); 5000A, 277Vac (Mod. 205, 277/480Vac) (20A max. rating).

Approval:

Q P L : MIL-C-55629



Models APG/UPG

Low-cost, precision operation. Multipole assemblies, single or multi-handle. For data processing, broadcast equipment, vending machines, controllers, etc.

Specifications: 1 to 4 poles. Ratings: 0.02-30A, 277Vac, 65Vdc, 31-50A, 50Vdc. Interrupting capacity: 1000A, 277Vac, 65Vdc, and at 5000A, max. ratings of 30A at 120Vac, 20A at 250Vac, 10A at 277Vac.

Approval:

Q P L : MIL-C-55629

AIRPAX®
We give you control.

Airpax Corporation,
a North American Philips Company
Cambridge Division
Woods Road
Cambridge, MD 21613
(301) 228-4600

ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,

645 stewart ave., garden city, ny 11530

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

ATLEE COMPONENT HOLDERS

Atlee component clips are made of spring steel and beryllium copper because they afford the most generally desirable combination of properties. Specific selection of material will depend on conditions of the application. In addition clips can be manufactured to your specification for a variety of uses. Please contact the factory with your questions and special requirements.

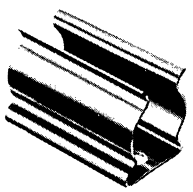
Atlee offers a complete line of MS and NAS component clips.

M24066 **M17160**

MS28136 **MS28137** **NAS1464**

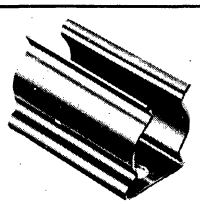
FEATURES

- The design of our component holders, from raw material through the finished product, ensures maximum performance and reliability under extreme usage, insertion, withdrawal force, and shock and vibration.
- Holding power increases as shock and vibration increase, measured by force required to remove component.
- Special contour design acquires closer set to component during shock and vibration, increasing security without localized pressure.
- Slotted design assures firm retention for fragile components without risk of injury.
- As an indication of the spring characteristics of Atlee's component holders, all of which are heat treated after forming, the following data is supplied; beryllium copper will withstand over 500 and spring steel 100 insertion-withdrawals of a slug 1/32" larger than nominal diameter, without metal fatigue.



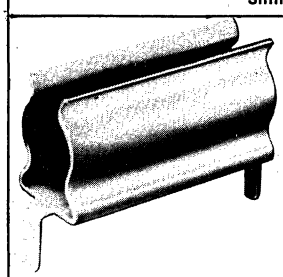
Beryllium Copper, QQ-C-533a

PLATING: cadmium CQ-P-416a; silver, QQ-S-365a; zinc, QQ-Z-325; tin, QQ-T-425; nickel, QQ-U-290; black matte, MIL-F-495A.
Various finishes available.
Designed to hold resistors, capacitors and small cylindrical devices. Fastened by means of rivets, eyelets, screws or similar fasteners.



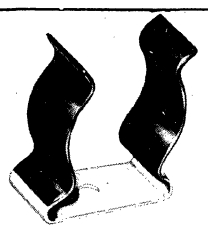
Spring Steel, QQ-S-777a

PLATING: cadmium CQ-P-416a; silver, QQ-S-365a; zinc, QQ-Z-325; tin, QQ-T-425; nickel, QQ-N-290; black matte, MIL-F-495A.
Various finishes available.
Designed to hold resistors, capacitors and small cylindrical devices. Fastened by means of rivets, eyelets, screws or similar fasteners.



Tab Mounted Clips

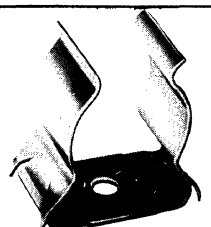
MATERIAL: beryllium copper, QQ-C-533a.
PLATING: cadmium, QQ-P-416a; silver, QQ-S-365a; zinc, QQ-Z-325; tin, QQ-M-151; nickel, QQ-N-290; black matte, MIL-F-495A.
Various finishes available.
Designed to hold resistors, capacitors, relays and similar cylindrical components. Fastened to a circuit board by tabs.



Industrial Component Holders

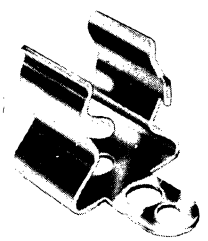
MATERIAL: spring steel S.A.E. 1065, .020 thick.

PLATING: commercial nickel, commercial nickel and vinyl coating
Designed for use in industrial and commercial applications.



No-Twist Clips

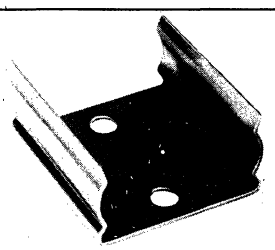
MATERIAL: spring steel, QQ-S-777a.
PLATING: cadmium, QQ-P-416a; silver, QQ-S-365a; zinc, QQ-Z-325; tin, QQ-M-151; nickel, QQ-N-290; black matte, MIL-F-495A.
Various finishes available.
Designed for holding capacitors and similar cylindrical components, without twisting.



Fuse and Resistor Holders

MATERIAL: phosphor bronze, QQ-B-750; beryllium copper, QQ-C-533a.

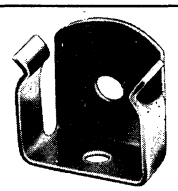
PLATING: silver, QQ-S-365a.
Finishes available silver plate.
Designed to hold fuses and ferrule-type resistors plus reduce heating by providing high contact pressure.



Crystal Clips

MATERIAL: spring steel, QQ-S-777a, spring steel S.A.E. 1065.

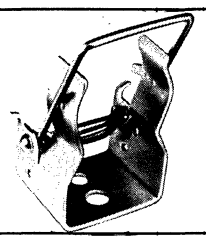
PLATING: cadmium, QQ-P-416a; silver, QQ-S-365a; zinc QQ-Z-325; tin, QQ-M-151; nickel, QQ-N-290; black matte, MIL-F-495A.
Various finishes available.
Designed to provide secure mounting for flattened elliptical components.



Transistor Clips

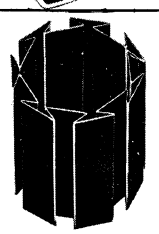
MATERIAL: beryllium copper, QQ-C-533a.

PLATING: cadmium, QQ-P-416a; silver, QQ-S-365a; tin, QQ-M-151; nickel, QQ-N-290; black matte, MIL-F-495A.
Various finishes available.
Designed to hold transistors without depending on soldered leads and at the same time act as a heat sink.



Locking Clips

MATERIAL: spring temper phosphor bronze, QQ-B-750.
PLATING: silver, QQ-S-365a; cadmium, QQ-P-416a; nickel, QQ-N-290; Class II, Type VI.
Various finishes available.
Designed to hold a fuse, ferrule-type resistor or similar component against the most severe shock and vibration.



Heat Dissipating Liners

MATERIAL: beryllium copper, .002 thick per QQ-C-533a, heat treated.

FINISH: black matte
Designed to cool many types of components combined with different types of cooling methods.

ATLEE 1 GILL STREET, WOBURN, MA 01801 • (617) 933-3510 • TELEX 949407

Atlee manufactures a full line of Bus Bars Card Guides and Component Holders. For additional information, please contact the factory.

FUSES/UL, CSA 1-1/4" x 1/4" & 1" x 1/4"

TYPE 3AG NORMAL BLOW GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
200%	5 seconds, maximum

MECHANICAL DIMENSIONS

Dimensions	Inches (mm)
Diameter	.250 (6.35)
Length	1.250 (31.75)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
3AG010	1/100	250	3AG1	1	250
3AG031	1/32	250	3AG1.25	1-1/4	250
3AG062	1/16	250	3AG1.5	1-1/2	250
3AG100	1/10	250	3AG1.6	1-6/10	250
3AG125	1/8	250	3AG1.75	1-3/4	250
3AG150	15/100	250	3AG2	2	250
3AG175	.175	250	3AG2.3	2-3/10	250
3AG187	3/16	250	3AG2.5	2-1/2	250
3AG200	2/10	250	3AG3	3	250
3AG250	1/4	250	3AG3.5	3-1/2	250
3AG300	3/10	250	3AG4	4	250
3AG375	3/8	250	3AG4.5	4-1/2	250
3AG400	4/10	250	3AG5	5	250
3AG500	1/2	250	3AG6	6	125
3AG600	6/10	250	3AG7	7	125
3AG750	3/4	250	3AG8	8	125
3AG800	8/10	250	3AG10	10	125

Listed by Underwriters' Laboratories through 8 amperes. Certified by Canadian Standards Association through 8 amperes.

Type 3AG fuses, described as normal blow, are medium to quick acting protectors for use in general circuit applications. Suitable for most circuits where high surges or transients are not anticipated.

TYPE 3AP NORMAL BLOW PIGTAIL GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
200%	5 seconds, maximum

MECHANICAL DIMENSIONS

Dimensions	Inches (mm)
Diameter	.270 (6.86)
Length	1.290 (32.77)
Pigtail Leads	**Inches (mm)**
Diameter	.032 (.813)
Length	1.5 (38.1)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
3AP010	1/100	250	3AP1	1	250
3AP031	1/32	250	3AP1.25	1-1/4	250
3AP062	1/16	250	3AP1.5	1-1/2	250
3AP100	1/10	250	3AP1.6	1-6/10	250
3AP125	1/8	250	3AP1.75	1-3/4	250
3AP150	15/100	250	3AP2	2	250
3AP175	.175	250	3AP2.3	2-3/10	250
3AP187	3/16	250	3AP2.5	2-1/2	250
3AP200	2/10	250	3AP3	3	250
3AP250	1/4	250	3AP3.5	3-1/2	250
3AP300	3/10	250	3AP4	4	250
3AP375	3/8	250	3AP4.5	4-1/2	250
3AP400	4/10	250	3AP5	5	250
3AP500	1/2	250	3AP6	6	125
3AP600	6/10	250	3AP7	7	125
3AP750	3/4	250	3AP8	8	125
3AP800	8/10	250	3AP10	10	125

Listed by Underwriters' Laboratories through 8 amperes. Certified by Canadian Standards Association through 7 amperes.

Type 3AP fuses are medium to quick blowing fuses with the same electrical characteristics as Type 3AG. They are supplied with pigtail leads so that the fuse can be wired directly to the circuit.

TYPE 3SB SLOW BLOW GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
200%	5 seconds, minimum

MECHANICAL DIMENSIONS

Dimensions	Inches (mm)
Diameter	.250 (6.35)
Length	1.250 (31.75)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
3SB010	1/100	250	3SB1	1	250
3SB031	1/32	250	3SB1.2	1-2/10	250
3SB040	4/100	250	3SB1.25	1-1/4	250
3SB062	1/16	250	3SB1.5	1-1/2	250
3SB100	1/10	250	3SB1.6	1-6/10	250
3SB125	1/8	250	3SB1.8	1-8/10	250
3SB150	15/100	250	3SB2	2	250
3SB175	.175	250	3SB2.25	2-1/4	250
3SB187	3/16	250	3SB2.5	2-1/2	250
3SB200	2/10	250	3SB2.8	2-8/10	250
3SB250	1/4	250	3SB3	3	250
3SB300	3/10	250	3SB3.2	3-2/10	250
3SB375	3/8	250	3SB3.5	3-1/2	250
3SB400	4/10	250	3SB4	4	250
3SB500	1/2	250	3SB4.5	4-1/2	250
3SB600	6/10	250	3SB5	5	250
3SB700	7/10	250	3SB6	6	250
3SB750	3/4	250			
3SB800	8/10	250			

Listed by Underwriters' Laboratories through 6 amperes. Certified by Canadian Standards Association through 5 amperes.

Type 3SB fuses, described as slow blow, are designed to prevent unnecessary blowing in circuits where transient surges are anticipated. Protection against short circuit or continued overload is still maintained.

TYPE 3SBP SLOW BLOW PIGTAIL GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
200%	5 seconds, minimum

MECHANICAL DIMENSIONS

Dimensions	Inches (mm)
Diameter	.270 (6.86)
Length	1.290 (32.77)
Pigtail Leads	**Inches (mm)**
Diameter	.032 (.813)
Length	1.5 (38.1)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Rating Voltage
3SBP010	1.100	250	3SBP1	1	250
3SBP031	1/32	250	3SBP1.2	1-2/10	250
3SBP040	4/100	250	3SBP1.25	1-1/4	250
3SBP062	1/16	250	3SBP1.5	1-1/2	250
3SBP100	1/10	250	3SBP1.6	1-6/10	250
3SBP125	1/8	250	3SBP1.8	1-8/10	250
3SBP150	15/100	250	3SBP2	2	250
3SBP175	.175	250	3SBP2.25	2-1/4	250
3SBP187	3/16	250	3SBP2.5	2-1/2	250
3SBP200	2/10	250	3SBP2.8	2-8/10	250
3SBP250	1/4	250	3SBP3	3	250
3SBP300	3/10	250	3SBP3.2	3-2/10	250
3SBP375	3/8	250	3SBP3.5	3-1/2	250
3SBP400	4/10	250	3SBP4	4	250
3SBP500	1/2	250	3SBP4.5	4-1/2	250
3SBP600	6/10	250	3SBP5	5	250
3SBP700	7/10	250	3SBP6	6	250
3SBP750	3/4	250			
3SBP800	8/10	250			

Listed by Underwriters' Laboratories through 6 amperes. Certified by Canadian Standards Association through 5 amperes.

Type 3SBP fuses, designated as slow blow, prevent unnecessary blowing from sudden current surges. Normal protection is still maintained against continued overload and short circuits. Similar electrically to the 3SB series, but supplied with pigtail leads.

TYPE 8AG/8AP NORMAL BLOW GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
200%	5 seconds, maximum

MECHANICAL DIMENSIONS

Dimensions	8AG Inches (mm)	8AP Inches (mm)	Pigtail Leads Inches (mm)
Diameter	.250 (6.35)	.275 (6.99)	.032 (.813)
Length	1.00 (25.4)	1.025 (26.04)	1.5 (38.1)

Catalog Number		Ampere Rating	Voltage Rating
8AG100	8AP100*	1/10	250
8AG125	8AP125	1/8	250
8AG250	8AP250	1/4	250
8AG375	8AP375	3/8	250
8AG500	8AP500	1/2	250
8AG750	8AP750	3/4	250
8AG1	8AP1	1	250
8AG1.5	8AP1.5	1-1/2	250
8AG2	8AP2	2	250
8AG2.5	8AP2.5	2-1/2	125
8AG3	8AP3	3	125
8AG4	8AP4	4	125
8AG5	8AP5	5	125
8AG6	A8P6	6	125
8AG7	8AP7	7	125

*Pigtail (AP)

Listed by Underwriters' Laboratories through 7 amperes. Certified by Canadian Standards Association through 5 amperes.

Type 8AG is designated as a normal blow fuse for use in general circuit protection. Their smaller size permits use where space limitations prevent use of Type 3AG. Pigtail leads (Type 8AP) are available when direct soldering into circuits is desired.

bel BEL FUSE INC. 198 Van Vorst Street • Jersey City, N. J. 07302 • (201) 432-0463 • TWX 710-730-5301

FUSES/UL, CSA & SEMKO 5mm x 20mm

TYPE 5MF FAST ACTING GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
200%	5 seconds, maximum

MECHANICAL DIMENSIONS

Dimensions	Millimeters (Inches)
Diameter	5 (0.197)
Length	20 (0.787)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
5MF100	1/10	250	5MF1	1	250
5MF125	1/8	250	5MF1.25	1-1/4	250
5MF200	2/10	250	5MF1.6	1-6/10	250
5MF250	1/4	250	5MF2	2	250
5MF300	3/10	250	5MF2.5	2-1/2	250
5MF400	4/10	250	5MF3	3	250
5MF500	1/2	250	5MF4	4	125
5MF600	6/10	250	5MF5	5	125
5MF700	7/10	250	5MF6	6	125
5MF800	8/10	250	5MF7	7	125

Listed by Underwriters' Laboratory from .050 mA to 5 amperes. Certified by Canadian Standards Association through 5 amperes.

Type 5MF fuses, described as fast acting are manufactured to meet the requirements of UL 198.6 and CSA 22.2. They permit European manufacturers of original equipment to substitute a fuse listed or certified by UL/CSA when exporting their equipment to the United States or Canada without making costly changes in mountings and printed circuit board layouts. Since fusing characteristics are different than those specified by IEC 127 for specific ratings, a careful analysis of the blowing curves should be made before determining the proper substitution. The small size of these fuses also offer the American/Canadian designer a protective device where space limitations are an important consideration. **Pigtail leads (5MFP) are available when direct soldering into circuits is desired.**

TYPE 5MT TIME LAG GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
1000%	10 milliseconds, minimum

MECHANICAL DIMENSIONS

Dimensions	Millimeters (Inches)
Diameter	5 (0.197)
Length	20 (0.797)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
5MT100	1/10	250	5MT1	1	125
5MT125	1/8	250	5MT1.25	1-1/4	125
5MT200	2/10	250	5MT1.6	1-6/10	125
5MT250	1/4	250	5MT2	2	125
5MT300	3/10	250	5MT2.5	2-1/2	125
5MT400	4/10	250	5MT3	3	125
5MT500	1/2	250	5MT4	4	125
5MT600	6/10	250	5MT5	5	125
5MT700	7/10	250	5MT6	6	125
5MT800	8/10	250	5MT7	7	125

Listed by Underwriters' Laboratories from .050 mA to 5 amperes. Certified by Canadian Standards Association through 5 amperes.

Type 5MT fuses, described as time lag offer additional surge protection for circuits where momentary transients are anticipated. They are built to meet the specifications of UL 198.6 and CSA 22.2. They permit the European manufacturers of original equipment to substitute a fuse listed or certified by UL/CSA when exporting their equipment to the United States or Canada without making costly changes in mountings and printed circuit board layouts. Since fusing characteristics are different than those specified by IEC 127 for specific ratings, a careful analysis of the blowing curves should be made before determining the proper substitution. The small size of these fuses also offer the American/Canadian designer a protective device where space limitations are an important consideration. Pigtail leads (5MTP) are available when direct soldering into circuits is desired.

TYPE 5SF QUICK ACTING GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rated Current	2.1 I_n Max.	2.75 I_n Min.	2.75 I_n Max.	4 I_n Min.	4 I_n Max.	10 I_n Max.
32 to 100 mA inclusive	30 min	10 ms	500 ms	3 ms	100 ms	20 ms
Above 100 mA to 6.3A	30 min	50 ms	2 s	10 ms	300 ms	20 ms

MECHANICAL DIMENSIONS

Dimensions	Millimeters (Inches)
Diameter	5 (0.197)
Length	20 (0.787)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
5SF032	.032	250	5SF500	1/2	250
5SF040	.040	250	5SF630	.630	250
5SF050	1/20	250	5SF800	8/10	250
5SF063	1/16	250	5SF1	1	250
5SF080	.080	250	5SF1.25	1-1/4	250
5SF100	1/10	250	5SF1.6	1-6/10	250
5SF125	1/8	250	5SF2	2	250
5SF160	.160	250	5SF2.5	2-1/2	250
5SF200	2/10	250	5SF3.15	3.15	250
5SF250	1/4	250	5SF4	4	250
5SF315	.315	250	5SF5	5	250
5SF400	4/10	250	5SF6.3	6-3/10	250

Approved by SEMKO for 80 mA, 125 mA, and from 250 mA through 6.3A.

Type 5SF fuses, described as quick acting, low breaking capacity, are manufactured to the specifications of IEC 127, CEE 4, Standard Sheet II (Type F). Used throughout Europe, they carry the SEMKO mark in the ratings indicated. They are used for general circuit protection in electrical and electronic equipment where momentary transients are not anticipated. Pigtail leads (5SFP) are available when direct soldering into circuits is desired.

TYPE 5ST TIME LAG GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rated Current	2.1 I_n Max.	2.75 I_n Min.	2.75 I_n Max.	4 I_n Min.	4 I_n Max.	10 I_n Min.	10 I_n Max.
32 to 100 mA inclusive	2 min	200 ms	10 s	40 ms	3 s	10 ms	300 ms
Above 100 mA to 6.3A	2 min	600 ms	10 s	150 ms	3 s	20 ms	300 ms

* MF, MB, MBP Certified by CSA through 7 Amps.

MECHANICAL DIMENSIONS

Dimensions	Millimeters (Inches)
Diameter	5 (0.197)
Length	20 (0.787)

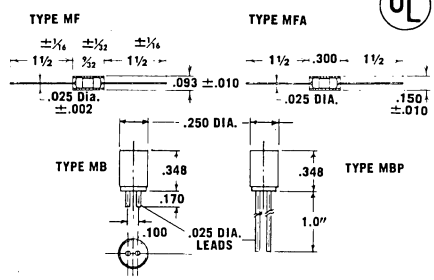
Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
5ST032	.032	250	5ST500	1/2	250
5ST040	.040	250	5ST630	.630	250
5ST050	1/20	250	5ST800	8/10	250
5ST063	1/16	250	5ST1	1	250
5ST080	.080	250	5ST1.25	1-1/4	250
5ST100	1/10	250	5ST1.6	1-6/10	250
5ST125	1/8	250	5ST2	2	250
5ST160	.160	250	5ST2.5	2-1/2	250
5ST200	2/10	250	5ST3.15	3.15	250
5ST250	1/4	250	5ST4	4	250
5ST315	.315	250	5ST5	5	250
5ST400	4/10	250	5ST6.3	6-3/10	250

Approved by SEMKO from 160 mA through 6.3A.

Type 5ST fuses, described as time lag, low breaking capacity, are manufactured to the specifications of IEC 127, CEE 4, Standard Sheet III (Type T). They carry the SEMKO mark in the ratings indicated. They are used for general circuit protection in electrical and electronic equipment where momentary transients are anticipated. Pigtail leads (5STP) are available when direct soldering into circuits is desired.

MICRO FUSES

TYPE MF/MFE/MB/MBP/MFA MICROBEL MICRO FUSE SERIES



ELECTRICAL CHARACTERISTICS

Rating	Blow Time
100%	4 hours, minimum
150%	10 minutes, maximum
200%	5 sec. max.

Catalog Number				Ampere Rating	Voltage Rating
MF125	MB125	MBP125	MFA125	1/8	125
MF250	MB250	MBP250	MFA250	1/4	125
MF375	MB375	MBP375	MFA375	3/8	125
MF500	MB500	MBP500	MFA500	1/2	125
MF750	MB750	MBP750	MFA750	3/4	125
MF1	MB1	MBP1	MFA1	1	125
MF1.5	MB1.5	MBP1.5	MFA1.5	1-1/2	125
MF2	MB2	MBP2	MFA2	2	125
MF2.5	MB2.5	MBP2.5	MFA2.5	2-1/2	125
MF3	MB3	MBP3	MFA3	3	125
MF3.5	MB3.5	MBP3.5	MFA3.5	3-1/2	125
MF4	MB4	MBP4	MFA4	4	125
MF5	MB5	MBP5	MFA5	5	125
MF7	MB7	MBP7	MFA7	7	125

Microbel Type Micro Fuses are subminiature fuses for use in circuits where space requirements are an important factor. Built to meet the requirements of UL 198.6 for micro-fuses, they are supplied in the four different mechanical configurations illustrated below.

Type MF is supplied with Kynar sleeve. Type MFE* is supplied with epoxy coating. Marked with or without color coding, MF fuses are available with radial or axial leads with the axial construction packaged either bulk or taped and reeled.

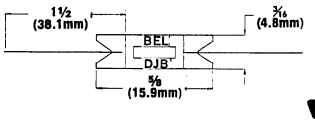
* UL Pending.

Listed by Underwriters' Laboratories through 7 amperes.

bel BEL FUSE INC. 198 Van Vorst Street • Jersey City, N. J. 07302 • (201) 432-0463 • TWX 710-730-5301

SPECIAL FUSES

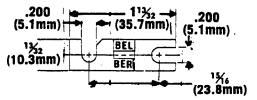
TYPE DJB FLAT PACK FUSE



ELECTRICAL CHARACTERISTICS

Rating	Blow Time
100%	4 hours, minimum
160%	20 seconds, maximum

TYPE BER FLAT PACK FUSE



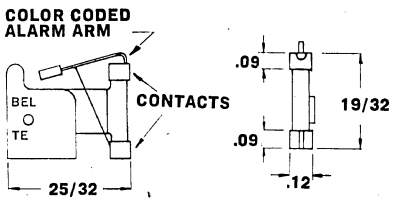
ELECTRICAL CHARACTERISTICS

Rating	Blow Time
100%	4 hours, minimum
135%	1 hour, maximum
200%	1 minute, maximum

Catalog Number		Ampere Rating	Catalog Number		Ampere Rating
DJB250	BER250	1/4	DJB2	BER2	2
DJB300	BER300	3/10	DJB2.25	BER2.25	2-1/4
DJB400	BER400	4/10	DJB2.5	BER2.5	2-1/2
DJB500	BER500	1/2	DJB2.75	BER2.75	2-3/4
DJB600	BER600	6/10	DJB3	BER3	3
DJB750	BER750	3/4	DJB3.5	BER3.5	3-1/2
DJB875	BER875	7/8	DJB4	BER4	4
DJB1	BER1	1	DJB5	BER5	5
DJB1.25	BER1.25	1-1/4	DJB8	BER8	8
DJB1.5	BER1.5	1-1/2	DJB10	BER10	10

Flat pack fuses, TYPE DJB with pigtails for direct soldering and TYPE BER for mounting with #10 screws, find broad application in telecommunication circuits and in low energy circuits where cost and space are important considerations. They are recognized under the component program of Underwriters' Laboratories and may be used in those circuits where the suitability of application has been investigated.

TYPE TE INDICATING FUSE



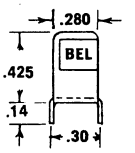
ELECTRICAL CHARACTERISTICS

Rating	Blow Time
80%	4 hours, minimum
100%	10 minutes, minimum
150%	5 minutes, maximum

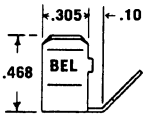
Catalog Number	Ampere Rating	Color Code	Catalog Number	Ampere Rating	Color Code
TE180	18/100	Y	TE2	2	OR
TE250	1/4	V	TE3	3	BLU
TE500	1/2	R	TE3.5	3-1/2	W/BLU
TE650	65/100	BK	TE4	4	W/BRN
TE750	3/4	BRN	TE5	5	GRN
TE1	1	6RY	TE7.5	7½	BK/W
TE1.3	1-1/3	W	TE10	10	R/W
TE1.5	1-1/2	W/Y			

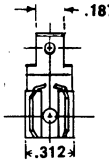
Type TE fuses find extensive use in telecommunication circuits and other applications where both electrical and visual fuse failure indication is required. The alarm spring is color coded to give quick current rating identification.

FUSE CLIPS AND FUSE MOUNTINGS

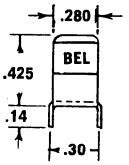


TYPE FC-101
3AG Clip
PC Board Mount
(Ear Stops)

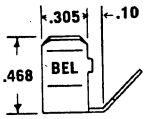


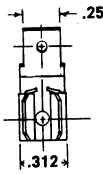


TYPE FC-106
3AG Clip
Hole Mount
(.187 Quick Connect)

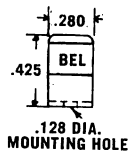


TYPE FC-102
3AG Clips
PC Board Mount
(Earless)

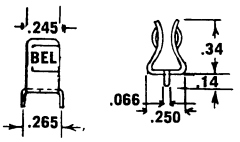




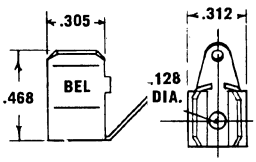
TYPE FC-107
3AG Clip
Hole Mount
(.250 Quick Connect)



TYPE FC-104
3AG Clip
Hole Mount
(Earless)

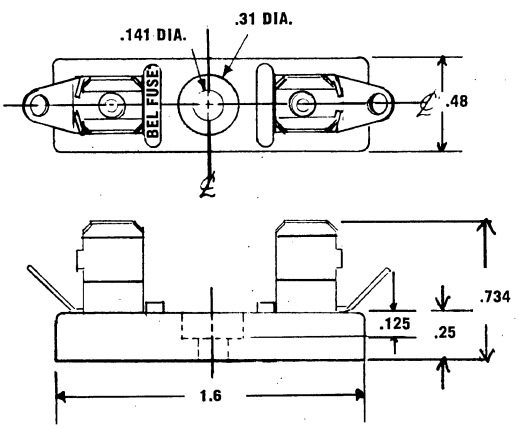


TYPE FC-201
5mm Clip
PC Board Mount
(Ear Stops)



TYPE FC-105
3AG Clip
Hole Mount
(Solder Lug)

Mountings



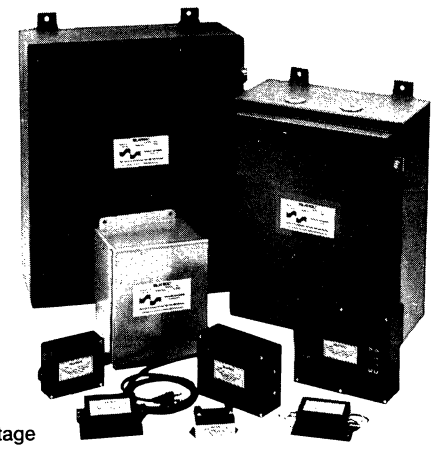
All Bel Fuse clips are manufactured from .020 phosphor bronze stock and specially hardened to assure long life and minimum contact resistance. They are bright tin plated to facilitate soldering and prevent oxidation. In addition to the stock designs illustrated, clips can be quickly tooled to meet customer specifications.

The bases on mountings illustrated above are molded from a polyamid modified nylon rated by Underwriters' Laboratories at 94V-0. Clips are riveted to the base for maximum strength and are butted against a barrier to prevent rotation and assure alginment. The fuse mounts illustrated use Type FC-105 clips. Fuse mounts can be supplied with any combination of hole mount type clips.

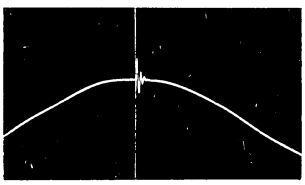
bel BEL FUSE INC. 198 Van Vorst Street • Jersey City, N. J. 07302 • (201) 432-0463 • TWX 710-730-5301

ISLATROL®

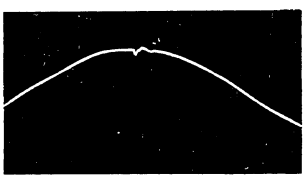
ACTIVE TRACKING SPIKE & TRANSIENT SUPPRESSORS THAT WORK



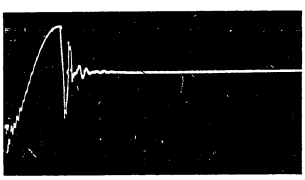
Why Islatrol is Different. These patented solid state units uniquely track the incoming sinusoid, will detect transients at any point on the sinusoid and, within 10 nanoseconds, become a low pass brute force active filter. No other device works like Islatrol, no other device protects like Islatrol.



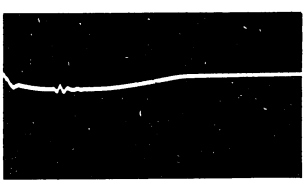
Input to Islatrol 700V transient



Output after Islatrol



Input to Islatrol 800V transient



Output after Islatrol

Suppression Performance:
Destructive or spurious transients, present at any point on the input sine wave of the AC power line, are clamped to within several volts, both above and below the instantaneous value of a filtered input sinusoid. For example, a two joule, 1000V spike (peak to peak) is suppressed to 10V (peak to peak). The above is accompanied with minimal power line loss.

control concepts
CORPORATION

Specifications

General Description:
A solid state, active tracking voltage suppressor which protects against transients, spikes, short-term outages and noise on incoming AC power lines to functional equipment.

Standard Voltage Inputs:
120V, 240V, 480V

Load Current:
Single Phase .5A - 100.0A
Three Phase 15.0A - 1200.0A

Power Line Frequency:
50-60 Hz. (400 Hz available)

Response Time:
5-10 Nanoseconds

Transient Reduction:
Minimum of 40db, from the midband audio range through 50 MHz. The active filter improves the quality of the input line. Attenuation is greater than 50db to the surge withstand capability ringwave test IEEE 472-74 and IEEE 587-80; and 30 db for IEEE 587-80 category B, 50 joule impulse.

Preset Switch Level:
Plus or minus 2V

Load Regulation:
Better than 1% from no load through full load.

Leakage:
Leakage to case less than 50 micro-amperes. Voltage isolation to case 5000V RMS.

Operating Temperature Range:
-40°C to 85°C

Reliability/Test Criteria:
Each Islatrol® unit is 300% fully tested at an input energy level of two joules for approximately 1000 strikes, superimposed at the peak of the input sinusoid at main power line distribution impedance.

Suppression Performance:
Destructive or spurious transients, present at any point on the input sine wave of the AC power line, are clamped to within several volts, both above and below with the instantaneous value of a filtered input sinusoid. For example, a six joule, 5000V spike (peak-to-peak) is suppressed to 10V (peak-to-peak). The above is accompanied with minimal power line loss.

Surge Current Ratings:
All units conservatively designed for current overload capability. 10 millisecond — 20× nominal rating; 1 second — 5× nominal rating; 5 second — 3× nominal rating.

Additional operating characteristics

- **ISLATROL** performance is not affected by line and/or load impedance.
- **ISLATROL** performance is not affected by the absolute magnitude of the line voltage.
- **ISLATROL** reduces large, high frequency transients with rise times of 2500V per microsecond, to rise times of less than 5V per microsecond.
- **ISLATROL** design prevents ringing in the output regardless of the input transient, or loading from zero through full load.

Islatrol attenuates spikes equally well at any point on the sinusoid. At peak, crossover or even negative going.

Sounds too good to be true? Contact us for additional information and applications assistance.

FULL 5 YEAR WARRANTY

Pat. #4095163, #4156838, #4491903 and other Patent pending.

Dept. EEM 328 Water St., P.O. Box 1380, Binghamton, NY 13902, (607) 724-2484

Fuses Unlimited

9300 Mason Avenue, Chatsworth, California 91311

Company Profile

Fuses Unlimited — our name says it all! For more than 28 years, we've been supplying the electronic, industrial, construction and military marketplaces with fuses, fuseholders, blocks and clips. We've earned the distinction of being the largest distributor of fuses in the world.

Since its inception, Fuses Unlimited has strived for excellence in quality, personalized service and competitive prices. In our 30,000 square foot facility, we stock millions of fuses and accessories of the leading manufacturers. Besides offering exceptional inventory, we can cross reference any fuse requirement that you might have . . . or tell you where to get it. Our off-the-shelf delivery allows you the advantage of same day shipment.

Your business is highly valued and we welcome the opportunity to serve you. When specifying fuses, remember, we really do carry our share of the load — and then some!

Product Lines

BUSSMANN
Full line of fuse products — electrical, electronic, commercial and MIL spec; UL — CSA — European standards

LITTELFUSE
Full line of fuse products — electrical, electronic, commercial and MIL spec; UL — CSA — European standards

GENERAL ELECTRIC
High voltage and current limiting fuses

WESTINGHOUSE
Power, current limiting and expulsion fuses; mounting and hardware

GOULD SHAWMUT
Electrical and electronic fuses; fuseholders, fuse blocks and power distribution blocks

ENGLISH ELECTRIC
H.R.C. and high voltage fuses; fittings

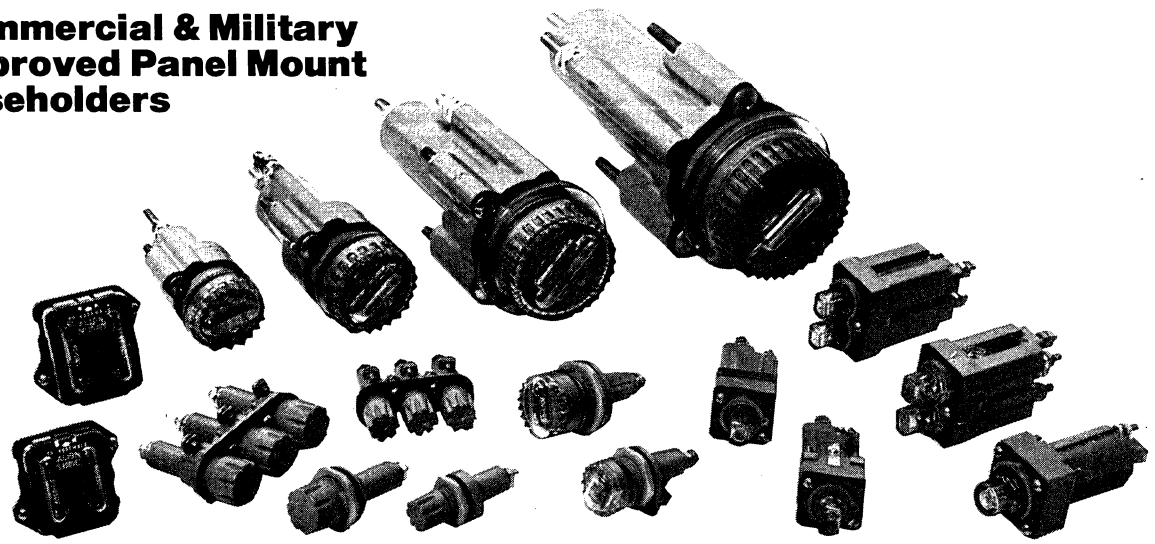
FUSE INDICATOR CORP.
Commercial and MIL spec fuseholders

MARATHON
Fuse and terminal blocks

Los Angeles: (818) 882-1515 • Telex: 880519
Toll Free: (800) 228-5715 in CA
(800) 255-1919 outside CA

fic ·Fuseholders·Fuse Clips ·Blown Fuse Indicators

Commercial & Military Approved Panel Mount Fuseholders



- Superior Clip Design for Solid Fuse Contact
- UL Recognized & C.S.A. Certified
- Most Commercial Models are recognized under the Marine Electrical and Fuel System (PEQZ2) as "Ignition Protected Devices"
- Blown Fuse Indicating & Non-Indicating
- High Impact Plastic for Superior Strength
- Dead-Front, Watertight
- Military Versions Meet MIL-F-19207

Commercial Fuseholders

All Recognized by Underwriters Laboratories

Model	Fuse Size	Qty	Indicating (I) or Non-Indicating (N)	Voltage AC/DC	UL Recognized Amps	UL Recognized Voltage
5000+	¼x1¼"	1	N	250	0-30	250 max
5100+	¼x1¼"	3	N	250	0-30	250 max
5200+	¼x1¼"	1	N or I	250	0-30	250 max
*5300+	¼x1¼"	2	N or I	250	0-30	250 max
*5400+	13/32x1½"	1	N	600	0-30	600 max
*5500+	13/32x1½"	3	N	600	0-30	600 max
*5600+	13/32x1½"	1	N or I	600	0-30	600 max
*5700+	13/32x1½"	2	N or I	600	0-30	600 max
*5800	3/16x2"	1	N or I	600	0-30	250 max
*5900	13/64x3"	1	N or I	600	31-60	250 max

*CSA Certified
+Ignition Protected Devices

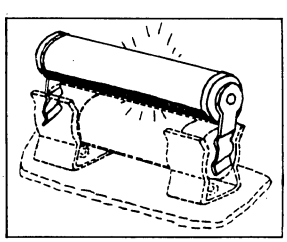
Indicating models can be modified for use in low voltage applications.

Military Fuseholders

MIL-SPEC	Type	Fuse Size	Qty	Indicating (I) or Non-Indicating (N)	Amps	Volts	Moisture Protection
19207/1	FHL10U	¼x1¼"	2	I	0-30	90-250	Unsealed
19207/2	FHL11U	¼x1¼"	1	I	0-30	90-250	Unsealed
19207/3	FHL12U	13/32x1½"	1	I	0-30	90-500	Unsealed
19207/4	FHL13G	3/16x2"	1	I	0-30	90-500	Dripproof
19207/5	FHL14G	13/64x3"	1	I	31-60	90-500	Dripproof
19207/6	FHL15G	1 1/16x5/8"	1	I	61-100	90-500	Dripproof
19207/7	FHL16G	1 3/8x7/8"	1	I	101-200	90-500	Dripproof
19207/17	FHN28WB	¼x1¼"	1	N	0-30	250 Max	Watertight Body Sealed
19207/18	FHL29G	¼x1¼"	2	I	0-30	12-90	Dripproof
19207/19	FHL30G	¼x1¼"	1	I	0-30	12-90	Dripproof
19207/21	FHL32W	¼x1¼"	1	I	0-30	90-250	Watertight
19207/22	FHL33W	¼x1¼"	2	I	0-30	90-250	Watertight
19207/23	FHL34W	13/32x1½"	2	I	0-30	90-500	Watertight
19207/24	FHL35W	13/32x1½"	1	I	0-30	90-500	Watertight
19207/25	FHN41WB	13/32x1½"	1	N	0-30	500 Max	Watertight Body Sealed
19207/30	FHN46WB	¼x1¼"	3	N	0-30	250 Max	Watertight Body Sealed
19207/31	FHN47WB	13/32x1½"	3	N	0-30	500 Max	Watertight Body Sealed

Blown Fuse Indicators

When A Fuse Blows, A Light Glows!®

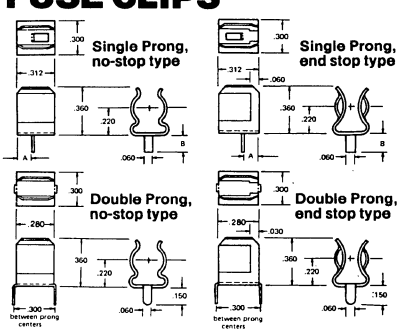


Several Models To Choose From

- Bolt Down for Rectifier Fuses
- Snap On for Ferrule Fuses
- Top Mounting for Knife Blade Fuses

PC BOARD FUSE CLIPS

Low profile clips (.360" high) are soldered to printed circuit boards eliminating eyeletting or riveting. Available in Spring brass, beryllium copper or spring bronze with various platings.



FIC CORPORATION
P.O. Box 2046
12216 Parklawn Drive
Rockville, MD 20852
TOLL FREE: 800/638-6594
IN MD: 301/881-8124
TWX: 710-828-9809

HEINEMANN®

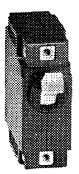
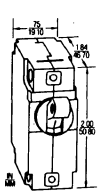
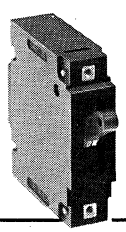
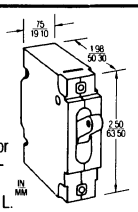
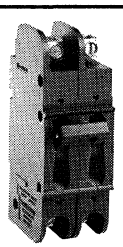
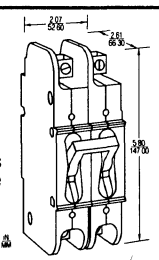
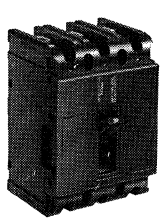
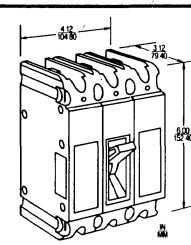
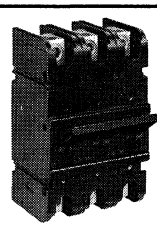
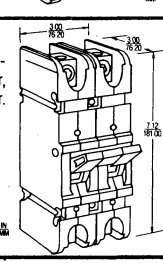
CIRCUIT PROTECTORS

Heinemann Electric Company
P.O. Box 6800, Lawrenceville, NJ 08648-0800 USA
(609) 882-4800 • Telex 843431

When your reputation's on the line

Heinemann offers the widest range of styles and current ratings in high-quality, reliable circuit protectors–from miniature, environmentally-sealed models with ratings as low as 0.020A to high-capacity industrial breakers rated 700A,160Vdc.

Heinemann hydraulic-magnetic circuit protectors hold their rated capacity regardless of ambient temperature—no derating, no nuisance tripping. A variety of time-delay characteris-

			APPLICATIONS	NO. OF POLES	MAX. VOLTAGE
TYPE J 0.020 — 30A		The Series J is an exceptionally compact, lightweight, and moderately-priced breaker for single or multipole OEM applications. Snap-in mounting, rocker handles, sealed-mount, and push-button models are available. Color-coded caps serve as panel accents and for circuit identification. Bulletin 81JA. 	OEM (power supplies, medical-electronic equipment, control systems, office and EDP equipment), control panels, marine equipment, field instrumentation.	1 to 4	277V, 50/60 Hz 240V, 400 Hz 415V, 50/60 Hz, 3-phase "Y" 65Vdc
Series J/S		Designed to meet VDE 0730 requirements; SEV approved. Series JB/S is J/S with snap-in mounting. Bulletin 81JS.			
SERIES AM 0.020-60A (ac) 0.020-100A (dc)		A low-cost, lightweight breaker available in single or multipole configurations, the Series AM features rear-connection studs, a high level of moisture resistance, and a current range up to 100A dc or 60A ac. Qualified under Mil-C-55629 to 50A dc and ac. Bulletins 81AM and 82AM-MIL. 	OEM (data-processing equipment, mobile applications, humid environments)	1 to 4	250V, 50/60 or 400 Hz 277V, 50/60 Hz, 1-phase 480V, 50/60 Hz, 3-phase "Y" 65Vdc
Series AM/S		Designed to meet VDE 0730 requirements; SEV approved. Bulletin 82 AM/S.			
SERIES CF E-FRAME 0.01 — 100A (ac) 0.04 — 100A (dc)		Priced considerably lower than competitive E-frame breakers, the Series CF is the most compact and versatile circuit breaker available for equipment and branch-circuit protection. Single and multipole models are stocked in a wide range of standard ratings for fast, off-the-shelf delivery. Bulletin 81CD. 	Panelboards, switchboards, branch circuits, EDP equipment, machine tools, environmental systems, single- and three-phase applications.	1 to 6	240V, 50/60 or 400 Hz 480V, 1- and 3-phase 125Vdc
SERIES GH EH-FRAME 10 — 100A		This rugged new EH-frame breaker offers all the advantages of a completely magnetic three-pole breaker with 14,000A interrupting capacity for less than most thermal units. Compact, environmentally stable to 100A at 480Vac and 250 Vdc. Bulletin 81GJ. 	Motor controls, air conditioning, electric heating, computer main frames, transportation, indoor or outdoor installations.	3	480V, 50/60 Hz 250Vdc
SERIES GJ 100 — 250A		Where space is at a premium and current capacity up to 250A is called for, the Series GJ is the answer. Available in one-, two-, or three-pole models, it is especially suitable for panelboards, service-entrances, and electric vehicles. Bulletin 81GJ. 	Commercial, industrial, and residential service-entrance or panelboard applications; lighting, appliance, transformer, electric vehicles, EDP power supplies, heating, air conditioning, and electronic circuit protection.	1 to 3	240V, 50/60 Hz 125/250Vdc
Series GJ1P 100-700A		Special 1-pole dc breaker with up to 700A capacity. Optional 25 mV shunt output permits current metering. Bulletin 83GJ1P.		1	160Vdc

tics lets you closely match load and circuit-protection requirements.

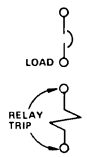
Invented by Heinemann, hydraulic-magnetic operation is now the specified standard for critical-hold/ critical-trip applications.

INTERRUPTING CAPACITY	UL/CSA RECOGNIZED OR LISTED
1000A 5000A with proper backup protection	Recognized, Component Recognition Program
1000A 5000A with proper backup protection	Recognized, Component Recognition Program
Up to 7500A (ac) 5000A (dc)	240V, 50/60 Hz and 125Vdc; Listed Others: Recognized
14,000A (ac) 10,000A (dc)	Listed (ac)
18,000A @ 240V, 50/60 Hz 10,000A @ 125/250Vdc 14,000A @ 160Vdc 25,000A @ 65Vdc	240V, 50/60 Hz and 125/250 Vdc; Listed
14,000A @ 160Vdc 25,000A @ 65 Vdc	160Vdc; Listed

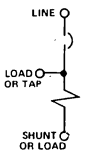
Special-Function Circuits

Heinemann protectors (except KD and TX) can be furnished with a number of special-function internal circuits. They permit a single protector to perform the protection and control functions of several components.

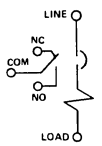
RELAY-TRIP
Provides for remote actuation using separate control circuit. Electrical isolation permits use of a different current or voltage from contact circuit. Both time-delay and non-time-delay constructions are available.



SHUNT/TAP
Use of third terminal permits remote tripping by utilizing line voltage with or without a time-delay response. On breakers rated up to 1A, the trip point may be raised by shunting with an external resistor on the shunt/tap terminal.

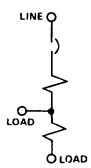


AUXILIARY SWITCH
Used for logic functions, alarms, lights, and other circuits. Miniature snap-action SPDT or DPDT switch is mounted on back of breaker, mechanically connected to switching mechanism. Contact capacity: 10A at 125/250V, 50/60 Hz; 4A resistive at 30Vdc; 2.5A inductive at 30Vdc. Minimum operating voltage: 6Vdc or ac, at 3VA dc or ac.

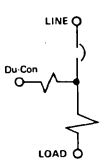


SERIES-TRIP (Standard internal circuit)
Ideal for use as both power switch and overload protector. Usually installed in series with line and load terminals to provide circuit interruption in the protected circuit.

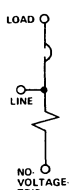
DUAL RATING
Two concentrically-wound sensing coils provide two discrete current ratings in the same breaker. Protects equipment designed to operate at two different current levels or supply voltages within certain limitations.



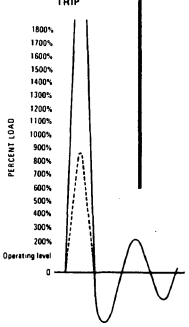
DU-CON™ (DUAL-CONTROL)
Provides sensing of both overcurrent and separate voltage signals in a single-pole breaker through a small, non-continuous-duty voltage sensing coil. DU-CON overload and voltage coils must be specified separately.



NO-VOLTAGE TRIP
Prevents uncontrolled re-start of equipment after power outage. Used in ground-fault interrupters and other safety applications. Not intended for overload protection without one pole connected in series-trip configuration.

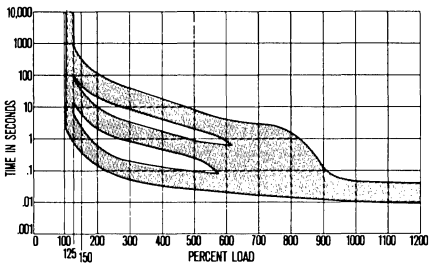


HIGH-INRUSH
Economical protection of high-reactance loads, which draw starting surges often as high as 30 times normal load current in a 50/60 Hz ½ cycle pulse, such as ferro-resonant power supplies and distribution transformers. Eliminates nuisance tripping without derating or special circuitry.



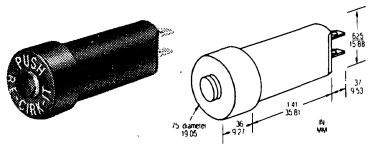
Typical Time-Delay Curves

Below are three time-delay curves for the Series CF at 50/60 Hz. Other special application curves, including high-inrush, dc, and non-time-delay, are also available.



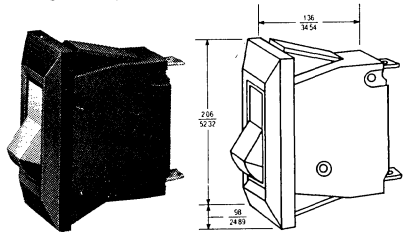
Re-Cirk-IT® Series KD

The UL- and CSA-recognized Re-Cirk-It® is a low-cost (non-magnetic) pushbutton circuit protector designed as a direct replacement for conventional ⅝-diameter fuse assemblies in consumer products and appliances. Resettable up to 1000% of its current rating of 2.5A through 15A, 500% at 0.25A to 2A. Both 250V, 50/60 Hz and 32Vdc models. SEV approvals. Bulletin 84KD.



Series TX

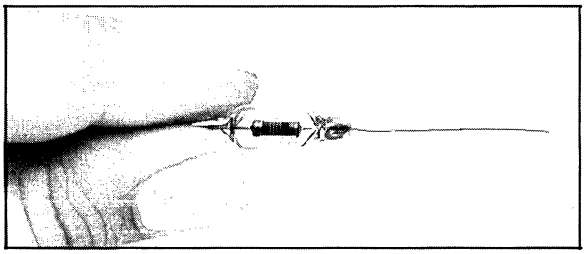
The Series TX is an attractive circuit protector designed to snap into a front panel to double as an off/on switch. A selection of colored rocker handles; backlighting available. Smudge-resistant matte black escutcheon. Cannot be held ON during an overload condition. Current rating from 2A to 20A at 125V, 50/60 Hz, or at 32 Vdc; 2A to 10A at 250V, 50/60 Hz. UL- and CSA-recognized. Unlighted models designed to meet VDE requirements. Bulletin 84TX.



8010

EEM PRODUCT SELECTION GUIDES

Use the EEM Product Selection Guides. There are 34 Guides in this edition of EEM. See page 2 (A•2, B•2, C•2, D•2) of each volume to locate the Product Selection Guides that pertain to your needs.



Mitsubishi DSA-A Series Gas Tube Surge Arresters

Twelve low cost gas tube arresters provide outstanding protection for data, components, equipment and personnel.

Features

- Laser scribed "micro-gap" insures accurate breakdown. DSA-A gas tubes are available in a range of DC striking voltages from 180 to 4500 volts with ± 20% tolerance (± 15% for some ranges).
- Rugged lead/electrode structure handles high current. Rated discharge current capability is 2,000 amps for an 8 x 20 microsecond wave. 1 second AC discharge capacity is 1 amp, and maximum follow-on AC for half wave sine (10 MS) is 25 amps.
- High field strength striking mechanism leads to fast protection. 10kV per microsecond wave strikes at less than 1.0kV for 500 VDC unit (less than 700 V for 1kV per microsecond wave).
- Unique electrode structure yields low transmission loading. Insulation resistance is more than 100 Megohm (at 100 V). Electrode capacitance is less than 2 pf (at 1 1kHz).

Description:

The Mitsubishi DSA-A Series gas tubes employ a uniquely designed starting mechanism that allows the component to function as a high speed voltage surge arrester. Because of this mechanism, the DSA combines the rugged, reliable, high energy handling characteristics of a gas tube with the fast striking speed of a metal-oxide varistor. High speed is a must in protecting today's sensitive semiconductor components from damage or data errors induced as a result of voltage transients.

The DSA-A series consists of twelve miniature glass tubes, covering a range of DC sparkover voltages from 180 to 4500 volts. All except the 180 volt and the 4500 volt units are Underwriters Laboratories recognized (file number E-70785). Each model includes a rugged glass envelope, sturdy 0.010 inch diameter axial leads and a pair of metal electrodes spaced by a solid ceramic cylinder. The cylinder is coated with a resistive film, and "micro-gap" precision grooves are laser-cut in the film to adjust the firing voltage. The gaps are typically a few thousandths of an inch wide, so a transient voltage pulse generates a high field gradient that results in a "field emission" discharge of electrons across the gap.

Unlike conventional gas surge tubes, which depend on a random build up of ionization from free photo electrons in the gas, the field emission discharge in the Mitsubishi DSA tubes builds up in nanoseconds, even in total darkness. Thus the DSA fires much faster than a standard gas tube, and, with a typical 1kV/microsecond wave front, will fire before the pulse voltage exceeds the DC voltage by more than 30%. The response of a standard tube to this 1kV/microsecond wave form normally results in a voltage overshoot of greater than twice the D.C. voltage.

Because of this the Mitsubishi DSA-A series, when installed immediately ahead of the protected circuits, will limit transient voltage to a level that can be tolerated by the electronic components used. These transients are caused by lightning, transmission line switching, or heavy machinery on the same line and can often exceed 10kV when not controlled. Use of the DSA-A tubes greatly improves the reliability and service life of the equipment protected.

Specifications:

Mitsubishi DSA-LA Gas Tube Arrester

Part number	Rated DC voltage (sparkover)	Tolerance ±%	Peak surge voltage 1kV/μsec (typ)	Peak surge voltage 10kV/μsec (typ)	U.L. recognition*
DSA-181-LA	180	15	650	1500	
DSA-231-LA	230	15	450	700	R
DSA-301-LA	300	15	500	750	R
DSA-401-MA	400	20	550	875	R
DSA-441-LA	440	15	575	925	R
DSA-501-MA	500	20	600	1000	R
DSA-701-MA	700	20	900	1350	R
DSA-102-MA	1000	20	1300	1800	R
DSA-152-MA	1500	20	2000	2800	R
DSA-242-MA	2400	20	3400	4000	R
DSA-302-MA	3000	20	4200	5000	R
DSA-452-MA	4500	20	6000	7500	

Data Common to all DSA-A Devices

Peak discharge current (8 x 20 microsecond wave) — 2,000 amperes
Maximum ½ wave/60Hz sine follow-on current — 25 amperes (peak)
Maximum 1 second continuous A.C. discharge current — 1 ampere (RMS)
Insulation resistance (at 100 Volts D.C.) — 100 Megohm (Minimum)
Interelectrode capacitance (at 1 kHz/6 VAC) — 2 picofarad (Maximum)

*U.S. Recognition (File No. E-70788) depends upon use of a wire wound 3 ohm resistor (Mitsubishi P/N RGB5-5 3 Ωk) in series with the DSA to limit A.C. follow-on current.

Characteristics:

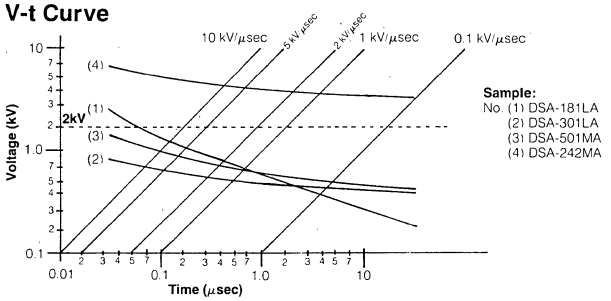
The Mitsubishi DSA-A series gas tube arresters are glass body, gas filled diodes. The rugged body and electrode structure withstands severe environments, including shock and vibration, thermal stress, humidity and dust. Depending on the D.C. voltage and application, these tubes are tested to a series of strict specifications, and meet or exceed the U.L. requirements (for power line applications) as well as both the U.S. F.C.C. and the Canadian D.O.C.

The response time of the "LA" series tubes to voltage surges is shown in figure 1. With voltage transient wave fronts less than 10 volts/microsecond, the peak firing voltage is essentially the same as the DC breakdown voltage. With faster wave fronts the firing voltage gradually increases. As shown, components are well protected even at rise times of 10kV/microsecond.

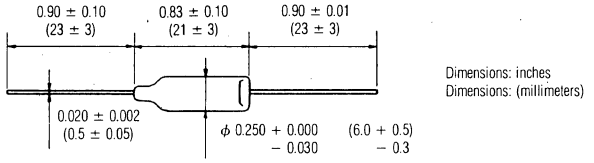
Unlike most devices, once the surge voltage fires the DSA, the voltage across the tube drops to ARC voltage level. ARC voltage, below 100 volts, is maintained as long as the surge energy can supply currents greater than one-tenth of an amp. Below this current level the tube jumps into a "glow" discharge, at voltages slightly lower than the D.C. breakdown voltage. The tube completely drops out of conduction at currents under one microamp. The MOV maintains a voltage at or near the D.C. breakdown level for the entire duration of the surge, thus permitting a much higher stress level to reach the protected equipment.

Peak surge currents of up to 2000 amps (on an 8 x 20 wave) can be repeatedly handled by a DSA-A device without performance degredation. When used across an A.C. line, a gas tube like the DSA will continue to conduct from the line voltage source (after being fired by a transient) until the line voltage drops below the ARC voltage. Because of the normally low line impedance, a series resistor (typically 3 ohms for a 120VAC/60Hz line) should be used to limit this "follow-on" current to 25 amperes peak for a single half line wave (10 milliseconds).

V-t Curve



Dimensions, DSA-A



Manufactured by:
Mitsubishi Mining and Cement Co., Ltd.
Sold in the US by:
Hi Tech Components and Plastics Company
A Division of
Mitsubishi International Corporation
520 Madison Ave., New York, NY 10022 (212) 605-2607

Littelfuse® CIRCUIT PROTECTION DEVICES

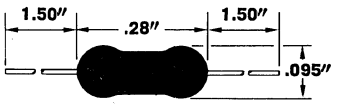
PICO II™ SUBMINIATURE FUSES

- World's smallest fuse for use in micro electronic circuits including computer and aerospace applications.
- Short circuit current of up to 300A.
- Low resistance values.
- Hi-speed action.
- Epoxy coated body for protection against environmental conditions.
- Withstand axial pull of 7 lbs.
- Available with or without color-coding per I.E.C. standards.

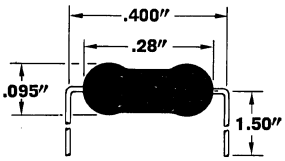
ENVIRONMENTAL CHARACTERISTICS

- Operating ambient temperature range: −55°C to 125°C
- Current carrying capacity:
  −55°C = 110% of rating
  25°C = 100% of rating
  125°C = 80% of rating
- Withstand vibrations of 10-55 Hz per method 201 of MIL-STD-202 and vibrations of 55-2000 Hz at 10 G's per method 204 test condition C of MIL-STD-202.

251 Series - Axial Leads



252 Series - Radial Leads

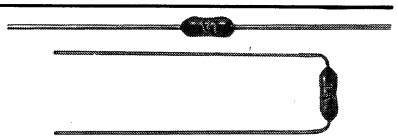


Note: Leads are solder-coated copper, .025″ diameter for 1/16-10A, .032″ diameter for 12-15A.

- Withstand shock of 100 G's for 6 milliseconds per method 213 test condition I of MIL-STD-202.

Blow Time: 100%, 4 hrs. min.; 200%, 5 sec. max. (1/16-10A) 10 sec. max. (12-15A)

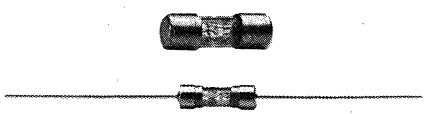
U.L. Recognized through 10 amps.
Certified by CSA through 7 amperes.



L.F. Number		Amp	Voltage
Axial Leads	Radial Leads	Rating	Rating
251.062	252.062	1/16	125
251.125	252.125	1/8	125
251.250	252.250	1/4	125
251.375	252.375	3/8	125
251.500	252.500	1/2	125
251.750	252.750	3/4	125
251001	252001	1	125
25101.5	25201.5	1-1/2	125
251002	252002	2	125
25102.5	25202.5	2-1/2	125
251003	252003	3	125
25103.5	25203.5	3-1/2	125
251004	252004	4	125
251005	252005	5	125
251007	252007	7	125
251010	252010	10	125
251012	252012	12	32
251015	252015	15	32

Note: To order color-coded PICO II™ fuses, use **255 Series** (for Axial leads) or **256 Series** (for Radial leads) in part number table above.

2AG SUBMINIATURE FUSES



Smallest glass fuse available today. Size .177″ dia. x .58″

FAST ACTING TYPE

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max.; 200%, 10 sec. max.

Short Circuit Rating: 1/8-1 amp — 10,000A (125V); 35A (250V). **1.5-3.5 amp** — 10,000A (125V); 100A (250V). **4-7 amps**—10,000A (125V).

Approvals: U.L. Listed and Certified by CSA.

SLO-BLO® TYPE

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max.; 200%, 3 sec. min./1 min. max.

Short Circuit Rating: 1/4-1 amp — 10,000A (125V); 35A (250V). **1.5-3.5 amps** — 10,000A (125V); 100A (250V). **4-7 amps** — 400A (125V).

Approvals: U.L. Listed and Certified by CSA thru 3.5 amps. U.L. Recognized 4-7 amps.

L.F. Number		Amp	Voltage
Fast-Acting	Slo-Blo®	Rating	Rating
225.125	—	1/8	250V
225.250	229.250	1/4	250V
225.375	229.375	3/8	250V
225.500	229.500	1/2	250V
225.750	229.750	3/4	250V
225001	229001	1	250V
22501.5	22901.5	1-1/2	250V
225002	229002	2	250V
22502.5	22902.5	2-1/2	250V
225003	229003	3	250V
22503.5	22903.5	3-1/2	250V
225004	229004	4	125V
225005	229005	5	125V
225007	229007	7	125V

Note: To order fast-acting fuses with pigtail leads, change **225** to **224**; to order Slo-Blo® fuses with pigtail leads, change **229** to **230**.

MICROFUSE SUBMINIATURE FUSES (125V)

Designed for applications where space is a critical factor. Ideal for installation on printed circuit boards. Short-circuit interrupting capacity — 125 volts at 10,000 amperes A.C.

Blow Time: 100%, 4 hour min.; 200%, 5 sec. max.

Size: 1/4″ dia. x 11/32″ (fuse body).

U.L. Recognized and Certified by CSA.

Plug-in, transparent cap type listed. Use prefix **272** for plug-in, metal cap; prefix **279** for pigtail, transparent cap; prefix **278** for pigtail, metal cap.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
273.002	1/500	273.125	1/8	273.750	3/4
273.005	1/200	273.200	2/10	273.800	8/10
273.010	1/100	273.250	1/4	273001	1
273.015	1/64	273.300	3/10	27301.5	1-1/2
273.031	1/32	273.400	4/10	273002	2
273.050	1/20	273.500	1/2	273003	3
273.062	1/16	273.600	6/10	273004	4
273.100	1/10	273.700	7/10	273005	5

SUBMINIATURE FUSES (250V) 5 x 20mm

For original installations and replacements in foreign-made equipment, such as home and car radios, amplifiers, tape recorders, etc. and in other applications where space is a factor. Available in fast-acting, high interrupting; fast-acting; and slo-blo types.

FAST-ACTING HIGH-INTERRUPTING (250V) TYPE F

Blow Time: .050-3.15 amp — 150%, 60 minutes min.; 210%, 30 minutes max.; 275%, .01-2 seconds; 400%, .003-0.3 seconds; 1000%, .02 seconds max. **4-10 amp** — 150%, 60 minutes min.; 210%, 30 minutes max.; 275%, .01-3 seconds; 400%, .003-0.3 seconds; 1000%, .02 seconds max.

Cat. No.	Amp. Rtg.	Cat. No.	Amp. Rtg.	Cat. No.	Amp. Rtg.
216.050	.050	216.315	.315	216002	2
216.063	.063	216.400	.400	21602.5	2.5
216.080	.080	216.500	.500	2163.15	3.15
216.100	.100	216.630	.630	216004	4
216.125	.125	216.800	.800	216005	5
216.160	.160	216001	1	21606.3	6.3
216.200	.200	2161.25	1.25	216008	8*
216.250	.250	21601.6	1.6	216010	10*

SEMKO approved through 6.3 amps.

FAST-ACTING (250V) TYPE F

Blow Time: .032-.100 amp — 150%, 60 minutes min.; 210%, 30 minutes max.; 275%, .01-.5 seconds; 400%, .003-.1 second; 1000%, .02 seconds max. **.125-10 amp** — 150%, 60 minutes min.; 210% 30 minutes max.; 275%, .05-2 seconds; 400%, .01-.3 seconds; 1000%, .02 seconds max.

Cat. No.	Amp. Rtg.	Cat. No.	Amp. Rtg.	Cat. No.	Amp. Rtg.
217.032	.032	217.250	.250	217002	2
217.040	.040	217.315	.315	21702.5	2.5
217.050	.050	217.400	.400	2173.15	3.15
217.063	.063	217.500	.500	217004	4
217.080	.080	217.630	.630	217005	5
217.100	.100	217.800	.800	21706.3	6.3
217.125	.125	217001	1	217008	8*
217.160	.160	21701.25	1.25	217010	10*
217.200	.200	21701.6	1.6		

SEMKO approved through 6.3 amperes. BEAB approved from .050-6.3 amperes.

SLO-BLO® (250V) TYPE T

Blow Time. .032-.100 amp — 150%, 60 minutes min.; 210%, 2 minutes max.; 275%, 0.2-10 seconds; 400%, .04-3 seconds; 1000%, .01-.3 seconds. **.125-10 amp** — 150%, 60 minutes min.; 210%, 2 minutes max.; 275%, 0.6-10 seconds; 400%, .15-3 seconds; 1000%, .02-.3 seconds.

Catalog Number	Ampere Rating	Catalog Number	Ampere Rating
218.032	.032	218.630	.630
218.040	.040	218.800	.800
218.050	.050	218001	1
218.063	.063	2181.25	1.25
218.080	.080	21801.6	1.6
218.100	.100	218002	2
218.125	.125	21802.5	2.5
218.160	.160	2183.15	3.15
218.200	.200	218004	4
218.250	.250	218005	5
218.315	.315	21806.3	6.3
218.400	.400	218008	8*
218.500	.500	218010	10*

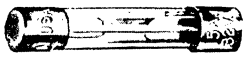
SEMKO and BEAB approved through 6.3 amperes.

* Standards for 5 x 20mm fuses do not include ratings above 6.3 amperes.

Littelfuse®

CIRCUIT PROTECTION DEVICES

3AG FUSES (32V) ¼" x 1¼"

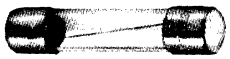


Medium-acting fuses for use in cars, radios, amplifiers, etc.

Blow Time: 110%, 4 hour min.; 135%, 1 hour max.; 200%, 10 sec. max.
U.L. Listed under U.L. STD 275 through 30 amps.
CSA Certified through 30 amps.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
311004	4	31107.5	7-1/2	311015	15
311005	5	311008	8	311025	25
311006	6	311010	10	311030	30
311007	7	311012	12	311035	35

3AG FUSES (250V) ¼" x 1¼"



Quick-acting, normal-blo fuses for general circuit protection.

3AG PIGTAIL FUSES

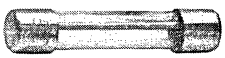
Same as above but with pigtails for direct wiring into chassis. Leads are 1-1/2" long, copper wire.

Blow Time: 110%, 4 hour min.; 135%, 1 hour max.; 200%, 5 sec. max.
U.L. Listed and Certified by CSA

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
312.010	1/100	312.300	3/10	31202.5	2-1/2
312.031	1/32	312.375	3/8	312003	3
312.062	1/16	312.500	1/2	312004	4
312.100	1/10	312.600	6/10	312005	5
312.125	1/8	312.750	3/4	312006	6
312.150	15/100	312001	1	312007	7
312.175	.175	3121.25	1-1/4	312008	8
312.187	3/16	31201.5	1-1/2	312010	10
312.200	2/10	31201.6	1-6/10		
312.250	1/4	312002	2		

Note: To order fuses with pigtail leads, change **312** series number to **318.**

3AG SLO BLO® FUSES (250V or less) ¼" x 1¼"



Designed to withstand momentary high-current surges but still blow quickly on shorts. Provide protection for equipment with high reactive current surges or heavy starting currents such as solenoids, motors and lamp circuits.

3AG SLO BLO® PIGTAIL FUSES

Same as above but with pigtails for direct wiring into chassis. Leads are 1-1/2" long, copper wire.

Blow Time: 110%, 4 hour min.; 135%, 1 hour max., 200%, 5 sec. min.
U.L. Listed and certified by CSA through 7 amps. U.L. Recognized from 8-30 amps.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
313.010	1/100	313.700	7/10	313005	5
313.031	1/32	313.750	3/4	3136.25	6-1/4
313.040	4/100	313.800	8/10	313007	7
313.062	1/16	313001	1	313008	8*
313.100	1/10	31301.2	1-2/10	313010	10*
313.125	1/8	3131.25	1-1/4	313012	12*
313.150	15/100	31301.5	1-1/2	313015	15*
313.175	.175	31301.6	1-6/10	313020	20*
313.187	3/16	31301.8	1-8/10	313025	25*
313.200	2/10	313002	2	313030	30*
313.250	1/4	3132.25	2-1/4		
313.300	3/10	31302.5	2-1/2		
313.375	3/8	31302.8	2-8/10		
313.400	4/10	313003	3		
313.500	1/2	31303.2	3-2/10		
313.600	6/10	313004	4		

* 32 volt. Note: For pigtail leads, change **313** to **315.**

3AB CERAMIC SLO BLO® FUSES (250V or less) ¼" x 1¼"

Similar to 313(000) series above, but have higher interrupting capacity.

Blow Time: 110%, 4 hour min.; 135%, 1 hour max.; 200%, 5 sec. min.
U.L. Listed 1/100 - 10 amps.
U.L. Recognized 12-30 amps.
CSA Certified 1/4-10 amps.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
326.010	1/100	326.600	6/10	326004	4
326.031	1/32	326.700	7/10	326005	5
326.062	1/16	326.750	3/4	3266.25	6-1/4
326.100	1/10	326.800	8/10	326007	7
326.125	1/8	326001	1	326008	8
326.150	15/100	32601.2	1-2/10	326010	10
326.175	.175	3261.25	1-1/4	326012	12
326.187	3/16	32601.5	1-1/2	326015	15
326.200	2/10	32601.6	1-6/10	326020	20
326.250	1/4	326002	2	326025	25*
326.300	3/10	32602.5	2-1/2	326030	30*
326.375	3/8	32602.8	2-8/10		
326.400	4/10	326003	3		
326.500	1/2	32603.2	3-2/10		

* 125 volt.

3AB CERAMIC BODY FUSES (250V or less) ¼" x 1¼"

Ceramic body and arc-quenching filler in higher amperages provide high interrupting capacity.

Blow Time: 1/8-30 amps: 110%, 4 hrs. min.; 135%, 1 hr. max.; **1/8-12 amps:** 200%, 15 sec. max.; **15-30** amps: 200%, 60 sec. max.
U.L. Listed through 15 amps.
Certified by CSA through 15 amps. U.L. Recognized 20-30 A.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
314.125	1/8	314003	3	314012	12
314.250	1/4	314004	4	314015	15
314.375	3/8	314005	5	314020	20
314.500	1/2	314006	6	314025	25*
314.750	3/4	314007	7	314030	30*
314001	1	314008	8		
314002	2	314010	10		

* 125 volt.

3AB CERAMIC BODY RECTIFIER FUSES (250V or less) ¼" x 1¼"

Extremely fast-acting fuses for protection of silicon controlled rectifiers and similar solid state devices.

Blow Time: 1-30 amps: 100%, 4 hour min.; **1-10 amps:** 250%, .2 sec. max. (pre-arcing); **12-30 amps:** 250%, 1 sec. max. (pre-arcing).
U.L. Recognized

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
322001	1	322006	6	322012	12*
3221.25	1-1/4	322007	7	322015	15*
322002	2	322008	8	322020	20*
322003	3	322009	9	322025	25*
322004	4	322010	10	322030	30*
322005	5				

* 65V. All others 250V.

Littelfuse® CIRCUIT PROTECTION DEVICES

8AG INSTRUMENT FUSES (250V or less) 1/4" x 1"

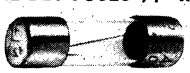
Very fast-acting fuses for protection of delicate equipment such as microammeters, galvanometers, voltmeters and other instruments.

Blow Time: 100%, 4 hour min.; 200%, 5 sec. max.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
361.002	1/500	361.125	1/8	361.750	3/4
361.005	1/200	361.187	3/16	361001	1
361.010	1/100	361.200	2/10	36101.5	1-1/2
361.015	1/64	361.250	1/4	361002	2
361.031	1/32	361.375	3/8	361003	3*
361.062	1/16	361.400	4/10	361004	4*
361.100	1/10	361.500	1/2	361005	5*

* 125 volt.

8AG NORMAL BLO FUSES 1/4" x 1"



Normal blo fuses designed to standard N.E.C. specs. Used when space limitations prevent use of 3AG fuses. **For pigtail leads, change series number to 368.**

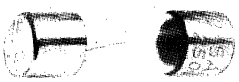
Blow Time: 110%, 4 hour min.; 135%, 1 hour max.;. 200%, 10 sec. max.

U.L. Listed through 5 amps. Certified by CSA 1/4-5 amps.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
362.125	1/8	362002	2*	362010	10†
362.250	1/4	36202.5	2-1/2*	362012	12†
362.375	3/8	362003	3*	362015	15†
362.500	1/2	362004	4*	362020	20†
362.750	3/4	362005	5*	362025	25†
362001	1	362006	6*	362030	30†
36201.5	1-1/2*	362008	8†		

* 125V. † 32V.

5AG NORMAL-BLO FUSES (250/125/32V) 13/32" x 1 1/2"



Normal blo fuses for general circuit protection requiring larger fuse with more rugged construction.

Blow Time: 35-60 amps: 100%, 4 hrs. min.; **1-30 amps:** 110%, 4 hrs. min.; 135% 1 hr. max.; **1-8 amps:** 200%, 5 sec. max.; **10-30 amps:** 200%, 10 sec. max.; **35-60 amps:** 300%, 4 sec. max.

U.L. Recognized 10-60 amps.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
512001*	512005*	511020	511040
512002*	512008†	511025	511050
512003*	511010	511030	511060
512004*	511015	511035	

Note: Numerals indicate amperage ratings.
* 250V. All others 32V except (†) is 125V.

BLF FUSES (250V/125V or less) 13/32" x 1 1/2"

For low-cost, non-time delay use in control circuits.

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max., 200%, 15 sec. max.
Short Circuit Rating: 10,000 Amperes AC.
U.L. Listed.
Certified by CSA.

* 125V. All others 250V.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
BLF 1/2	BLF 3	BLF 7	BLF 15
BLF 1	BLF 4	BLF 8	BLF 20*
BLF 1-1/2	BLF 5	BLF 9	BLF 25*
BLF 2	BLF 6	BLF 10	BLF 30*
BLF 2-1/2	BLF 6-1/4	BLF 12	

Note: Numerals indicate amperage ratings.

BLN FUSES (250V or less) 13/32" x 1 1/2"

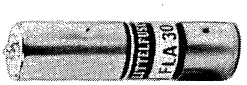
For low-cost, non-time delay use in control circuits and military applications.

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max., 200%, 15 sec. max.
Short Circuit Rating: 10,000 Amperes AC.
U.L. Listed. Certified by CSA.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
BLN 1	BLN 5	BLN 10	BLN 20
BLN 2	BLN 6	BLN 12	BLN 25
BLN 3	BLN 8	BLN 15	BLN 30
BLN 4			

Note: Numerals indicate amperage ratings.

FLA FUSES (250V/125V/32V) 13/32" x 1 1/2"



Time delay fuses. Indicating pin protrudes when fuse blows.

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max.
Short Circuit Rating: 10,000 Amperes AC.
U.L. Listed 1/10 - 15 amperes.
C.S.A. Certified 1/10 - 10 amperes.

* 250V. All others 125V except (†) are 32V.
Note: Numerals indicate amperage ratings.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
FLA 1/10*	FLA 1	FLA 2-8/10	FLA 6-1/4
FLA 15/100*	FLA 1-1/8	FLA 3	FLA 7
FLA 2/10*	FLA 1-1/4	FLA 3-2/10	FLA 8
FLA 1/4*	FLA 1-1/2	FLA 3-1/2	FLA 10
FLA 3/10*	FLA 1-6/10	FLA 4	FLA 12
FLA 4/10*	FLA 1-8/10	FLA 4-1/2	FLA 15
FLA 1/2*	FLA 2	FLA 5	FLA 20†
FLA 6/10*	FLA 2-1/4	FLA 5-6/10	FLA 25†
FLA 8/10*	FLA 2-1/2	FLA 6	FLA 30†

FLM FUSES (250V or less) 13/32" x 1 1/2"

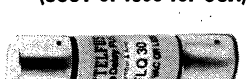
Dual element, time delay fuses for use in circuits with high in-rush currents.

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max., 200%, 12 sec. min.
Short Circuit Rating: 10,000 Amperes AC.
U.L. Listed.
CSA Certified

Note: Numerals indicate amperage ratings.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
FLM 1/10	FLM 1-1/8	FLM 3	FLM 8
FLM 15/100	FLM 1-1/4	FLM 3-2/10	FLM 9
FLM 2/10	FLM 1-4/10	FLM 3-1/2	FLM 10
FLM 1/4	FLM 1-1/2	FLM 4	FLM 12
FLM 3/10	FLM 1-6/10	FLM 4-1/2	FLM 15
FLM 4/10	FLM 1-8/10	FLM 5	FLM 20
FLM 1/2	FLM 2	FLM 5-6/10	FLM 25
FLM 6/10	FLM 2-1/4	FLM 6	FLM 30
FLM 8/10	FLM 2-1/2	FLM 6-1/4	
FLM 1	FLM 2-8/10	FLM 7	

FLQ FUSES (500V or less for U.L.) 13/32" x 1 1/2" (600V or less for CSA)



Dual element, time delay fuses for circuits with high in-rush currents.

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max., 200%, 12 sec. min.
Short Circuit Rating: 10,000 Amperes AC.
U.L. Listed. CSA Certified

Note: Numerals indicate amperage ratings.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
FLQ 1/10	FLQ 8/10	FLQ 3-2/10	FLQ 9
FLQ 1/8	FLQ 1	FLQ 3-1/2	FLQ 10
FLQ 15/100	FLQ 1-1/8	FLQ 4	FLQ 12
FLQ 3/16	FLQ 1-1/4	FLQ 4-1/2	FLQ 14
FLQ 2/10	FLQ 1-1/2	FLQ 5	FLQ 15
FLQ 1/4	FLQ 1-6/10	FLQ 5-6/10	FLQ 20
FLQ 3/10	FLQ 2	FLQ 6	FLQ 25
FLQ 4/10	FLQ 2-1/4	FLQ 6-1/4	FLQ 30
FLQ 1/2	FLQ 2-1/2	FLQ 7	
FLQ 6/10	FLQ 3	FLQ 8	

Littelfuse®

CIRCUIT PROTECTION DEVICES

BLS FUSES (600V or less) 13/32" x 13/8"

Fast clearing, space-saving fuses for street lighting, control and electronic circuits.

Blow Time: 110%, 4 hrs. min., 135%, 1 hr. max.
Short Circuit Rating: 10,000 amperes AC.
U.L. Listed 1/2-5 amperes.
C.S.A. Certified 1/2 - 5 amperes.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
BLS 2/10	BLS 1	BLS 2	BLS 6
BLS 4/10	BLS 1-1/2	BLS 3	BLS 7
BLS 1/2	BLS 1-6/10	BLS 4	BLS 8
BLS 3/4	BLS 1-8/10	BLS 5	BLS 10
BLS 8/10			

Note: Numerals indicate amperage ratings.

KLK FUSES (600 VAC or less) 13/32" x 1½"

Fast-acting, current limiting fuses for use in control, electronic and other circuits with high fault current capacity.

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max.
Short Circuit Rating: 100,000 amperes AC.
U.L. Listed 3/10 - 30 amperes.
C.S.A. Certified 3/10 - 30 amperes.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
KLK 1/10	KLK 1/3	KLK 3	KLK 10
KLK 1/8	KLK 3/4	KLK 4	KLK 15
KLK 2/10	KLK 1	KLK 5	KLK 20
KLK 1/4	KLK 1-1/2	KLK 6	KLK 25
KLK 3/10	KLK 2	KLK 8	KLK 30

Note: Numerals indicate amperage ratings.

KLW RECTIFIER FUSES (130V or less) 13/32" x 1½"

Fast-acting fuses for protection of rectifiers, S.C.R.'s, thyristors, solid state devices.

Blow Time: 100%, 4 hrs. min.; 250%, 1 sec. max.
Interrupting Rating: 200,000 amperes AC.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
KLW 1	KLW 5	KLW 9	KLW 20
KLW 2	KLW 6	KLW 10	KLW 25
KLW 3	KLW 7	KLW 12	KLW 30
KLW 4	KLW 8	KLW 15	

Note: Numerals indicate amperage ratings.

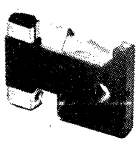
BLADE TYPE TERMINAL FUSES (32V)

Low voltage plug-in fuses. Color-coded for amperage identification.

Blow Time: 110%, 100 hours min.; 135%, 1500 sec. max.; 200%, 5 sec. max. 350%, .080 sec. min. **Size:** .76" wide x .75" high x .207" deep.
U.L. Listed 3 - 30 amps.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
257003	3	25707.5	7.5	257020	20
257004	4	257010	10	257025	25
257005	5	257015	15	257030	30

ALARM INDICATING FUSES (125 VAC, 60 VDC)

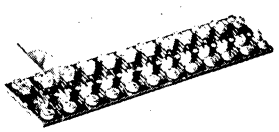


Plug-in fuses for telecommunications and similar applications. Blown fuse indicating flag can also activate alarm circuit. Flag is color-coded by ampere rating.

Blow Time: 100%, 10 minutes min.; 150%, 5 minutes max.
U.L. Recognized at 60 VDC.

L.F. No.	Amp Rtg.	Color Code	L.F. No.	Amp Rtg.	Color Code
401.180	18/100	Yellow	401002	2	Orange
401.250	1/4	Violet	401003	3	Blue
401.500	1/2	Red	401005	5	Green
401.650	65/100	Black	40107.5	7-1/2	Black/ White
401.750	3/4	Brown			
401001	1	Gray	401010	10	Red/ White
4011.33	1-1/3	White			

TYPE T FUSE BLOCKS WITH SCREW TERMINAL CLIPS



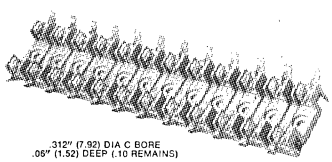
Open type blocks available for 3AG and 5AG fuse sizes from one to twelve poles. Bases are of grade X black laminate with 1/32" insulator sheet cemented to underside. Screw terminal clips.

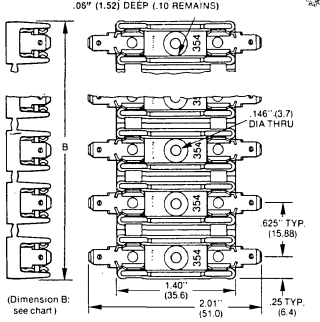
Mounting Hole: 3AG — .142"/.147" dia. with .295"/.302" by 82°CS. **5AG** — .171"/.176" dia. with .342"/.349" x 82°CS.
Clip Material: 356 Series—Nickel Plated Spring Brass. **359** and **556** Series—Silver Plated Beryllium Copper.
Size: Width: 2-3/8" (3AG), 2-3/4" (5AG). See chart for length dimensions. **356 Series and 556 Series are Recognized under the Components Program of Underwriters Laboratories.**

No. of Poles	For 3AG Fuses		For 5AG Fuses	
	Length (In.)	Part No.	Length (In.)	Part No.
1	25/32	356001	27/32	556001
2	1-11/16	356002	1-13/16	556002
3	2-19/32	356003	2-25/32	556003
4	3-1/2	356004	3-3/4	556004
5	4-13/32	356005	4-23/32	556005
6	5-5/16	356006	5-11/16	556006
7	6-7/32	356007	6-21/32	556007
8	7-1/8	356008	7-5/8	556008
9	8-1/32	356009	8-19/32	556009
10	8-15/16	356010	9-9/16	556010
11	9-27/32	356011	10-17/32	556011
12	10-3/4	356012	11-1/2	556012

For 3AG block with silver plated beryllium copper, change series number to **359.**

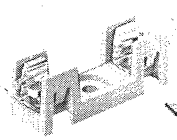
OMNI-BLOK® FUSE BLOCKS





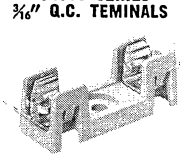
For 3AG fuses. New, low profile fuse blocks with "break-away" pole feature.

354000 SERIES SOLDER TERMINALS



354800, 354900 SERIES ¼" Q.C. TERMINALS

354600 SERIES 3/16" Q.C. TEMINALS



354101-GY P.C. BOARD TERMINALS

Approvals: U.L. Recognized and Certified by CSA up to 300V and at current ratings shown below.

Series	Current Rating	
	U.L.	CSA
354000	30A	30A
354600	20A	20A
354800	20A	20A
354900	30A	25A
354101-GY	15A	15A

Specifications: 354 (000) Series (Solder type terminals); 30 amps, 300V. 354 (600) Series (3/16" Q.C. terminals); 20 amps, 300V. 354 (800) Series (¼" Q.C. terminals); 20 amps, 300V. 354 (900) Series (¼" Q.C. terminals); 30 amps, 300V. 354101-GY (PC Board): 15A, 300V.

Materials: Clip/terminal; High tensile spring brass, electro-tin plated. Base; Grey Polyester, glass reinforced. UL-94V0 flammability rating.

Special Options: Standard color is gray. Contact factory for special colors. Single pole units can be supplied with anti-rotation boss. Contact factory.

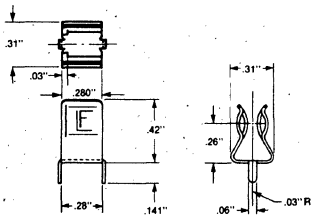
Catalog Number				No. of Poles	Dimension "B"
Solder Type Terminals	3/16" Q.C. Terminals	1/4" Q.C. Terminals	1/4" Q.C. Terminals		
354001-GY	354601-GY	354801-GY	354901-GY	1	.50"
354002-GY	354602-GY	354802-GY	354902-GY	2	1.12"
354003-GY	354603-GY	354803-GY	354903-GY	3	1.75"
354004-GY	354604-GY	354804-GY	354904-GY	4	2.38"
354005-GY	354605-GY	354805-GY	354905-GY	5	3.00"
354006-GY	354606-GY	354806-GY	354906-GY	6	3.63"
354007-GY	354607-GY	354807-GY	354907-GY	7	4.25"
354008-GY	354608-GY	354808-GY	354908-GY	8	4.88"
354009-GY	354609-GY	354809-GY	354909-GY	9	5.50"
354010-GY	354610-GY	354810-GY	354910-GY	10	6.13"
354011-GY	354611-GY	354811-GY	354911-GY	11	6.75"
354012-GY	354612-GY	354812-GY	354912-GY	12	7.38"

FOR INFORMATION ON OTHER STYLES OF FUSE BLOCKS, CONTACT FACTORY.

LITTELFUSE, Inc. • Dept. EM, 800 E. Northwest Highway • Des Plaines, IL 60016 • (312) 824-1188

Littelfuse® CIRCUIT PROTECTION DEVICES

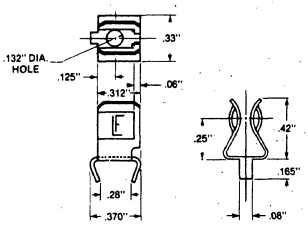
P.C. BOARD FUSE CLIPS
FOR 1/4" DIAMETER FUSES



Cat. No.	Clip Material	Finish	Style
102071	Spring Brass	Tin Plated	Ear
102074	Spring Brass	Tin Plated	Earless
122083	Beryllium Copper	Silver Plated	Ear
122088	Beryllium Copper	Tin Plated	Ear
122087	Beryllium Copper	Silver Plated	Earless

Note: Spring brass clips are suitable for current levels up to 15 amperes; beryllium copper clips up to 30 amps.

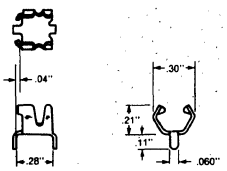
P.C. BOARD FUSE CLIPS
BOWED TAB TYPE FOR 1/4" DIAMETER FUSES



Cat. No.	Clip Material	Finish	Style
102078	Spring Brass	Tin Plated	Earless
102079	Spring Brass	Tin Plated	Ear

Note: Spring brass clips are suitable for current levels up to 15 amperes.

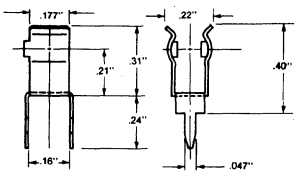
P.C. BOARD FUSE CLIPS
LOW PROFILE TYPE FOR 1/4" DIAMETER FUSES



Cat. No.	Clip Material	Finish	Style
122090	Beryllium Copper	Silver Plated	Low Profile
102080	Spring Brass	Tin Plated	Low Profile

Note: Spring brass clips are suitable for current levels up to 15 amperes; beryllium copper clips up to 30 amperes.

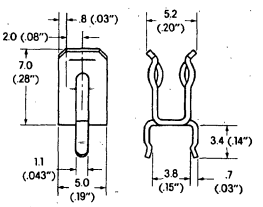
P.C. BOARD FUSE CLIPS
FOR 5mm DIAMETER FUSES



Cat. No.	Clip Material	Finish	Style
100054	Spring Brass	Silver Plated	Ear
100056	Spring Brass	Tin Plated	Ear

Note: Spring brass clips are suitable for current levels up to 10 amperes.

P.C. BOARD FUSE CLIPS
FOR 2AG OR 5mm DIAMETER FUSES

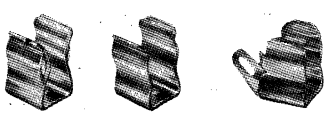


Cat. No.	Clip Material	Finish	Style
111501	Spring Brass	Tin Plated	Ear

Note: Suitable for current levels up to 10 amperes.

Note: Metric dimensions are shown. Inch dimensions are in parentheses.

RIVET MOUNT FUSE CLIPS



EAR TYPE EARLESS TYPE LUG TYPE

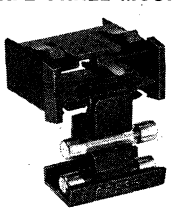
Be Cu*	Spring Brass†	Style	Fuse Dia.
121001	101001	Ear	1/4"
125001	105001		13/32"
127001	107001		9/16"
129001	109001		13/16"
121002	101002	Earless	1/4"

* Silver Plated. † Nickel Plated. ‡ Tin Plated.

Be Cu*	Spring Brass†	Style	Fuse Dia.
125002	105002	Earless	13/32"
127002	107002		9/16"
129002	109002		13/16"
121004	101003‡	Lug-45°	1/4"
122081	102064‡	Lug-Straight	1/4"

FLIP TOP SHOCK-SAFE PANEL MOUNT FUSEHOLDER #346877 FOR 3AG FUSES

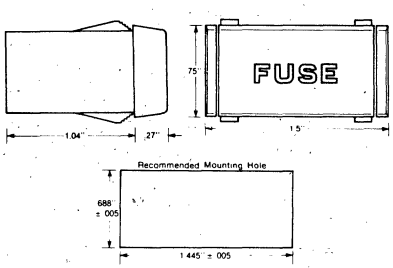
FUSE CARRIER HOLDS SPARE FUSE



Shock-Safe design eliminates any possibility of electrical shock, per IEC Standards 257 and 65. Fuse carrier holds spare fuse for fast, easy fuse replacement and convenient servicing. Low profile design complements modern panels.
APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA (10A, 250V).

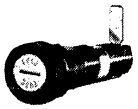
SPECIFICATIONS:
Electrical Rating: See Approvals.
Insulation Resistance: 10,000 megohm minimum at 500 VDC.
Contact Resistance: Less than .005 ohm.
Dielectric Strength: 2500 volts minimum.
Mounting: Snap-in mounting. No hardware required. Panel thickness = .032"/.125".
Molded Parts: Polyester, 94V0 black standard (other colors available as special).
Fuse Carrier: Springloaded. Unlocks with a press of the finger. Locks into place to prevent accidental circuit interruption. Permanently attached to fuseholder body to prevent loss. Extracts fuse from live terminals.
Terminals: Copper alloy, tin plate. Accept .250" x .032" quick-connect or solder. .072" dia. hole.

Ambient Temperature: −40°C to +85°C.
Vibration: 10-55-10 Hz at .06 double amplitude (Method 201, MIL-STD-202).
PATENTS: Pending.



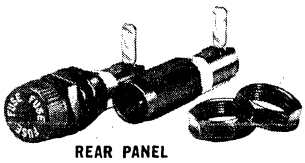
Littelfuse® CIRCUIT PROTECTION DEVICES

SHOCK-SAFE FUSEHOLDERS FOR 3AG OR 5 x 20mm FUSES


FRONT PANEL, LOW PROFILE

FRONT PANEL, HIGH PROFILE

FRONT PANEL


REAR PANEL

LOW PROFILE, FAST MOUNT

- Designed to meet IEC (International Electrotechnical Commission) specifications 65 and 257.
- Eliminate possibility of electrical shock.
- Bodies accept ¼" x 1¼" or 5 x 20mm fuses with use of appropriate knob.
- **U.L. Recognized. Certified by CSA (20A, 300V). SEMKO approved (6.3A, 250 V). VDE approved (10A, 250V).**

SPECIFICATIONS

MOLDED PARTS
Body material: black glass-filled thermoplastic
Knob material: grey or black glass-filled thermoplastic
Hex nut material: glass filled thermoplastic

LOW PROFILE BODY
(with screwdriver slot knob)

L.F. No.		Bottom Terminal	
1/4" x 1-1/4" Fuses	5mm x 20mm Fuses	Right Angle	Straight
345601	345621	X	
345611	345631		X

Body and Nut only: #345601-010 (Rt. Angle) #345611-010 (Straight)
Knob only: #345601-020 (¼" x 1¼") #345621-020 (5 x 20mm)

HIGH PROFILE BODY
(with screwdriver slot knob)

L.F. No.		Bottom Terminal	
1/4" x 1-1/4" Fuses	5mm x 20mm Fuses	Right Angle	Straight
345602	345622	X	
345612	345632		X

Body and Nut only: #345602-010 (Rt. Angle) #345612-010 (Straight)
Knob only: #345601-020 (¼" x 1¼") #345621-020 (5 x 20mm)

KNOB
Finger grip or screwdriver slot types
Spring loaded, bayonet style
Fuse extractor
Nickel plated copper alloy insert

TERMINALS
Electro tin plated brass
Accept solder or 3/16" female connector. See below.

MOUNTING
Withstands 15 pound/inch mounting torque
Maximum panel thickness: 5/16"

ELECTRICAL CHARACTERISTICS
300 volt rating 20 amperes max.
Insulation resistance: 10,000 megohm minimum at 500 VDC

FINGER GRIP BODY
(with finger grip knob)

L.F. No.		Bottom Terminal	
1/4" x 1-1/4" Fuses	5mm x 20mm Fuses	Right Angle	Straight
345603	345623	X	
345613	345633		X

Body and Nut only: #345603-010 (Rt. Angle) #345613-010 (Straight)
Knob only: #345603-020 (¼" x 1¼") #345623-020 (5 x 20mm)

REAR PANEL-FINGER GRIP

L.F. No.		Bottom Terminal	
1/4" x 1-1/4" Fuses	5mm x 20mm Fuses	Right Angle	Straight
345903	345923	X	
345913	345933		X

Body and Nuts (2) only: #345903-010 (Rt. Angle) #345913-010 (Straight)
Knob only: #345603-020 (¼" x 1¼") #345623-020 (5 x 20mm)

Contact Resistance: Less than .005 ohms average at currents up to 1 ampere.
Dielectric strength: 4000 volts minimum

ENVIRONMENTAL
Ambient temperature: −40°C to +85°C
Vibration: 10-500 Hz, .03" constant amplitude or 10 G's constant acceleration

Patents: Pending

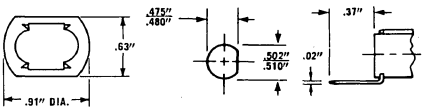
LOW PROFILE-FAST MOUNT

L.F. No.		Bottom Terminal	
1/4" x 1-1/4" Fuses	5mm x 20mm Fuses	Right Angle	Straight
345701	345721	X	
345711	345731		X

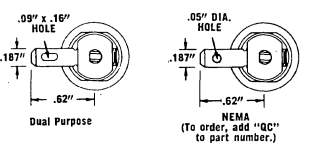
Body and Retaining Nut only: #345701-010 (Rt. Angle) #345711-010 (Straight)
Knob only: #345601-020 (¼" x 1¼") #345621-020 (5 x 20mm)

NOTE: Knobs are color-coded. On screwdriver slot type, knobs are grey for 1/4" x 1-1/4" fuses, black for 5 x 20mm fuses. On finger grip type, the lettering on knobs for 1/4" x 1-1/4" fuses are filled with grey paint.

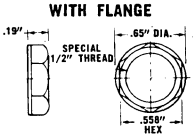
"PUSH-ON" TYPE RETAINING NUT
SUGGESTED MOUNTING HOLE
STRAIGHT BOTTOM TERMINAL



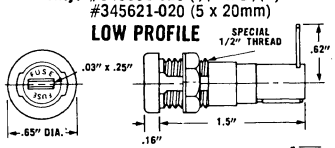
QC Terminal Styles



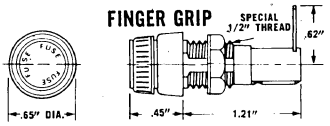
PLASTIC HEX NUT WITH FLANGE



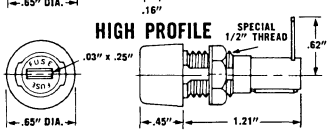
LOW PROFILE



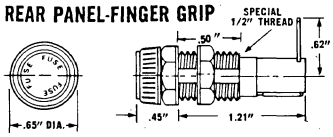
FINGER GRIP



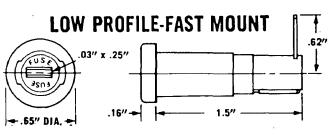
HIGH PROFILE



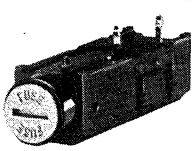
REAR PANEL-FINGER GRIP



LOW PROFILE-FAST MOUNT



P.C. BOARD SHOCK-SAFE FUSEHOLDERS FOR 3AG OR 5x20MM FUSES



Similar to shock-safe fuseholders shown above but designed for p.c. board mounting. Shock-safe design per IEC Standards 257 and 65. Two different knob styles available for use with ¼" x 1¼" or 5 x 20mm fuses.

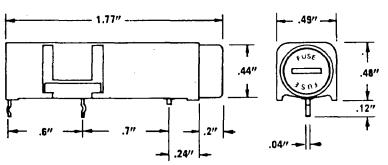
SPECIFICATIONS:
Electrical: Rating See APPROVALS.
Insulation Resistance: 10,000 megohm minimum at 500 VDC.
Contact Resistance: Less than .005 ohms average at a current of one ampere.
Dielectric Strength: 4000 volts minimum.

Mounting: Intended for soldering to printed circuit boards.
Molded Parts: Body Material: Black glass-filled thermoplastic. Knob Material: Grey or black glass-filled thermoplastic.
Knob: Screwdriver slot, fuse extractor type with nickel-plated copper alloy insert. Spring-loaded, bayonet style.
Terminals: Brass. Tin-plated.
Ambient Temperature: −40°C to +85°C.

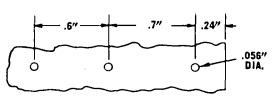
APPROVALS: Recognized under the Components Program of Underwriters Laboratories (16A, 250V)
Certified by CSA (15A, 250V).
SEMKO approved (6.3A, 250V). VDE approval pending.

L.F. No.	
1/4" x 1-1/4 FUSES 345101	5mm x 20mm FUSES 345121

Body only: #345101-010
Knob only: #345101-020 (¼" x 1¼") #345121-020 (5 x 20mm)



RECOMMENDED HOLE PATTERN



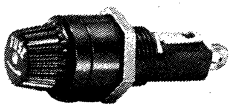
NOTE: Knobs are color-coded; grey for 1/4" x 1-1/4" fuses, black for 5 x 20mm fuses.

Littelfuse® CIRCUIT PROTECTION DEVICES

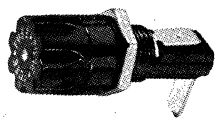
3AG FUSEHOLDERS WITH SOLDER TYPE, 3/16" OR 1/4" QUICK-CONNECT TERMINALS

Extend only 1" behind panel. **UL Recognized and Certified by CSA.**

KNURLED KNOB



FLUTED KNOB



SPECIFICATIONS

Electrical: Rated at 20 amperes for any voltage up to 250V. Dielectric withstanding voltage exceeds 2400 volts.

Mounting: Withstands 15 pound/inch (1.69Nm) mounting torque. Maximum panel thickness .18" (4.8)

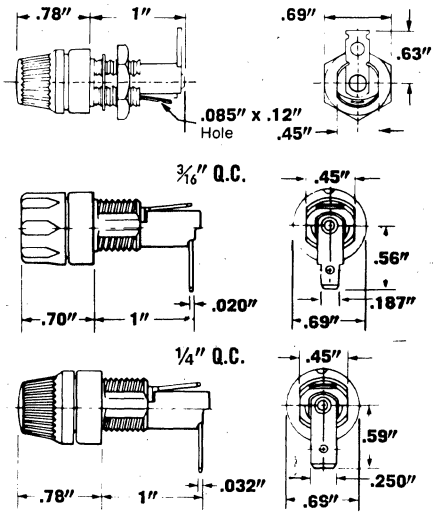
Molded Parts: Black thermoset

Knob: Bayonet style with white lettering

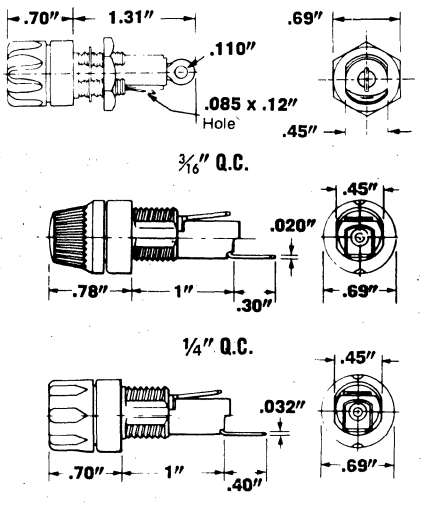
Brass Terminals: Tin plated except 1/4" quick connect terminals are nickel plated.

Hardware: Standard fuseholders supplied with a neoprene washer and a hex nut unassembled. Lockwasher (L) and drip-proof seal (P) variations available by adding appropriate suffix letters (L, P or PL) to catalog number.

Right Angle Terminal
SOLDER



Straight Bottom Terminal
SOLDER



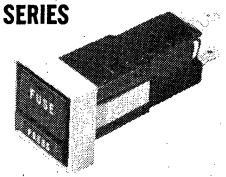
RIGHT ANGLE TERMINAL

Fluted Knob	Knurled Knob	Type of Terminal
342004	342022	Solder
342028	342048	3/16" Q.C.
342828	342848	1/4" Q.C.

STRAIGHT BOTTOM TERMINAL

Fluted Knob	Knurled Knob	Type of Terminal
342014	342012	Solder
342038	342058	3/16" Q.C.
342838	342858	1/4" Q.C.

LOW PROFILE FUSEHOLDERS 348 (000) SERIES

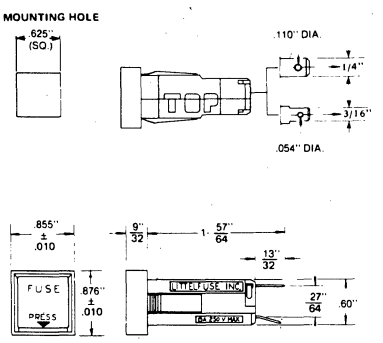


Snap into panel. Eliminate need for mounting hardware. Square cap design and choice of cap and bezel colors. 3/16" or 1/4" Q.C. terminals. **U.L. Recognized and Certified by CSA.**

SPECIFICATIONS

Molded Parts: Body-Black Thermoset. Cap-High temperature thermoplastic.
Terminals: One piece-brass-Electro-tin plated.
Electrical Characteristics: Rated at 15 amps for any voltage to 250. Dielectric withstanding voltage between terminals and terminals to ground at room temperature and 90% R.H. exceeds 1,500 volts.

Mounting: .625" sq. hole in 1/32" through 1/8" thick chassis panel.



HOW TO ORDER LOW PROFILE FUSEHOLDERS

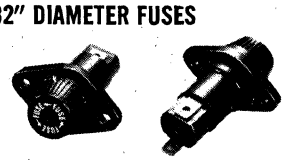
The six digit catalog number is a coded description of the finished unit. To specify type required, select appropriate code numbers from chart below. To order a cap assembly only for 3AG fuses, use **348** series numbers and insert a "0" in the terminal style and bezel color locations. To order a body assembly only, use **348** series number and insert a "0" in the cap color location.

SIX DIGIT CATALOG NUMBERS CONSIST OF

Series No.	Terminal Style	Bezel Color	Cap Color
348 For 3AG Fuses		1 Red	1
		2 Green	2
		3 Yellow	3
		4 Blue	4
	6 3/16" Wide Terminals	5 White	5
	8 1/4" Wide Terminals	7 Black	7
		9 Grey	9

For example: 348615 is a holder with 3/16" terminals, red bezel and white cap.

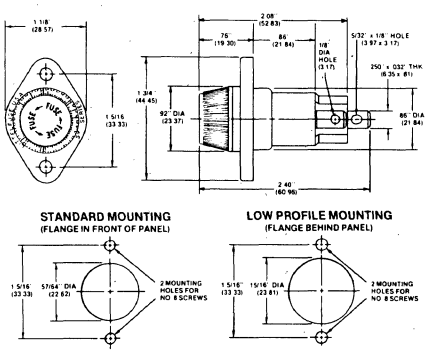
PANEL FUSEHOLDER FOR 13/32" DIAMETER FUSES



Recessed side terminal for additional shock-safe characteristics. **U.L. Recognized and Certified by CSA.**

Catalog Number		Fuse Length Range*
Standard	Watertight	
571027	571027P	15/16" — 1 3/8"
571007	571007P	1 13/32" — 1 1/2"

* Fuse diameter is 13/32".



SPECIFICATIONS

Molded Parts: Black Thermoset.

Knob: Screw type, with engraved markings: Unfilled characters (571007, 571007P), light blue characters (571027, 571027P).

Terminals: Brass, tin plated. Combination solder/1/4" quick-connect. Side terminal has .125" diameter hole. Bottom terminal has .156" x .124" elongated hole.

Mounting: Flange mounting either in front of or behind panel. Watertight version must be front panel mounted. Maximum panel thickness is .75".

Electrical Characteristics: Rated at 30 amps for any voltage up to 600. Dielectric withstanding voltage greater than 2400V.

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M

MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O

OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P

PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

WPS word processing software

Y

YIG yttrium iron garnet

Z

ZIF zero insertion force

do you know!

INFORMATION ABOUT SAVING YOUR ELECTRONIC EQUIPMENT

AC Power Line Protector Application Guide

SERIES	MODEL	DESCRIPTION	SINGLE PHASE	WYE "Y"	DELTA "Δ"	RESPONSE TIME (ns)
SURGE-MASTER™ SERVICE PANEL 120, 208, 220, 240 277, 380, 480, VAC	12000A	to 5000A	•	•	•	5ns
	4100A	to 2500A	•	•	•	5ns
	3100A	to 1000A	•	•	•	5ns
	2800A	to 300A	•	•	•	5ns
	1800A	to 100A	•	•	•	5ns
"MINI" SURGE-MASTER™ (to 50A)	634	277/480 VAC, 4 wire plus gnd.		•		15ns
	632	240/415 VAC, 4 wire plus gnd.		•		15ns
	630	120/208 VAC, 4 wire plus gnd.		•		15ns
	602	120/240 VAC, 3 wire plus gnd.	•			15ns
	600	120/VAC, 2 wire plus gnd.	•			15ns
SURGE-MASTER™ CLIP & FILTER	584.5	480 VAC, 40A, 3 wire plus gnd.			•	1ns
	582.2	208 VAC, 40A, 3 wire plus gnd.			•	1ns
	552.8	277/480 VAC, 40A, 4 wire plus gnd.		•		1ns
	552.4	220/380 VAC, 40A, 4 wire plus gnd.		•		1ns
	551.2	120/208 VAC, 40A, 4 wire plus gnd.		•		1ns
	522.6	240 VAC, 40A, 2 wire plus gnd.	•			1ns
	521.3	120 VAC, 40A, 2 wire plus gnd.	•			1ns
RACK/CABINET PROTECTION	400, 401	120 VAC, 10A, 15A	•			1ns
PLUG-IN, SHUNT FUSE	300	120 VAC, 10A	•			1ns
SURGE-GUARDIAN™ POWER STRIPS 120 VAC, 15A	275	Same as 270 plus transient counter	•			1ns
	270	Same as 265 plus intelligent socket	•			1ns
	265	Same as 260 plus filter	•			1ns
	260	6 outlet with wiring integrity monitor	•			15ns
PLUG-IN, SERIES FUSE	P210	120 VAC, 10A, duplex outlet	•			1ns

MCG ELECTRONICS INC.

12 Burt Drive, Deer Park, NY 11729 • 516-586-5125 • Telex: 645518

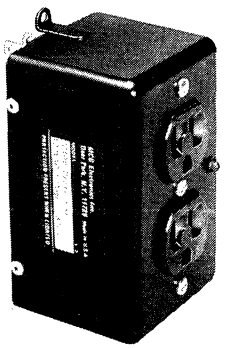
Specialists in Circuit Protectors, Transients, Lightning & Surges.

Call or write for our **FREE CATALOG**

MCG ELECTRONICS INC.

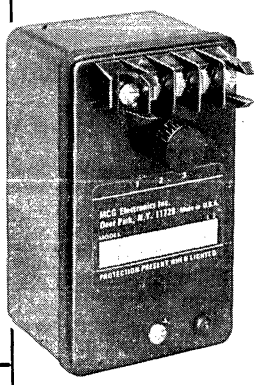
HEAVY DUTY AC Power Line Protectors

A Sophisticated Blend of High Speed and Brute Force Protection.



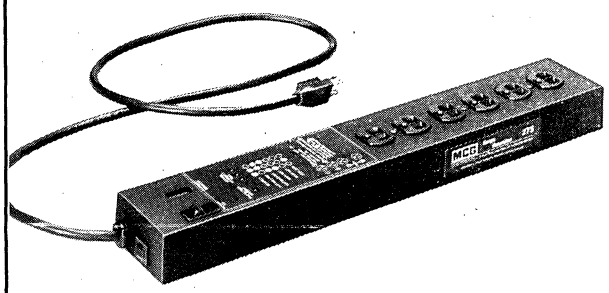
P210/300

Plug-in protection that provides heavy duty clamping and filtering preventing transients and noise (EMI, RFI) from damaging or disturbing sensitive electronic equipment. Absorption capability exceeds 350 joules, with automatic reset. For 120 VAC, 10A. P210 series provides series fuse protection, the 300 series provides shunt fuse protection. Incorporates anti-theft bracket.



400 SERIES

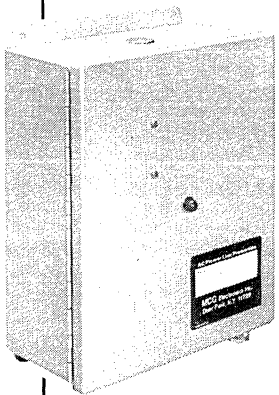
Equipment level protection "within" a piece of equipment. Employs sophisticated combination of brute force surge protection and impluse filtering. Reaction time less than 1ns. Absorption capability exceeds 480 joules. Provides attenuation of 20dB (65 KHz), 40dB (150 KHz), 60 dB (650 KHz). Automatic reset after transient has passed. For 120 VAC single phase, 50/60/400 Hz lines handling currents to 15A.



SURGE-GUARDIAN™ POWER STRIPS

Superior power strip protection for sensitive computers and peripherals, audio and video equipment. Prevents damage to equipment from transients and power "spikes" and disruption and/or loss of memory or data base. Incorporates 6 protected outlets (120VAC, 15A), a wiring integrity monitor, a heavy duty filter (64 KHz/20db; 150 KHz/40db; 650 KHz/60db) and other unique features not found elsewhere. The models 270 and 275 feature intelligent sockets which provide remote, one switch control of the station, or system.

Features	Model No. 260	265	270	275
MOV protection, 3-line (240 joule) L-L, L-N, N-G	x	x	x	x
Wiring integrity monitor	x	x	x	x
Overload protection	x	x	x	x
"Protection present" indicator	x	x	x	x
Heavy duty filter		x	x	x
"Always on" socket (disc drives)			x	x
Intelligent socket			x	x
Event counter				x
Response time	15ns	1ns	1ns	1ns



500 SERIES

High performance **department/office level protection** for computers, minicomputers and other electronic equipment. Combines filtering (50db/ 500KHz) and substantial suppression of high energy transients. Less than 1ns response with 650 joule surge protection. for 120 VAC to 480 VAC service to 40A single phase, delta or wye configurations.

600 SERIES

"Mini" Surge-Master **local service panel protector.** Installs on load side of local service panels (to 50A) to provide shunt protection against lightning and transient overvolatages common to industrial environments. Protects without power interruption. Energy absorption capability to 2250 joules. Automatic reset when transient passes. Long life, maintenance free, triple redundant operation makes the 600 Series ideal for remote unattended sites, mobile vans or any station without back-up service. Protects 120 VAC to 480 VAC, single-phase or 3-phase wye service panels.

MCG ELECTRONICS INC.

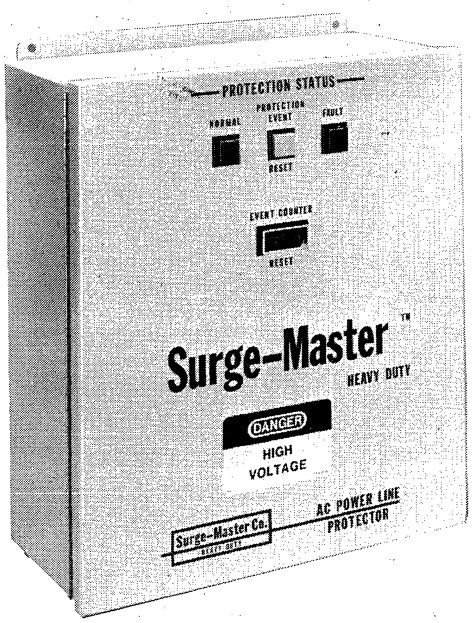
Specialists in Circuit Protectors, Transients, Lightning & Surges.

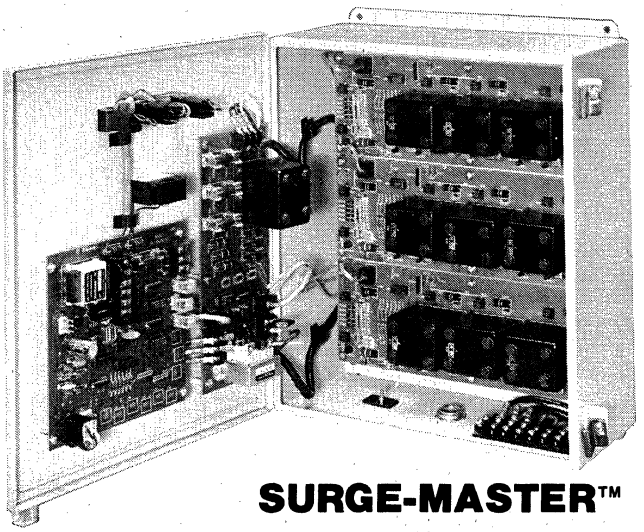
12 Burt Drive, Deer Park, NY 11729 • 516-586-5125 • Telex: 645518

Call or write for our **FREE CATALOG**

MCG ELECTRONICS INC. HEAVY DUTY AC Power Line Protectors

A Sophisticated Blend of High Speed and Brute Force Protection.





SURGE-MASTER™

Surge-Master **Heavy-Duty** Power Line Protectors give **superior protection** against transients, power spikes, overvoltages, etc. by offering 2 stage, triple redundant protection. The first stage provides high speed (5ns) silicon suppression to absorb lesser transients and leading edge of major transients. The second stage uses "brute force", dependable, field proven MOV technology to absorb the brunt of lightning spikes and other major transients. Three (3) modules on each line provide triple redundant, uninterrupted protection at all times. In the event of extraordinary occurrences such as close lightning strikes or power crosses, the modular construction allows fast, easy repair, without loss of protection.

Panel indicator lights show precise status of system—Normal, Protection Event, or Fault. Internal LEDs pinpoint location of any fault eliminating time consuming troubleshooting. The event counter enables the logging of the number of significant transient "events" suppressed.

Models available with capabilities from 100 to 5000A service panel current and 120, 208, 240 or 480 VAC. Single, 3 phase wye and delta power systems. Two (2) year, "no nonsense" warranty provided.

Specifications

Model	**1800**	**2800**	**3100**	**4100**	**12000**
Service Panel Current	to 100A	to 300A	to 1000A	to 2500A	to 5000A
Power diss./per leg‡	1.4-3.6mw	2-4.8mw	3-7.2mw	6-14.mw	12-30mw
Energy Handling (joules)‡ (joules = watts x sec.)	3600	4000	7200	14000	30000
Response time	5ns	5ns	5ns	5ns	5ns
Voltage	see voltage chart				
Frequency/Phase	50/60/400Hz/1 phase, 3 phase, wye delta				
Temperature Operating	-40 degrees C to +85 degrees C				

‡Depends on the nominal AC voltage level.

Voltage

Line AC (rms) Volts	**Description**	**Model Suffix**	**(Line-Ground) Protection Levels Min.**	**Max.**
120	120V, 1 phase, 2 wire + gnd	-120S	200V	350V
120/240	120/240V, 1 phase, 3 wire + gnd	-120T	200	350
120/208	120/208V, 3 phase, 4 wire + gnd	-120Y	200	350
240	240V, 3 phase, 3 wire + gnd	-240D	400	600*
240	240V, 3 phase, 4 wire (1)	-240DCT	400	600*
277/480	277/480V, 3 phase, 4 wire + gnd	-277Y	450	650
480	480V, 3 phase, 3 wire + gnd	-480D	800	1000

*Measured Line-Line
(1) Center taped phase to ground.

Unit Dimensions

Models	
1800-3100	14" x 16" x 6"
4100	30" x 24" x 8"
12000	60" x 36" x 8"

MCG ELECTRONICS INC.
Specialists in Circuit Protectors, Transients, Lightning & Surges.
12 Burt Drive, Deer Park, NY 11729 • 516-586-5125 • Telex: 645518
Call or write for our **FREE CATALOG**

do you know!

INFORMATION ABOUT SAVING YOUR ELECTRONIC EQUIPMENT

Data Line Protector Application Guide

MODEL	CONNECTOR TYPE	DESCRIPTION	DIAL-UP LINES	RS 232	RS 422	RS 423	20 ma Loop	VIDEO WIDE BAND
DLP-40D	15-25 PIN D-SUB	Up to 260 wire protector		•	•	•	•	
DLP-40A	TERMINALS	Up to 100 wire protector		•	•	•	•	
DLP-36	50 PIN RIBBON	50 Wire (25 pair) protector	•	•	•	•	•	
DLP-32.13	25 PIN D-SUB	13 Wire protector		•				
DLP-32.8	25 PIN D-SUB	8 Wire protector		•				
DLP-32.5	25 PIN D-SUB	5 Wire protector			•			
DLP-30	TERMINALS	8 Wire protector		•	•	•	•	
DLP-20	TERMINALS	4 Wire protector		•	•	•	•	
DLP-10	TERMINALS	2 Wire protector		•	•	•	•	
DLP-6.2	TWIN AX	Video protector, 5 channels (1), (2)						•
DLP-6.1	BNC	Video protector, 5 channels (1)						•
DLP-5.2	TWIN AX	Video protector (1), (2)						•
DLP-5.1	BNC	Video protector (1), (3)						•
DLP-4.4	RJ45 (4)	4 Wire, leased line protector		•	•	•	•	
DLP-4.2	RJ45 (4)	2 Wire, dial-up protector	•					
DLP-3.1	25 PIN D-SUB	Terminal, printer, peripheral protector		•	•	•	•	
DLP-2.2	TWIN AX	Video bandwidth—to 10 mHz (1), (2)						•
DLP-2.1	BNC	Video bandwidth—to 10 mHz (1)						•

(1) Wide band video available to 100 mHz
(2) Used on IBM systems
(3) Qualified to factory mutual standards
(4) Compatible with RJ11 connector

MCG ELECTRONICS INC.

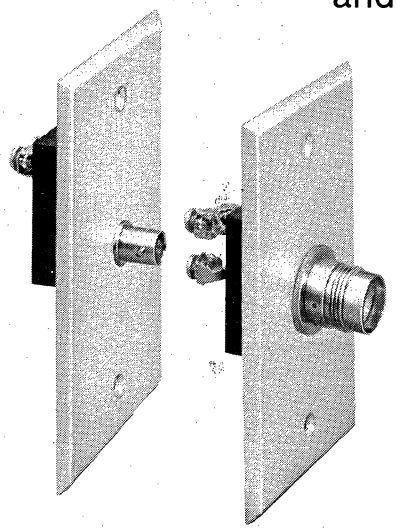
12 Burt Drive, Deer Park, NY 11729 • 516-586-5125 • Telex: 645518

Specialists in Circuit Protectors, Transients, Lightning & Surges.

Call or write for our **FREE CATALOG**

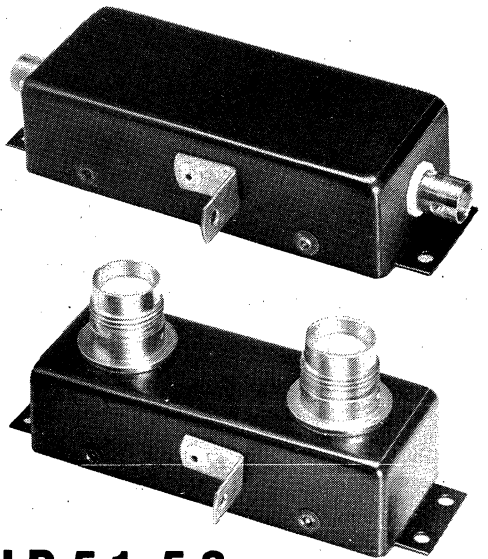
MCG ELECTRONICS INC. Data Line Protectors

A Sophisticated Blend of High Speed and Brute Force Protection.



DLP-2.1, 2.2

Protects video wide band equipment from damaging transients. Wall mounted, ideal for new installations or retrofits. Wide band width (to 10 MHz) with BNC (2.1) or twin axial (2.2) connector.

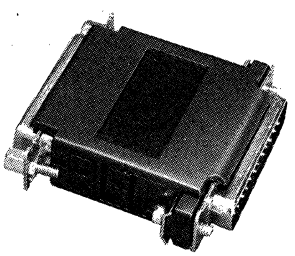


DLP-5.1, 5.2

Protects video cameras, high speed data lines, etc. up to 10 MHz or greater, with an attenuation of less than 1 db. Shunts damaging transients from center conductors to earth ground. With BNC (5.1) or twin axial (5.2) connectors. The 5.2 is widely used on IBM systems. Protects one circuit.

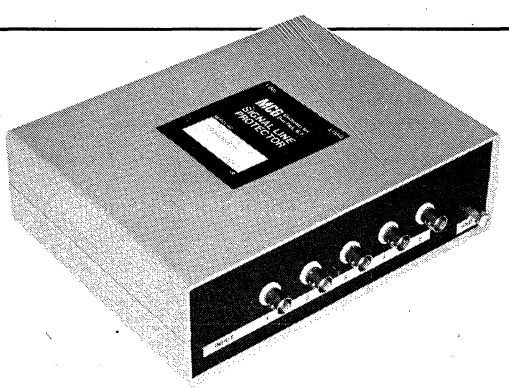
DLP-3.1

In-line **computer and terminal protection** against transients and overvoltages. Employs 25 pin D-Sub connectors. Pins 2, 3, 7 and 20 are protected. For applications using RS232, 422, 423, 20 ma loops. DEC compatible.



DLP-4.2, 4.4

Modem protection against transients. Prevents costly downtime and equipment failures. Use DLP-4.2 for 2-wire dial-up telephone lines. Protects tip and ring (RJ45). DLP-4.4 is for 4-wire leased lines. Protects RS232, 422, 423 and 20 ma loops. RJ45 jack accommodates RJ11 plug.



DLP-6.1, 6.2

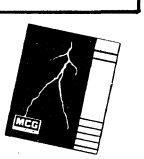
Video cable and high speed data line protection. Shunts transients from center conductors to earth ground. Ideal where wide band width (up to 10 MHz) is needed. Attenuation less than 1 db. With BNC (6.1) or twin axial (6.2) connectors. The 6.2 is widely used on IBM systems. Protects five circuits.

MCG ELECTRONICS INC.

Specialists in Circuit Protectors, Transients, Lightning & Surges.

12 Burt Drive, Deer Park, NY 11729 • 516-586-5125 • Telex: 645518

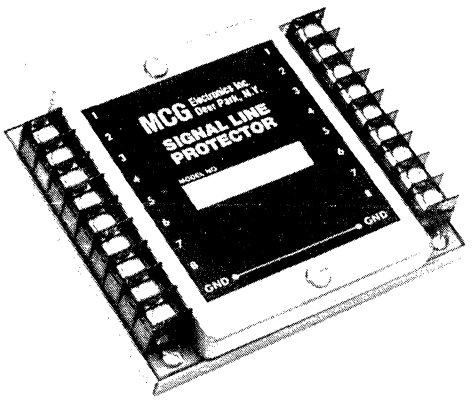
Call or write for our **FREE CATALOG**



MCG ELECTRONICS INC.

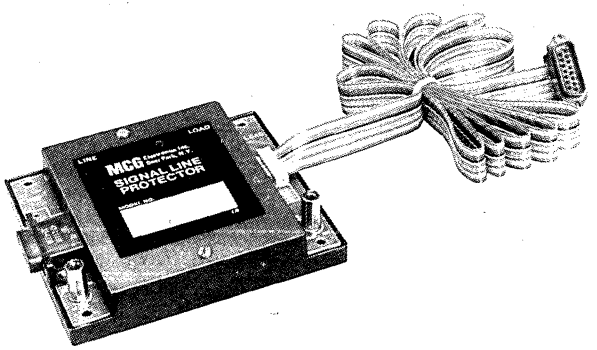
Data Line Protectors

A Sophisticated Blend of High Speed and Brute Force Protection.



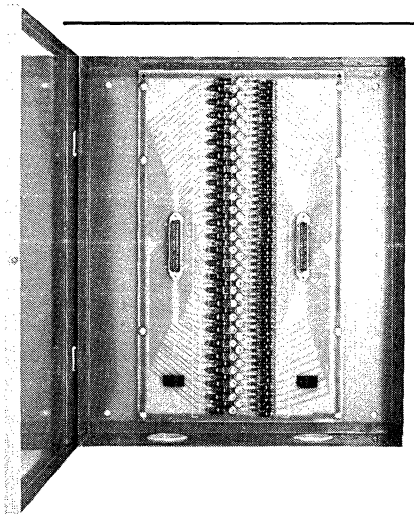
DLP-10, 20, 30

Multiple line protection against damaging transients and overvoltages, in a single compact package. Ideal for data logging and monitoring complex instrumentation. Protects computer main frames and peripherals. Available for 2 wire (DLP-10), 4 wire (DLP-20) and 8 wire (DLP-30) protection for RS232, 422, 423 and 20 ma loops.



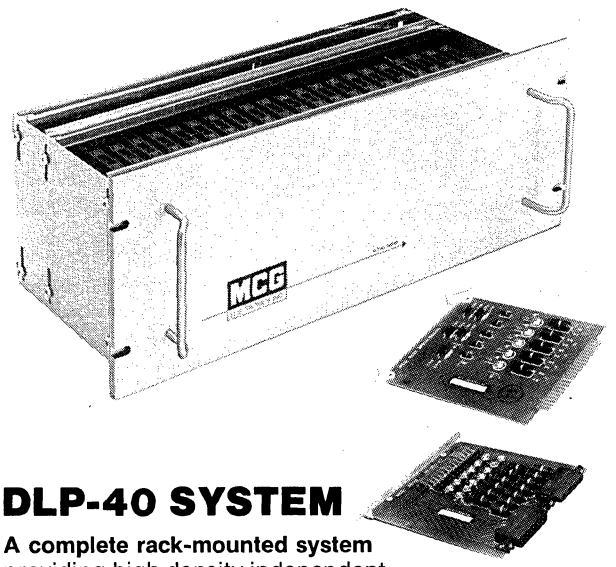
DLP-32

Computer and terminal transient protection. Installed in series with 25 pin D-Sub line to protect peripherals, terminals, main frames, I/O ports, etc. Offers 5, 8 or 13 protection circuits per unit, providing RS232, 422, 423 and 20 ma loop protection. Honeywell compatible.



DLP-36

Provides **point of entry transient protection** between external lines and internal systems. Has 50 pin ribbon telephone connectors. Protects 50 wires (25 pairs). For PABX systems, CPU's and instrumentation systems using dial-up telephone lines RS232, 422, 423 and 20 ma loops. Ideal for terminating to 66 blocks. Fast and easy to install.



DLP-40 SYSTEM

A complete rack-mounted system providing high density independent transient/surge protection for up to 20 terminals or printers per system. A variety of plug-in protection cards (5, 8 or 13 circuits) are available for applications such as RS232, 422, 423, 4-20 ma loops, optical isolators, modems and telephone lines. Ideal for data logging and monitoring complex instrumentation. Protects computer main frames and peripherals. Interface options include terminal strips and RS232 connectors (DP-25's).

MCG ELECTRONICS INC.

Specialists in Circuit Protectors, Transients, Lightning & Surges.

12 Burt Drive, Deer Park, NY 11729 • 516-586-5125 • Telex: 645518

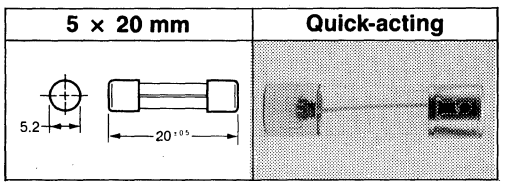
Call or write for our **FREE CATALOG**

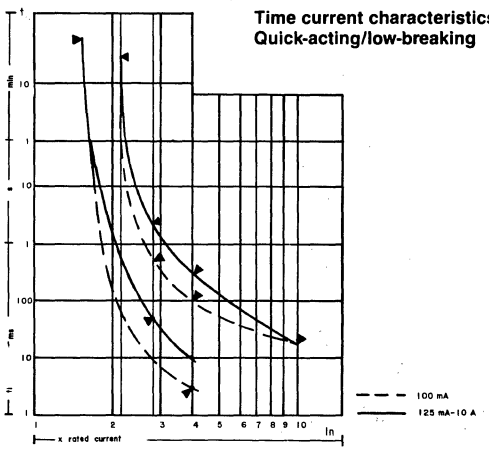
INTERNATIONAL 5 × 20 mm Fuses

interpower™ International 5 × 20 mm Fuses

Interpower™ 5 × 20 mm fuses conform to IEC 127; most have been tested and approved by SEMKO and carry the SEMKO test mark. Approval documents available upon request.

All fuses are rated at 250 VAC. Minimum order: 1 box (10 fuses).





Quick-acting/ low-breaking capacity

to IEC publication 127, data sheet II; DIN 41661; SEMKO 104-1976.

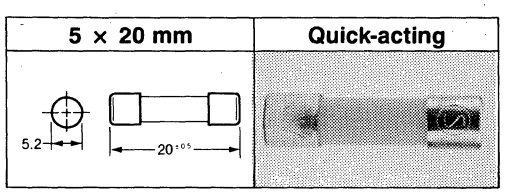
Model Number	Rated Current I_n	Breaking Capacity at 250 V cosφ1	Voltage drop max. mV	I^2t***
81411101	32* mA	35 A	10,000	0.000056
81411120**	40		8,000	0.00012
81411140**	50		7,000	0.00054
81411160**	63*		5,000	0.00077
81411181	71		4,500	0.00123
81411200**	80		4,000	0.0019
81411221	100		3,500	0.0037
81411241	125		2,000	0.007
81411261	160		2,000	0.013
81411281	200		1,700	0.023
81411301	250		1,400	0.054
81411321	315		1,300	0.081
81411341	400		1,200	0.2

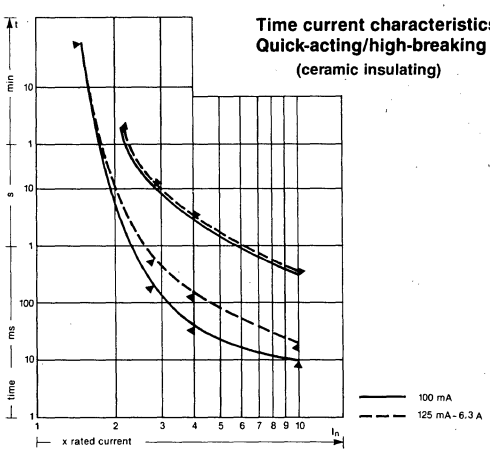
Model Number	Rated Current I_n	Breaking Capacity at 250 V cosφ1	Voltage drop max. mV	I^2t***
81411361	500	35 A	1,000	0.16
81411381	630		650	0.37
81411401	800		240	0.67
81411421	1 A		200	0.94
81411441	1.25		200	1.17
81411461	1.4		190	1.41
81411481	1.6		190	2.7
81411501	2		170	5.4
81411521	2.5		170	6.0
81411541	3.15		150	22.8
81411561	4	10 I_n	130	42.0
81411581	5		130	63.0
81411601	6.3		130	100.0

* Not included in applicable standards
** Special order
*** t equals time (seconds)

Time current characteristics

Rated Current I_n	2.1xI_n min	2.1xI_n max	2.75 x I_n min	2.75 x I_n max	4xI_n min	4xI_n max	10xI_n min	10xI_n max
32mA-100mA		30min	10ms	500ms	3ms	100ms		20ms
125mA-6.3A		30min	50ms	2s	10ms	300ms		20ms





Quick-acting/ high-breaking capacity

to IEC publication 127, data sheet I; DIN 41660; SEMKO 104-1976.

Model Number	Rated Current I_n	Breaking Capacity at 250 V cosφ1	Voltage drop max. mV	I^2t***
81413140**	50* mA	1500 A: at 250 V, 50 Hz, cosφ0.7-0.8	10,000	
81413160**	63*		8,800	
81413180**	71		8,000	
81413200**	80		7,600	
81413220**	100		7,000	
81413240**	120		5,000	
81413260**	160		4,300	
81413280**	200		3,500	
81413300**	250		2,800	
81413320**	315		2,500	
81413340**	400		2,000	

Model Number	Rated Current I_n	Breaking Capacity at 250 V cosφ1	Voltage drop max. mV	I^2t***
81413360**	500	1500 A: at 250 V, 50 Hz, cosφ0.7-0.8	1,800	
81413380**	630		1,500	
81413400**	800		1,200	
81413421	1 A		1,000	0.24
81413440**	1.25		800	0.95
81413481	1.6		600	1.7
81413501	2		500	1.8
81413520**	2.5		400	2.8
81413541	3.15		350	2.7
81413560**	4		300	19.7
81413580**	5		250	41.8
81413601	6.3		200	60.5

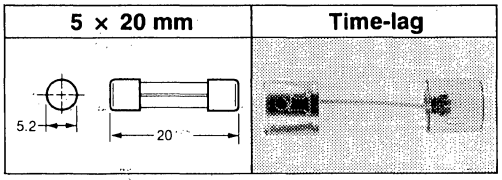
* Not included in applicable standards
** Special order
*** t equals time (seconds)

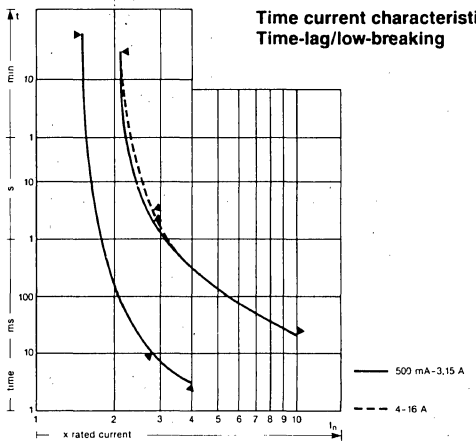
Time current characteristics

Rated Current I_n	2.1xI_n min	2.1xI_n max	2.75 x I_n min	2.75 x I_n max	4xI_n min	4xI_n max	10xI_n min	10xI_n max
50mA-315mA		30min	10ms	2s	3ms	300ms		20ms
4 A-6.3 A		30min	10ms	3s	3ms	300ms		20ms

PANEL COMPONENTS CORPORATION P.O. Box 6626, Santa Rosa, CA 95406 • (707) 523-0600 • TX 176-747

From Panel Components Corporation





Time-lag/ low-breaking capacity

to IEC publication 127, data sheet III; DIN 41662; SEMKO 104-1976.

Model Number	Rated Current I_n	Breaking Capacity at 250 V cosφ1	Voltage drop max. mV	I^2t***
81412100**	32* mA	35 A	5,000	0.004
81412120**	40*		4,000	0.006
81412140**	50		3,500	0.01
81412161	63		3,000	0.025
81412181	71		3,000	0.024
81412200**	80		3,000	0.036
81412221	100		2,500	0.055
81412241	125		2,000	0.12
81412261	160		1,900	0.2
81412281	200		1,500	0.27
81412301	250		1,300	0.5
81412321	315		1,100	1.5
81412341	400		1,000	2.9

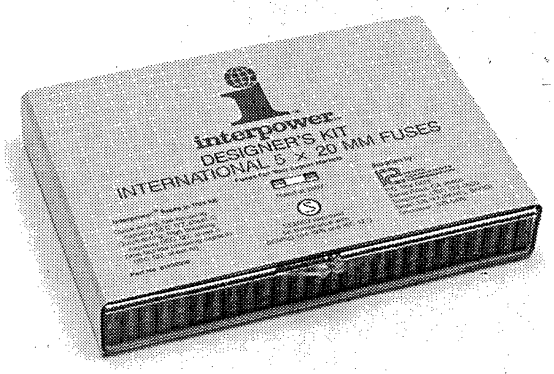
Model Number	Rated Current I_n	Breaking Capacity at 250 V cosφ1	Voltage drop max. mV	I^2t***
81412361	500	35 A	900	3.2
81412381	630		300	1.12
81412401	800		250	1.67
81412421	1 A		150	3.12
81412441	1.25		150	5.9
81412461*	1.4		150	6.8
81412481	1.6		150	11.0
81412501	2		150	14.5
81412521	2.5		120	25.0
81412541	3.15		100	54.5
81412561	4		100	95.0
81412581	5	10 I_n	100	200.0
81412601	6.3		100	260.0

* Not included in applicable standards
** Special order
*** t equals time (seconds)

Time current characteristics

Rated Current I_n	2.1xI_n		2.75 x I_n		4xI_n		10xI_n	
	min	max	min	max	min	max	min	max
32mA-100mA		2min	200ms	10s	40ms	3s	10ms	300ms
125 ma-6.3A		2min	600ms	10s	150ms	3s	20ms	300ms

DESIGNER'S KIT P/N 81490010



Use the broad range of 5 x 20 mm fuses in this Interpower™ Designer's Kit to design the circuit protection system on equipment destined for international markets.

This fuse kit contains 52 ten-pack boxes of Interpower™ 5 x 20 mm fuses in the following range of values:

QUICK-ACTING/ LOW BREAKING CAPACITY
IEC 320/sheet II

Part Number	Rated Current
81411101	32 mA
81411181	71
81411221	100
81411241	125
81411261	160
81411281	200
81411301*	250
81411321	315
81411341	400
81411361*	500
81411381	630
81411401	800
81411421*	1 A
81411441	1.25
81411461	1.4
81411481	1.6
81411501*	2 A
81411521	2.5
81411541	3.15
81411561	4
81411581	5
81411601	6.3

QUICK-ACTING/ HIGH BREAKING CAPACITY
IEC 320/sheet I (ceramic insulators)

Part Number	Rated Current
81413421	1 A
81413481	1.6
81413501	2
81413541	3.15
81413601	6.3

TIME-LAG/ LOW BREAKING CAPACITY
IEC 320/sheet III

Part Number	Rated Current
81412161	63 mA
81412181	71
81412221	100
81412241	125
81412261	160
81412281	200
81412301	250
81412321	315
81412341	400
81412361	500
81412381	630
81412401	800
81412421	1 A
81412441	1.25
81412481	1.6
81412501	2 A
81412521	2.5
81412541	3.15
81412561	4
81412581	5
81412601	6.3

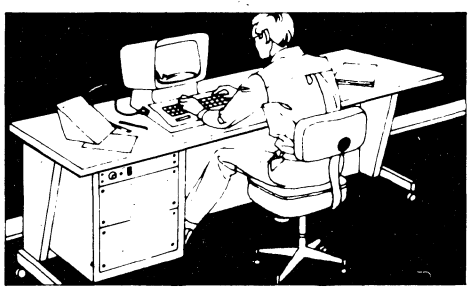
*2 ten-pack boxes of this value in the fuse kit

PANEL COMPONENTS CORPORATION P.O. Box 6626, Santa Rosa, CA 95406 • (707) 523-0600 • TX 176-747

PERMA POWER®

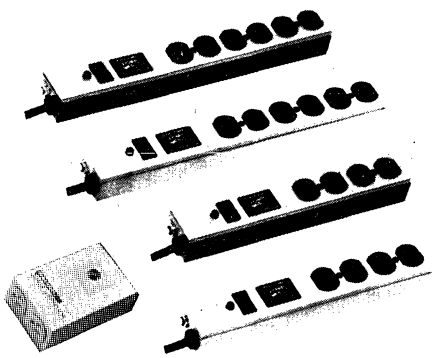
sockets PLUS™

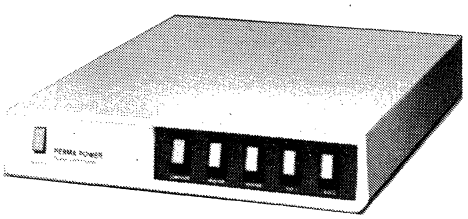
SURGE SUPPRESSORS



PROTECT COMPUTERS AND SENSITIVE EQUIPMENT FROM DAMAGE CAUSED BY POWER LINE VOLTAGE SURGES

PROTECT PROGRAMS FROM DATA ERRORS





FEATURES OF ALL SURGE SUPPRESSOR MODELS

- Both normal and common mode suppression
- Low let-through voltage
- High single-surge energy rating
- Automatic failure shutdown
- 1 year warranty

ADDITIONAL FEATURES OF EXTENDED LIFE SURGE SUPPRESSOR MODELS

- High steady-state (repetitive surges) power rating
- Lower let-through voltage
- High pulse lifetime
- Reduced RF/EMI interference
- 5 year warranty

SURGE SUPPRESSOR MODEL SELECTOR CHART

Model No.	Number of Outlets	Master Switch	Indicator Light	Case Length (Inches)
PT 209	2	—	1	3⅛ x 4¾ x 2¼
RT 410	4	1	1	12
KT 410	4	1	1	12
RT 610	6	1	1	15
KT 610	6	1	1	15
JT 06B0	6	1	1	19
JT 06B2*	6	1	1	19
Perma Power Extended Life Surge Suppressors				
PS 209	2	—	1	3⅛ x 4¾ x 2¼
RT 410	4	1	1	12
KS 410	4	1	1	12
RT 610	6	1	1	15
KS 610	6	1	1	15
JS 06B0	6	1	1	19
JS 06B2*	6	1	1	19

Case Style and Color: (prefix)
P—Tan plastic case
R—Tan and plastic walnut on steel, beige components
K—Silver and textured black plastic on steel
J—Black baked enamel on steel/rack mount
*12 foot power cord

PERMA POWER POWER COMMANDER™ POWER CONTROL CENTER

Switches	One master, five auxiliary
Outlets	Five
Indicator Lights	Six
Overload Protection	15 amp circuit breaker
Power Cord	12-foot, type SJT:14/3
Dimensions	
Width	13¼"
Height	2¼"
Depth	13"
Warranty	5 years

specifications

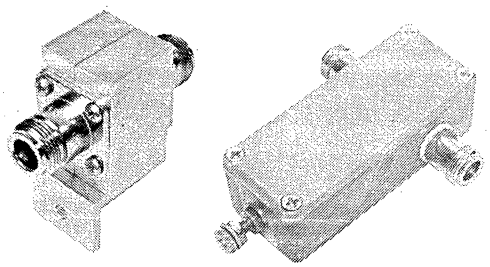
	PERMA POWER SURGE SUPPRESSORS	EXTENDED LIFE SURGE SUPPRESSORS
Protection Modes	normal (lines/neutral) common (line/ground) common (neutral/ground)	normal (line/neutral) common (line/ground) common (neutral/ground)
Clamping Threshold (Nominal)	250 Volts	225 Volts
Let-Through Voltage[1]	600 Volts	400 Volts
Response Time	5 nanoseconds	5 picoseconds
Pulse Life[1]	10^6 cycles	10^6 cycles
Pulse Life[2]	10^4 cycles	10^8 cycles
Steady State Power[3]	0.8 watts	5.0 watts
Single-Surge Energy[4]	70 joules	70 joules
Peak Current[4]	6000 amperes	6000 amperes
Maximum Transient Voltage[5]	6000 Volts	6000 Volts
Power Rating, Load	1875 watts	1875 watts
Noise Filtering	—	More than 20 db, 2-100 mhz
Warranty	1 year	5 years

TEST WAVES

1. IEEE Std. 587 (0.5 us-100 KHz., 600 Volt, 200 Amp., Ringwave).
2. 5KW peak, 1.0 millisecond, expotential switching transient.
3. 10 x 100 us-expotential (accepted industry test impulse for inductive load switching transients).
4. IEEE Std. 587 (8 x 20 us., 3.0 KA., Unipolar current wave).
5. Limited in 120VAC distribution systems by wiring devices *arcover* to 6000 Volts peak (IEEE Std. 587).

PERMA POWER® Electronics Inc.
5615 West Howard Avenue
Chicago, Illinois 60648
Telephone (312) 647-9414

Nano-Fast Coax Protection from PolyPhaser Corporation



The patented PolyPhaser Impulse Suppressor Family is your best answer for protecting those vital communication links from lightning and static induced impulses (as well as high altitude nuclear blasts-EMP).

With over 44 models of patented Impulse Suppression, PolyPhaser Corporation makes more reliable, longer lasting, faster, better VSWR, lower loss and having less throughput energy to your valuable equipment than air-gap type arrestors. Designed using the time proven controlled gas ionization discharge tube, these family members can handle tens-of-thousands of amperes time after time. They are made from quality, highly conductive aluminum with 18-8 stainless fasteners and weather-coated for marine applications.

BULKHEAD MOUNTABLE - TRANSMIT/RECEIVE

Model	Description	Frequency	Power	Connector	Max. Surge*	Thru put Energy	Loss dB	VSWR
IS-B50LU	Low power "UHF"	30-220 MHz 220-700 MHz	325 W 125 W	UHF	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-B50LN	Low power "N"	125-220 MHz 220-700 MHz 700-1 GHz	325 W 125 W 50 W	N**	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-B50HU	Hi power "UHF"	30-220 MHz 220-700 MHz	500 W 250 W	UHF	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-B50HN	Hi power "N"	125-220 MHz 220-700 MHz 700-1 GHz	500 W 250 W 125 W	N**	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-CT50HN	Cellular "N"	806-890 MHz	10 ch @ 70 W ea	N**	10,000 A	≤ 10uJ	0.1	1.1 to 1
IS-PT50HN	890-980 MHz	890-980 MHz	10 ch @ 70 W ea	N**	10,000 A	≤ 10uJ	0.1	1.1 to 1
IS-UT50HN	"UHF" Combiner/out	450-512 MHz	3-200 W trans. 5-100 W trans.	N† **	10,000 A	≤ 20uJ	0.1	1.1 to 1
IS-IE50LN	Isolated Equipment	125-220 MHz 220-500 MHz	325 W 125 W	N**	20,000 A	≤ 600uJ	0.1	1.2 to 1

BULKHEAD MOUNTABLE RECEIVE ONLY

Model	Description	Frequency	Power	Connector	Max. Surge*	Thru put Energy	Loss dB	VSWR
IS-GF50LN	GaAs Fet	125 MHz-1 GHz	N/A	N† **	10,000 A	≤ 150 pJ	0.1	1.2 to 1
IS-GC50LN	DC Pick-off +15VDC	400 MHz-1 GHz	N/A	N† **	10,000 A	≤ 150 pJ	0.3	1.2 to 1
IS-DC50LN	DC Injector +15VDC	400 MHz-1 GHz	N/A	N† **	10,000 A	≤ 150 pJ	0.3	1.2 to 1

FLANGE MOUNTABLE - TRANSMIT/RECEIVE

Model	Description	Frequency	Power	Connector	Max. Surge*	Thru put Energy	Loss dB	VSWR
IS-50UX-C0	HF transceive	1.5-50 MHz	2 KW	UHF	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-50UX-C1	Similar to IS-B50LU	30-220 MHz 220-700 MHz	325 W 125 W	UHF	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-50NX-C1	Like IS-50UX-C1-"N"	30-220 MHz 220-700 MHz	325 W 125 W	N**	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-50NX-C2	Similar to IS-B50LN	220-700 MHz 700-1GHz	125 W 50 W	N**	20,000 A	≤ 600uJ	0.1	1.1 to 1

DATA/VIDEO/NEMP

Model	Description	Frequency	Impedance Ω	Connector	Max. Surge*	Clamp Voltage	Loss dB	VSWR
IS-50BB	HF-NEMP-R.O.	DC to 30 MHz	50	BNC	5,000 A	5.4	0.1	1.1 to 1
IS-75BB	CCTV	DC to 20 MHz	75	BNC***	5,000 A	5.4	0.1	1.1 to 1
IS-93BB	Data	DC to 20 MHz	93	BNC	5,000 A	5.4	0.1	1.1 to 1
IS-TWAX	IBM-34-36-38 Data	DC to 9 MHz	100	Twin Ax	5,000 A	2.8	0.1	1.1 to 1
IS-NEMP	HF-NEMP	1 to 1,000 MHz	50	BNC† **	5,000 A	200	0.1	1.1 to 1

POWER LINE/TV

Model	Description	Frequency	Impedance & Misc.	Max. Surge*	Thru put Energy	Loss dB	VSWR
IS-PSP/240	120/240 VAC	50-60 Hz	3 wire (solder)	12,000 A	N/A	N/A	N/A
IS-75F-C1	Ch 2-83 TV	50-750 MHz	75 Ω F58	20,000 A	≤ 600uJ	0.2	1.2 to 1
IS-300T-C2	TV Ribbon line	50-750 MHz	300 Ω Screws	10,000 A	≤ 600uJ	1.0	1.5 to 1
IS-RCT	Rotor Cable 8 lines	N/A	24 VAC Max 8 Screws/lugs	2 KA ea. line	N/A	N/A	N/A
IS-PLDO	120 VAC line	50-60 Hz	Duplex Outlet	15,000 A	N/A	N/A	N/A

*Based on 8us rise/20us decay wave form; †also available in UHF; **also available in N/Male on Antenna port; ***also available in type F connector

***Other products include:* Ground Interconnect Resistance/Inductance Tester, Field Impulse Suppressor Tester, EMP - Coaxial Protectors, Dedicated Line/Telephone Line Protectors, Protectors for 1.7 GHz - 2.3 GHz.**

For complete information and application assistance contact:

PolyPhaser Corporation

1425 Industrial Way ● P.O. Box 1237E ● Gardnerville, NV 89410-1237
Phone: 800-325-7170 (702) 782-2511
RCA Telex: 215406 TBYT UR Attn: POLYPHASER

Power Dynamics, Inc.

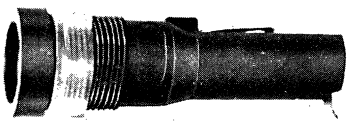
P.O. Box 539, 59 Lakeside Avenue, West Orange, NJ 07052 • (201) 736-5722 • TWX: 136567 (PDI) • Intl. Telex: 666173 (PDI)

COMBINATION FUSE HOLDERS

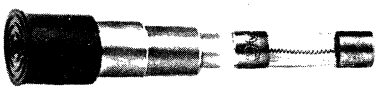
COMBI FUSE-HOLDER
with bayonet caps according to IEC 257, VDE 0820/2 and UL 512 for miniature fuses 5 x 20 mm acc. to DIN 41 571, IEC 127 and 6.3 x 32 mm (¼" x 1¼").

APPROVALS
UL, CSA, VDE, SEMKO

19 **780**



19 **785**



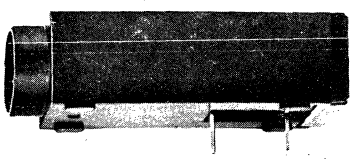
19 **786**

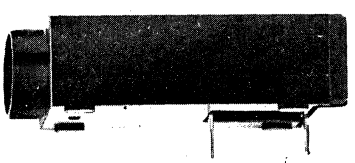
Electrical Data:
Rated voltage 250V
Rated current 6.3A acc. to IEC, 16A acc. to UL, CSA and VDE
Testing voltage 4 kV, 50 Hz, 1 min., protection mode IP 40 to DIN 40050

COMBI FUSE-HOLDER
for printed circuit boards with bayonet caps according to IEC 257, VDE 0820/2 and UL 512 for miniature fuses 5 x 20 mm acc. to DIN 41571, IEC 127 and 6.3 x 32 mm (¼" x 1¼")

APPROVALS
UL, CSA, VDE, SEMKO

19 **781**
19 **785**
19 **786**
19 **782**
19 **785**
19 **786**





Electrical Data:
Rated voltage 250V
Rated current 6.3A acc. to IEC, 16A acc. to UL, CSA and VDE
Testing voltage 4 kV, 50 Hz, 1 min., protection mode IP 40 to DIN 40050

COMBI FUSE-HOLDER
for printed circuit boards with bayonet caps according to IEC 257, VDE 0820/2 and UL 512 for miniature fuses 5 x 20 mm acc. to DIN 41571, IEC 127 and 6.3 x 32 mm (¼" x 1¼")

APPROVALS
UL, CSA, VDE, SEMKO

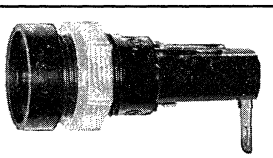
19 **783**
19 **785**
19 **786**

Electrical Data:
Rated voltage 250V
Rated current 6.3A acc. to IEC, 16A acc. to UL, CSA and VDE
Testing voltage 4 kV, 50 Hz, 1 min., dry protection mode IP 40

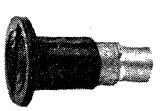
COMBI FUSE-HOLDER
with bayonet cap according to IEC 257 and VDE 0820/2 suitable for miniature fuses 5 x 20 mm according to DIN 41571 and IEC 127

APPROVALS
UL, CSA, VDE, SEMKO

19 **601**



19 **602**



19 **522**

Electrical Data:
Rated voltage 250V
Rated current 6.3A acc. to IEC, 10A acc. to VDE, 16A acc. to UL, 12.5A acc. to CSA
Testing voltage 4 kV, 50 Hz, 1 min., protection mode IP 40

CALL OR WRITE POWER DYNAMICS, INC. FOR COMPLETE ENGINEERING CATALOG • FSC60046

Power Dynamics, Inc.

P.O. Box 539, 59 Lakeside Avenue, West Orange, NJ 07052 • (201) 736-5722 • TWX: 136567 (PDI) • Intl. Telex: 666173 (PDI)

SUB-MINIATURE FUSES

Type TR 3

Catalog numbers:
TR3-F No. 19300 (Pigtails)
TR3-F No. 19300 K (Plug-in-pins)
Holders No. 19556, 19557 and 19561

The TR 3 construction evolved from our well-established microfuse. Because of more economic production the TR 3 offers the advantage of automatic insertion. TR 3 construction meets UL 1986 and international standard 32C (CO34).

Rated current range: 50 mA, 5A
Rated voltage: 125V
Characteristic: F (quick acting)
Breaking capacity: 50A
Pin distance: 2.54 mm, round pins, surface
Pluggable into (miniature) holder No. 19556, No. 19557, No. 19558 and **solderable**
Body: Temperature resistant thermoplastics, black
Temperature range: −55°C to +125°C

Vibration test: from 10-2000 Hz at 10g-0.06 inch amplitude
Acceleration test: up to 50g
Weight: 100 pieces = 36g (No. 19300); 100 pieces = 29g (No. 19303)
Packaging: boxes of 100 pieces; industrial boxes of each 1000 pieces resp. taped
Approvals: application for UL approval has been filed

Type TR5

Catalog numbers:
TR5-F No. 19370
TR5-M No. 19371 } Pigtails
TR5-T No. 19372

TR5-F No. 19370 K
TR5-M No. 19371 K } Plug-in pins
TR5-T No. 19372 K

Holders No. 19559 and No. 19560
Rated current range: 50 mA . . . 4 A
Rated voltage: 250 V

Characteristic: F (quick-acting), M (medium time-lag), T (time-lag)
Breaking capacity: 35 A
Pin distance: 5.08 mm, round pins, surface
Pluggable and **solderable**
Body: Temperature resistant thermo plastics, black
Temperature range: −55°C to +125°C
Vibration test: From 10 . . . 2000 Hz at 10 g-0,06 inch amplitude

Approvals: UL
VDE
SEMKO
Acceleration test: up to 50 g
Weight: 100 pieces = 40 g
Packaging: boxes of 100 pieces; 850 reps. 1000 pieces taped

Type	Rated current A					
TR5-F	Holder	0,25	1,0	1,25	1,6	2,0
TR5-M	0,16	0,2	0,315	0,5	0,63	0,8
TR5-T	1,0	1,6	2,0	2,5	3,15	4,0

Microfuses

Catalog numbers:
278 (pigtails)
278 K (plug-in- pins)
274 acc. to MIL-F-23419 Type FM 02, (on request)

Rated current range: 2 mA, 5A (acc. to UL)
Rated voltage: 125V
Characteristic: F (Quick Acting)
Breaking capacity: 10,000A (acc. to UL); 40A art 1/16 and 1/20A

Pin distance: 2.54 mm, round pins, tin plated
Socket: 278 and 278 K, rated current 1/500, 132A, temperature resistant glass socket with Vacon pins
278 and 278 K, rated current 1/20, 5A, temperature resistant plastic socket with copper pins
274, rated current 1/500, 5A, temperature resistant plastic socket with copper pins

Temperature range: −55°C to +125°C
Vibration test: from 10-2000 Hz at 10g-0.06 inch amplitude
Acceleration test: up to 50g
Pluggable into different holder and **solderable**
Also available with UL approval (on request)
Weight: 100 pieces = 50g
Packaging: 50 pieces resp. 100 pieces

Picofuses

Catalog numbers:
19275 axial
277 according to MIL-F-23419

Approvals: UL
CSA

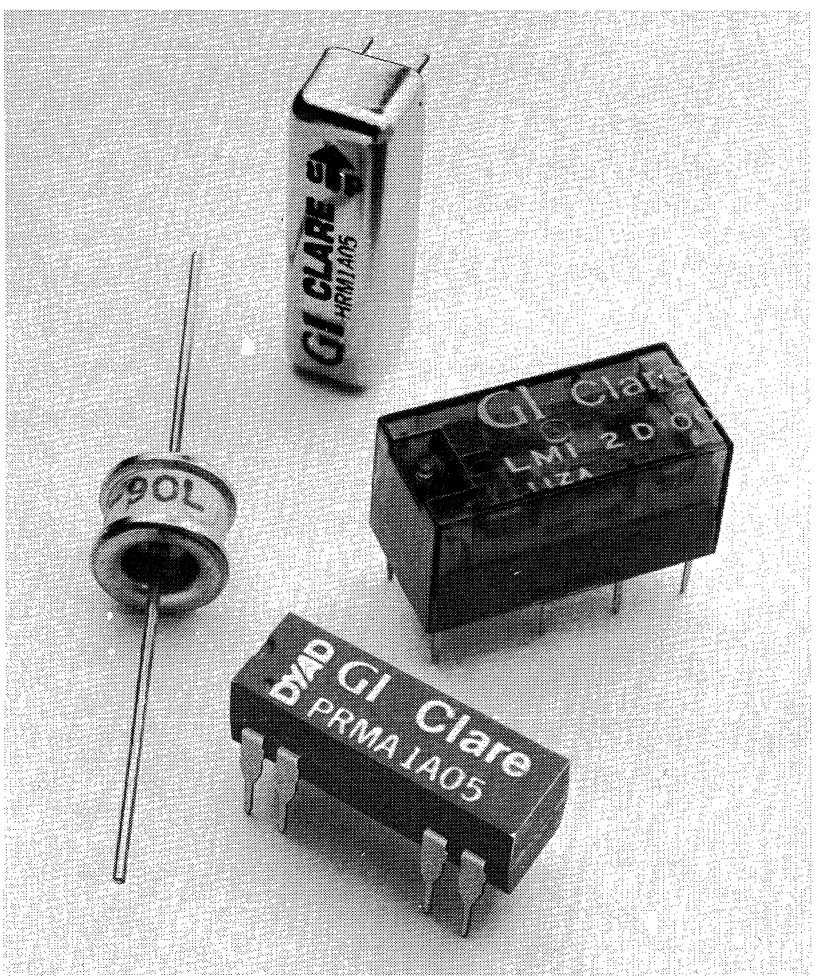
Rated current range: 62 mA, 10A acc. to UL (15A)
Rated voltage: 125 VDC (32V)
Characteristic: FF (Very Quick Acting)
Breaking capacity: 300A
Temperature range: −55°C to +125°C
Vibration test: from 10-2000 Hz at 10g-0.06 inch amplitude

Acceleration test: up to 50g
Solderable, wire leads tin-coated, **pluggable** into tubular receptacles No. 19555
Weight: 100 pieces = 50g
Packaging: 100 pieces; 200 resp. 5000 pieces taped

CALL OR WRITE POWER DYNAMICS, INC. FOR COMPLETE ENGINEERING CATALOG • FSC60046

The Clare Division Family Of Quality Products.

Reliability Through Technology.



Quality in the Clare Tradition.

Clare Division has earned the position of being the world's largest supplier of mercury-wetted and dry reed relays.

This leadership position has not come easy, but has come as a result of Clare Division's total commitment to products offering improved technology through innovation . . . and to the quality and performance you expect from the leader in switching technology.

Couple this with high volume manufacturing capabilities, and you get superior quality products, at competitive prices, with fast off-the-shelf delivery.

Call your local Clare Representative or authorized Clare Distributor for more information about:

- Mercury-wetted contact relays
- Dry reed relays
- Electromechanical relays
- Surge arresters

Clare Division
General Instrument Corporation
3101 W. Pratt Avenue
Chicago, IL 60645
312/262-7700

We Help You Compete®

GENERAL INSTRUMENT

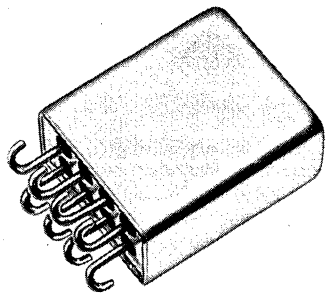
RELAYS

Manufacturer	EEM Page No.	Reed: Dry Contacts	Reed: Mercury Wetted Contacts	Solid State	Hybrid	Thermal	Time Delay	Vacuum	I/O Module	General Purpose	Latching	Current Sensing	Sensitive	Power	High Voltage	RF	Plug-in	PC Mount	DIP/SIP	Low Profile	Crystal Can	Sealed	Ratings/Approvals: UL	Ratings/Approvals: CSA	Ratings/Approvals: Mil.
Airpax	B•1263									•			•	•			•	•			•		•	•	•
American Zettler	B•1264-B•1274	•								•		•	•	•			•	•	•	•		•	•	•	
Applied Electro Technology	B•1275			•						•							•	•				•			•
Aromat	B•1276-B•1295	•								•	•		•	•		•	•	•	•	•	•	•	•	•	
Bosch	B•1296 B•1297									•				•			•	•							
Clare Division	B•1302-B•1306	•	•							•			•	•			•	•	•	•		•			
Communications Instruments	B•1298-B•1301									•			•	•		•		•	•	•	•	•			•
Computer Components	B•1307	•				•				•					•		•	•	•		•	•	•		•
Cornell-Dubilier	B•1309	•								•								•				•	•	•	
Coto	B•1310 B•1311	•	•			•					•	•	•		•	•		•				•	•		
Crouzet Controls	B•1315 B•1316						•																		
Crydon	B•1312-B•1314			•						•				•	•			•	•						
Deltrol Controls	B•1320 B•1321									•	•			•			•						•	•	
Diversified Electronics	B•1322						•										•						•		
Douglas Randall	B•1323-B•1331	•	•	•					•	•	•	•	•	•	•			•	•	•		•	•		
Elec-Trol	B•1332-B•1342	•	•	•		•			•	•	•		•	•	•	•		•	•	•		•			
Electronic Instr. & Spec.	B•1344 B•1345	•	•	•						•				•				•	•	•		•	•	•	•
Electronic Specialty	B•1346 B•1347									•	•		•			•	•	•			•	•			•
Fifth Dimension	B•1348		•							•								•				•			

RELAYS

Manufacturer	EEM Page No.	Reed		Solid State	Hybrid	Thermal	Time Delay	Vacuum	I/O Module	General Purpose	Latching	Current Sensing	Sensitive	Power	High Voltage	RF	Plug-in	PC Mount	DIP/SIP	Low Profile	Crystal Can	Sealed	Ratings/Approvals		
		Dry Contacts	Mercury Wetted Contacts																				UL	CSA	Mil.
Fujitsu America	B•1349 B•1368	•	•							•	•		•	•			•	•	•	•		•	•	•	
Genicom	B•1370- B•1373				•					•	•	•	•	•		•	•	•		•	•	•			•
Gordos Arkansas	B•1375- B•1383	•	•	•	•					•				•	•			•	•	•		•			
Grayhill	B•1384 B•1385			•						•				•			•	•		•			•	•	
Guardian Electric	B•1386 B•1387			•						•	•						•	•	•			•	•	•	
Hamlin	B•1389	•	•							•								•	•	•					
Hasco Components	B•1390- B•1396	•								•	•			•		•	•	•	•	•	•	•	•	•	
Hi-G•Nytronics	B•1398- B•1407			•						•				•		•	•	•	•	•	•	•			•
IDEC	B•1408- B•1412			•										•				•	•				•	•	
IEI-Iskra Elctrns.	B•1413									•				•			•						•		
Instrumentation & Control Systems	B•1318 B•1319						•																		
ITT Components	B•1414- B•1422			•					•	•			•				•	•				•			
Jennings	B•1424 B•1425						•	•			•			•	•	•									
Kilovac	B•1426 B•1427							•						•	•	•						•			
Leach	B•1428- B•1435			•	•		•			•	•			•							•	•			•
Logitek	B•1436 B•1437						•																		•
Magnecraft	B•1438	•	•	•			•			•	•	⊙	•	•	•	•	•	•	•	•			•	•	•
Microelectronic Relays	B•1439			•	•					•				•					•				•	•	
Opto 22	B•1440 B•1441			•					•	•				•	•			•		•			•	•	
Ross Engineering	B•1445							•						•	•										
Schrack North America	B•1444- B•1446									•	•	•		•			•	•				•			
Stancor	B•1447									•			•	•				•							
Standex Elctrns.	B•1448		•															•							
Struthers-Dunn	B•1449	•		•	•		•			•	•	•		•	•		•	•	•	•	•				•
Telemecarique	B•1450- B•1459			•						•	•		•	•			•	•			•	•	•	•	•
Wabash Relay & Elctrns.	B•1400 B•1461	•								•								•	•	•			•	•	

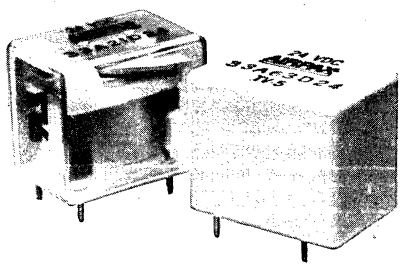
Relays and Solenoids



Series 07 – Crystal Can

Developed specifically for the aerospace industry. The standard unit features a solder terminal arrangement, 26.5Vdc coil voltage and 10 amp contacts.

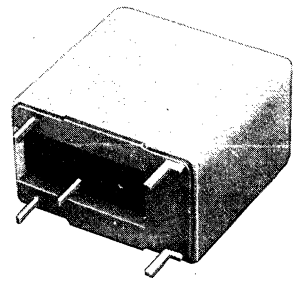
Features:
- Qualified to MIL-R-5757, M5757/23, MS 27245, MS 27247 and MIL-R-6106.
- Withstands severe vibration and shock.
- DPDT Contacts.



Series 33 Relay

This small (½ cubic inch) relay is especially suited for use as an output device for remote control and cable television, office equipment, appliances, door openers, automotive controls and various types of instruments. It offers complete isolation from noisy environments and can also handle high-inductive and tungsten filament loads. Coil voltages from 3Vdc to 48Vdc may be specified. Sensitive models, requiring as little as 180 mW of coil power, are available. Terminals are designed for PC board installation.

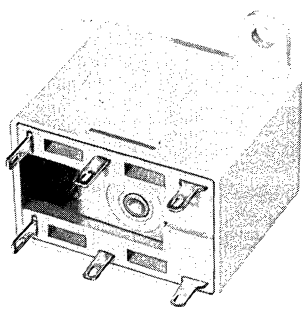
Features:
- Small size — ½ cubic inch
- Sensitive — as little as 180 milliwatts coil power
- TV 5 rating available
- Approval —
- Inexpensive — typically under $1.00.



Series 28 – Sensitive Control Relay

Applications of this relay include automotive control functions (electronic fuel injection, intermittent windshield wiper, etc.), entertainment equipment – remote TV tuning – and other communication switching functions. A variety of D.C. coil voltages and contact configurations are available. Ratings up to 15 amp, 120Vac may also be specified.

Features:
- High amperage ratings in small package.
- Super sensitivity – 44 milliwatts coil power.
- Variety of contact materials.
- TV 5 rating available.
- Approval:



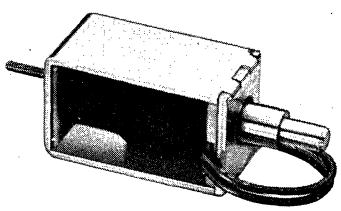
Series 39 – 2 Pole, 10 Amp Relay

This low-cost relay features 2 heavy-duty, 10 amp contacts available in a number of materials and configurations. Fast-on/solder combination terminals aid installation and service replacement. Ideal for home appliance where heavy work loads are common, but power to drive coils is at a premium.

Features:
- Contact ratings available up to 15 amps.
- Can be furnished with DPNO, DPNC, DPDT.
- 470 milliwatts sensitivity.
- Available with one heavy-duty contact and one signal contact for economy.
- Approval:

7019 Solenoid

This direct Current Tubular Pull Type Solenoid is designed to provide up to 50 ozs. of force with a maximum stroke of .437". Actual usable force will depend on the stoke and power level. Coils are available from 6Vdc to 115Vdc with a continuous duty power level of 5 watts and an intermittent (25%) duty power of 15 watts.



7007ED33-0013 D.C. Box-Frame Push-Type Solenoid

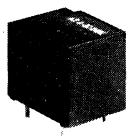
Provides up to 20 ozs. of force with a maximum stroke of .200". Actual usable force will depend on the stroke and power level. Coils are available from 6 to 115Vdc with a continuous duty power level of 3.0 watts and an intermittent (25%) duty power level of 9.0 watts.

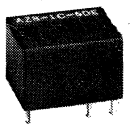
AIRPAX®
WE GIVE YOU CONTROL.

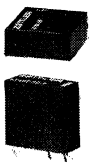
Airpax Corporation
a North American Philips Company,
Frederick Division
Husky Park,
Frederick, MD 21701

GENERAL PURPOSE RELAYS

On the following pages you'll find summary specifications for our most popular relays. For additional technical information on these relays, or those marked (*), which are not covered here, call (800) 854-8474. In California call (714) 660-1670. For ordering information, call our local sales office listed in the eem yellow section.







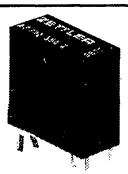
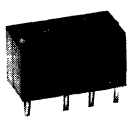
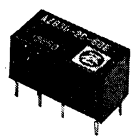
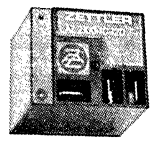
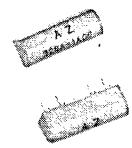
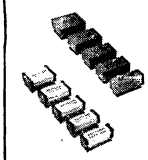
SERIES		AZ 3	AZ 4	AZ 7	AZ 8	AZ 420	AZ 690
FEATURES		-Ultra High Sensitivity -Wide Switching Range -Rugged Construction	-Subminiature Size -Low Cost -Rugged Construction	-Meets FCC 1500V Surge Requirement -Low Profile -High Sensitivity -Ag-Pd Contacts Available	-High Sensitivity -Subminiature Size -Low Cost -Wide Switching Range	-Versatile Contact Configurations -Wide Switching Range -High Sensitivity -Long Life	-High Dielectric Strength, 4000 Vrms -Complete List of International Approvals -10 Amp Switching Capability in Compact Size
SEALED		No	Yes	Yes	Yes	Yes	Yes
CONTACTS	FORM	1 Form C	2 and 4 Form C	2 and 4 Form C Form D available	1 Form C	1-6 Form C Forms A, B, & D available	1 Form A, B or C
	RATING (RESISTIVE)	3A @ 30 VDC or 120 VAC 5A @ 30 VDC or 120 VAC 10A @ 30 VDC or 120 VAC	3A @ 30 VDC or 120 VAC 5A @ 30 VDC or 120 VAC	2A @ 30 VDC 0.5A @ 125 VAC	3A @ 30 VDC or 200 VAC 6A @ 30 VDC or 300 VAC	2A @ 28 VDC or 115 VAC 3A @ 30 VDC or 115 VAC 7.5A @ 30 VDC or 115 VAC	10A @ 30 VDC or 200 VAC ¼ HP 120 VAC Motor Load
COIL VOLTAGE		6, 12, 24, 48V (DC)	5, 6, 9, 12, 24, 48V (DC)	5, 6, 12, 24, 48V (DC)	5, 6, 9, 12, 24, 48V (DC)	3 thru 115V (DC)	5, 6, 12, 24, 48V (DC)
OPERATING POWER AT PICK UP VOLTAGE		3 & 5A Contact: 50 to 70 mW 10A Contact: 150 mW	230 mW	2 Pole: 190 mW 4 Pole: 310 mW	110 to 210 mW	Standard: 450 to 850 mW Sensitive: 40 mW per pole 25 mW per pole available	Standard Coils: 350 mW Sensitive Coils: 250 mW
DIELECTRIC STRENGTH		Between All Points: 1500 Vrms Contact to Contact: 750 Vrms	Contact to Contact: 1750 Vrms Contact to Coil: 1500 Vrms	Between All Points: 1000 Vrms Between Open Contacts: 750 Vrms Contact to Coil: 1500 Vrms	Contact to Contact: 750 Vrms Contact to Coil: 2000 Vrms	Between All Points: 1000 Vrms 1500 Vrms Versions Available	Coil to Contact: 4000 Vrms Between Open Contact: 1000 Vrms
TYPICAL LIFE OPERATIONS	ELECTRICAL	2×10^5 (at rated load)	10^5 (at rated load)	5×10^6 — 1A/30 VDC 10^6 — 2A/30 VDC	(LD) 10^5 — 3A/120 VAC 5×10^5 — 3A/24 VDC (HD) 10^5 — 6A/24 VDC or 120 VAC	1×10^8 — 10 mA/6 VDC 1.5×10^6 — 2A/28 VDC or 115 VAC 2×10^5 — 5A/28 VDC or 115 VAC 1×10^5 — 7.5A/28VDC or 115 VAC	10^5 — 10A/30 VDC 2×10^5 — 10A/115 VAC or 8A/220 VAC
	MECHANICAL	5×10^6	10^7	10^8	2×10^7	10^8	3×10^7
MAXIMUM SIZE IN INCHES L x W x H		1.210 x 0.750 x 1.190	0.866 x 0.635 x 0.745	1.200 x 0.826 x 0.458 (Min.) 1.200 x 0.965 x 0.458 (Max.)	0.830 x 0.630 x 0.560	0.940 x 0.735 x 1.230 (Min.) 1.395 x 0.735 x 1.230 (Max.)	SLIMPAK - 1.110 x 0.476 x 1.030 THINPAK - 1.110 x 1.030 x 0.441
TERMINALS	PC	X	X	X	X	X	X
	SOLDER/ PLUG-IN	—	—	—	—	X	—
UL, CSA, VDE		UL/CSA	UL/CSA	UL/CSA	UL/CSA	UL/CSA	UL/CSA/VDE

All listed data are for the type with the minimum number of contacts.
For more detailed information, request individual data sheets.

"It's a better relay"

AMERICAN ZETTLER, INC.
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

FROM AMERICAN ZETTLER

							
AZ 730	**AZ 735**	**AZ 820**	**AZ 830**	**AZ 2100**	**AZ 2530/2531***	**30**	**60**
-High Dielectric Strength, 4000 Vrms -Complete List of International Approvals -8 Amp Switching Capability in Compact Size	-High Dielectric Strength, 5000 Vrms -Complete List of International Approvals -16 Amp Switching Capability in Compact Size	-Meets FCC 1500V Surge Requirement -Bifurcated Pd Ag Contacts -Low Profile -Dip Package	-Meets FCC Part 68.302 and 68.304 -Polarized Coil -Dip Package -Bifurcated Contacts -Pd-Ag Contacts Available	-30 Amp Switching Capability in Compact Size -Low Cost -Unique PC/QC Terminal Design -Rugged Construction	-Low Profile -High Insulation Resistance -High Sensitivity -Long Life	-Encapsulated Reed -SIP Package -Stable Contact Resistance -Low Cost	-Encapsulated Reed -Stable Contact Resistance -Low Cost -Versatile Contact Configurations
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 Form A, B or C	1 Form A or C	2 Form C	2 Form C	1 Form A, B, or C	1 and 2 Form C	1 Form A and C	1-6 Form A 1-4 Form C
8A @ 30 VDC or 180 VAC ⅛ HP 120 VAC Motor Load	16A @ 30 VDC or 120 VAC ½ HP 120 VAC Motor Load	2.0A @ 15 VDC or 30 VAC 1.0A @ 30 VDC or 60 VAC 0.5A @ 60 VDC or 120 VAC	2.0A @ 30 VDC or 60 VAC 1.0A @ 60 VDC or 120 VAC 0.5A @ 120 VDC or 240 VAC	Form C — 5A @ 5-28 VDC Form A — 30A @ 5-28 VDC Form B — 20A @ 5-28 VDC	2A @ 26 VDC 1A @ 115 VAC	1 Form A — 10W 1 Form C — 3W	1-6 Form A — 10W 1-4 Form C — 3W
5, 6, 12, 24, 48V (DC)	6, 12, 24, 48V (DC)	5, 6, 12, 24, 48V (DC)	5, 6, 12, 24, 48V (DC)	5, 6, 9, 12, 15, 18, 24V (DC)	5, 6, 12, 24, 48V (DC)	5, 6, 12, 24, 48V (DC)	5, 6, 12, 24, 48V (DC)
Standard Coils: 350 mW Sensitive Coils: 250 mW	350 mW	250 mW	Standard: 200 mW Sensitive: 100 mW	500 mW	Standard 1 Form C: 125 mW Sensitive 1 Form C: 85 mW Standard 2 Form C: 270 mW	1 Form A: 29 mW 1 Form C: 80 mW	29 to 482 mW
Coil to Contact: 4000 Vrms Contact to Contact: 2500 Vrms Between Open Contacts: 1000 Vrms	Coil to Contact: 5000 Vrms Between Open Contacts: 1000 Vrms 10,000 V Surge, Max., 40 micro seconds, contact to coil	Between All Points: 1500 Vrms Between Open Contacts: 500 Vrms	Between Open Contacts: 1000 Vrms Between Contact Sets: 1000 Vrms Contact to Coil: 1500 Vrms	Coil to Contact: 2500 Vrms Between Open Contacts: 1500 Vrms	Contact to Contact: 500 Vrms Contact to Coil: 500 Vrms	Between Open Contacts: 500 VDC Coil to Contact: 1000 Vrms	Between All Points: 500 VDC Between Open Contacts: 300 VDC
10^5 — 8A/30 VDC 2×10^5 — 8A/115 VAC or 6A/220 VAC	10^5 — 16A/30 VDC 2×10^5 — 16A/120 VAC 10^5 — 14A/250 VAC	5×10^5 — 1A/30 VDC 2×10^5 — 0.5A/120 VAC	5×10^5 — 2A/30 VDC 1A/125 VAC 2×10^6 — 1A/30 VDC 0.5A/125 VAC	10^5 (at rated load)	10^6 — 1A/26 VDC or 0.5A/115 VAC 2×10^5 — 2A/26 VDC or 1A/115 VAC	Form A — 10^7 Form C — 5×10^6	Form A — 10^7 Form C — 5×10^6
3×10^7	10^7	10^7	10^8	10^7	10^7	Form A — 10^8 Form C — 10^7	Form A — 2×10^8 Form C — 5×10^7
1.110 x 0.496 x 1.030	1.110 x 0.496 x 1.030	0.795 x 0.394 x 0.453	0.787 x 0.390 x 0.366	1.270 x 1.080 x 1.110	1.090 x 0.593 x 0.445 (Min.) 1.090 x 0.888 x 0.445 (Max.)	1.000 x 0.340 x 0.375	1.125 x 0.360 x 0.350 (Min.) 1.175 x 0.910 x 0.375 (Max.)
X	X	X	X	X	X	X	X
—	—	—	—	"Quick Connect"	—	—	—
UL/CSA/VDE	UL/CSA/VDE	UL/CSA	UL/CSA	UL/CSA	UL/CSA	—	—

"It's a better relay"

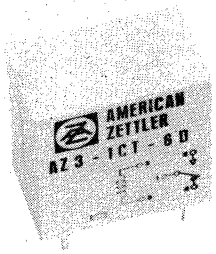
AMERICAN ZETTLER, INC.

16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

SERIES AZ 3

SPDT Contacts to 10 Amps

L: 1.21″
W: 0.75″
H: 1.19″



FEATURES

- Compact Size
- Coils to 48 VDC
- Contacts Rated at 3, 5, or 10 Amps
- Life Expectancy 200,000 Operations
- PC Board Mounting
- UL File #E43203; CSA File #LR 36664

Contact Arrangement: SPDT (1 Form C)
Contact Rating: Noninductive load
Light Duty: Max. switched power: 90 W or 360 VA
Max. switched current: 3 Amps
Max. switched voltage: 150 VDC or VAC
Medium Duty: Max. switched power: 150 W or 600 VA
Max. switched current: 5 Amps
Max. switched voltage: 150 VDC or VAC
Heavy Duty: Max. switched power: 280 W or 1200 VA
Max. switched current: 10 Amps
Max. switched voltage: 150 VDC or VAC
Contact Material: Light Duty: Silver-Nickel, gold plated
Medium Duty: Silver-Nickel alloy
Heavy Duty: Silver-Nickel alloy
Operate Time: 20 ms at nominal coil voltage (typical)
Release Time: 20 ms at nominal coil voltage (typical)
Dielectric Strength: 1500 Vrms; 750 Vrms contact to contact
Coil Power
At Pick Up Voltage (typical): Light and Medium Duty: 70 mW
Heavy Duty: 150 mW
Max. Continuous Dissipation: 2 W at 20°C (68°F) ambient
Life Expectancy: Mechanical: 5 million operation
Electrical:
Light Duty: $2x10^5$ @ 3 A, 28 VDC/120 VAC
Medium Duty: $2x10^5$ @ 5 A, 28 VDC/120 VAC
Heavy Duty: $2x10^5$ @ 10 A, 28 VDC/120 VAC

RELAY ORDERING DATA

STANDARD RELAYS: LIGHT DUTY TYPE (3 Amp Contact)

COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
6	20	350	4.8	AZ 3-1C-6D	2.65
12	40	1,400	9.6	AZ 3-1C-12D	2.65
24	80	5,600	19.2	AZ 3-1C-24D	2.75
48	157	21,500	38.4	AZ 3-1C-48D	3.40

STANDARD RELAYS: MEDIUM DUTY TYPE (5 Amp Contact)

COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
6	20	350	4.8	AZ 3-1CH-6D	2.85
12	40	1,400	9.6	AZ 3-1CH-12D	2.85
24	80	5,600	19.2	AZ 3-1CH-24D	2.95
48	157	21,500	38.4	AZ 3-1CH-48D	3.60

STANDARD RELAYS: HEAVY DUTY TYPE (10 Amp Contact)

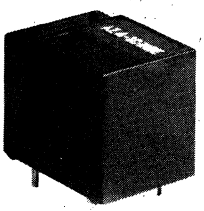
COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
6	14	164	4.8	AZ 3-1CT-6D	3.05
12	28	660	9.6	AZ 3-1CT-12D	3.05
24	54	2,500	19.2	AZ 3-1CT-24D	3.15
48	107	9,900	38.4	AZ 3-1CT-48D	3.80

1. All values at 20°C

SERIES AZ 4

SPDT Up to 5 Amp Contacts

L: 0.866″
W: 0.635″
H: 0.745″



FEATURES

- Subminiature Size
- DC Coils to 48 VDC
- PC Board Terminals
- Extremely Low Cost
- 3 and 5 Amp Contacts
- Rugged Construction for High Reliability
- UL File #E43203x; CSA File #LR 36664
- Epoxy Sealed for Automatic Wave Soldering

Contact Arrangement: SPDT (1 Form C)
Contact Rating: Noninductive load
Light Duty: Max. switched power: 90 W or 360 VA
Max. switched current: 3 Amps
Max. switched voltage: 60 VDC or 250 VAC
Heavy Duty: Max. switched power: 150 W or 600 VA
Max. switched current: 5 Amps
Max. switched voltage: 60 VDC or 250 VAC
Pilot Duty: 2.5 Amp @ 120/250 VAC resistive
1/10 HP @ 120 VAC for 100,000 cycles
3 Amp @ 120 VAC 100,000 cyc pilot duty
Contact Material: Gold Plated, silver alloy
Life Expectancy: Mechanical: 10 million operations
Electrical: 10^5 operations at rated load
Contact Resistance: 5 milliohms initially (typical)
Operate Time: 6 ms at nominal coil voltage (typical)
Release Time: 2 ms at nominal coil voltage (typical)
Dielectric Strength: Contact to contact: 1000 Vrms
Contact to coil: 1500 Vrms
Coil Power:
At Pick Up Voltage: 230 mW (typical)
Max. Continuous Dissipation: 1.6 W @ 20°C (68°F) ambient

RELAY ORDERING DATA

LIGHT DUTY: 3 Amp Contact — Unsealed Version

COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
5	6.5	70	4.0	AZ 4-1C-5D	2.00
6	7.8	100	4.8	AZ 4-1C-6D	2.00
12	15.6	400	9.6	AZ 4-1C-12D	2.00
24	31.2	1,600	19.2	AZ 4-1C-24D	2.00
48	62.4	6,400	38.4	AZ 4-1C-48D	2.45

LIGHT DUTY: 3 Amp Contact — Sealed Version

5	6.5	70	4.0	AZ 4-1C-5DE	2.55
6	7.8	100	4.8	AZ 4-1C-6DE	2.55
12	15.6	400	9.6	AZ 4-1C-12DE	2.55
24	31.2	1,600	19.2	AZ 4-1C-24DE	2.55
48	62.4	6,400	38.4	AZ 4-1C-48DE	3.00

HEAVY DUTY: 5 Amp Contact — Unsealed Version

COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
5	6.5	70	4.0	AZ 4-1CH-5D	2.20
6	7.8	100	4.8	AZ 4-1CH-6D	2.20
12	15.6	400	9.6	AZ 4-1CH-12D	2.20
24	31.2	1,600	19.2	AZ 4-1CH-24D	2.20
48	62.4	6,400	38.4	AZ 4-1CH-48D	2.65

HEAVY DUTY: 5 Amp Contact — Sealed Version

5	6.5	70	4.0	AZ 4-1CH-5DE	2.75
6	7.8	100	4.8	AZ 4-1CH-6DE	2.75
12	15.6	400	9.6	AZ 4-1CH-12DE	2.75
24	31.2	1,600	19.2	AZ 4-1CH-24DE	2.75
48	62.4	6,400	38.4	AZ 4-1CH-48DE	3.55

"It's a better relay"

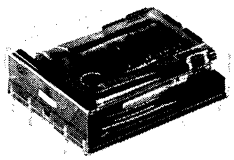
AMERICAN ZETTLER, INC.
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

SERIES AZ 7

DPDT, 4PDT Dry Circuit to 2 Amp Contacts

2 POLE
L: 1.200″
W: 0.826″
H: 0.458″

4 POLE
L: 1.200″
W: 0.965″
H: 0.458″



FEATURES

- Low Profile For Compact Board Spacing
- DC Coils to 48 VDC
- Life Expectancy to 100 Million Operations
- Standard PC 0.2″ Grid Spacing
- Contact Resistance Less Than 50 Milliohms
- Welded Bifurcated Contacts
- Both Form C and Form D Contacts Available
- Epoxy Sealed "Process-Proof" Version Available
- UL File #E43203; CSA File #LR 36664
- Meets FCC 1500V Surge Requirement

Contact Arrangement: DPDT (2 Form C) bifurcated
4PDT (4 Form C) bifurcated
Form D also available

Contact Rating: Noninductive load — Form C contact
2 Amp @ 30 VDC
0.5 Amp @ 125 VAC

Contact Material: Silver alloy, gold clad
Other material available upon request

Life Expectancy: Mechanical: 100 million operations

Electrical:	Unsealed	Sealed
1 A @ 26 VDC	$5x10^6$ ops	10^6 ops
2 A @ 26 VDC	10^6 ops	$2x10^5$ ops

Contact Resistance: 50 milliohms initially
200 milliohms at end of life

Operate Time: 10 ms at nominal coil voltage (typical)

Release Time: 4 ms at nominal coil voltage (typical)

Dielectric Strength (initial): 1000 Vrms; 100 Vrms across contact gap; 1500 Vrms across all other points

Coil Power
At Pick Up Voltage (typical): 2 pole: 190 mW; 4 pole: 310 mW
Max. Continuous Dissipation: 1.6 W @ 20°C (68°F) ambient; 1.2 W @ 40°C (105°F) ambient

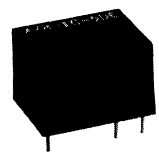
RELAY ORDERING DATA

COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
STANDARD RELAYS: 2 FORM C (DPDT) CONTACTS (Unsealed)					
5	11	90	3.6	AZ 7-2C-5D	4.65
6	13	137	4.2	AZ 7-2C-6D	4.65
12	26	500	8.4	AZ 7-2C-12D	4.65
24	52	2,000	16.8	AZ 7-2C-24D	4.65
48	97	7,000	33.6	AZ 7-2C-48D	5.15
STANDARD RELAYS: 2 FORM C (DPDT) CONTACTS (Sealed)					
5	11	90	4.0	AZ 7-2C-5DE	5.25
6	13	137	4.8	AZ 7-2C-5DE	5.25
12	26	500	9.6	AZ 7-2C-12DE	5.25
24	52	2,000	19.2	AZ 7-2C-24DE	5.25
48	97	7,000	38.4	AZ 7-2C-48DE	5.85
STANDARD RELAYS: 4 FORM C (4PDT) CONTACTS (Unsealed)					
5	8	53	3.6	AZ 7-4C-5D	5.60
6	11	90	4.2	AZ 7-4C-6D	5.60
12	21	330	8.4	AZ 7-4C-12D	5.60
24	40	1,200	16.8	AZ 7-4C-24D	5.60
48	72	4,200	33.6	AZ 7-4C-48D	6.20
STANDARD RELAYS: 4 FORM C (4PDT) CONTACTS (Sealed)					
5	8	53	4.0	AZ 7-4C-5DE	6.20
6	11	90	4.8	AZ 7-4C-6DE	6.20
12	21	330	9.6	AZ 7-4C-12DE	6.20
24	40	1,200	19.2	AZ 7-4C-24DE	6.20
48	72	4,200	38.4	AZ 7-4C-48DE	6.90

SERIES AZ 8

Epoxy Sealed SPDT Up to 6 Amps

L: 0.83″
W: 0.63″
H: 0.56″



FEATURES

- Subminiature Size
- Coils to 48 VDC
- Epoxy Sealed for Automatic Wave Soldering
- Contacts Rated at 3 or 6 Amps
- Life Expectancy to 20 Million Operations
- Extremely Low Cost
- UL File #E44211; CSA File #LR 36664
- Suitable for Class B Applications

Contact Arrangement: SPDT (1 Form C)

Contact Rating: Noninductive load

Light Duty: Max. switched power: 100 W or 600 VA
Max. switched current: 3 Amps
Max. switched voltage: 30 VDC/300 VAC
U.L. Rating: 2 A @ 28 VDC or 120/300 VAC; ⅛ HP @ 120 VAC; Standard Pilot Duty @ 120/240 VAC

Heavy Duty: Max. switched power: 170 W or 1800 VA
Max. switched current: 6 amps
Max. switched voltage: 30 VDC/300 VAC
U.L. Rating: 6 A @ 28 VDC or 120/300 VAC; ⅛ HP @ 120 VAC; Standard Pilot Duty @ 120/240 VAC

Contact Material: Light Duty: Fine silver, gold plated
Heavy Duty: Silver nickel, gold plated

Life Expectancy: Mechanical: 20 million operations
Electrical:
Light Duty: $1x10^5$ — 3 A 120 VAC; $5x10^5$ — 3 A 24 VDC
Heavy Duty: $1x10^5$ — 6 A 24 VDC or 120 VAC

Operate Time: 5 ms at nominal coil voltage (typical)

Release Time: 3 ms at nominal coil voltage (typical with no coil suppression)

Dielectric Strength: 750 Vrms contact to contact
2000 Vrms contact to coil

Coil Power
At pick Up Voltage (typical): Standard version: 210 mW; Sensitive version: 140 mW (110 mW available)
Max. Continuous Dissipation: 1.5 W @ 20°C (68°F) ambient
Temperature Rise: 75°C per Watt (typical)

RELAY ORDERING DATA

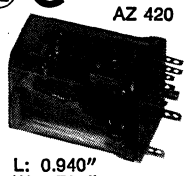
Nom. Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Unsealed Order Number	Unsealed List Price	Epoxy Sealed Order Number	Epoxy Sealed List Price
STANDARD RELAYS: LIGHT DUTY (3 Amp Contact)							
5	8.3	56	3.25	AZ 8-1C-5D	2.35	AZ 8-1C-5DE	2.65
6	9.9	80	3.90	AZ 8-1C-6D	2.35	AZ 8-1C-6DE	2.65
12	19.8	320	7.80	AZ 8-1C-12D	2.35	AZ 8-1C-12DE	2.65
24	39.6	1280	15.60	AZ 8-1C-24D	2.45	AZ 8-1C-24DE	2.75
48	79.2	3800	28.80	AZ 8-1C-48D	2.85	AZ 8-1C-48DE	3.15
STANDARD RELAYS: HEAVY DUTY (6 Amp Contact)							
5	8.3	56	3.25	AZ 8-1CH-5D	2.50	AZ 8-1CH-5DE	2.80
6	9.9	80	3.90	AZ 8-1CH-6D	2.50	AZ 8-1CH-6DE	2.80
12	19.8	320	7.80	AZ 8-1CH-12D	2.50	AZ 8-1CH-12DE	2.80
24	39.6	1280	15.60	AZ 8-1CH-24D	2.60	AZ 8-1CH-24DE	2.90
48	79.2	3800	28.80	AZ 8-1CH-48D	3.00	AZ 8-1CH-48DE	3.30
SENSITIVE RELAYS: LIGHT DUTY (3 Amp Contact)							
5	9.8	80	3.25	AZ 8-1C-5DS	2.55	AZ 8-1C-5DSE	2.85
6	11.7	110	3.90	AZ 8-1C-6DS	2.55	AZ 8-1C-6DSE	2.85
12	23.4	440	7.80	AZ 8-1C-12DS	2.55	AZ 8-1C-12DSE	2.85
24	46.8	1780	15.60	AZ 8-1C-24DS	2.65	AZ 8-1C-24DSE	2.95
SENSITIVE RELAYS: HEAVY DUTY (6 Amp Contact)							
5	9.8	80	3.25	AZ 8-1CH-5DS	2.70	AZ 8-1CH-5DSE	3.00
6	11.7	110	3.90	AZ 8-1CH-6DS	2.70	AZ 8-1CH-6DSE	3.00
12	23.4	440	7.80	AZ 8-1CH-12DS	2.70	AZ 8-1CH-12DSE	3.00
24	46.8	1780	15.60	AZ 8-1CH-24DS	2.80	AZ 8-1CH-24DSE	3.10

"It's a better relay"

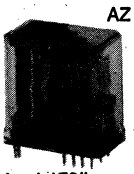
AMERICAN ZETTLER, INC.
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

SERIES AZ 420

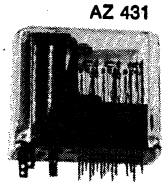
Up to 6 PDT or 8 PST
Dry Circuit thru 7.5 Amp Contacts


AZ 420

L: 0.940″
W: 0.735″
H: 1.230″


AZ 421

L: 1.172″
W: 0.735″
H: 1.230″


AZ 431

L: 1.395″
W: 0.735″
H: 1.230″

FEATURES

- International Standard Type
- Occupies Less Than One Cubic Inch of Space
- Life Expectancy More Than 100 Million Operations
- Coils to 115V — DC or AC
- Current and Voltage Sensitive Coils Available
- Dry Circuit, 2 Amp, 3 Amp, or 7.5 Amp Contacts
- Form A, B, C and D Contacts Available
- Solder/plug in or PC Terminals
- Hydrogen Annealed Iron Magnetic Circuit
- Molded Comb Eliminates Phenolic Dust Inside Relay
- Balanced Spring-held Armature Allows Dependable Operation in Any Position
- Round Core and Larger Coil Volume Provide More Pull Force
- UL File #E43203; CSA File #LR 36664; VDE 0110 Gr. A

Contact Arrangement:	2, 4, or 6 Form C; 6 or 8 Form A or B; 2 or 4 Form D available
Contact Rating:	Noninductive load — U.L. Rating
Code: WL	Fine silver, gold plated 3 Amp at 26 VDC or 115 VAC
Code: WH	Silver cadmium oxide, gold plated 7.5 Amp at 26 VDC or 115 VAC
Code: 10L, 40L	Fine silver, gold plated 2 Amp at 26 VDC; 1 Amp at 115 VAC
Life Expectancy:	Mechanical operations: 100 million Electrical: $1x10^6$ at 2 A, 30 VDC or 120 VAC (Code WL) $1x10^5$ at 5 A, 30 VDC or 120 VAC (Code WH)
Contact Resistance:	50 milliohms initially (typical)
Operate Time (typical):	10 ms at nom. coil voltage
Release Time (typical):	3 ms at nom. coil voltage with no coil suppression
Dielectric Strength (initial):	1000 Vrms between all points 1500 Vrms versions available
Coil Power	
At Pick Up Power (typical):	40 mW per pole (sensitive version) 25 mW per pole available
Max. Continuous Dissipation:	2.6 W @ 20°C (68°F) ambient 2.0 W @ 40°C (105°F) ambient
Temperature Rise:	30°C (86°F) per Watt (typical)

CONTACTS RATED 2 AMPS — FINE SILVER GOLD PLATED

COIL SPECIFICATONS						
Nom. Voltage (Volts)	Must Operate (VDC)	Resistance (Ohms)	Contacts	Solder Plug-in Terminals Order Number	PC Terminals Order Number	List Price
6 DC	4.5	52	DPDT	AZ 420-15-4WL	AZ 428-15-4WL	5.50
12 DC	9.0	185	DPDT	AZ 420-1011-4WL	AZ 428-1011-4WL	5.50
24 DC	18.0	700	DPDT	AZ 420-70-4WL	AZ 428-70-4WL	5.50
48 DC	36.0	2.5K	DPDT	AZ 420-56-4WL	AZ 428-56-4WL	5.50
115 DC	86.0	15K	DPDT	AZ 420-035-4WL	AZ 428-035-4WL	7.60
6 DC	4.5	52	4PDT	AZ 421-15-1WL	AZ 429-15-1WL	6.45
12 DC	9.0	185	4PDT	AZ 421-1011-1WL	AZ 429-1011-1WL	6.45
24 DC	18.0	700	4PDT	AZ 421-70-1WL	AZ 429-70-1WL	6.45
48 DC	36.0	2.5K	4PDT	AZ 421-56-1WL	AZ 429-56-1WL	6.45
115 DC	86.0	15K	4PDT	AZ 421-035-1WL	AZ 429-035-1WL	8.55
6 DC	4.5	25	6PDT	AZ 431-18-1WL	AZ 439-18-1WL	9.80
12 DC	9.0	90	6PDT	AZ 431-13-1WL	AZ 439-13-1WL	9.80
24 DC	18.0	430	6PDT	AZ 431-80-1WL	AZ 439-80-1WL	9.80
48 DC	36.0	1.8K	6PDT	AZ 431-06-1WL	AZ 439-06-1WL	9.80
115 DC	86.0	9K	6PDT	AZ 431-04-1WL	AZ 439-04-1WL	11.35

CONTACTS RATED 5 AMPS — SILVER CADMIUM

COIL SPECIFICATIONS					
Nominal Voltage (Volts)	Must Operate (VDC)	Resistance (Ohms)	Contacts	Solder Plug-in Terminals Order Number	List Price
6 DC	4.5	52	DPDT	AZ 420-15-4WH	5.80
12 DC	9.0	185	DPDT	AZ 420-1011-4WH	5.80
24 DC	18.0	700	DPDT	AZ 420-70-4WH	5.80
48 DC	36.0	2.5K	DPDT	AZ 420-56-4WH	5.80
115 DC	86.0	15K	DPDT	AZ 420-035-4WH	7.90
6 DC	4.5	52	4PDT	AZ 421-15-1WH	7.05
12 DC	9.0	185	4PDT	AZ 421-1011-1WH	7.05
24 DC	18.0	700	4PDT	AZ 421-70-1WH	7.05
48 DC	36.0	2.5K	4PDT	AZ 421-56-1WH	7.05
115 DC	86.0	15K	4PDT	AZ 421-035-1WH	9.15
6 DC	4.5	25	6PDT	AZ 431-18-1WH	10.70
12 DC	9.0	90	6PDT	AZ 431-13-1WH	10.70
24 DC	18.0	430	6PDT	AZ 431-80-1WH	10.70
48 DC	36.0	1.8K	6PDT	AZ 431-06-1WH	10.70
115 DC	86.0	9K	6PDT	AZ 431-04-1WH	12.05

Epoxy Sealed Versions Available

BIFURCATED CONTACTS RATED 2 AMPS — FINE SILVER GOLD PLATED

COIL SPECIFICATONS						
Nom. Voltage (Volts)	Must Operate (VDC)	Resistance (Ohms)	Contacts	Solder Plug-in Terminals Order Number	PC Terminals Order Number	List Price
6 DC	4.5	52	DPDT	AZ 420-15-40L	AZ 428-15-40L	6.45
12 DC	9.0	185	DPDT	AZ 420-1011-40L	AZ 428-1011-40L	6.45
24 DC	18.0	700	DPDT	AZ 420-70-40L	AZ 428-70-40L	6.45
48 DC	36.0	2.5K	DPDT	AZ 420-56-40L	AZ 428-56-40L	6.45
115 DC	86.0	15K	DPDT	AZ 420-035-40L	AZ 428-035-40L	8.55
6 DC	4.5	52	4PDT	AZ 421-15-10L	AZ 429-15-10L	8.10
12 DC	9.0	185	4PDT	AZ 421-1011-10L	AZ 429-1011-10L	8.10
24 DC	18.0	700	4PDT	AZ 421-70-10L	AZ 429-70-10L	8.10
48 DC	36.0	2.5K	4PDT	AZ 421-56-10L	AZ 429-56-10L	8.10
115 DC	86.0	15K	4PDT	AZ 421-035-10L	AZ 429-035-10L	10.20
6 DC	4.5	25	6PDT	AZ 431-18-10L	AZ 439-18-10L	12.20
12 DC	9.0	90	6PDT	AZ 431-13-10L	AZ 439-13-10L	12.20
24 DC	18.0	430	6PDT	AZ 431-80-10L	AZ 439-80-10L	12.20
48 DC	36.0	1.8K	6PDT	AZ 431-06-10L	AZ 439-06-10L	12.20
115 DC	86.0	9	6PDT	AZ 431-04-10L	AZ 439-04-10L	13.80

CONTACTS RATED 5 AMPS — SILVER CADMIUM

COIL SPECIFICATIONS					
Nominal Voltage (Volts)	Must Operate (VDC)	Resistance (Ohms)	Contacts	PC Terminals Order Number	List Price
6 DC	4.5	52	DPDT	AZ 428-15-4WH	5.80
12 DC	9.0	185	DPDT	AZ 428-1011-4WH	5.80
24 DC	18.0	700	DPDT	AZ 428-70-4WH	5.80
48 DC	36.0	2.5K	DPDT	AZ 428-56-4WH	5.80
115 DC	86.0	15K	DPDT	AZ 428-035-4WH	7.90
6 DC	4.5	52	4PDT	AZ 429-15-1WH	7.05
12 DC	9.0	185	4PDT	AZ 429-1011-1WH	7.05
24 DC	18.0	700	4PDT	AZ 429-70-1WH	7.05
48 DC	36.0	2.5K	4PDT	AZ 429-56-1WH	7.05
115 DC	86.0	15K	4PDT	AZ 429-035-1WH	9.15
6 DC	4.5	25	6PDT	AZ 439-18-1WH	10.70
12 DC	9.0	90	6PDT	AZ 439-13-1WH	10.70
24 DC	18.0	430	6PDT	AZ 439-80-1WH	10.70
48 DC	36.0	1.8K	6PDT	AZ 439-06-1WH	10.70
115 DC	86.0	9K	6PDT	AZ 439-04-1WH	12.05

HARDWARE

Poles	Socket	List Price	Retaining Clip	List Price	Ground Clip	List Price
2	ST 140-A1	1.10	ST 140-1	0.18	ST 140-2	0.27
4	ST 141-A1	1.40	ST 141-1	0.18	ST 140-2	0.27
6	ST 345-A1	1.90	ST 345-1	0.19	ST 140-2	0.27

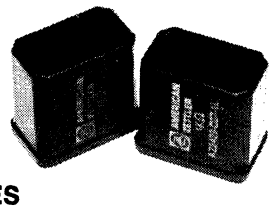
Gold Plating Available Upon Request

"It's a better relay"

AMERICAN ZETTLER, INC.
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

SERIES AZ 2420

DPDT or 4PDT
Dry Circuit to 7.5 Amp Contacts



2 POLE
L: 0.980″
W: 0.750″
H: 1.200″

4 POLE
L: 1.210″
W: 0.750″
H: 1.200″

FEATURES

- Epoxy Sealed for Automatic Wave Soldering and Cleaning
- Life Expectancy to 100 million operations
- Current and Voltage Sensitive Coils available
- Dry Circuit, 3 Amp, or 7.5 Amp Contacts
- UL File #E43203; CSA File #LR 36664

Contact Arrangement: DPDT (2 Form C)
4PDT (4 Form C)

Contact Rating: Noninductive Load — U.L. Rating
Dry Circuit Version: 2 A @ 28 VDC or 115 VAC
Light Duty Version: 3 A @ 28 VDC or 115 VAC
Heavy Duty Version: 7.5 A @ 28 VDC or 115 VAC

Contact Materials: Dry Circuit: Fine silver, gold plated
Light Duty: Fine silver, gold plated
Heavy Duty: SCO, gold plated

Contact Resistance: 50 milliohms max. initially

Life Expectancy: Mechanical: 500 million operations
Electrical:
Standard coils: 1.5×10^6 @ 2 A, 28 VDC or 115 VAC for light duty versions
2×10^5 @ 5 A, 28 VDC or 115 VAC for heavy duty versions

Operate Time: (typical) 10 ms at nominal coil voltage

Release Time: (typical) 3 ms at nominal coil voltage with no coil suppression

Dielectric Strength: 1500 Vrms coil to contact
1000 Vrms all other points

Coil Power: (typical) At Pick Up Power
Standard Version: 450 mW
Sensitive Version: 80 mW @ 2 pole; 180 mW @ 4 pole

Max. Continuous Dissipation: 2.6 W @ 20°C (68°F) ambient
2.0 W @ 40°C (105°F) ambient

Temperature Rise: 30°C (86°F per watt (typical)

Coil Temperature: Max. 105°C (220°F)

RELAY ORDERING DATA

A. TWO POLE (DPDT) — DRY CIRCUIT CONTACTS

COIL SPECIFICATIONS				ORDER NUMBER		
Nominal Coil VDC	Must Operate VDC	Max. Continuous VDC	Coil Resistance ±10%	Solder/Plug-In Terminals	PC Terminals	List Price
1. STANDARD DC VOLTAGE VERSION						
6	4.5	10	52	AZ 2420-15-40LUS	AZ 2428-15-40LUS	7.45
12	9.0	19	185	AZ 2420-1011-40LUS	AZ 2428-1011-40LUS	7.45
24	18.0	37	700	AZ 2420-70-40LUS	AZ 2428-70-40LUS	7.45
48	36.0	70	2500	AZ 2420-56-40LUS	AZ 2428-56-40LUS	7.45
115	86.0	170	15000	AZ 2420-035-40LUS	AZ 2428-035-40LUS	9.75
2. SENSITIVE DC VOLTAGE VERSION						
6	4.5	20	200	AZ 2420-V10-40LUS	AZ 2428-V10-40LUS	8.55
12	9.0	41	800	AZ 2420-V70-40LUS	AZ 2428-V70-40LUS	8.55
24	18.0	81	3200	AZ 2420-V50-40LUS	AZ 2428-V50-40LUS	8.55
48	36.0	104	13000	AZ 2420-V04-40LUS	AZ 2428-V04-40LUS	10.65
3. SENSITIVE DC CURRENT VERSION						
12	8.5 mA	44	1000	AZ 2420-C07-40LUS	AZ 2428-C07-40LUS	8.55
18	5.4 mA	70	2500	AZ 2420-C56-40LUS	AZ 2428-C56-40LUS	8.55
29	4.1 mA	102	5000	AZ 2420-C045-40LUS	AZ 2428-C045-40LUS	9.65
51	2.4 mA	170	15000	AZ 2420-C035-40LUS	AZ 2428-C035-40LUS	10.65

B. TWO POLE (DPDT) — LIGHT DUTY CONTACTS

1. STANDARD DC VOLTAGE VERSION						
6	4.5	10	52	AZ 2420-15-4WLUS	AZ 2428-15-4WLUS	6.95
12	9.0	19	185	AZ 2420-1011-4WLUS	AZ 2428-1011-4WLUS	6.95
24	18.0	37	700	AZ 2420-70-4WLUS	AZ 2428-70-4WLUS	6.95
48	36.0	70	2500	AZ 2420-56-4WLUS	AZ 2428-56-4WLUS	6.95
115	86.0	170	15000	AZ 2420-035-4WLUS	AZ 2428-035-4WLUS	9.05
2. SENSITIVE DC VOLTAGE VERSION						
6	4.5	20	200	AZ 2420-V10-4WLUS	AZ 2428-V10-4WLUS	7.90
12	9.0	41	800	AZ 2420-V70-4WLUS	AZ 2428-V70-4WLUS	7.90
24	18.0	81	3200	AZ 2420-V50-4WLUS	AZ 2428-V50-4WLUS	7.90
48	36.0	104	13000	AZ 2420-V04-4WLUS	AZ 2428-V04-4WLUS	10.00
3. SENSITIVE DC CURRENT VERSION						
12	8.5 mA	44	1000	AZ 2420-C07-4WLUS	AZ 2428-C07 4WLUS	7.90
18	5.4 mA	70	2500	AZ 2420-C56-4WLUS	AZ 2428-C56-4WLUS	7.90
29	4.1 mA	102	5000	AZ 2420-C045-4WLUS	AZ 2428-C045 4WLUS	9.00
51	2.4 mA	170	15000	AZ 2420-C035-4WLUS	AZ 2428-C035-4WLUS	10.00

C. TWO POLE (DPDT) — HEAVY DUTY CONTACTS

1. STANDARD DC VOLTAGE VERSION						
6	4.5	10	52	AZ 2420-15-4WLUS	AZ 2428-15-4WHUS	7.25
12	9.0	19	185	AZ 2420-1011-4WHUS	AZ 2428-1011-4WHUS	7.25
24	18.0	37	700	AZ 2420-70-4WHUS	AZ 2428-70-4WHUS	7.25
48	36.0	70	2500	AZ 2420-56-4WHUS	AZ 2428-56-4WHUS	7.25
115	86.0	170	15000	AZ 2420-035-4WHUS	AZ 2428-035-4WHUS	9.35
2. SENSITIVE DC VOLTAGE VERSION						
6	4.5	20	200	AZ 2420-V10-4WHUS	AZ 2428-V10-4WHUS	8.15
12	9.0	41	800	AZ 2420-V70-4WHUS	AZ 2428-V70-4WHUS	8.15
24	18.0	81	3200	AZ 2420-V50-4WHUS	AZ 428-V50-4WHUS	8.15
48	36.0	104	13000	AZ 2420-V04-4WHUS	AZ 2428-V04-4WHUS	10.30
3. SENSITIVE DC CURRENT VERSION						
12	8.5 mA	44	1000	AZ 2420-C07-4WHUS	AZ 2428-C07-4WHUS	8.15
18	5.4 mA	70	2500	AZ 2420-C56-4WHUS	AZ 2428-C56-4WHUS	8.15
29	4.1 mA	102	5000	AZ 2420-C045-4WHUS	AZ 2428-C045-4WHUS	9.30
51	2.4 mA	170	15000	AZ 2420-C035-4WHUS	AZ 2428-C035-4WHUS	10.30

D. FOUR POLE (4PDT) — DRY CIRCUIT CONTACTS

COIL SPECIFICATIONS				ORDER NUMBER		
Nominal Coil VDC	Must Operate VDC	Max. Continuous VDC	Coil Resistance ±10%	Solder/Plug-In Terminals	PC Terminals	List Price
1. STANDARD DC VOLTAGE VERSION						
6	4.5	10	52	AZ 2421-15-10LUS	AZ 2429-15-10LUS	9.25
12	9.0	19	185	AZ 2421-1011-10LUS	AZ 2429-1011-10LUS	9.25
24	18.0	37	700	AZ 2421-70-10LUS	AZ 2429-70-10LUS	9.25
48	36.0	70	2500	AZ 2421-56-10LUS	AZ 2429-56-10LUS	9.25
115	86.0	170	15000	AZ 2421-035-10LUS	AZ 2429-035-10LUS	11.35
2. SENSITIVE DC VOLTAGE VERSION						
6	4.5	15	110	AZ 2421-V12-10LUS	AZ 2429-V12-10LUS	10.50
12	9.0	30	450	AZ 2421-V80-10LUS	AZ 2429-V80-10LUS	10.50
24	18.0	61	1800	AZ 2421-V05-10LUS	AZ 2429-V05-10LUS	10.50
48	36.0	124	7500	AZ 2421-V40-10LUS	AZ 2429-V40-10LUS	11.85
3. SENSITIVE DC CURRENT VERSION						
19	13 mA	44	1000	AZ 2421-C07-10LUS	AZ 2429-C07-10LUS	10.50
30	8.3 mA	70	2500	AZ 2421-C56-10LUS	AZ 2429-C56-10LUS	10.50
44	6.2 mA	102	5000	AZ 2421-C045-10LUS	AZ 429-C045-10LUS	11.85
75	3.5 mA	170	15000	AZ 2421-C035-10LUS	AZ 2429-C035-10LUS	12.60

E. FOUR POLE (4PDT) — LIGHT DUTY CONTACTS

1. STANDARD DC VOLTAGE VERSION						
6	4.5	10	52	AZ 2421-15-1WLUS	AZ 2429-15-1WLUS	8.00
12	9.0	19	185	AZ 2421-1011-1WLUS	AZ 2429-1011-1WLUS	8.00
24	18.0	37	700	AZ 2421-70-1WLUS	AZ 2429-70-1WLUS	8.00
48	36.0	70	2500	AZ 2421-56-1WLUS	AZ 2429-56-1WLUS	8.00
115	86.0	170	15000	AZ 2421-035-1WLUS	AZ 2429-035-1WLUS	10.10
2. SENSITIVE DC VOLTAGE VERSION						
6	4.5	15	110	AZ 2421-V12-1WLUS	AZ 2429-V12-1WLUS	9.20
12	9.0	30	450	AZ 2421-V80-1WLUS	AZ 2429-V80-1WLUS	9.20
24	18.0	61	1800	AZ 2421-V05-1WLUS	AZ 2429-V05-1WLUS	9.20
48	36.0	124	7500	AZ 2421-V40-1WLUS	AZ 2429-V40-1WLUS	10.70
3. SENSITIVE DC CURRENT VERSION						
19	13 mA	44	1000	AZ 2421-C07-1WLUS	AZ 2429-C07-1WLUS	9.20
30	8.3 mA	70	2500	AZ 2421-C56-1WLUS	AZ 2429-C56-1WLUS	9.20
44	6.2 mA	102	5000	AZ 2421-C045-1WLUS	AZ 2429-C045-1WLUS	10.60
75	3.5 mA	170	15000	AZ 2421-C035-1WLUS	AZ 2429-C035-1WLUS	11.30

F. FOUR POLE (4PDT) — HEAVY DUTY CONTACTS

1. STANDARD DC VOLTAGE VERSION						
6	4.5	10	52	AZ 2421-15-1WHUS	AZ 2429-15-1WHUS	8.65
12	9.0	19	185	AZ 2421-1011-1WHUS	AZ 2429-1011-1WHUS	8.65
24	18.0	37	700	AZ 2421-70-1WHUS	AZ 2429-70-1WHUS	8.65
48	36.0	70	2500	AZ 2421-56-1WHUS	AZ 2429-56-1WHUS	8.65
115	86.0	170	15000	AZ 2421-035-1WHUS	AZ 2429-035-1WHUS	10.75
2. SENSITIVE DC VOLTAGE VERSION						
6	4.5	15	110	AZ 2421-V12-1WHUS	AZ 2429-V12-1WHUS	9.85
12	9.0	30	450	AZ 2421-V80-1WHUS	AZ 2429-V80-1WHUS	9.85
24	18.0	61	1800	AZ 2421-V05-1WHUS	AZ 2429-V05-1WHUS	9.85
48	36.0	124	7500	AZ 2421-V40-1WHUS	AZ 2429-V40-1WHUS	11.30
3. SENSITIVE DC CURRENT VERSION						
19	13 mA	44	1000	AZ 2421-C07-1WHUS	AZ 2429-C07-1WHUS	9.85
30	8.3 mA	70	2500	AZ 2421-C56-1WHUS	AZ 2429-C56-1WHUS	9.85
44	6.2 mA	102	5000	AZ 2421-C045-1WHUS	AZ 2429-C045-1WHUS	11.20
75	3.5 mA	170	15000	AZ 2421-C035-1WHUS	AZ 2429-C035-1WHUS	11.95

1. All values at 20°C.
2. Other coil resistances and sensitivities available. See Series AZ 420 Data Sheet or contact factory.
3. Other contact materials available. Contact factory.
4. Relay will pull in with less than "must operate" value.

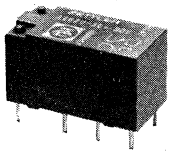
"It's a better relay"

AMERICAN ZETTLER, INC.
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

SERIES AZ 820

DPDT, Up to 2 Amps Bifurcated Contact

DIP PACKAGE
L: 0.795″
W: 0.394″
H: 0.453″



FEATURES

- Low Profile for Compact Board Spacing
- DC Coils to 48 VDC
- Life Expectancy to 10 Million Operations
- Standard PC 0.1″ Grid Terminal Spacing
- Fits Standard 16 Pin IC Socket
- Epoxy Sealed for Automatic Wave Soldering and Cleaning
- Meets FCC Part 68.302 Lightning Surge
- Meets FCC Part 68.304 1000V Dielectric
- UL File #E43203; CSA File #LR 36664

Contact Arrangement: DPDT (2 Form C)
Bifurcated Contact

Contact Rating: Noninductive load
Max. switched power: 30 W or 60 VA
Max. switched current: 2 Amps
Max. switched voltage: 150 VDC or VAC

Contact Material: Silver palladium, gold plated

Life Expectancy: Mechanical: 10 million operations
Electrical: $5x10^5$ @ 1 A, 30 VDC
$2x10^5$ @ 0.5 A, 120 VAC

Dielectric Strength (initial): 1500 Vrms; 500 Vrms between open contacts

Contact Resistance (typical): 50 milliohms initially
200 milliohms at end of life

Operate Time: 5 ms at nominal coil voltage (typical)

Release Time: 2 ms at nominal coil voltage (typical with no coil suppression)

Coil Power
At Pick Up Voltage (typical): 220 mW
Max. Continuous Dissipation: 1.05 mW @ 20°C (68°F) ambient
0.84 W @ 40°C (105°F) ambient
Temperature Rise: 95°C per Watt (typical)

RELAY ORDERING DATA

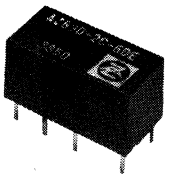
STANDARD RELAYS: 2 FORM C (DPDT)

COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
5	7.5	45	3.5	AZ 820-2C-5DE	3.50
6	9.0	66	4.2	AZ 820-2C-6DE	3.50
12	18.0	280	8.4	AZ 820-2C-12DE	3.50
24	36.0	1,070	16.8	AZ 820-2C-24DE	3.50
48	72.0	4,000	34.6	AZ 820-2C-48DE	3.75

SERIES AZ 830

DPDT to 2 Amps, Bifurcated Contacts
Polarized

DIP PACKAGE
L: 0.788″
W: 0.390″
H: 0.385″



FEATURES

- Low Profile for Compact Board Spacing
- DC Coils to 48 VDC
- High Sensitivity, 100 mW Pick-up
- Life Expectancy to 100 Million Operations
- High Switching Capacity, 60W, 125 VA
- Fits Standard 16 Pin IC Socket
- Epoxy Sealed for Automatic Wave Soldering and Cleaning
- Meets FCC Part 68.302 Lightning Surge
- Meets FCC Part 68.304 1000V Dielectric
- UL File #E43203; CSA File #LR 36664

Contact Arrangement: DPDT (2 Form C)
Bifurcated Contact

Contact Rating: Noninductive load
Max. switched power: 60 W at 125 VA
Max. switched current: 2 Amps
Max. switched voltage: 220 VDC or 250 VAC

UL Rating: 2 amp @ 30 VDC
1 amp @ 120 VAC

Contact Material: Silver alloy, gold clad
Silver palladium, gold clad available

Life Expectancy: Mechanical: 100 million operations
Electrical: 5×10^5 @ 2 A, 30 VDC or 1 A, 125 VAC
2×10^6 @ 1 A, 30 VDC or .5 A, 125 VAC

Contact Resistance: 50 milliohms initially (typical)
200 milliohms at end of life

Operate Time: 3 ms at nominal coil voltage (typical)

Release Time: 2 ms at nominal coil voltage (typical)

Dielectric Strength: (Initial) 1000 Vrms between contact sets
1000 Vrms across contacts
1500 Vrms contacts to coil

Coil Power
At Pick Up Voltage: (typical) Standard Version: 200 mW
Sensitive Version: 100 mW
Max. Continuous Dissipation: 1.35 W @ 20°C (68°F) ambient
1.05 W @ 40°C (105°F) ambient
Temperature Rise: 72°C per watt (typical)

RELAY ORDERING DATA

STANDARD COILS

Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
5	7.5	62.5	3.5	AZ 830-2C-5DE	3.80
6	9.0	90	4.2	AZ 830-2C-6DE	3.80
12	18.0	360	8.4	AZ 830-2C-12DE	3.80
24	36.0	1,440	16.8	AZ 830-2C-24DE	3.90
48	72.0	5,760	33.6	AZ 830-2C-48DE	4.25

SENSITIVE COILS

Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
5	10	125	3.5	AZ 830-2C-5DSE	4.30
6	12	180	4.2	AZ 830-2C-6DSE	4.30
12	24	720	8.4	AZ 830-2C-12DSE	4.30
24	48	2,880	16.8	AZ 830-2C-24DSE	4.40
48	96	11,520	33.6	AZ 830-2C-48DSE	4.75

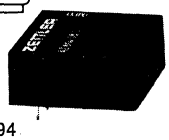
1. All values at 20°C.
2. Relay has fixed coil polarity.

"It's a better relay"
AMERICAN ZETTLER, INC.
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

SERIES AZ 690

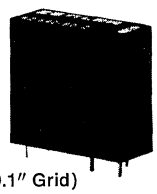
Single Pole — 10 Amp
High Dielectric — 4000 Vrms
Complete International Approvals

L: 1.110″
W: 1.030″
H: 0.441″



AZ 694

L: 1.110″
W: 0.476″
H: 1.030″



AZ 692
AZ 693 (0.1″ Grid)

FEATURES

- Isolation Spacing Greater Than 8mm
- Dielectric Strength 4000 Vrms Coil to Contact
- Approvals/Standards Include UL, CSA, VDE, IEC, CEE, SEMKO
- Single Pole — Forms A, B, C Available
- 10 Amp Switching
- Life Expectancy to 30 Million Operations
- THINPAK™ Version Less Than .500″ High
- SLIMPAK™ Version Saves Board Space
- Epoxy Sealed Version for Automatic Wave Soldering and Cleaning
- UL File #E44211; CSA File #LR 36664; VDE4120-4940-4001/A1

Contact Arrangement:	SPDT (1 Form C); other forms optional
Contact Rating:	**Noninductive load** Max. switched power: 300 W or 2000 VA Max. switched current: 10 Amp, 64 Amp for 2 msec Max. switched voltage: 150 VDC or 250 VAC U.L. Rating: 10 Amp @ 24 VDC or 115 VAC ¼ HP 120 VAC Motor Load
Contact Material:	Silver cadmium oxide
Life Expectancy:	Mechanical: 30 million operations Electrical: 10^5 @ 10 Amp, 30 VDC $2x10^5$ @ 10 Amp, 115 VAC or 8 Amp 250 VAC
Contact Resistance:	30 milliohms max. initially (@ 6 VDC 1 Amp voltage drop method)
Operate Time:	6 ms at nominal coil voltage (typical)
Release Time:	4 ms at nominal coil voltage (typical wtih no coil suppression)
Coil Power:	
At Pick Up Voltage (typical):	Standard Coil: 350 mW Sensitive Coil: 250 mW
Max. Continuous Dissipation:	1.9 W @ 20°C (68°F) ambient 1.45 W @ 40°C (105°F) ambient
Temperature Rise:	42°C (108°F) per Watt (typical)
Coil Temperature:	Max. 110°C (230°F)
Dielectric Strength (initial):	4000 Vrms Coil to Contact 1000 Vrms between open contact

RELAY ORDERING DATA: Single Pole .138 spacing

STANDARD RELAYS: 1 Form C

COIL SPECIFICATIONS				ORDER NUMBER			
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance Ohms ±10%	Must Operate VDC	Unsealed	List Price	Sealed	List Price
5	8	38	3.5	AZ 692-125-2*	4.25	AZ 2692-125-2*	5.25
6	10	58	4.2	AZ 692-112-2	4.25	AZ 2692-112-2	5.25
12	19	215	8.4	AZ 692-08-2	4.25	AZ 2692-08-02	5.25
24	35	740	16.8	AZ 692-560-2	4.25	AZ 2692-560-2	5.25
48	74	3200	33.6	AZ 692-04-2	4.75	AZ 2692-04-2	5.75

SENSITIVE RELAYS: 1 Form C

COIL SPECIFICATIONS				ORDER NUMBER			
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance Ohms ±10%	Must Operate VDC	Unsealed	List Price	Sealed	List Price
5	9	47	3.5	AZ 692-118-52*	4.50	AZ 2692-118-52*	5.50
6	12	80	4.2	AZ 692-010-52	4.50	AZ 2692-010-52	5.50
12	24	330	8.4	AZ 692-071-52	4.50	AZ 2692-071-52	5.50
24	45	1200	16.8	AZ 692-052-52	4.50	AZ 2692-052-52	5.50
48	89	4700	33.6	AZ 692-518-52	5.00	AZ 2692-518-52	6.00

* Substitute "4 or 54", "6 or 56" in place of "2 or 52" to indicate 1 Form A and 1 Form B respectively.

HARDWARE ORDERING DATA

Description	Order Numer	Price	Description	Order Number	Price
Socket	ST 482-U1	1.60	Retainer	ST 482-2	0.25

RELAY ORDERING DATA: Single Pole Thinpak™

STANDARD RELAYS: 1 Form C

COIL SPECIFICATIONS				ORDER NUMBER			
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance Ohms ±10%	Must Operate VDC	Unsealed	List Price	Sealed	List Price
5	8	38	3.5	AZ 694-125-2*	4.75	AZ 2694-125-2*	6.00
6	10	58	4.2	AZ 694-112-2	4.75	AZ 2694-112-2	6.00
12	19	215	8.4	AZ 694-08-2	4.75	AZ 2694-08-2	6.00
24	35	740	16.8	AZ 694-560-2	4.75	AZ 2694-560-2	6.00
48	74	3200	33.6	AZ 694-04-2	5.25	AZ 2694-04-2	6.50

SENSITIVE RELAYS: 1 Form C

COIL SPECIFICATIONS				ORDER NUMBER			
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance Ohms ±10%	Must Operate VDC	Unsealed	List Price	Sealed	List Price
5	9	47	3.5	AZ 694-118-52*	5.25	AZ 2694-118-52*	6.50
6	12	80	4.2	AZ 694-010-52	5.25	AZ 2694-010-52	6.50
12	24	330	8.4	AZ 694-071-52	5.25	AZ 2694-071-52	6.50
24	45	1200	16.8	AZ 694-052-52	5.25	AZ 2694-052-52	6.50
48	89	4700	33.6	AZ 694-518-52	5.75	AZ 2694-518-52	7.00

* Substitute "4 or 54", "6 or 56" in place of "2 or 52" to indicate 1 Form A and 1 Form B respectively.

RELAY ORDERING DATA: Single Pole .100 spacing

STANDARD RELAYS: 1 Form C

COIL SPECIFICATIONS				ORDER NUMBER			
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance Ohms ±10%	Must Operate VDC	Unsealed	List Price	Sealed	List Price
5	8	38	3.5	AZ 693-125-2*	4.50	AZ 2693-125-2*	5.50
6	10	58	4.2	AZ 693-112-2	4.50	AZ 2693-112-2	5.50
12	19	215	8.4	AZ 693-08-2	4.50	AZ 2693-08-2	5.50
24	35	740	16.8	AZ 693-560-2	4.50	AZ 2693-560-2	5.50
48	74	3200	33.6	AZ 693-04-2	5.00	AZ 2693-04-2	6.00

SENSITIVE RELAYS: 1 Form C

COIL SPECIFICATIONS				ORDER NUMBER			
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance Ohms ±10%	Must Operate VDC	Unsealed	List Price	Sealed	List Price
5	9	47	3.5	AZ 693-118-52*	5.00	AZ 2693-118-52*	6.00
6	12	80	4.2	AZ 693-010-52	5.00	AZ 2693-010-52	6.00
12	24	330	8.4	AZ 693-071-52	5.00	AZ 2693-071-52	6.00
24	45	1200	16.8	AZ 693-052-52	5.00	AZ 2693-052-52	6.00
48	89	4700	33.6	AZ 693-518-52	5.50	AZ 2693-518-52	6.50

* Substitute "4 or 54", "6 or 56" in place of "2 or 52" to indicate 1 Form A and 1 Form B respectively.

HARDWARE ORDERING DATA

Description	Order Number	List Price	Description	Order Number	List Price
Socket	ST 483-U1	1.60	Retainer	ST 482-2	0.25

INTERNATIONAL APPROVALS

PASSED INTERNATIONAL ELECTRICAL CODE IEC 380

• Germany:	VDE 0860/8.81 paragraphs 10, 14 VDE 0806/8.81 paragraphs 7, 11, 15, 16, 29 VDE 0631/9.77 paragraphs 9, 12, 14 VDE 0730/T. 1/3.72 paragraph 22 VDE 0435/9.72 (with production monitoring)
• Sweden:	SEMKO 43-95771/1-2 SEMKO 43-95765/1-2
• Norway:	NEMKO 55938/M 54234 T
• Finland:	SEIT 050471-01
• Switzerland:	SEV D 3.31/98
• U.S.A.:	UL File E44211
• Canada:	CSA File LR 36664-12

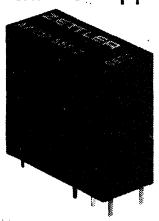
"It's a better relay"

AMERICAN ZETTLER, INC.
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

SERIES AZ 730

Double Pole — 8 Amp
High Dielectric — 4000 Vrms
Complete International Approvals

L: 1.110″
W: 0.496″
H: 1.030″



FEATURES

- Dielectric Strength 4000 Vrms Coil to Contact
- Isolation Spacing Greater Than 8mm
- Approvals/Standards Include UL, CSA, VDE, IEC, CEE, SEMKO
- Double Pole — Forms A, B, C Available
- 8 Amp Switching
- Life Expectancy to 30 Million Operations
- SLIMPAK™ Version Saves Board Space
- Epoxy Sealed Version for Automatic Wave Soldering and cleaning
- UL File #E44211; CSA File #LR 36664; VDE4120-4940-4002/A1

Contact Arrangement: DPDT (2 Form C); other forms optional
Contact Rating: Noninductive load
Max. switched power: 240 W or 1500 VA
Max. switched current: 8 Amp, 51 Amp for 2 ms
Max. switched voltage: 150 VDC or 250 VAC
U.L. Rating: 8 Amp @ 24 VDC or 115 VAC
⅛ HP 120 VAC Motor Load
Contact Material: Silver cadmium oxide
Life Expectancy: Mechanical: 30 million operations
Electrical: 10^5 @ 8 Amp 30 VDC
$2x10^5$ @ 8 Amp 115 VAC or 6 Amp 250 VAC
Contact Resistance: 30 milliohms max. initially
(@ 6 VDC 1 Amp voltage drop method)
Operate Time: 8 ms at nominal coil voltage (typical)
Release Time: 4 ms at nominal coil voltage (typical with no coil suppression)
Dielectric Strength: 4000 Vrms contacts to coil
2500 Vrms contact to contact
1000 Vrms between open contact
Coil Power:
At Pick Up Voltage (typical): Standard Coil: 350 mW
Sensitive Coil: 250 mW
Max. Continuous Dissipation: 1.9 W @ 20°C (68°F) ambient
1.45 W @ 40°C (105°F) ambient
Temperature Rise: 42°C (108°F) per Watt (typical)
Coil Temperature: Max. 110°C (230°F)

RELAY ORDERING DATA

STANDARD COILS

Nom. Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Unsealed Order Number	Unsealed List Price	Sealed Order Number	Sealed List Price
5	8	38	3.5	AZ 732-125-2*	5.30	AZ 2732-125-2*	6.30
6	10	58	4.2	AZ 732-112-2	5.30	AZ 2732-112-2	6.30
12	19	215	8.4	AZ 732-08-2	5.30	AZ 2732-08-2	6.30
24	35	740	16.8	AZ 732-560-2	5.30	AZ 2732-560-2	6.30
48	74	3200	33.6	AZ 732-04-2	5.80	AZ 2732-04-2	6.80

SENSITIVE COILS

Nom. Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Unsealed Order Number	Unsealed List Price	Sealed Order Number	Sealed List Price
5	9	47	3.5	AZ 732-118-52*	5.60	AZ 2732-118-52*	6.60
6	11	70	4.2	AZ 732-509-52	5.60	AZ 2732-509-52	6.60
12	21	270	8.4	AZ 732-521-52	5.60	AZ 2732-521-52	6.60
24	43	1100	16.8	AZ 732-053-52	5.60	AZ 2732-053-52	6.60
48	86	4400	33.6	AZ 732-510-52	6.10	AZ 2732-510-52	7.10

* Substitute "-4" or "-54"; "-6" or "-56" in place of "-2" or "-52" to indicate 2 Form A and 2 Form B respectively.

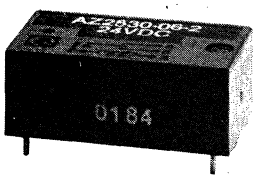
HARDWARE

Socket	List Price	Retaining Clip	List Price
ST 484-U1	1.80	ST 482-2	0.25

SERIES AZ 2530

Epoxy Sealed SPDT

L: 1.090″
W: 0.593″
H: 0.445″



FEATURES

- Epoxy Sealed for Automatic Wave Soldering and Cleaning
- Low Profile for Compact Board Spacing
- High Sensitivity, 80 mW Pick-up
- UL File #E43203; CSA File #LR 36664

Contact Arrangement: SPDT (1 Form C)
Contact Rating: Noninductive load
Standard Version
Light Duty: Max. switched power: 30 W or 100 VA
Max. switched current: 2.0 A
Max. switched voltage: 125 VDC or VAC
U.L. Rating: 1 Amp @ 26 VDC
0.5 Amp @ 115 VAC
Medium Duty: Max. switched power: 50 W or 200 VA
Max. switched current: 3.0 A
Max. switched voltage: 125 VDC or VAC
U.L. Rating: 2 Amp @ 26 VDC
1 Amp @ 115 VAC
Sensitive Version
Light Duty: Max. switched power: 15 W or 50 VA
Max. switched current: 1 A
Max. switched voltage: 26 VDC or 115 VAC
Medium Duty: Max. switched power: 25 W or 100 VA
Max. switched current: 1.5 A
Max. switched voltage: 26 VDC or 115 VAC
U.L. Approvals pending
Contact Material:
Light Duty: Fine silver, gold plated
Medium Duty: Silver cadmium oxide
Life Expectancy: Mechanical: 10 million operations
Electrical: Standard Coils
1 x 10^6 @ 1 A, 26 VDC or 0.5 A, 115 VAC for light duty versions
2 x 10^5 @ 2 A, 26 VDC or 1 A, 115 VAC for medium duty versions
Sensitive Coils
2 x 10^5 @ 0.5 A, 26 VDC or 50 VAC for light duty versions
2 x 10^5 @ 1 A, 26 VDC or 50 VAC for medium duty versions
Coil Power: Standard, light duty type: 125 mW
At Pick Up Voltage (typical): Sensitive, light duty type: 80 mW
Standard, medium duty type: 250 mW
Sensitive, medium duty type: 80 mW
Max. Continuous Dissipation: 1.6 W @ 20°C (68°F) ambient
1.2 W @ 40°C (105°F) ambient
Temperature Rise: 55°C (130°F) per Watt (typical)
Coil Temperature: Max. 105°C (220°F)

RELAY ORDERING DATA

COIL SPECIFICATIONS Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
STANDARD RELAYS: Light Duty Type (1 Amp Contact)					
5	9.5	64	3.75	AZ 2530-12-1	3.85
6	11.0	90	4.5	AZ 2530-11-1	3.85
12	21.0	310	9.0	AZ 2530-08-1	3.85
24	37.0	950	18.0	AZ 2530-06-1	4.10
48	80.0	4,500	36.0	AZ 2530-04-1	4.80
100	143.0	14,000	75.0	AZ 2530-03-1	6.95
STANDARD RELAYS: Medium Duty Type (2 Amp Contact)					
5	7.1	35	3.75	AZ 2530-14-2	3.95
6	9.5	47	4.5	AZ 2530-13-2	3.95
12	17.0	200	9.0	AZ 2530-09-2	3.95
24	37.0	950	18.0	AZ 2530-06-2	4.35
48	66.0	3,000	36.0	AZ 2530-045-2	4.95
100	143.0	14,000	75.0	AZ 2530-03-2	7.20
SENSITIVE RELAYS: Light Duty Type (0.5 Amp Contact)					
5	21	310	16.0 mA	AZ 2530-08-51	5.00
12	42	1,250	8.5 mA	AZ 2530-56-51	5.20
24	66	3,000	6.1 mA	AZ 2530-45-51	6.55
48	143	14,000	2.7 mA	AZ 2530-03-51	7.30
SENSITIVE RELAYS: Medium Duty Type (1 Amp Contact)					
5	21	310	16.0 mA	AZ 2530-08-52	5.20
12	42	1,250	8.9 mA	AZ 2530-56-52	5.35
24	66	3,000	6.1 mA	AZ 2530-45-52	6.80
48	143	14,000	2.7 mA	AZ 2530-03-52	7.50

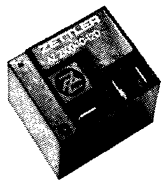
2 Form C (DPDT) Series AZ 2531 also available.

"It's a better relay"

AMERICAN ZETTLER, INC.
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

SERIES AZ 2100

SPDT, SPST
Up to 30 Amp Contacts



L: 1.27″
W: 1.08″
H: 1.10″

FEATURES

- Innovative Package Design
- PC and Quick Connect Terminals
- Single Pole — Form A, B, or C
- DC Coils to 24 VDC
- Epoxy Sealed for Automatic Wave Soldering and Immersion Cleaning
- UL File #E44211; CSA File #LR 36664
- Suitable for Class B Applications

Contact Arrangement: 1 Form A, B, or C

Contact Rating: Noninductive load
Max. switched power: 900 W or 7200 VA
Max. switched current: 30 Amps
Max. switched voltage: 30 VDC, 300 VAC

Contact Material: Silver alloy

Life Expectancy: Mechanical: 10 million operations
Electrical: 10^5 at rated load

Contact Resistance (typical): 20 milliohms max. initially
(@ 6 VDC 1 Amp voltage drop method)

Operate Time: 9 ms at nominal coil voltage (typical)

Release Time: 7 ms at nominal coil voltage (typical)

Dielectric Strength: Coil to Contact: 2500 Vrms
Between Open Contacts: 1500 Vrms

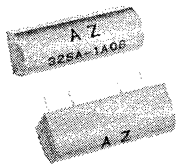
Coil Power:
At Pick Up Voltage: 500 mW (typical)
Max. Continuous Dissipation: 2.2 W @ 20°C (68°F) ambient
1.8 W @ 40°C (105°F) ambient
Temperature Rise: 50°C per Watt (typical)

RELAY ORDERING DATA

COIL SPECIFICATIONS				Order Number	List Price
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC		
STANDARD RELAYS: 1 Form A, 30 Amps, Unsealed					
5	6.0	27	3.7	AZ 2101-1A-5D	3.10
6	7.2	40	4.5	AZ 2101-1A-6D	3.10
9	10.8	97	6.7	AZ 2101-1A-9D	3.10
12	14.4	155	9.0	AZ 2101-1A-12D	3.10
24	28.8	660	18.0	AZ 2101-1A-24D	3.10
STANDARD RELAYS: 1 Form A, 30 Amps, Sealed					
5	6.0	27	3.7	AZ 2101-1A-5DE	3.60
6	7.2	40	4.5	AZ 2101-1A-6DE	3.60
9	10.8	97	6.7	AZ 2101-1A-9DE	3.60
12	14.4	155	9.0	AZ 2101-1A-12DE	3.60
24	28.8	660	18.0	AZ 2101-1A-24DE	3.60
STANDARD RELAYS: 1 Form C, 5 Amps, Unsealed					
5	6.0	27	3.7	AZ 2101-1C-5D	3.40
6	7.2	40	4.5	AZ 2101-1C-6D	3.40
9	10.8	97	6.7	AZ 2101-1C-9C	3.40
12	14.4	155	9.0	AZ 2101-1C-12D	3.40
24	28.8	660	18.0	AZ 2101-1C-24D	3.40
STANDARD RELAYS: 1 Form C, 5 Amps, Sealed					
5	6.0	27	3.7	AZ 2101-1C-5DE	3.90
6	7.2	40	4.5	AZ 2101-1C-6DE	3.90
9	10.8	97	6.7	AZ 2101-1C-9DE	3.90
12	14.4	155	9.0	AZ 2101-1C-12DE	3.90
24	28.8	660	18.0	AZ 2101-1C-24DE	3.90

SERIES 30

REED RELAY
SPST, SPDT
3W and 10W Contacts



L: 1.000″
W: 0.340″
H: 0.375″

FEATURES

- SIP — .200″ Grid
- Form A and Form C Contacts
- Contacts Rated at 3W and 10W
- DC Coils to 48 VDC
- Rugged Molded Case
- Epoxy Encpsulated Package
- Maximum Performance at Minimum Cost
- High Quality Switch Insures Stable Contact Resistance

Contact Rating: (Resistive Load)
1 Form A (SPST — NO)
10 W DC Max. switched power
0.5 A Max. switched current
1 A Max. carrying current
200 VDC Max. switched voltage
1 Form C (SPDT)
3 W DC Max. switched power
0.25 A Max. switched current
0.5 A Max. carrying current
28 VDC Max. switched voltage

Life Expectancy: (Resistive Load)
Form A Contact
10 x 10^6 at rated load
100 x 10^6 at low level
Form C Contact
5 x 10^6 at rated load
50 x 10^6 at low level

Contact Resistance: 200 milliohms max. initially

Dielectric Strength: 500 VDC across open contact
1000 VRMS coil to contact

Operate Time: (Typical) Form A: 0.5 ms at nom. coil voltage
Form C: 0.5 ms at nom. coil voltage

Release Time: (Typical) Form A: 0.1 ms at nom. coil voltage
Form C: 0.5 ms at nom. coil voltage

Coil Temperature: 105°C (220°F) max.

RELAY ORDERING DATA

A. 1 Form A (SPST - NO)
Maximum Load: 10W Maximum Voltage: 200 VDC
Maximum Current: 0.5A Grid: .200″ x .400″ x .200″

Nominal Coil VDC	Max. Coil VDC	Coil Resistance ±10%	Must Operate VDC	Min. Dropout VDC	American Zettler Part Number	List Price
5	16	500	3.8	0.5	32SA-1A05	2.25
6	8	125	3.8	0.5	32SA-1A06	2.05
12	16	500	8.0	1.0	32SA-1A12	2.25
24	32	2,000	16.0	2.0	32SA-1A24	2.35
48	64	8,000	32.0	4.0	32SA-1A48	3.60

All Values at 20°C

B. 1 Form C (SPDT)
Maximum Load: 3W Maximum Voltage: 28 VDC
Maximum Current: 0.25A

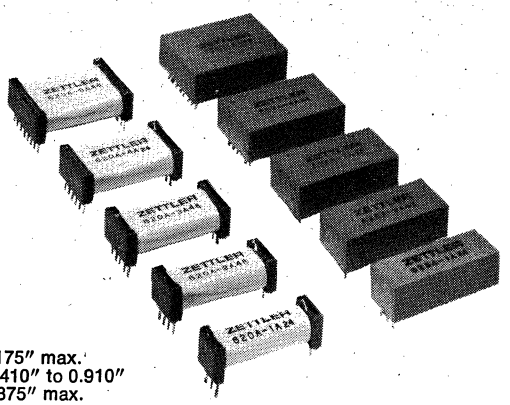
Nominal Coil VDC	Max. Coil VDC	Coil Resistance ±10%	Must Operate VDC	Min. Dropout VDC	American Zettler Part Number	List Price
5	8	200	4.0	0.5	31SA-1C05	4.40
6	8	125	4.0	0.5	31SA-1C06	4.40
12	16	500	8.0	1.0	31SA-1C12	4.40
24	32	2,000	16.0	2.0	31SA-1C24	4.75

All Values at 20°C

"It's a better relay"
AMERICAN ZETTLER, INC.
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

SERIES 60

REED RELAY
Contacts to 6 Form A, 4 Form C
3W & 10W Contacts



L: 1.175″ max.
W: 0.410″ to 0.910″
H: 0.375″ max.

FEATURES

- Form A and Form C Contacts
- Contcts Rated at 3W and 10W
- DC Coils to 48 VDC
- Unsealed or Epoxy Encapsulated Versions Available
- Maximum Performance at Minimum Cost
- High Quality Switch Insures Stable Contact Resistance

Contact Rating: (Resistive Load)
Form A (1, 2, 3, 4, 6 poles)
10 W DC max. switched power
0.5 A max. switched current
2 A max. carrying current
200 VDC max. switched voltage
Form C (1, 2, 3, 4 poles)
3 W DC max. switched power
0.25 A max. switched current
1 A max. carrying current
28 VDC max. switched voltage

Life Expectancy: (Resistive Load)
Form A Contact
10 x 10^6 at rated load
200 x 10^6 at low level
Form C Contact
5 x 10^6 at rated load
50 x 10^6 at low level

Contact Resistance: 200 milliohms max. initially
Dielectric Strength: 300 VDC across contact gap
500 VDC all other points

Operate Time: (typical) **Form A:** 0.5 ms at nominal coil voltage
Form C: 0.5 ms at nominal coil voltage

Release Time: (typical) **Form A:** 0.1 ms at nominal coil voltage
Form C: 0.5 ms at nominal coil voltage

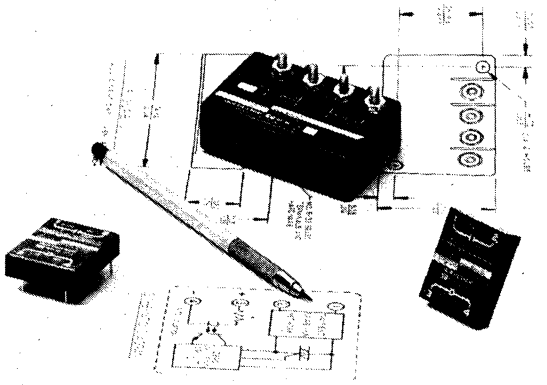
Coil Temperature: Max. 120°C (249°F)

RELAY ORDERING DATA

Contact Configuration	Nominal Coil Voltage	Coil Resistance ±10%	Must Operate VDC	Min. Drop-out VDC	American Zettler Part Number Open	List Price	Sealed	List Price
1 Form A (SPST-NO) Max. Load: 10 Watt Max. Current: 0.5 Amp Max. Voltage: 200 VAC	5	500	3.8	0.5	620A-1A05	2.40	62SA-1A05	3.15
	6	125	4.0	0.5	620A-1A06	2.40	62SA-1A06	3.15
	12	500	8.0	1.0	620A-1A12	2.40	62SA-1A12	3.15
	24	2,000	16.0	2.0	620A-1A24	2.65	62SA-1A24	3.35
	48	8,000	32.0	4.0	620A-1A48	4.50	62SA-1A48	5.15
2 Form A (DPST-NO) Max. Load: 10 Watt Max. Current: 0.5 Amp Max. Voltage: 200 VDC	5	200	3.8	0.5	620A-2A05	3.55	62SA-2A05	4.15
	6	110	4.0	0.5	620A-2A06	3.55	62SA-2A06	4.15
	12	440	8.0	1.0	620A-2A12	3.55	62SA-2A12	4.15
	24	1,750	16.0	2.0	620A-2A24	4.05	62SA-2A24	4.35
	48	7,000	32.0	4.0	620A-2A48	5.70	62SA-2A48	6.10
3 Form A (3PST-NO) Max. Load: 10 Watt Max. Current: 0.5 Amp Max. Voltage: 200 VDC	5	200	3.8	0.5	620A-3A05	4.90	62SA-3A05	5.50
	6	85	4.0	0.5	620A-3A06	4.90	62SA-3A06	5.50
	12	340	8.0	1.0	620A-3A12	4.90	62SA-3A12	5.50
	24	1,350	16.0	2.0	620A-3A24	5.25	62SA-3A24	5.85
	48	5,400	32.0	4.0	620A-3A48	7.00	62SA-3A48	7.65
4 Form A (4PST-NO) Max. Load: 10 Watt Max. Current: 0.5 Amp Max. Voltage: 200 VDC	5	120	3.8	0.5	620A-4A05	6.15	62SA-4A05	6.40
	6	60	4.0	0.5	620A-4A06	6.15	62SA-4A06	6.40
	12	250	8.0	1.0	620A-4A12	6.15	62SA-4A12	6.40
	24	1,000	16.0	2.0	620A-4A24	6.45	62SA-4A24	6.70
	48	4,000	32.0	4.0	620A-4A48	8.00	62SA-4A48	8.50
6 Form A (6PST-NO) Max. Load: 10 Watt Max. Current: 0.5 Amp Max. Voltage: 200 VDC	5	70	3.8	0.5	620A-6A05	8.20	62SA-6A05	8.65
	6	35	4.0	0.5	620A-6A06	8.20	62SA-6A06	8.65
	12	135	8.0	1.0	620A-6A12	8.20	62SA-6A12	8.65
	24	550	16.0	2.0	620A-6A24	8.50	62SA-6A24	8.85
	48	2,200	32.0	4.0	620A-6A48	10.00	62SA-6A48	10.65
1 Form C (SPDT) Max. Load: 3 Watt Max. Current: 0.25 Amp Max. Voltage: 28 VDC	5	500	3.8	0.5	610A-1C05	6.45	61SA-1C05	6.80
	6	125	4.0	0.5	610A-1C06	6.45	61SA-1C06	6.80
	12	500	8.0	1.0	610A-1C12	6.45	61SA-1C12	6.80
	24	2,000	16.0	2.0	610A-1C24	6.65	61SA-1C24	7.05
	48	8,000	32.0	4.0	610A-1C48	8.50	61SA-1C48	8.90
2 Form C (DPDT) Max. Load: 3 Watt Max. Current: 0.25 Amp Max. Voltage: 28 VDC	5	200	3.8	0.5	610A-2C05	11.30	61SA-2C05	11.80
	6	80	4.0	0.5	610A-2C06	11.30	61SA-2C06	11.80
	12	310	8.0	1.0	610A-2C12	11.30	61SA-2C12	11.80
	24	1,250	16.0	2.0	610A-2C24	11.60	61SA-2C24	12.15
	48	5,000	32.0	4.0	610A-2C48	13.35	61SA-2C48	13.90
3 Form C (3PDT) Max. Load: 3 Watt Max. Current: 0.25 Amp Max. Voltage: 28 VDC	6	45	4.0	0.5	610A-3C06	16.80	61SA-3C06	17.30
	12	175	8.0	1.0	610A-3C12	16.80	61SA-3C12	17.30
	24	700	16.0	2.0	610A-3C24	17.10	61SA-3C24	17.65
	48	2,800	32.0	4.0	610A-3C48	18.50	61SA-3C48	19.05
4 Form C (4PDT) Max. Load: 3 Watt Max. Current: 0.25 Amp Max. Voltage: 200 VDC	6	30	3.8	0.5	610A-4C06	22.30	61SA-4C06	23.80
	12	125	8.0	1.0	610A-4C12	22.30	61SA-4C12	23.80
	24	500	16.0	2.0	610A-4C24	22.50	61SA-4C24	24.15
	48	2,000	32.0	4.0	610A-4C48	24.25	61SA-4C48	25.80

All values at 20°C.

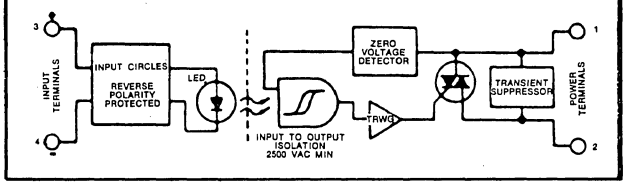
"It's a better relay"
AMERICAN ZETTLER, INC.
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472



Optoswitch™

GENERAL PURPOSE AC SOLID STATE RELAYS OPTO-ISOLATED

SCHEMATIC DIAGRAM



The OPTOSWITCH™ general purpose AC solid state relays have been specifically designed to meet or exceed commercial requirements. Applied Electro Technology Int. has a long history of manufacturing aerospace and military high reliability solid state relays and this high quality experience has influenced a new design in solid state relays with stringent manufacturing and testing.

Use these relays in all your commercial applications such as copiers, instruments, controls, gas pumps, microprocessor controllers, automated machinery, etc.

The OPTOSWITCH™ totally solid state AC relays are total encapsulated and especially recommended for harsh industrial environments where high shock or severe temperature excursions are encountered. All inputs are opto-isolated and turn-on is synchronized with load voltage zero crossing to minimize radio frequency interference.

In many instances these relays have been replaced and are constantly replacing mechanical relays very successfully.

Our special features are:

- Operating temperature range of −40 to 100°C.
- Optical isolation of 2500 Vrms between control and load circuits.
- Zero voltage turn-on for reduced EMI.
- High transient immunity to prevent false turn-on.
- Maximum control current of 2 ma DC (rms for AC control type) to turn on relay over temperature range.
- Optional DC control voltage range of 4-32 VDC.
- Optional AC control voltage range of 90-140 VAC or 90-280 VAC.

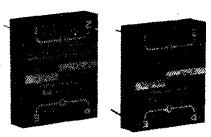
These relays are available in 6, 10, 15, 25 and 40 amp switching capacity at 120, 240 or 480 VAC.

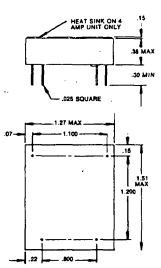
In addition, the user has a choice of DC control or AC control as stated above.

For further information please contact AET directly.

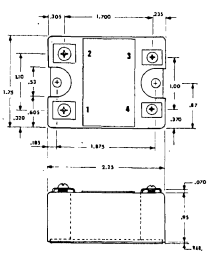
Some models available are shown below:

12-OPC SERIES

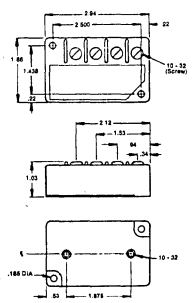




12-OEM SERIES

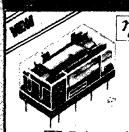
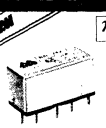
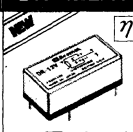
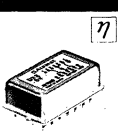
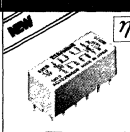
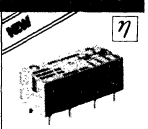


12-OTM SERIES



APPLIED ELECTRO TECHNOLOGY, INT.
AN Sti® COMPANY
2220 S. Anne St. / Santa Ana, CA 92704 / Tel (714) 556-6570 / TWX 910-595-1797

Aromat Relay Selector Chart

	High Breakdown Voltage Capacity	Half-Size Amber	Highly Reliable DIP	Hermetically Sealed	Economical Reed	High Density Amber	Field Switching Power
	DS-RELAY	R-RELAY	DR-RELAY	DX-RELAY	DA-RELAY	SEB-RELAY	STE-RELAY
• Type of relay	 IC Relay option	 IC Relay option	 IC Relay option			 IC Relay option	 IC Relay option
• Features	• 1500V FCC surge satisfied • High sensitivity • High switching power • Ag-Pd contact type available	• Magnetically shielded • High sensitivity • High speed operation	• High sensitivity • High sticking resistance • High breakdown voltage • High speed operation	• High radio frequency characteristics • High sensitivity • High insulation resistance • High shock and vibration resistance • Bifurcated contacts	• DIP terminal • Glass encapsulated reed switch	• High sensitivity • High vibration and shock resistance • Low thermal electromotive force • DIL terminal	• High sensitivity • Large capacity in small size • Capable of switching field inductive loads • High inrush capability
• Amber sealed types availability	●	●	●	●		●	●
• Latching types availability	●	●	●	●		●	●
• Mounting method: Plug-in							
• Mounting method: PC board	●	●	●	●	●	●	●
• Mounting method: Top-mount							
• Contact arrangement	1C, 2C, 4C	1C	1C	2C	1a, 2a	2a2b, 4a	1a1b, 2a
• Contact rating (resistive)	0.6A 125VAC 0.6A 110VDC 2A 30VDC	0.3A 110VAC 1A 20VDC	0.3A 110VAC 1A 20VDC	1A 30VDC 0.5A 30VDC 0.1A 12VDC	0.1A 100VAC	4A 250VAC 3A 30VDC	8A 250VAC 5A 30VDC 1/4 HP 125VAC
• Contact material	Gold-clad silver	Gold cobalt	Gold cobalt	Gold-clad silver alloy	Rh-plated nickel-iron alloy	Gold-clad silver alloy	Silver alloy
• Life (min. operations): Electrical (at rated load)	5×10^5 at 0.3A 220VAC 5×10^5 at 2A 30VDC	10^6	10^6	2×10^5 at 1A 30VDC	10^6	10^5 at 4A 250VAC	10^5 at 8A 250VAC
• Life (min. operations): Mech.	10^8	10^9	10^9	3×10^7	10^8	10^8	10^7
• Breakdown voltage: Between open contacts	1000Vrms (500 Vrms for DS1-S)	350Vrms or 500VDC	750Vrms	500Vrms	200VDC	750Vrms	1200Vrms
• Breakdown voltage: Between contact sets	1000Vrms	—	—	500Vrms	—	1000Vrms	2000Vrms
• Breakdown voltage: Between contacts and coil	1500Vrms (1000 Vrms for DS1-S)	1000Vrms	1500Vrms	500Vrms	500VDC	1500Vrms	3750Vrms
• Breakdown voltage: Between live parts and ground	—	1000Vrms	1000Vrms	—	—	—	—
• Surge withstand voltage	1500V FCC						
• Coil voltage	(DC) 1.5, 3, 5, 6, 9, 12, 24, 48V	(DC) 5, 6, 12, 24, 48V	(DC) 3, 5, 6, 12, 24, 48V	(DC) 3, 5, 6, 12, 24V	(DC) 5, 6, 12, 24V	(DC) 5, 6, 12, 24, 48V	(DC) 3, 5, 6, 12, 24, 48V
• Nominal operating power	M: (Single) 400mW (−ML2) 360mW S: (Single) 200mW (−SL2) 180mW	(Single) 150 to 280mW (−L) 70 to 100mW (−L2) 150 to 230mW	(Single) 96 to 209mW (−L) 56 to 109mW (−L2) 111 to 290mW	(Single) 125 to 144mW (−L) 125 to 144mW (−L2) 250 to 288mW	(1a) 230mW (2a) 325mW	192 to 355mW	240mW
• UL, CSA, VDE	UL/CSA	UL/CSA	—	—	—	UL/CSA	*UL/*CSA
• Page							

Notes: 1. When ordering, please specify UL/CSA or VDE. 2. *denotes UL/CSA or VDE application under way.

Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

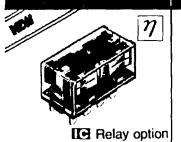
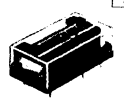
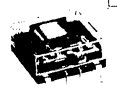
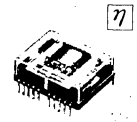
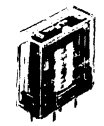
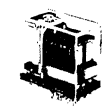
Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

Compact Power Sensitive	Flatpack	Thin 1 Form C	Flatpack/Lean line 5 AMP	6PDT Flatpack DIL	Lean Line	High sensitivity Cradle
SP-RELAY	**NF-RELAY**	**NB-RELAY**	**NC-RELAY**	**NL-RELAY**	**NT-RELAY**	**K-RELAY**
 IC Relay option						
• High sensitivity • High vibration and shock resistance • Wide switching range	• 1500V FCC surge satisfied • Low profile • High sensitivity • MBB contacts available • Ag-Pd contacts type available	• 1500V FCC surge staisfied • Thin height • 5A contact rating • DIL terminal	• Flatpack and Lean line • DIL terminal • Bifurcated contacts	• 6PDT Flat-pack • Low operating power • DIL terminal. • MBB contacts available	• Large capacity 8A • Compact size	• Patented magnetic system • Long life • Bifurcated contact
	●	●	●	●		●
●		●	●	●		
● (Faston) No. 187			●			●
	●	●	●	●	●	●
2C, 4C	2C, 4C	1C	2C, 4C	6C	1C	2C, 4C, 6C
(2C) 15A 250VAC 10A 30VDC 1/2HP 125VAC (4C) 10A 250VAC 10A 30VDC 1/3HP 125VAC	0.5A 125VAC 2A 30VDC	(Single) 5A 250VAC 5A 30VDC 1/10HP 125VAC (bifurcated) 3A 250VAC 3A 30VDC 1/20HP 125VAC	(2C) 5A 250VAC 5A 30VDC 1/10HP 125VAC (4C) 5A 125VAC 5A 30VDC 1/10HP 125VAC	2A 30VDC 0.6A 100VDC	8A 250VAC 8A 24VDC 1/10HP 125VAC	2A 28VDC
Silver alloy/gold-plated silver alloy	Gold-clad silver	(Single) Silver nickel (Bifurcated) Gold-clad silver nickel	Gold-clad Silver nickel	Gold-clad silver	Gold-clad silver nickel	Gold-clad silver/ silver
10^5	10^6 at 2A 30VDC	2×10^5	(2C) 10^5 at 5A 250VAC (4C) 10^5 at 5A 125VAC	5×10^5 at 2A 30VDC	10^5	10^6
5×10^7	(2C) 3×10^8 (4C) 10^8	10^7	2×10^7	5×10^7	10^7	10^8
1500Vrms	750Vrms	1000Vrms	1000Vrms	1000Vrms	1000Vrms	750Vrms
3000Vrms	1000Vrms	—	1000Vrms	1000Vrms	—	750Vrms
3000Vrms	1000Vrms	2000Vrms	2000Vrms	2000Vrms	2000Vrms	1500Vrms
—	1000Vrms	—	—	—	—	1250Vrms
	1500V FCC	1500V FCC				
(DC) 3, 5, 6, 12, 24, 48V	(DC) 5, 6, 12, 24, 48V	(DC) 3, 5, 6, 12, 24, 48V	(DC) 5, 6, 12, 24, 48V	(DC) 5, 6, 12, 24, 48V	(DC) 5, 6, 12, 24, 48V (AC) 6, 12, 24, 48, 115V	(DC) 6, 12, 24, 48, 60, 110V
300mW	(2C) 300mW (4C) 480mW	400mW	(Single) (2C) 360mW (4C) 720mW (−L2) (2C) 800mW (4C) 1,600mW	(single) 720mW (−L2) 1,600mW	(DC) 290mW (AC) 0.75VA	(2C) 200 to 400mW (4C) 500 to 700mW (6C) 1,300mW
UL/CSA	UL/**CSA or VDE	UL/CSA	UL/CSA or VDE	UL/CSA or VDE	UL/CSA	UL/CSA or VDE

3. **CSA is approved under NF-A (without grounding terminal) types.

Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

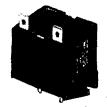
Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

Aromat Relay Selector Chart

	High Frequency	Slim Type Power	Compact Power	Compact High Power	1 HP Compact Power	Compact High Power
	RF-RELAY	JR-RELAY	JB-RELAY	JC-RELAY	JA-RELAY	JH-RELAY
• Type of relay						
• Features	• Excellent high frequency • High reliability and long life • Flux-resistant molded construction • DIL terminal	• Wide insulation distance • High dielectric withstanding: 10,000 V surge • High inrush current capability	• High dielectric withstanding 10,000V surge • Large capacity 8A in compact size • Flux-resistant	• High inrush current capability • TV-rated type available • High dielectric withstanding: 10,000V surge	• High switching capacity 55A inrush, 15A steady • TV-rated type available • High dielectric withstanding: 5,000V surge	• Many safety-oriented characteristics incorporated • High dielectric withstanding: 10,000V surge • High inrush resistance
• Amber sealed types availability	●					
• Latching types availability						
• Mounting method: Plug-in				●		
• Mounting method: PC board	●	●	●	●	●	
• Mounting method: Top-mount				●	●	●
• Contact arrangement	1C	1a, 1c	1C	1a, 2a, 1a1b	1a, 1b, 1C	1X, 2X
• Contact rating (resistive)	0.01A 24VAC 0.01A 24VDC	10A 250VAC 10A 30VDC	8A 250VAC 5A 30VDC 1/6HP 125VAC	(1a) 10A 250VAC 1/2HP 125VAC (2a, 1a1b) 5A 250VAC 1/4HP 125VAC	10A 250VAC 15A 125VAC 1HP 125VAC	(1X) 30A 250VAC 1HP 125VAC (2X) 20A 250VAC 1HP 125VAC
• Contact material	(Stationary contact) Gold-plated nickel silver (Movable contact) Gold-clad phosphorus bronze	Silver alloy	Silver alloy	Silver alloy	Silver alloy	Silver alloy
• Life (min. operations): Electrical (at rated load)	10^5	10^5	10^5	10^5	10^5	10^5
• Life (min. operations): Mech.	5×10^6	5×10^6	10^7	5×10^6	5×10^6	5×10^6
• Breakdown voltage: Between open contacts	1000Vrms	1,000Vrms	1000Vrms	2000Vrms	1000Vrms	2000Vrms
• Breakdown voltage: Between contact sets	—	—	—	2000Vrms	—	2000Vrms
• Breakdown voltage: Between contacts and coil	2000Vrms	5,000Vrms	2500Vrms	4000Vrms	2000Vrms	5000Vrms
• Breakdown voltage: Between live parts and ground		—	—	—	—	—
• Surge withstand voltage	—	10,000V surge	10,000V surge	10,000V surge	5,000V surge	10,000V surge
• Coil voltage	(DC) 5, 6, 9, 12, 24, 48V	(DC) 6, 12, 24, 48V	(DC) 5, 6, 12, 24, 48V	(DC) 6, 12, 24, 48V	(DC) 6, 12, 24V (AC) 6, 12, 24, 115V	(DC) 6, 12, 24, 48, 110V (AC) 6, 12, 24, 48, 120, 220, 240V
• Nominal operating power	450mW	530mW	(Up to DC24V) 480mW (DC48V) 560mW	(1a) 0.9W (2a) 1W	(DC) 1.2W (AC) 1.3VA	(DC) 1.9W (AC) 3.2VA
• UL, CSA, VDE	—	UL/CSA	UL/CSA	UL/CSA or VDE	UL/CSA	UL/CSA or *VDE
• Page						

Notes: 1. When ordering, please specify UL/CSA or VDE. 2. *denotes UL/CSA or VDE application under way.

Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

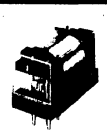
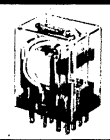
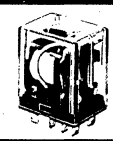
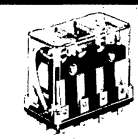
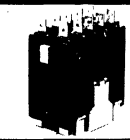
Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

Subminiature DIP	Subminiature	Miniature Power	Compact Power	10 Amp Power	20 Amp Power	Heavy Duty Power
HB-RELAY	**HA-RELAY**	**HC-RELAY**	**HL-RELAY**	**HP-RELAY**	**HG-RELAY**	**VC-RELAY**
						
• DIP terminal • Flux-resistant • Ag-Pd contacts type available	• Compact size • Flux-resistant	• Wide applications • Versatile range	• Large capacity • Compact size	• Long life	• Large capacity 20A	• 20A type
●	●	●				
		●	● (Faston) No. 187	● (Faston) No. 187	● (Faston) No. 250	● (Faston) No. 250
●	●	●	●			
		●	●			
1C, 2C	1C	1C, 2C, 3C, 4C	1C, 2C	1C, 2C, 3C	2C, 3C, 4C	1X, 2X, 3X
1A 125VAC 2A 30VDC 1/20HP 125VAC	3A 250VAC 3A 30VDC	(1C) 10A 250VAC 1/3HP 125VAC (2C) 7A 250VAC 1/6HP 125VAC (3C) 7A 250VAC 1/6HP 125VAC (4C) 5A 250VAC 1/10HP 125VAC	(1C) 15A 125VAC 3A 30VDC 1/3HP 125VAC (2C) 10A 250VAC 3A 30VDC 1/3HP 125VAC	10A 250VAC 7.5A 24VDC 1/3HP 125VAC	20A 250VAC 15A 24VDC 3/4HP 125VAC	20A 200VAC
Silver nickel	Silver nickel	Gold-flashed silver alloy	Silver alloy	Silver alloy	Silver-cadmium-oxide	Silver-cadmium-oxide
2×10^5	10^5 at 3A 250VAC	2×10^5	5×10^7	2×10^5 at 10A 125VAC	2×10^5 at 20A 250VAC	2.5×10^5
10^7	10^7	(DC) 10^8 (AC) 5×10^7	(DC) 10^8 (AC) 5×10^7	10^7	(DC) 10^6 (AC) 10^7	10^6
500Vrms	750Vrms	700Vrms	1000Vrms	(HP31,32)1000Vrms (HP33) 2000Vrms	2000Vrms	2500Vrms
500Vrms	—	700Vrms	1500Vrms	2000Vrms	2000Vrms	2500Vrms
1000Vrms	1500Vrms	1500Vrms	1500Vrms	2000Vrms	2000Vrms	2500Vrms
—	—	1500Vrms	—	—	—	—
(DC) 5, 6, 12, 24, 48V	(DC) 5, 6, 9, 12, 24, 48V (AC) 6, 12, 24, 48, 115V	(DC) 6, 12, 24, 48, 110V (AC) 6, 12, 24, 48, 115, 220, 240V	(DC) 6, 12, 24, 48, 110V (AC) 6, 12, 24, 48, 115, 220, 240V		(DC) 6, 12, 24, 48, 110V (AC) 6, 12, 24, 48, 115, 220, 240V	(AC) 24, 120, 240V
(1C) 360mW (2C) 580mW	(DC) 360mW (AC) 0.9VA	(DC) 0.9W (AC) 1.2VA	(DC) 0.9 to 1.0W (AC) 1.2 to 1.3VA	(DC) 1.5W (AC) 2.0VA	(2C) 1.4W (DC) 3.6VA (AC) (3C) 1.6W (DC) 5.2VA (AC) (4C) 2.0W (DC) 7.6VA (AC)	5.0 to 6.6VA
UL/CSA	UL/CSA	UL/CSA or VDE (1C, 2C, 4C)	UL/CSA	UL/CSA or VDE	UL/CSA	UL/CSA

Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

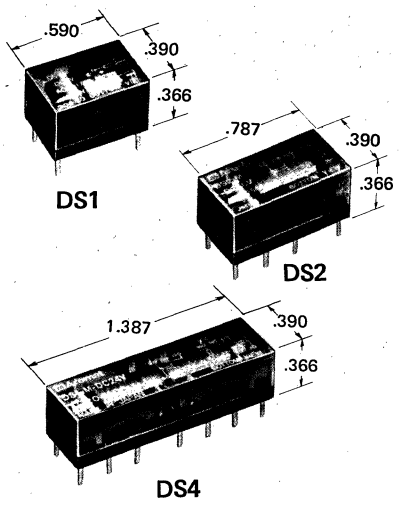
Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

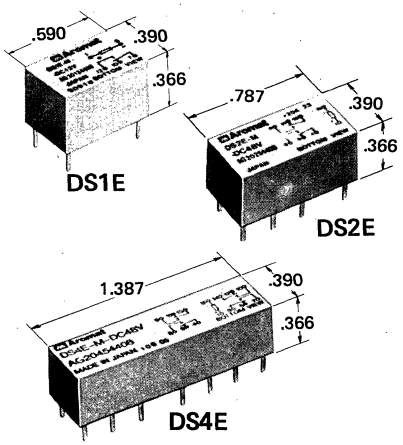
Aromat®
Member of Matsushita Group

Highly Sensitive 1,500 V FCC Surge Withstanding Miniature Relays — DS-RELAYS

Relay Efficiency

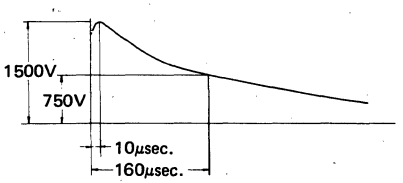


DSE Amber Relays



- High sensitivity
- High switching capacity
- High breakdown voltage —1,500V FCC surge between open contacts, 1,000VAC between open contacts
- DIP terminal arrangement
- Latching types available

* FCC (Federal Communication Commission) requests following standard as Breakdown Voltage specification



Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
Single side stable	DC5V	5VDC	62.5			
DS1–M–	DC6V	6	90			
DS1E–M–	DC9V	9	203	400	1C	2
	DC12V	12	360			
	DC24V	24	1440			
	DC48V	48	5760			
2 coil latching	DC5V	5VDC	69.4			
DS1–ML2–	DC6V	6	100			
DS1E–ML2–	DC9V	9	225	360	1C	2
	DC12V	12	400			
	DC24V	24	1600			
Single side stable	DC5V	5VDC	62.5			
DS2–M–	DC6V	6	90			
DS2E–M–	DC9V	9	203	400	2C	2
	DC12V	12	360			
	DC24V	24	1440			
	DC48V	48	5760			
2 coil latching	DC5V	5VDC	69.4			
DS2–ML2–	DC6V	6	100			
DS2E–ML2–	DC9V	9	225	360	2C	2
	DC12V	12	400			
	DC24V	24	1600			
	DC48V	48	6400			
Single side stable	DC5V	5VDC	125			
DS2–S–	DC6V	6	180			
DS2E–S–	DC9V	9	405	200	2C	2
	DC12V	12	720			
	DC24V	24	2880			
	DC48V	48	11520			
2 coil latching	DC5C	5VDC	139			
DS2–SL2–	DC6V	6	200			
DS2E–SL2–	DC9V	9	450			
	DC12V	12	800	180	2C	2
	DC24V	24	3200			
	DC48V	48	12800			
Single side stable	DC5V	5VDC	62.5			
DS4–M–	DC6V	6	90			
DS4E–M–	DC9V	9	203			
	DC12V	12	360	400	4C	2
	DC24V	24	1440			
	DC48V	48	5760			
2 coil latching	DC5V	5VDC	69.4			
DS4–ML2–	DC6V	6	100			
DS4E–ML2–	DC9V	9	225			
	DC12V	12	400	360	4C	2
	DC24V	24	1600			
	DC48V	48	6400			
Single site stable	DC5V	5VDC	125			
DS4–S–	DC6V	6	180			
DS4E–S–	DC9V	9	405			
	DC12V	12	720	200	4C	2
	DC24V	24	2880			
	DC48V	48	11520			
2 coil latching	DC5V	5VDC	139			
DS4–SL2–	DC6V	6	200			
DS4E–SL2–	DC9V	9	450			
	DC12V	12	800	180	4C	2
	DC24V	24	3200			
	DC48V	48	12800			

Note: 1. Reverse polarity types available
2. Gold capped silver pallarium contacts available
3. For UL/CSA recognized types : 2 Form C and 4 form C, add suffix UL/CSA.
4. Standard packing → Carton : 50 pcs./Case: 500 pcs.

Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

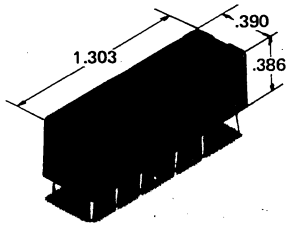
Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

NEW IC Built-in Power Saving Relays for Battery Devices DS-C UNIT RELAYS

Relay Efficiency



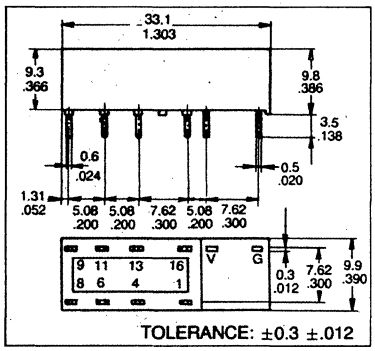
Types and Data

Type	Coils		Contacts	
	Voltage	Nom. Power (mW)	Arrangement	Rating (A)
DS2-C-9V	9	0.54	2C	2
DS2-C-12V	12	1.2		
DS2-C-24V	24	2.64		

Note: Standard packing → Carton : 50 pcs./Case : 500 pcs.

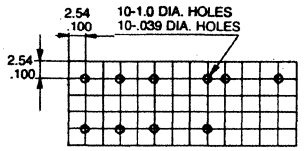
Dimensions

mm inch



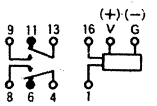
TOLERANCE: ±0.3 ±.012

PC board pattern (Copper side view)



TOLERANCE: ±0.1 ±.004

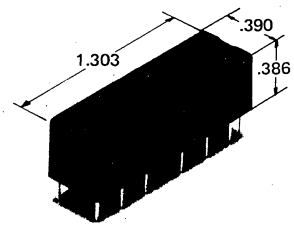
Schematic (Bottom view)



Note: Diagram shows the condition when volatge is not applied to V and G terminals.
Do not use 1 and 16 terminals.

NEW IC Built-in Relays for Intelligent Systems DS-C3-RELAYS

Relay Efficiency

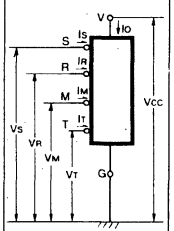


Type	Contacts	
	Arrangement	Rating (A)
DS2-C3-5V	2C	2

Note: Standard packing → Carton: 50 pcs./Case: 500 pcs.

Input Data

Symbol



A. Absolute maximum rating

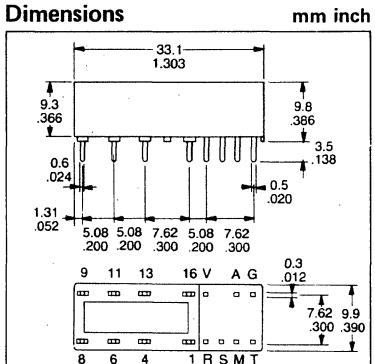
Item	Symbol	Value	Unit
Max. power source voltage	Vcc	14	V
Max. Input Voltage	VHS, VHR, VHM, VHT	Vcc	V
Max. power source current	I_o	100	mA

B. Operation conditions

Item		Sumbol	Condition	Allowable value			Unit
				Min.	Center	Max.	
Rated power source voltage		Vcc		4.75	5	14	V
Power source current	Operating	I_o	Vcc=5V (when relay is operating)			45	mA
	Steady		Vcc=5V			2	mA
L level voltage		VS, VR, VT, VM	Vcc=5V	−0.5		0.8	V
H level voltage		VS, VR, VM, VT	Vcc=5V	2.0		Vcc	V
Input current		IR, IS, IT, IM	Vcc=5V, Input is 5V			50	μA
			Vcc=5V, Input is 0V	−200			μA

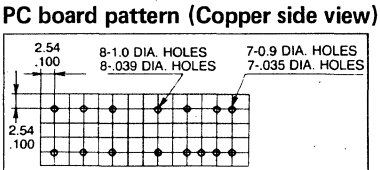
Dimensions

mm inch



TOLERANCE: ±0.3 ±.012

PC board pattern (Copper side view)



TOLERANCE: ±0.1 ±.004

Schematic (Bottom view)

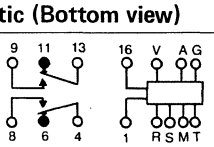


Diagram shows the condition when 5 V is applied to V and G terminals and signal of L level is applied to R terminal.

Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

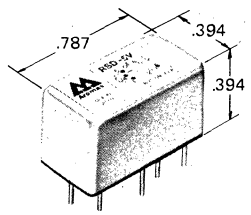
Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

Half Size Amber Relays
More than 50 Million Units around the World

R-RELAYS

Relay Efficiency



- Amber sealed construction
- High sensitivity
- High speed: 1 msec. max.
- Wide switching range and high welding resistance
- Small size
- High reliability and long life
- Latching types available

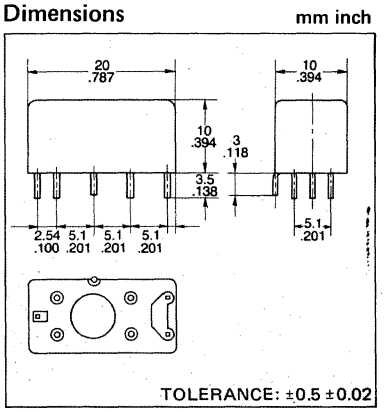
Types and Data

Type		Coils: Voltage	Coils: Res. (Ω)	Coils: Nom. Power (mW)	Contacts: Arrangement	Contacts: Rating (A)
Single side stable RSD–	DC5V	5VDC	170	147	1C	1
	DC6V	6	220	164		
	DC12V	12	890	162		
	DC24V	24	2,000	288		
	DC48V	48	8,000	221		
1-coil latching RSLD–	DC5V	5VDC	340	74	1C	1
	DC6V	6	450	80		
	DC12V	12	1,500	96		
	DC24V	24	6,000	96		
	DC48V	48	12,000	147		
2-coil latching RSL2D–	DC5V	5VDC	170	147	1C	1
	DC6V	6	225	160		
	DC12V	12	650	230		
	DC24V	24	2,700	213		
	DC48V	48	6,500	321		

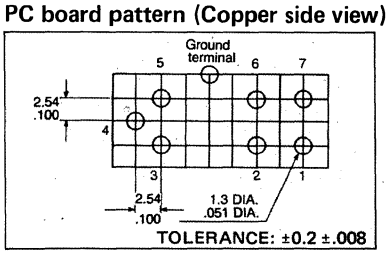
Note: 1. R1a (1 Form a contact) types available
2. Standard packing → Carton: 50 pcs./Case: 500 pcs.

Dimensions

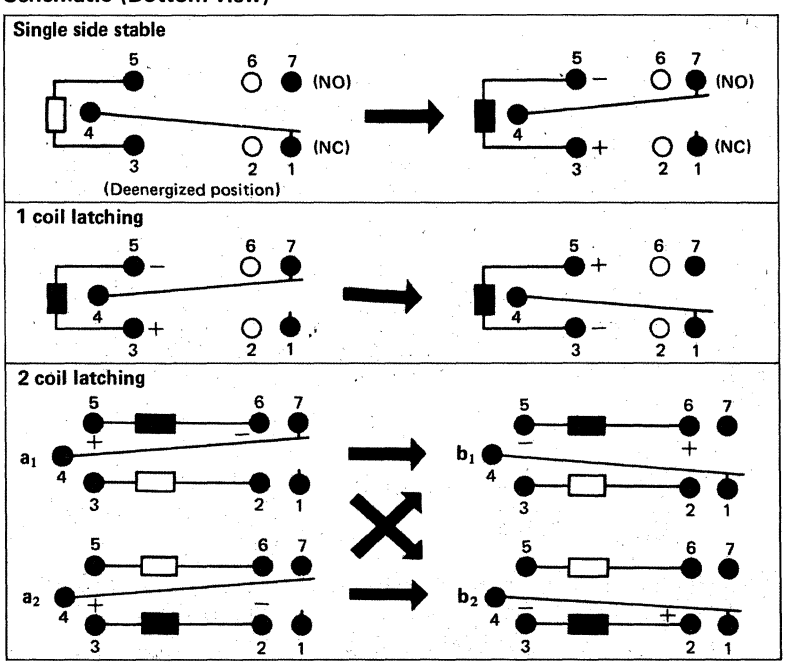
mm inch



PC board pattern (Copper side view)

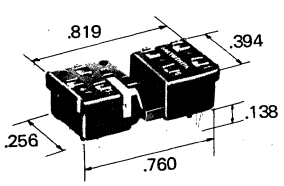


Schematic (Bottom view)



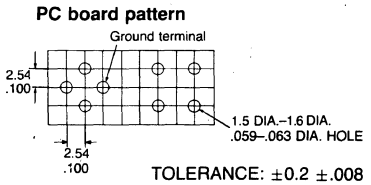
R Socket

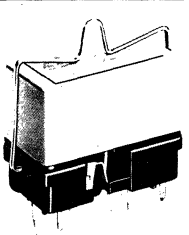
R–PS	PC terminal



R-PS

PC board pattern





The R-Relay with R-PS attached

Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

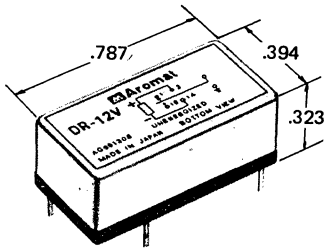
Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

Highly Reliable Miniature DIP Relays

DR-RELAYS

Relay Efficiency



- High breakdown voltage: 750 Vrms between open contacts
- High sensitivity
- High sticking resistance
- Miniature size and flat form
- High speed – Operate time: Approx. 1 msec.
- DIP terminal arrangement
- Latching types available

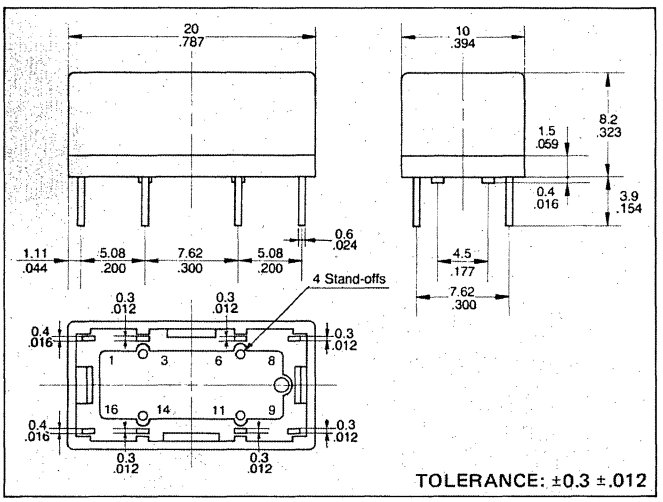
Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
Single side stable	5V	5VDC	240	104		
DR–	6V	6	330	109		
	12V	12	1,400	103	1C	1
	24V	24	3,600	160		
	48V	48	11,000	209		
1-coil latching	5V	5VDC	420	59		
DR–L–	6V	6	610	59		
	12V	12	2,300	62	1C	1
	24V	24	5,800	99		
	48V	48	21,100	109		
2-coil latching	5V	5VDC	225	111		
DR–L2–	6V	6	290	124		
	12V	12	1,210	119	1C	1
	24V	24	3,840	150		
	48V	48	7,950	290		

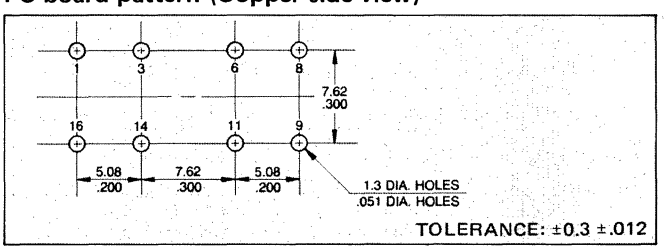
Note: Standard packing → Carton: 50 pcs./Case: 500 pcs.

Dimensions

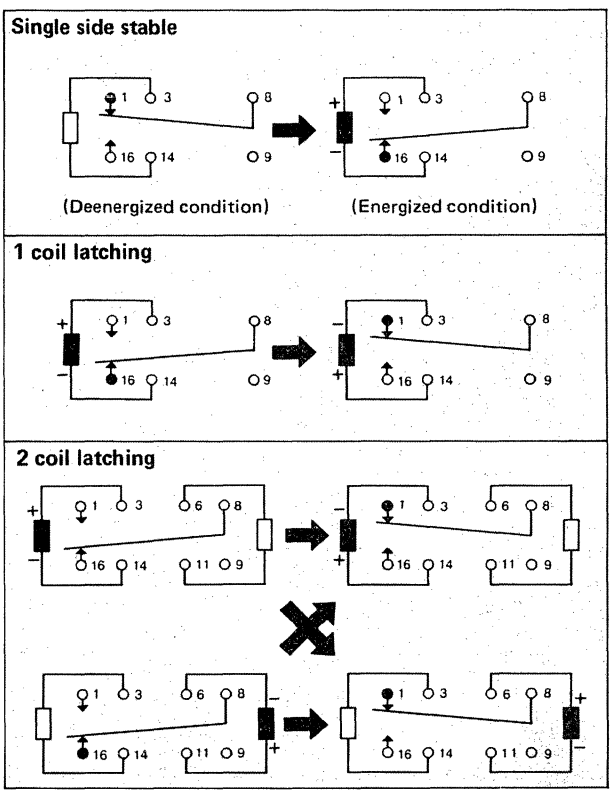
mm inch



PC board pattern (Copper side view)



Schematic (Bottom view)



Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

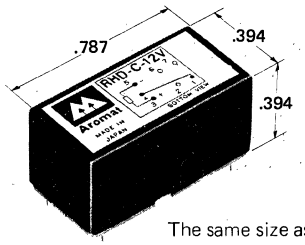
Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

NEW IC Built-in Power Saving Relays for Battery Devices R-C UNIT RELAYS

Relay Efficiency



The same size as R relay.

- Ultra low operating power
- Little heat generation
- Wider operating voltage range
- Low bounce

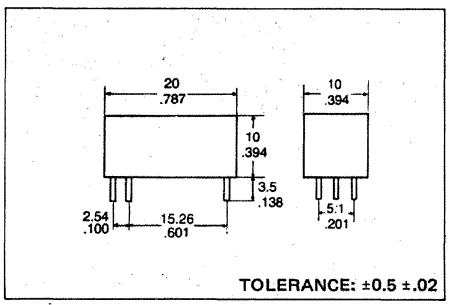
Types and Data

Type	Coils		Contacts	
	Voltage	Nom. Power (mW)	Arrange-ment	Rating (A)
RHD–C– 5V	5	0.3 to 0.78	1C	1
RHD–C–12V	12	1.56 to 3.12		

Note: Standard packing → Carton : 50 pcs./Case : 500 pcs.

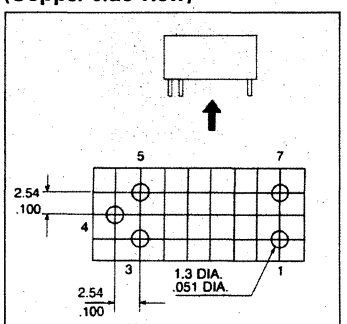
Dimensions

mm inch



TOLERANCE: ±0.5 ±.02

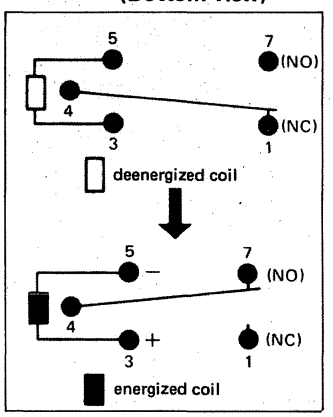
P/C board pattern (Copper side view)



TOLERANCE: ±0.2 ±0.08

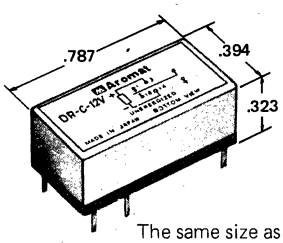
Note: A standard pattern: P/C board with a pitch of .100 inch is suitable for mounting RHD-C relays.

Schematic (Bottom view)



NEW IC Built-in Power Saving Relays for Battery Devices DR-C UNIT RELAYS

Relay Efficiency



The same size as DR relay.

- Ultra low operating power
- Little heat generation
- Wider operating voltage range
- Low bounce

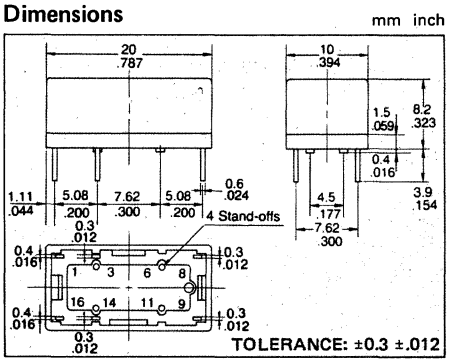
Types and Data

Type	Coils		Contacts	
	Voltage	Nom. Power (mW)	Arrange-ment	Rating (A)
DR–C– 5V	5	0.175 to 0.245	1C	1
DR–C–12V	12	1.56 to 3.38		

Note: Standard packing → Carton: 50 pcs./Case : 500 pcs.

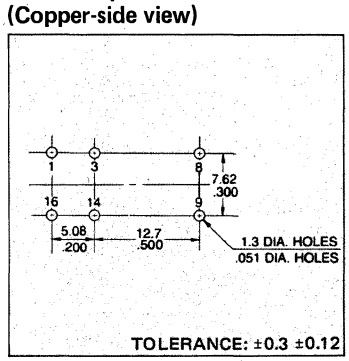
Dimensions

mm inch



TOLERANCE: ±0.3 ±.012

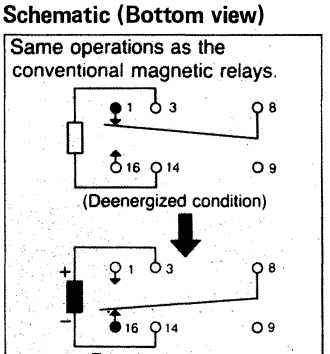
PC board pattern (Copper-side view)



TOLERANCE: ±0.3 ±0.12

Schematic (Bottom view)

Same operations as the conventional magnetic relays.



Note: Energization with an opposite polarity does not switch the contact. The reverse polarity may damage the built-in IC. Apply proper polarity to switch the contact.

Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

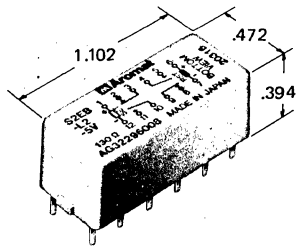
Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

4 Amp Polarized High Density Relays with High Sensistivity

SEB-RELAYS

Relay Efficiency



- Amber sealed construction
- High sensitivity in small size
- Wide switching range: 100μA to 4A
- High shock/vibration resistance: 50G/18G (10 to 55 Hz at double amplitude of 3 mm)
- A variety of contact arrangement
- Low thermal electromotive force: Approx. 3μV
- DIL terminal arrangement
- Multiple latching

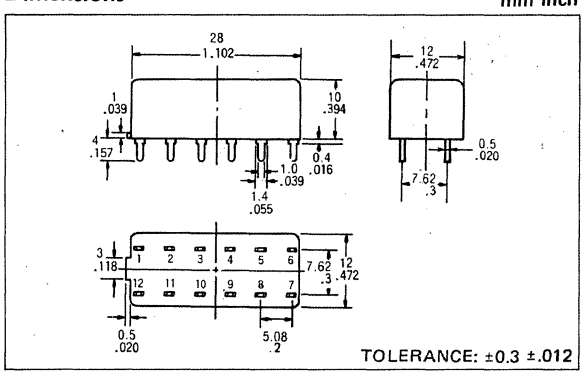
Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
Single side stable S2EB–	5V	5VDC	130	192	2a2b	4
	6V	6	180	200		
	12V	12	720	200		
	24V	24	2,850	202		
	48V	48	8,500	271		
2 coil latching S2EB–L2–	5V	5VDC	130	192	2a2b	4
	6V	6	180	200		
	12V	12	720	200		
	24V	24	2,850	202		
	48V	48	6,500	355		
Single side stable S4EB–	5V	5VDC	130	192	4a	4
	6V	6	180	200		
	12V	12	720	200		
	24V	24	2,850	202		
	48V	48	8,500	271		
2 coil latching S4EB–L2–	5V	5VDC	130	192	4a	4
	6V	6	180	200		
	12V	12	720	200		
	24V	24	2,850	202		
	48V	48	6,500	355		

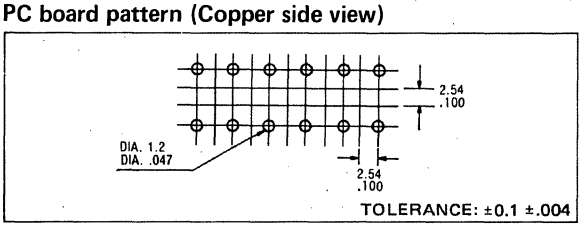
Note: Standard packing → Carton: 50 pcs./Case: 500 pcs.

Dimensions

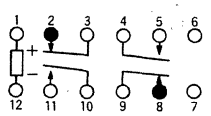
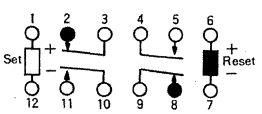
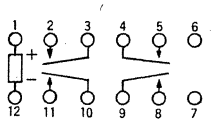
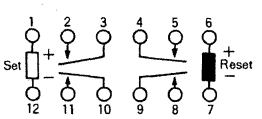
mm inch

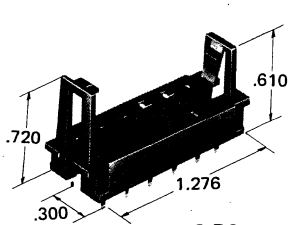


PC board pattern (Copper side view)



Schematic (Bottom view)

	Single side stable (De-energized position)	2 coil latching "Reset" position when reset coil is energized with indicated polarity..
2a2b		
4a		



S-PS

S Socket

S–PS	PC terminal

Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

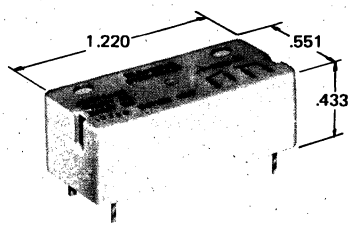
Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

IC Drivable PC Board Relays for Field Load Switching

STE-RELAYS

Relay Efficiency



- Amber sealed construction
- High switching capacity—8A
- High sensitivity
- Miniature size
- High shock/vibration resistance — 20G/12G (10 to 55 Hz at double amplitude of 2 mm)
- Latching types available

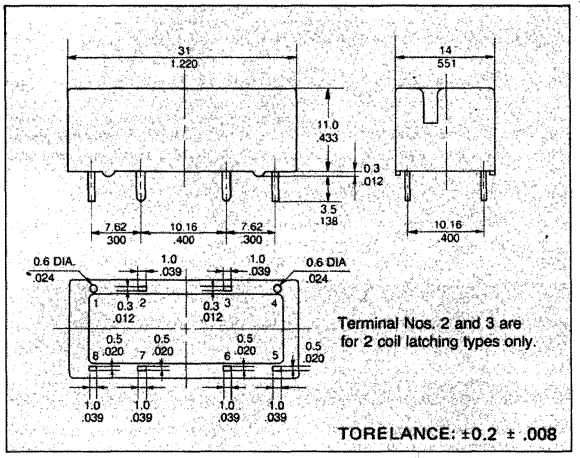
Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
Single side stable ST1E—	DC 5V	5VDC	110	240	1a1b	8
	DC 6V	6	150			
	DC 9V	9	360			
	DC12V	12	640			
	DC24V	24	2,400			
	DC48V	48	9,000			
2 coil latching ST1E—L2—	DC 5V	5VDC	110	240	1a1b	8
	DC 6V	6	160			
	DC 9V	9	360			
	DC12V	12	640			
	DC24V	24	2,440			
	DC48V	48	10,200			
Single side stable ST2E—	DC 5V	5VDC	110	240	2a	8
	DC 6V	6	150			
	DC 9V	9	360			
	DC12V	12	640			
	DC24V	24	2,400			
	DC48V	48	9,000			
2 coil latching ST2E—L2—	DC 5V	5VDC	110	240	2a	8
	DC 6V	6	160			
	DC 9V	9	360			
	DC12V	12	640			
	DC24V	24	2,440			
	DC48V	48	10,200			

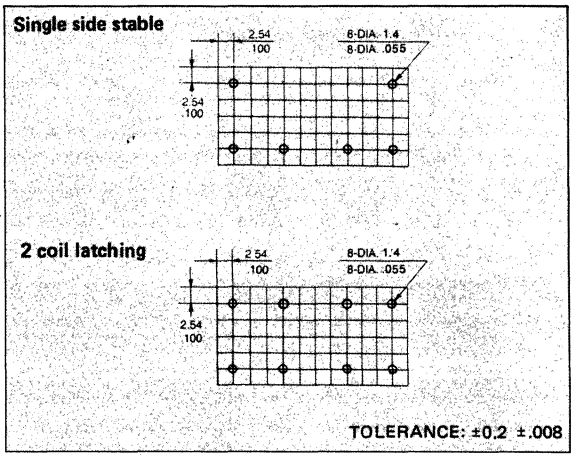
Note: Standard packing→Carton: 50 pcs./Case: 500 pcs.

Dimensions

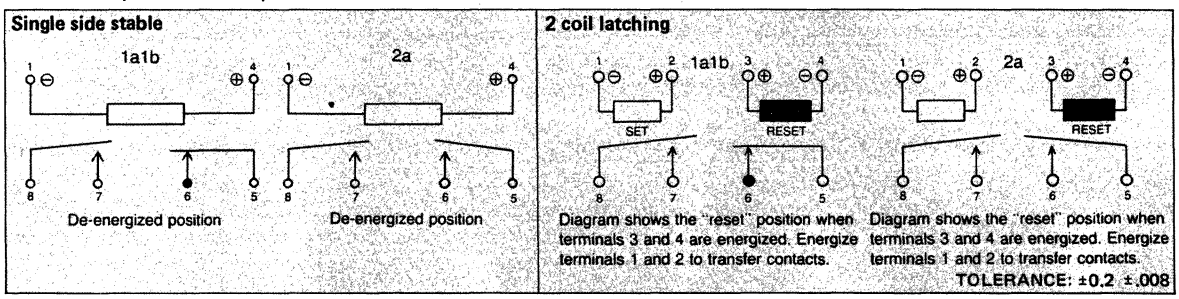
mm inch



PC board pattern (Copper side view)



Schematic (Bottom view)



Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

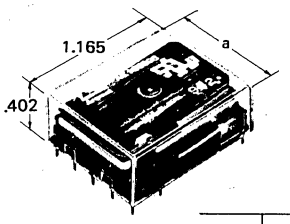
Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

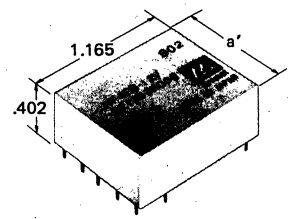
High Sensitivity Flatpack Relays with High Reliability

NF-RELAYS



	a
NF2	.764
NF4	.945

NFEB Amber Relays



	a'
NF2EB	.772
NF4EB	.953

More than 30,000,000 pcs. in use all over the world

- Low profile – stands only .402 inches high
  Ideal for high packaging density
- High sensitivity – minimum operating power
  NF2/150mW, NF4/240mW
- Variety of available lines –
  Amber Sealed types
  MBB (Form D) contact types
  High breakdown voltage types for transient protection – 1,000V rms between open contacts, contact sets
- Gold capped silver palladium contacts available.

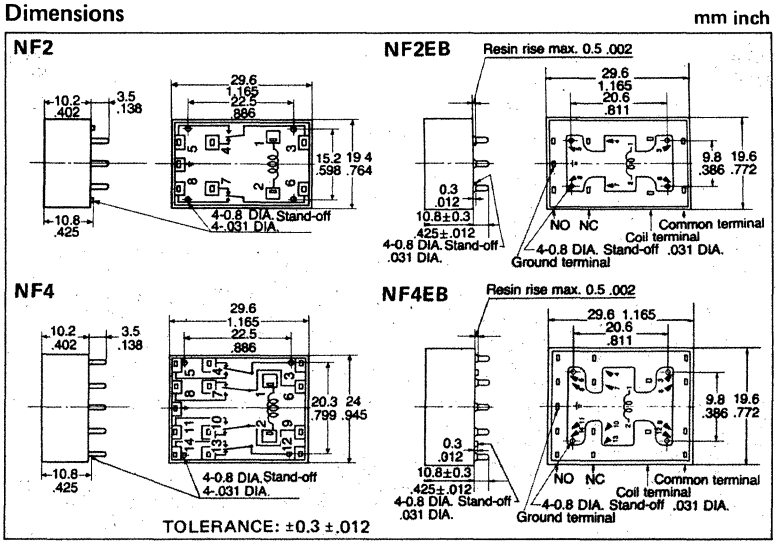
Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
NF2–	5V	5VDC	90	278		
NF2EB–	6V	6	137	260		
	12V	12	500	290	2C	2
	24V	14	2,000	290		
	48V	48	7,000	330		
NF4–	5V	5VDC	53	472		
NF4EB–	6V	6	90	400		
	12V	12	330	440	4C	2
	24V	24	1,200	480		
	48V	48	4,200	550		

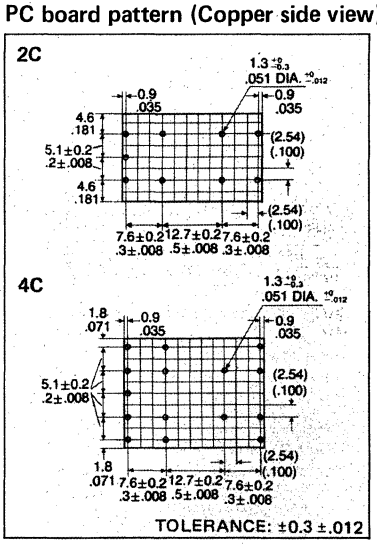
Notes: 1. MBB (Form D) contact types available.
2. Standard packing → Carton: 20 pcs./Case: 200 pcs.

Dimensions

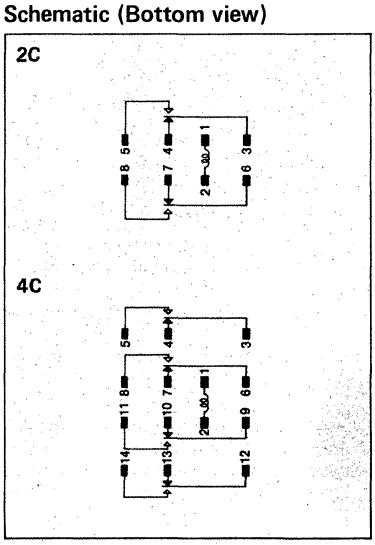
mm inch



PC board pattern (Copper side view)



Schematic (Bottom view)



Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

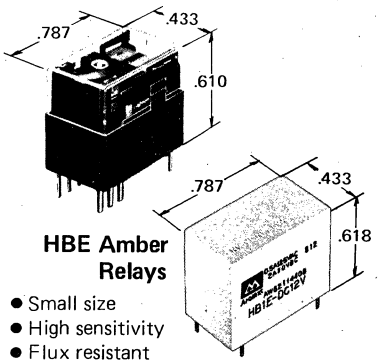
Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

Cost Saving Flux Resistant Subminiature DIP Relays — HB-RELAYS



HBE Amber Relays

- Small size
- High sensitivity
- Flux resistant
- DIP terminal arrangement

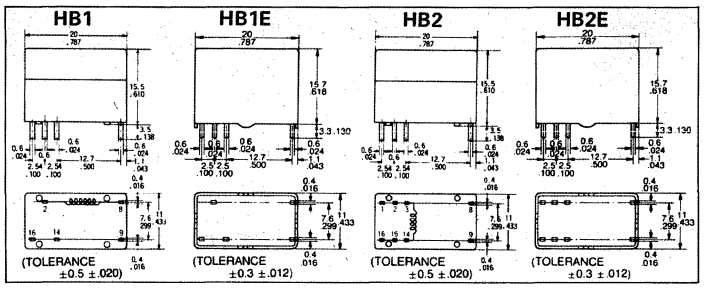
Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
HB1– / HB1E–	5V	5VDC	69	360	1C	2
	6V	6	100	360		
	12V	12	400	360		
	24V	24	1,600	360		
	48V	48	6,000	384		
HB2– / HB2E–	5V	5VDC	43.4	576	2C	2
	6V	6	62.5	576		
	12V	12	250	576		
	24V	24	1,000	576		
	48V	48	4,000	576		

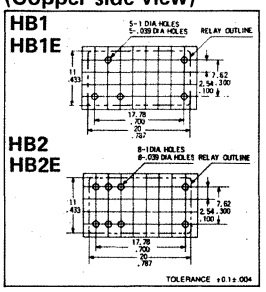
Notes: 1. Gold capped silver palladium contacts available
2. Standard packing → Carton: 100 pcs./Case: 500 pcs.

Dimensions

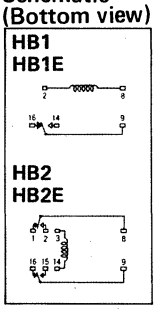
mm inch



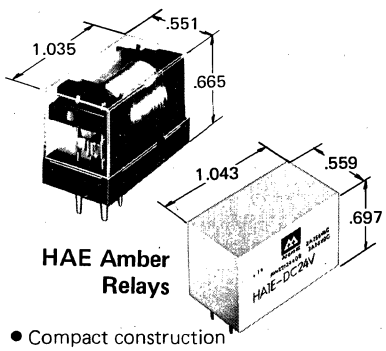
PC board pattern (Copper side view)



Schematic (Bottom view)



Cost Saving Flux Resistant Subminiature PC Board Relays — HA-RELAYS



HAE Amber Relays

- Compact construction
- High sensitivity
- Flux resistant

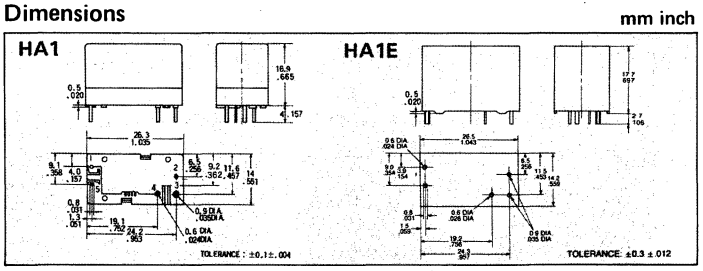
Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
HA1–DC / HA1E–	5V	5VDC	69	360	1C	3
	6V	6	100	360		
	9V	9	225	360		
	12V	12	400	360		
	24V	24	1,600	360		
	48V	48	6,400	360		
HA1–AC / HA1E–	6V	6VAC	–	0.9VA	1C	3
	12V	12	–	0.9VA		
	24V	24	–	0.9VA		
	48V	48	–	0.9VA		
	115V	115	–	0.9VA		

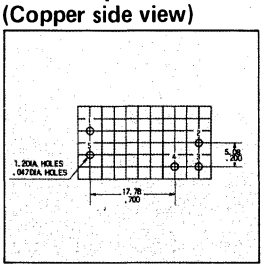
Note: Standard packing → Carton: 100 pcs./Case: 500 pcs.

Dimensions

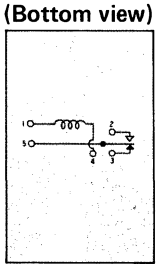
mm inch



PC board pattern (Copper side view)



Schematic (Bottom view)



Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

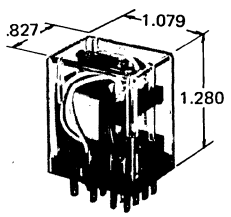
Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

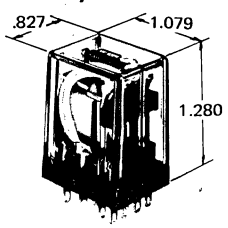
Aromat®
Member of Matsushita Group

Highly Rated Relays for Wider Applications

HC-RELAYS

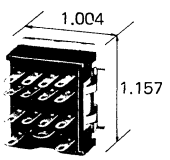


HCE Amber Relays

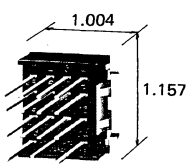


Versatile range

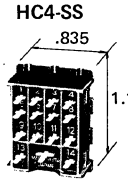
- Interchangeable with comparable relays.
- Extra long life — more than 10^8 mechanical operations.
- 4 types of contact arrangement — 4C (5A 250VAC), 3C (7A 250VAC), 2C (7A 250VAC), 1C (10A 250VAC)



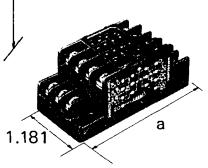
HC4-SS



HC4-WS

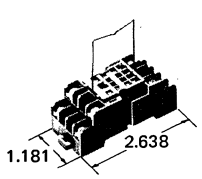


HC4-PS



HC-HSF

	a
HC-HSF	2.323
HC2-SF	1.575
HC3-HSF	2.638



HC2-SFD

Types and Data

Type	Coils: Voltage	Coils: Res. (Ω)	Coils: Nom. Power (mW)	Contacts: Arrangement	Contacts: Rating (A) Standard	Contacts: Rating (A) Amber
HC1— DC6V	6VDC	40	approx. 900	1C	10	5
(HC1-P*) DC12V	12	160				
DC24V	24	650				
DC48V	48	2,600				
DC110V	110	11,000				
HC1— AC6V	6VAC	—	approx. 1.2VA	1C	10	5
(HC1-P*) AC12V	12	—				
AC24V	24	—				
AC48V	48	—				
AC115V	115	—				
HC2— DC6V	6VDC	40	approx. 900	2C	7	3
(HC2-P*) DC12V	12	160				
DC24V	24	650				
DC48V	48	2,600				
DC110V	110	11,000				
HC2— AC6V	6VAC	—	approx. 1.2VA	2C	7	3
(HC2-P*) AC12V	12	—				
AC24V	24	—				
AC48V	48	—				
AC115V	115	—				
HC3— DC6V	6VDC	40	approx. 900	3C	7	
(HC3-P*) DC12V	12	160				
DC24V	24	650				
DC48V	48	2,600				
DC110V	110	11,000				
HC3— AC6V	6VAC	—	approx. 1.2VA	3C	7	
(HC3-P*) AC12V	12	—				
AC24V	24	—				
AC48V	48	—				
AC115V	115	—				
HC4— DC6V	6VDC	40	approx. 900	4C	5	2
(HC4-P*) DC12V	12	160				
DC24V	24	650				
DC48V	48	2,600				
DC110V	110	11,000				
HC4— AC6V	6VAC	—	approx. 1.2VA	4C	5	2
(HC4-P*) AC12V	12	—				
AC24V	24	—				
AC48V	48	—				
AC115V	115	—				

Notes: 1. *: P denotes PC terminal relay.
2. Standard packing → Carbon: 20 pcs./Case: 200 pcs. or 800 pcs.
3. Top mounting (TM) types available.

HC Sockets

Solder Socket	Socket for PC board	Socket for Wrapping	Screw Terminal Socket
HC1-SS	HC1-PS	HC1-WS	HC-HSF
HC2-SS	HC2-PS	HC2-WS	HC2-SF
HC3-SS	HC3-PS	HC3-WS	HC3-HSF
HC4-SS	HC4-PS	HC4-WS	HC Bracket
			HC Mounting Strip
			HC2-SFD
			HC3-SFD
			HC4-SFD

Note: —SFD types are for DIN rail mounting.

Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

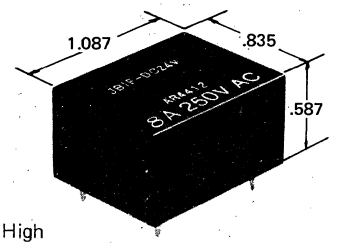
Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

Compact Power Relays JB-RELAYS



- High dielectric strength —10,000V surge in 1x40 μsec. between coil and contact
- Flux resistant construction
- More than 0.3" terminal pitch

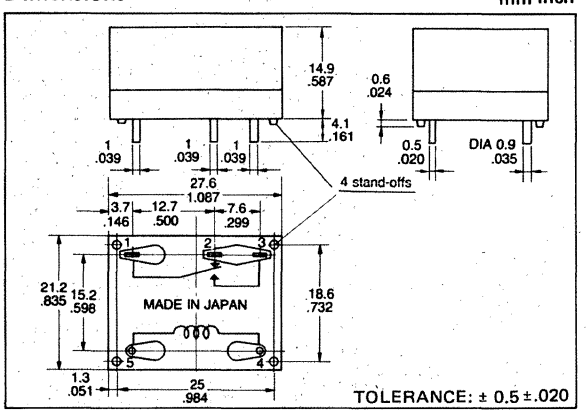
Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
JB1F–	DC 5V	5VDC	52	480	1C	8
	DC 6V	6	75	480		
	DC12V	12	300	480		
	DC24V	24	1,200	480		
	DC48V	48	4,100	560		

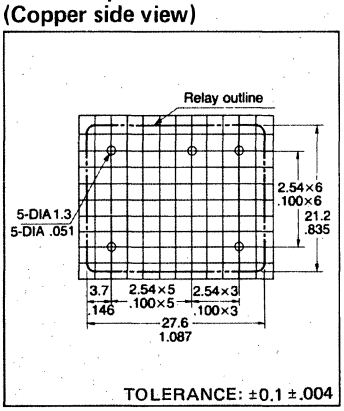
Note: Standard packing → Carton: 20 pcs./Case: 200 pcs.

Dimensions

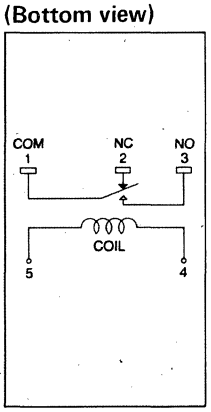
mm inch



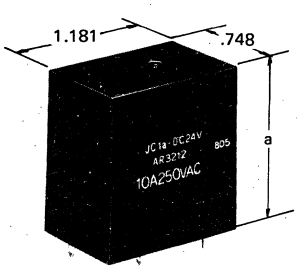
PC board pattern (Copper side view)



Schematic (Bottom view)



Compact Power Relays JC-RELAYS



	a
PC board type	1.181
Top mount type	1.201
Plug-in type	1.181

- High inrush current capacility.
  1a : 111A inrush (TV-5), 10A steady
  2a : 71A inrush (TV-3), 5A steady
- High dielectric withstanding for transient protection.
  JC can withstand 10,000V surge in 1 x 40 μsec. between coil and contact
- TV-rated types available

Types and Data

Type	Coils			Contacts	
	Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
JC1a– DC 6V	6VDC	40	900	1a	10
(JC1a–S*) 12V	12	160			
(JC1a–TM*) 24V	24	640			
JC2a– DC 6V	6VDC	36	1,000	2a	5
(JC2a–S*) 12V	12	144			
(JC2a–TM*) 24V	24	576			
JC1a1b– DC 6V	6VDC	36	1,000	1a1b	5
(JC1a1b–S*) 12V	12	144			
(JC1a1b–TM*) 24V	24	576			

Notes:
1. S* : Denotes Plug-in terminal types.
2. TM*: Denotes Top mounting types.
3. Sockets for plug-in types also available
4. Upgraded rating types available as JC-F types.
   15A 250VAC 1 HP 125VAC (JC1aF)
   10A 250VAC 1/3 HP 125VAC (JC2aF)
   5A 250VAC 1/3 HP 125VAC (JC1a1bF)
5. Standard packing → Carton: 50 pcs./Case: 200 pcs.

JC Sockets

JC1-SS	PC terminal
JC2-SS	PC terminal
JC1-PS	Solder terminal
JC2-PS	Solder terminal

Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

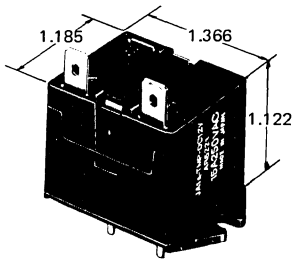
Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

1 Horse Power Compact Power Relays

JA-RELAYS



- High switching capacity – 55A inrush, 15A steady state inductive load
- Particularly suitable for air conditioners, dish waters, copiers and other consumer and office equipment
- Two types available
  "TM" type for direct chassis mounting
  "TMP" types for PCB mounting
- TV-rated types available

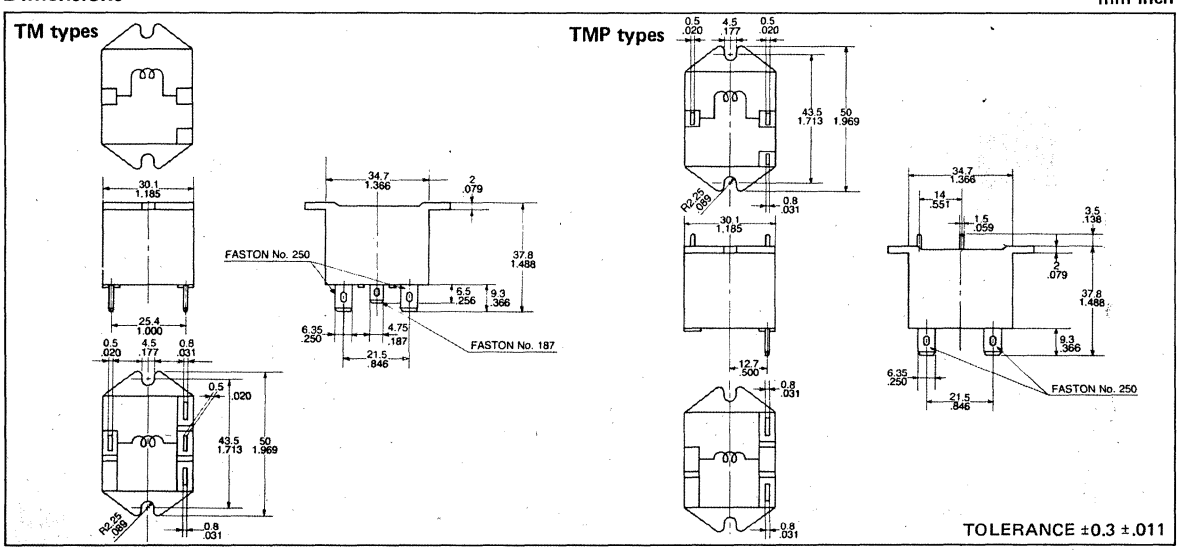
Types and Data

Type	Coils			Contacts	
	Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
JA1a–TM– DC 6V	6VDC	30	1.2W	1a	1 HP
DC12V	12	120	1.2		
DC24V	24	480	1.2		
JA1a–TM– AC24V	24VAC	–	*1.4VA	1a	1 HP
AC115V	115	–	1.4		
AC240V	240	–	1.4		
JA1a–TMP– DC 6V	6VDC	30	1.2W	1a	1 HP
DC12V	12	120	1.2		
DC24V	24	480	1.2		
JA1a–TMP– AC24V	24VAC	–	1.4VA	1a	1 HP
AC115V	115	–	1.4		
AC240V	240	–	1.4		

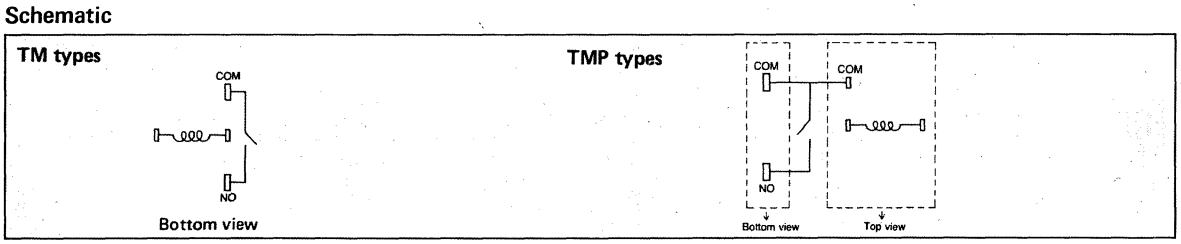
Notes: 1. *1.4VA is nominal operating power at 50Hz.
In case of 60Hz, nominal operating power is 1.3VA.
2. JA1b (1 Form B) and JA1C (1 Form C) versions are available.
3. Terminals
"TM" type : .187" quick-connect terminals for coil and .250" for contacts.
"TMP" type : PC board terminals for coils nd .250" quick connect terminals for contacts.
4. Upgraded rating types available as JA-P types. (25A 250VAC 1HP 125, 250VAC)
5. Standard packing → Carton: 20 pcs./Case: 200 pcs.

Dimensions

mm inch



Schematic



Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

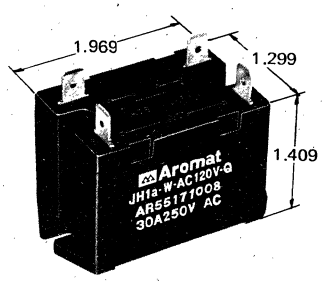
Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

Power Relays with Space Saving Design

JH-RELAYS



- Many safety-oriented characteristics incorporated.
- High dielectric strength — 10,000V surge in μsec.
- High inrush resistance —
  1X : 117A (TV-8 equivalence)
  2X : 91A (TV-6 equivalence)

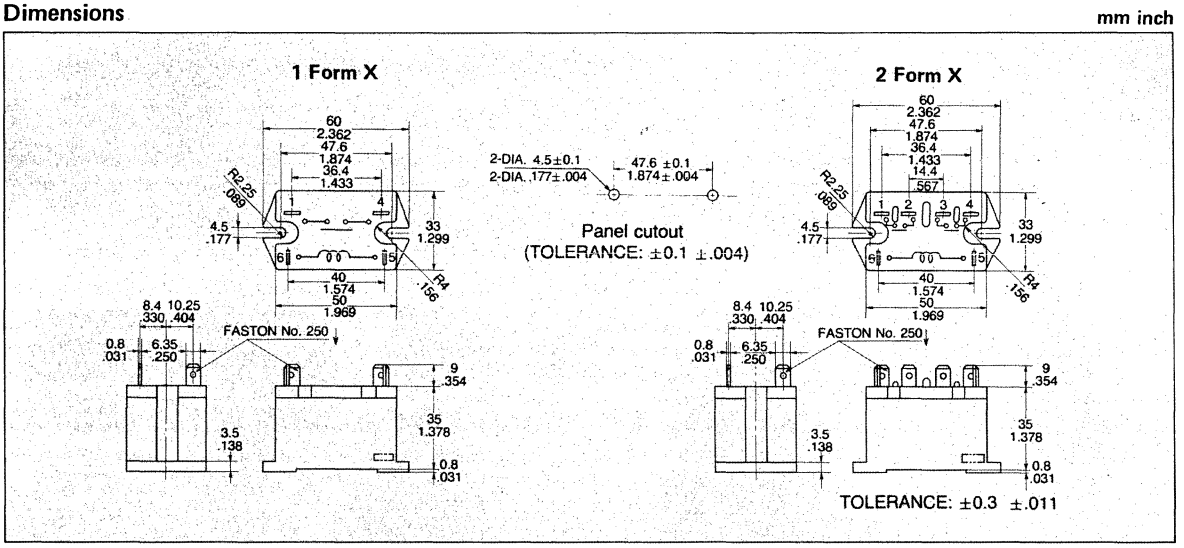
Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
JH1a–W–	DC 6V-Q	6VDC	18.7	1.9 W	1X	30
	DC12V-Q	12	75			
	DC24V-Q	24	300			
	DC110V-Q	110	6,300			
JH1a–W–	AC 6V-Q	6	–	3.2 VA	1X	30
	AC12V-Q	12	–			
	AC24V-Q	24	–			
	AC120V-Q	120	–			
JH2a–W–	DC 6V-Q	6VDC	18.7	1.9 W	2X	20
	DC12V-Q	12	75			
	DC24V-Q	24	300			
	DC110V-Q	110	6,300			
JH2a–W–	AC 6V-Q	6VAC	–	3.2 VA	2X	20
	AC12V-Q	12	–			
	AC24V-Q	24	–			
	AC120V-Q	120	–			

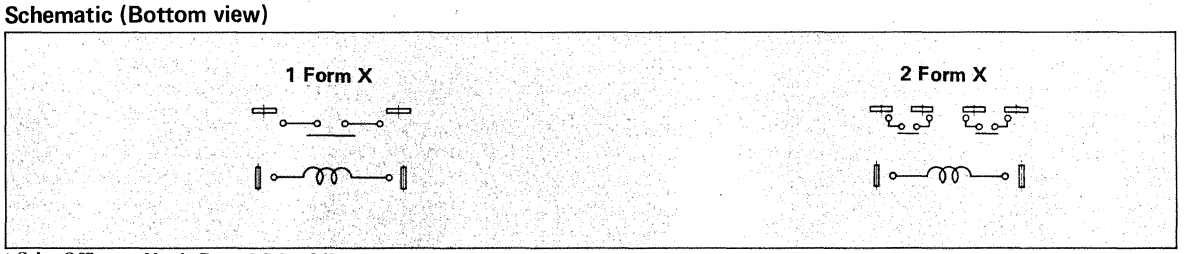
Note: Standard packing →Carton: 20 pcs./Case: 100 pcs.

Dimensions

mm inch



Schematic (Bottom view)



Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

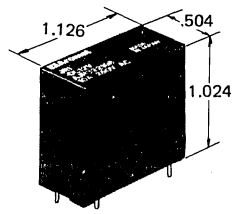
Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

Slim Type Power Relays — JR-RELAYS



- Wide insulation distance: 8 mm .315 between coil and contact
- High dielectric withstanding for transient protection: JR can withstand 10,000 V surge in μsec. between coil and contact.
- High inrush current capability:
  1 Form A: 111 A inrush (TV-5),
  1 Form C: 71 A inrush (TV-3) for N.O. contact
  2 Form A : 71A inrush (TV-3)
  2 Form C . 71A inrush (TV-3) for N.O. contact
  51A inrush (TV-2) for N.C. contact
- Slim package for tandem mounting: Header area is 28.6 mm x 12.8 mm 1.126 x .504
- Molded materials: all 94 V-0

Types and Data

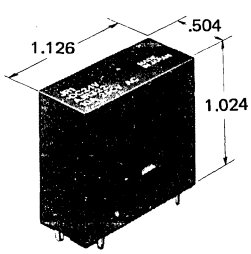
Type		Coils: Voltage	Coils: Res. (Ω)	Coils: Nom. Power (mW)	Contacts: Arrangement	Contacts: Rating (A)
JR1a–	DC6V	6VDC	68	530	1a	10
	DC12V	12	270	530		
	DC24V	24	1,100	530		
	DC48V	48	4,300	530		
JR1–	DC6V	6VDC	68	530	1C	10
	DC12V	12	270	530		
	DC24V	24	1,100	530		
	DC48V	48	4,300	530		
JR2a–	DC6V	6VDC	68	530	2a	5
	DC12V	12	270	530		
	DC24V	24	1,100	530		
	DC48V	48	4,300	530		
JR2–	DC6V	6VDC	68	530	2C	5
	DC12V	12	270	530		
	DC24V	24	1,100	530		
	DC48V	48	4,300	530		

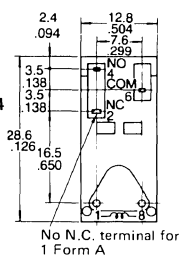
Note: 1. For UL/CSA recognized type, add suffix UL/CSA.
2. Standard packing → Carton : 100 pcs./Case : 500 pcs.

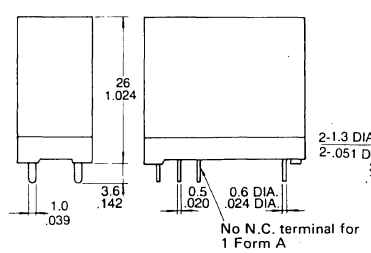
Dimensions

mm inch

1 Form C, 1 Form A

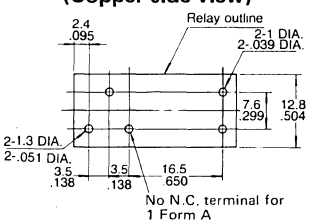






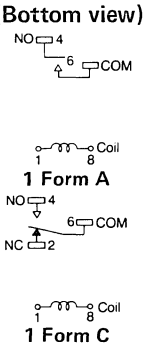
Tolerance ±0.3 .012

PC board pattern (Copper side view)

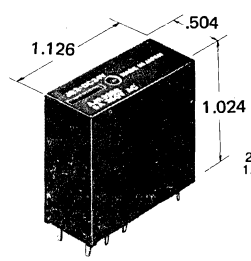


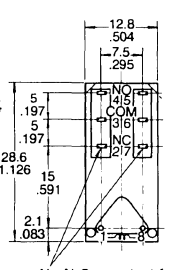
Tolerance: ±0.1 ±.004

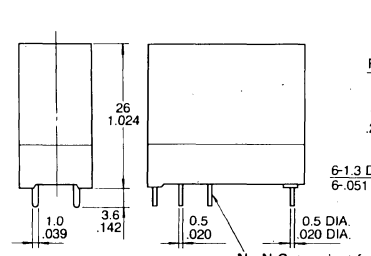
Schematic (Bottom view)



2 Form C, 2 Form A

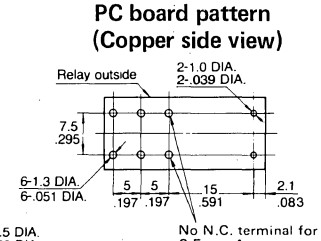






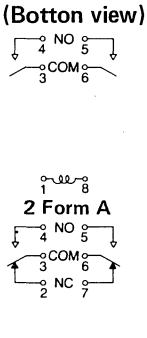
Tolerance: ±0.3 ±.012

PC board pattern (Copper side view)



Tolerance: ±0.1 ±.004

Schematic (Botton view)



Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

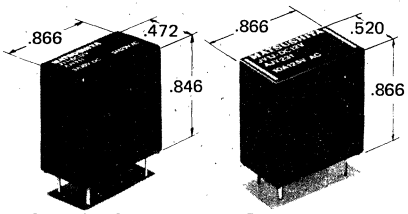
South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

NEW Compact Power Economical Relays — JY-RELAYS



Standard type **Power type**

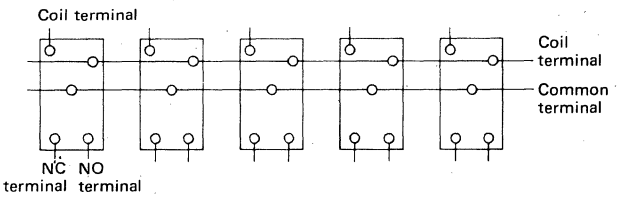
- Three types available: 3A, 5A and 10A
- Compact size: small mounting space for high density packaging
- High dielectric strength for transient protection
  JY can withstand 5,000 V surge in ±(1x40) μsec between coil and contact.
- All plastic materials: UL flame retardance 94V-0
- UL/CSA recognized (Power types are under application)

Types and Data

Type		Coils: Voltage	Coils: Res. (Ω)	Coils: Nom. power (mW)	Contacts: Arrangement	Contacts: Rating (A)
JY1–	DC5V	5VDC	62.5	400	1C	Standard type 3 (F type) 5 (J type) 10
JY1F–	DC6V	6VDC	90	400		
JY1J–	DC9V	9VDC	203	400		
	DC12V	12VDC	360	400		
	DC24V	24VDC	1,440	400		
	DC48V	48VDC	5,760	400		

Note: Standard packing → Carton 100 pcs./Case 500 pcs.

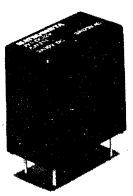
Ease of PC board artwork

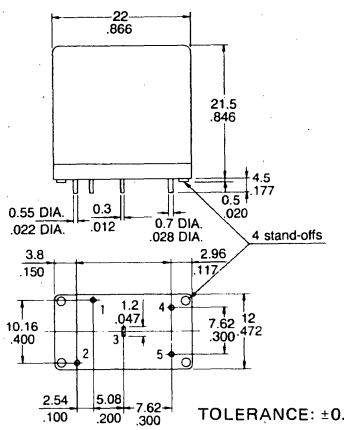


Dimensions

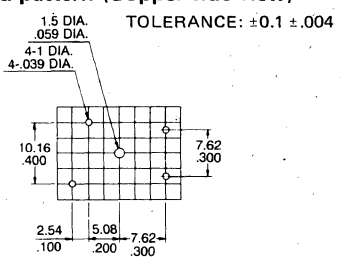
mm inch

Standard type

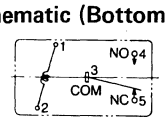




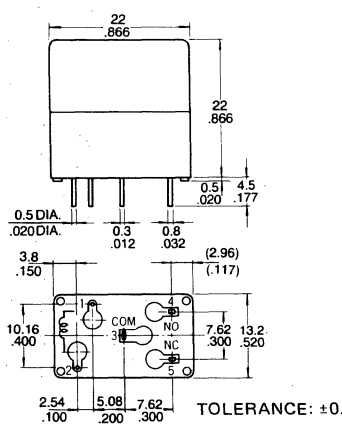
PC board pattern (Copper-side view)



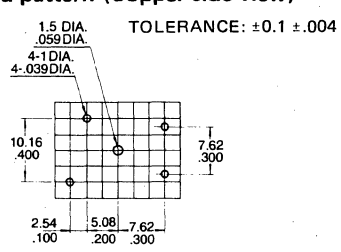
Schematic (Bottom view)



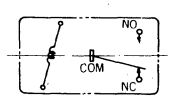
Power types (JY1F and JY1J)



PC board pattern (Copper-side view)



Schematic (Bottom view)



Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

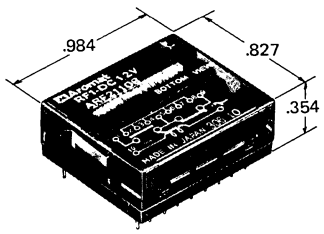
Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

Highly Reliable Miniature High Frequency Relays — RF-RELAYS

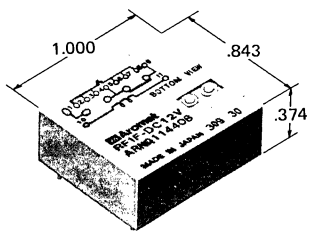


Types and Data

Type		Coils: Voltage	Coils: Res. (Ω)	Coils: Nom. Power (mW)	Contacts: Arrangement	Contacts: Rating (A)
RF1 –	DC5V	5VDC	56	450	1C	0.01A
RF1R–	DC6V	6	80	450		
RF1E–	DC9V	9	180	450		
RF1ER–	DC12V	12	320	450		
	DC24V	24	1,280	450		
	DC48V	48	5,120	450		

Note: 1. Standard packing → Carton : 50 pcs./Case : 500 pcs.

RFE Amber Relays

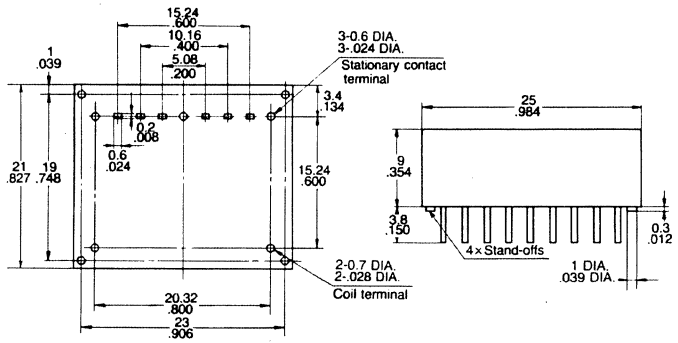


- Excellent high frequency charcteristics
  —Isolation loss: 65 dB min. (900 MHz), Insertion loss: 1.5 dB max (900 MHz).
- Satisfies the high frequency standard of FCC: more than 60 dB isolation loss
- High relaibility and long life
  —Mechanical: more than 5×10^6 operations
  Electrical: more than 10^5 operations
- Compact size and light weight
  —Small mounting space, Unit weight: 9.2 g
- Amber sealed types available
- DIL terminal arrangement: 2.54 mm .1 inch pitch

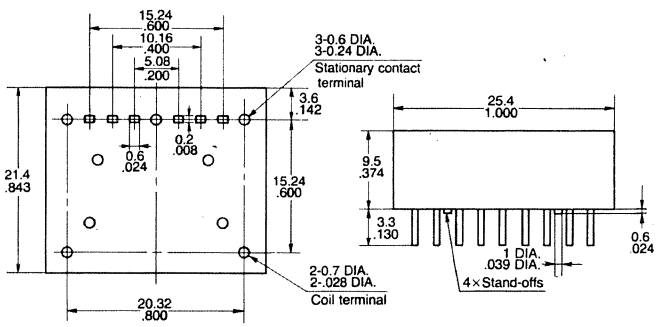
Dimensions

mm inch

RF1, RF1R (Dust Cover Type)

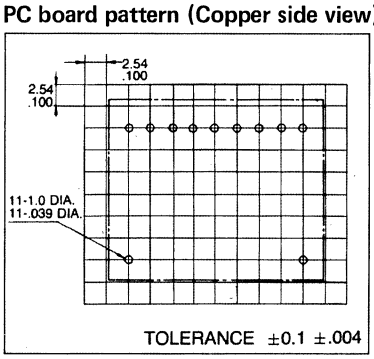


RF1E, RF1ER (Amber Sealed Type)



TOLERANCE: ±0.2 ±.008

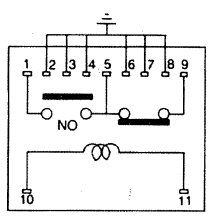
PC board pattern (Copper side view)



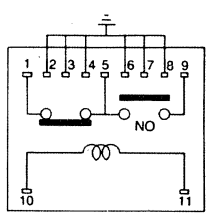
TOLERANCE ±0.1 ±.004

Schematic (Bottom view)

RF1: N.O. Terminal on the left



RF1R: N.O. Terminal on the right



Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

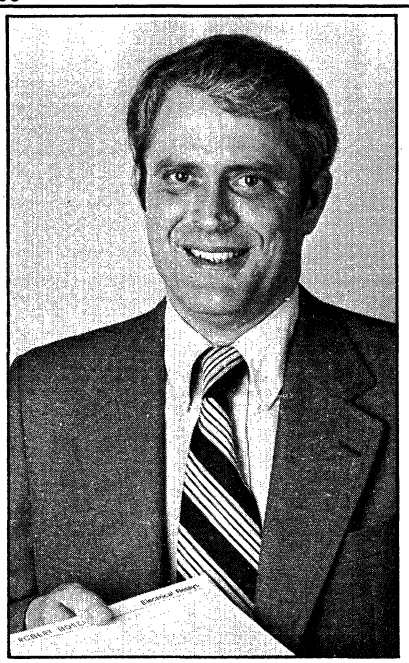
Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group



Dave Robson

"Tell me your relay application and I'll tell you how Bosch Mini-Giants® can help."

Whether it's automobiles or main frame computers, alarm systems or 100-ton cranes, Robert Bosch speaks your language on any of dozens of relay applications. So let's talk.

Whether it's plug-in relays (30 amp; 6, 12 and 24 VDC) or PCBs (15 or 30 amp), let's talk.

Whether your main concern is quality (automated production keeps Mini-Giant® Relays quality consistent) or price (we'll match any of our competitors), let's talk.

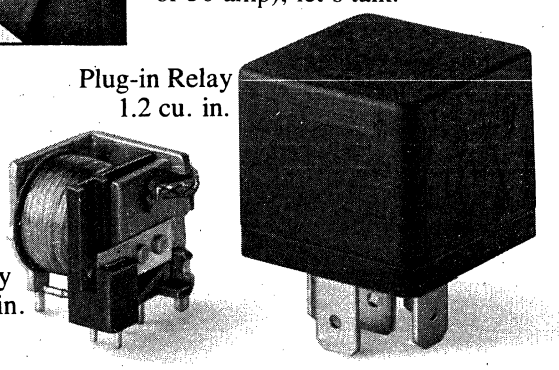
Whether delivery is needed in 24 days or 24 hours, let's talk.

I'm **Dave Robson.** For a free brochure on Robert Bosch Mini-Giant® Relays just phone me, **Mike or Barb,** at **(312) 865-5301.** Or write us at:

Robert Bosch Corporation
Dept. O/SHE
2800 So. 25th Avenue
Broadview, Ill. 60153

Plug-in Relay
1.2 cu. in.

PCB Relay
0.56 cu. in.



OR CALL OUR NEAREST REPRESENTATIVE

NEW ENGLAND
Conti-Younger Associates, Inc.
Massachusetts—(617) 273-1582
Connecticut—(800) 343-5019

NEW YORK
Sonkin Associates
NYC—(914) 668-9809

EASTERN PENNSYLVANIA
William D. Staats Company
(215) 639-5231

NORTHERN ILLINOIS & WISCONSIN
Trend-Tronics, Inc.
(312) 963-2210

MINNESOTA & DAKOTAS
HMR, Inc.
(612) 831-7400

MOUNTAIN STATES
Piper Sales Company
(303) 443-5337

SOUTHERN ILLINOIS & MISSOURI
Rush & West Assoc., Inc.
St. Louis—(314) 394-7271

IOWA & NEBRASKA
Rush & West Assoc., Inc.
Davenport—(319) 326-3091

NORTHWEST
Electronic Component Sales
(206) 232-9301
(503) 245-2342

SOUTHWEST
Luscombe Engineering Co.
(602) 974-6566

CALIFORNIA
Luscombe Engineering Co.
(408) 354-6496
(213) 684-2000
(714) 295-4300

NORTHERN TEXAS, OKLAHOMA & ARKANSAS
J. P. Scanlon Company, Inc.
(214) 231-4661

SOUTHERN TEXAS
J. P. Scanlon Company, Inc.
(512) 258-7717
(713) 370-4908

KANSAS
Rush & West Assoc., Inc.
Kansas City—(913) 764-2700

ALABAMA, LOUISIANA & MISSISSIPPI
20th Century Mkt., Inc.
(205) 533-2981

FLORIDA
D. J. E. Associates Inc.
(305) 321-6623

GEORGIA, SOUTH CAROLINA & TENNESSEE
20th Century Mkt., Inc.
(615) 966-3608

OR CALL OUR DISTRIBUTORS

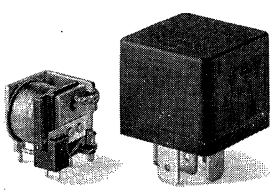
Kin-Tronics
(914) 668-9885

Trend-Tronics Distribution
(800) 323-1697 or
Illinois (312) 963-2210

Bosch Mini-Giant® Relays

Technical Specifications

	LINE NO.	PART NUMBER	TYPE	VOLTAGE	CURRENT SWITCHING MAKE/BREAK CONTACT		SWITCHING CYCLE LIFE		COIL	
					RESISTIVE	LAMP, MOTOR LOAD	RESISTIVE	LAMP, MOTOR INDUCTIVE	RESISTANCE	OPERATING CURRENT
PLUG IN METAL CAP	1	0 332 014 101	SPST Flasher	12V		100W		5,000,000[1]	85±5 Ω	140mA
	2	0 332 014 107	SPST Flasher/W.B.	12V		100W		5,000,000	85±5 Ω	140mA
	3	0 332 014 113	SPST	12V	30/A	24/A	250,000	100,000	85±5 Ω	140mA
	4	0 332 014 125	SPST with Bracket	12V	30/A	24/A	250,000	100,000	85±5 Ω	140mA
	5	0 332 014 213	SPST	24V	20/A	16/A	250,000	100,000	305±15Ω	80mA
	6	0 332 014 203	SPST with Bracket	24V	20/A	16/A	250,000	100,000	305±15Ω	80mA
	7	0 332 015 001	SPST Dual Make Cont.	12V	2x15/A	2x55/W	100,000	50,000	63±3 Ω	200mA
	8	0 332 015 002	SPST Dual Make Cont.	24V	2x10/A	2x70/W	100,000	50,000	210±12Ω	120mA
	9	0 332 015 006	SPST Dual Make Cont. w/o Bracket	12V	2x15/A	2x55/W	100,000	50,000	63±3 Ω	200mA
	10	0 332 204 001	SPDT with Bracket	6V	30/20A	24/16A	250,000	100,000	22±2 Ω	300mA
	11	0 332 204 101	SPDT	12V	30/20A	24/16A	250,000	100,000	85±5 Ω	140mA
	12	0 332 204 125	SPDT with Bracket	12V	30/20A	24/16A	250,000	100,000	85±5 Ω	140mA
	13	0 332 204 201	SPDT	24V	20/10A	16/8A	250,000	100,000	305±15Ω	80mA
	14	0 332 204 203	SPDT with Bracket	24V	20/10A	16/8A	250,000	100,000	305±15Ω	80mA
PLASTIC CAP	15	0 332 014 150	SPST with Bracket	12V	30A	24/A	100,000	50,000	85±5 Ω	140mA
	16	0 332 014 151	SPST	12V	30A	24/A	100,000	50,000	85±5 Ω	140mA
	17	0 332 204 150	SPDT with Bracket	12V	30/20A	24/16A	100,000	50,000	85±5 Ω	140mA
	18	0 332 204 151	SPDT	12V	30/20A	24/16A	100,000	50,000	85±5 Ω	140mA
PC BOARD	19	0 332 016 102	SPST	12V	15/A	12/A	250,000	100,000	85±5 Ω	140mA
	20	0 332 206 001	SPDT Emergency light	6V	15/10A	37/10A	250,000	6,000	32±4 Ω	200mA
	21	0 332 206 101	SPDT	12V	15/10A	12/8A	250,000	100,000	85±5 Ω	140mA
	22	0 332 206 102	SPDT High Resistance	12V	8/4A	6/3A	250,000	100,000	200±10Ω	60mA
	23	0 332 206 105	SPDT Fasher	12V		100W		5,000,000[1]	85±5 Ω	140mA
	24	0 332 206 106	SPDT High Current	12V	30/10A	24/8A	50,000	50,000	85±10Ω	140mA
	25	0 332 206 201	SPDT	24V	10/7A	8/5A	250,000	100,000	305±15Ω	80mA



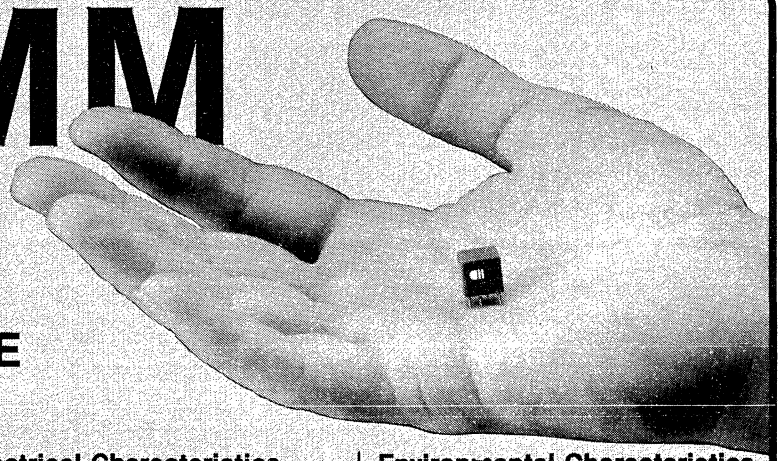
BOSCH

©1985 Robert Bosch Corporation

HIGH PERFORMANCE RELAYS from COMMUNICATIONS INSTRUMENTS, INC.

MIGHTY MICRO MM

THE SMALLEST MICRO-MINIATURE HIGH RELIABILITY INDUSTRIAL GRADE RELAY



Special Features

- Two Form C bifurcated contacts gold clad silver-palladium.
- Rated for low level to 2.0 amp switching.
- Requires only .155 square inch circuit board space, thus permitting a mounting density of more than six relays per square inch.
- Long Life – Mechanical life expectancy more than 100 million operations.
- High shock/high vibration resistance.
- Footprint compatible with .1 inch (2.54 mm) grid arrangement.
- Total volume less than a cubic centimeter.
- Fast operate and release time.
- Low contact resistance.

Electrical Characteristics

Contact Arrangement
CII Type MM relays are suitable for RF switching. The choice of contact materials and careful design assures consistently low contact resistance of 50 milliohms max.

Enclosure
All Communications Instruments type MM relays are epoxy sealed thus permitting automatic printed circuit board processing.

Flammability Rating
All plastic materials used in the construction of Communications Instruments type MM conform to UL 94-VO.

Contact Rating & Life Expectancy

Communications Instruments type MM relay is designed for long life, high reliability switching from low level (Microwatts) up to 2.0 amps. Mechanical life expectancy is 100 million operations.

Maximum voltage: 120 VAC, 150 VDC.
Maximum power switched: 60 watts or 120 VA.

Environmental Characteristics

Ambient Temperature Rating
– 35° to + 70°C.

Vibration Resistance
Functional:
MML 20Gs 10 to 2000 Hz
MMS 15Gs 10 to 2000 Hz
Destructive: 50G, both types

Shock Resistance
Functional:
MML 100G 6 mS Half Sine
MMS 50G 6 mS Half Sine
Destructive: 150G, both types

Operate & Release Time
When tested at nominal rated voltage, the maximum operate time is 3 milliseconds and the maximum release time is 1.5 milliseconds.

Insulation Resistance
Insulation resistance at 500 VDC exceeds 1000 megohms.

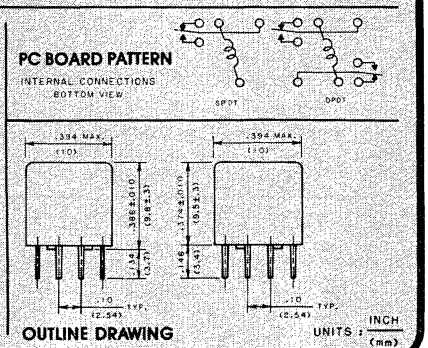
Dielectric Withstanding Voltage
All mutually insulated points – 500 VAC – 1 minute.

Standard Sensitivity, 2 Form C

Part Number	Nominal Voltage (DC)	Coil Resistance Ohms ±10%	Pickup Voltage	Dropout Voltage
MML203	3	20	2.2	0.3
MML205	5	55	3.7	0.5
MML206	6	80	4.2	0.6
MML209	9	180	6.7	0.9
MML212	12	320	9.0	1.2
MML224	24	1280	18.0	2.4

High Sensitivity, 2 Form C

Part Number	Nominal Voltage (DC)	Coil Resistance Ohms ±10%	Pickup Voltage	Dropout Voltage
MMS203	3	28	2.2	0.3
MMS205	5	75	3.7	0.5
MMS206	6	110	4.2	0.6
MMS209	9	250	6.7	0.9
MMS212	12	440	9.0	1.2
MMS224	24	1500	18.0	2.4



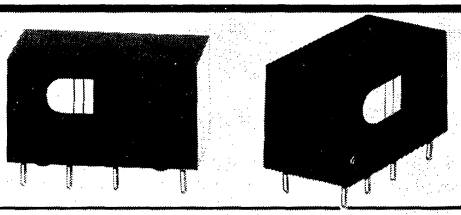
Communications Instruments, Inc.™

P.O. Box 520 • Fairview, North Carolina 28730
704/628-1711 • TELEX 577436 • FAX #704-628-1439
Contact Lee Holt for samples and information.

HIGH PERFORMANCE RELAYS from COMMUNICATIONS INSTRUMENTS, INC.

MINIATURE SEALED DUAL IN-LINE RELAY

MD



Special Features

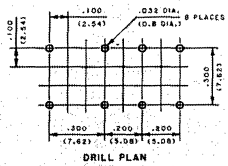
- Two Form C bifurcated contacts - gold clad silver-palladium.
- Standard and high sensitivity models.
- Completely sealed or with optional dust cover.
- Contact rating from low level to 2.0 amps switching - 3.0 amps carry.
- Super clean construction - inert gas filled.
- Designed for low contact resistance and contact resistance stability during life.
- UL recognized component.
- Maximum voltage: 125 VAC, 150 VDC. Maximum power switched: 60 watts or 120 VA.
- Surge resistance - Type MD relay conforms to FCC Part 68-1500 V Peak.

Part Number	Coil Resistance Ohms ±10%
MDL05H	45
MDL06H	66
MDL09H	140
MDL12H	280
MDL24H	1070
MDL48H	4000

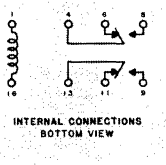
High Sensitivity, 2 Form C

Part Number	Coil Resistance Ohms ±10%
MDS05H	164
MDS06H	240
MDS09H	540
MDS12H	960
MDS24H	2880
MDS48H	7680

PC BOARD PATTERN

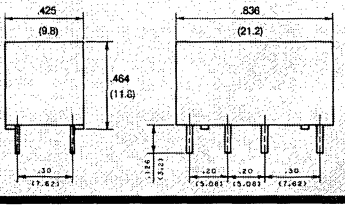


SCHEMATIC



UNITS : INCH / (mm)

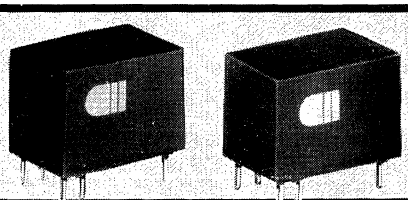
OUTLINE DRAWING



COMM. INSTR.

SEALED SINGLE POLE DUAL IN-LINE RELAY

MS



Special Features

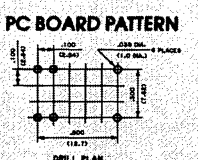
- High reliability switching at low cost.
- Standard and high sensitivity models.
- Gold clad silver-palladium contacts.
- Low contact resistance.
- High shock and high vibration resistance.
- Super clean construction - inert gas filled.
- Low level to 2.0 amps contact switching - 3.0 amps carry.
- UL recognized component.
- Maximum voltage: 120 VAC, 100 VDC. Maximum power switched: 60 watts or 120 VA.

Part Number	Nominal Voltage (DC)	Coil Resistance Ohms ±10%
MSL03	3	20
MSL05	5	56
MSL06	6	80
MSL09	9	180
MSL12	12	320
MSL24	24	1280
MSL48	48	5120

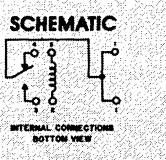
High Sensitivity, 1 Form C

Part Number	Nominal Voltage (DC)	Coil Resistance Ohms ±10%
MSS03	3	45
MSS05	5	120
MSS06	6	180
MSS09	9	400
MSS12	12	700
MSS24	24	2800

PC BOARD PATTERN

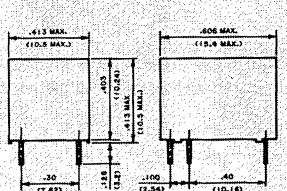


SCHEMATIC



OUTLINE DRAWING

COMM. INSTR.

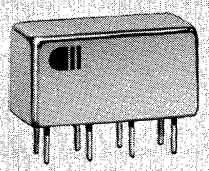


Communications Instruments, Inc.

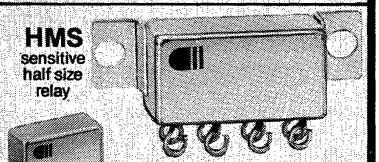
P.O. Box 520 • Fairview, North Carolina 28730
704/628-1711 • TELEX 577436 • FAX #704-628-1439
Contact Lee Holt for samples and information.

HIGH PERFORMANCE RELAYS from COMMUNICATIONS INSTRUMENTS, INC.

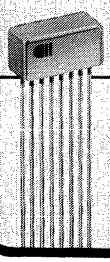
Half Size Relays



HFW
half size miniature relay



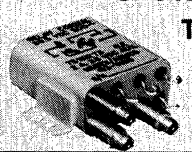
HMS
sensitive half size relay



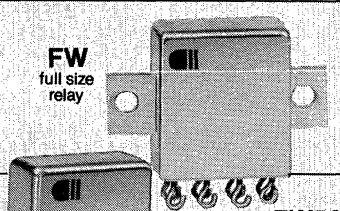
HMB
bifilar transient suppression relay

Contact Data	Coil Voltage	Features
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 4.0 Amps	5 to 48.0 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • Sensitive version available • Excellent RF switching • Ambient temp rating −65°C to +125°C • Qualified to MIL-R-39016/6 level L, M & P *(Request Data Sheet HFW-81)*
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 2.0 Amps	5 to 36.0 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • Energy-saving 100/125 milliwatt sensitivity • Excellent RF switching • Ambient temp rating −65°C to +125°C • Qualified to MIL-R-39016/44 level L, M & P *(Request Data Sheet HMS-83)*
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 3.0 Amps	6 to 32.0 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • Bifilar transient suppression • Excellent RF switching • Ambient temp rating −65°C to +125°C • Qualified to MIL-R-39016/22 level L, M & *(Request Data Sheet HMB-83)*

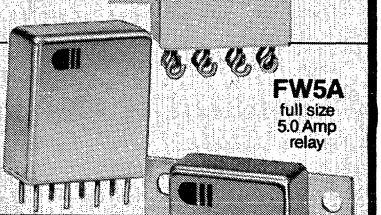
Full Size Relays



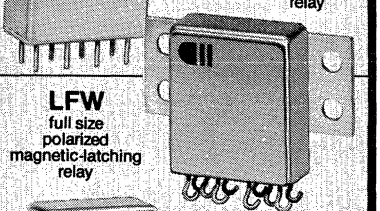
Types 153/95
coaxial relays



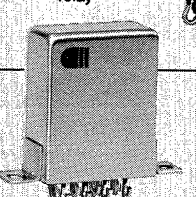
FW
full size relay



FW5A
full size 5.0 Amp relay



LFW
full size polarized magnetic-latching relay



PF
10 Amp miniature power relay

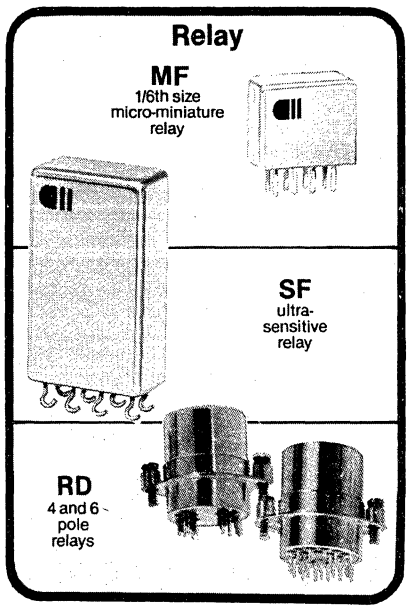
Note: All relays available in a variety of terminals and mountings.

Contact Arrangements: 1 Form C, 2 Form C, RF Contacts — Up to 75 Watts	12 VDC 26.5 VDC	• Hermetic-seal enclosure • RF switch to 1000 MHz • Meets applicable portions of Mil-R-5757 and Mil-S-3928 • Terminates with coax cable • or LEPRA/CON connectors
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 3.0 Amps	6.3 to 110 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • Sensitive version available • Excellent RF switching • Ambient temp rating −65°C to +125°C • Qualified to MIL-R-5757/10 *(Request Data Sheet FW-81)*
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 5.0 Amps	6.3 to 110 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • 5.0 Amp version of FW • Excellent RF switching • Ambient temp rating −65°C to +125°C • Designed to MIL-R-5757 *(Request Data Sheet FW5A-81)*
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 3.0 Amps	3.2 to 110 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • One and two coil operation • Excellent RF switching • Ambient temp rating −65°C to +125°C • Designed to MIL-R-5757/53 *(Request Data Sheet LFW-81)*
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 10.0 Amps	6.3 to 110 VDC	• Welded, hermetically sealed enclosures • Very low contact resistance • Package volume .72 cubic inch • Excellent RF switching • Ambient temp rating −65°C to +125°C • Designed to MIL-R-5757/23 & 28 *(Request Data Sheet PF-83)*

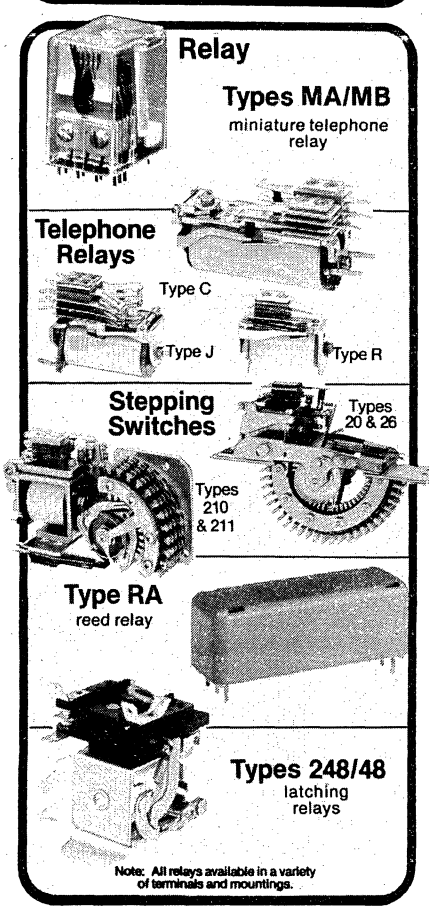
Communications Instruments, Inc.™

P.O. Box 520 • Fairview, North Carolina 28730
704/628-1711 • TELEX 577436 • FAX #704-628-1439
For samples and information on our products, contact:
DAVE ARROWOOD Sales Manager for Crystal Can Relays

HIGH PERFORMANCE RELAYS from COMMUNICATIONS INSTRUMENTS, INC.



Contact Data	Coil Voltage	Features
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 1.0 Amp	3.4 to 53.0 VDC	• Hermetically sealed enclosures • Low contact resistance • Total volume only .046 cubic inch • Excellent RF switching • Ambient temp rating −65°C to +125°C • Designed to MIL-R-39016/34 *(Request Data Sheet MF-81)*
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 3.0 Amps	1.8 to 48.0 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • 40 milliwatt sensitivity • Excellent RF switching • Ambient temp rating −65°C to +125°C • Designed to MIL-R-5757/13 *(Request Data Sheet SF-81)*
Contact Arrangements: 4 Form C 6 Form C Contact rating: low level to 2.0 Amps	18.0 to 36.0 VDC	• Hermetically sealed enclosures • Low contact resistance • Optional all-welded construction • 100 G shock • Ambient temp rating −65°C to +125°C • Qualified to MIL-R-5757/1 & 7 *(Request Data Sheet RD-83)*



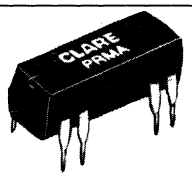
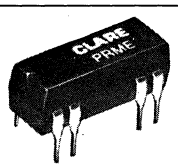
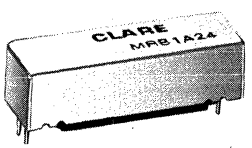
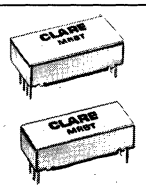
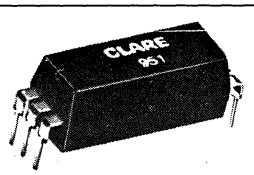
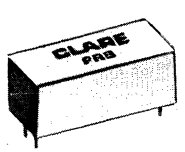
Contact Arrangements: MA—4 pole MB—6 pole Contact rating: low level to 2.0 Amp.	5 to 110.0 VDC	• 4 pole and 6 pole contacts • Small size • Versatile contacts—bifurcated low level to 2 Amperes • Low cost • PCB or plug-in mounting
Contact Arrangements: Long frame: up to 8 Form C Med. frame: up to 8 Form C Short frame: up to 4 Form C Contact rating: low level to 10.0 Amps	6 to 250 VDC	• Optional hermetic sealing • Ac or dc operation • Fast operate and fast release • Variety of accessories • Ambient temp rating −55°C to +85°C • Custom designs available *(Request Catalog 502)*
Point variations: 10 to 52 point operation Contact rating: 0.1 Amp at 115 VAC or 30 VDC resistive Carry: 3.0 Amps	6 to 110 VDC	• Optional sealing • Insulation resistance $10^9\ \Omega$ at 500 VDC • Fast operate and release times • Variety of switch mounting accessories • Operating temperature −0°C to +85°C • Custom designed models available *(Request Catalog 601)*
Contact Arrangements: 1 Form A Contact rating: 10 Watts, 200 VDC		• Dry reed 1 Form A relay • Designed to meet AT&T Part 327 • Single or dual-wound coil • DC current operation • Life of 100 million operations
Contact Arrangements: 2 Form C, 1 Form C, Contact rating: 15 Amp/120 VAC 10 Amp/240 VAC	6 to 240 VAC 6 to 110 VDC	• Mechanical latch relay • Eliminates continuous current • UL/CSA recognized • Quick-connect terminals • Chassis mounting flange

™ Communications Instruments, Inc.

P.O. Box 520 • Fairview, North Carolina 28730
704/628-1711 • TELEX 577436 • FAX #704-628-1439
For samples and information on our products, contact:
DAVE ARROWOOD Sales Manager for Crystal Can Relays
BOB MILLER: Product Manager for Telephone Relays and Stepping Switches

CLARE Dry Reed Relays

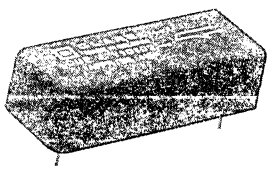
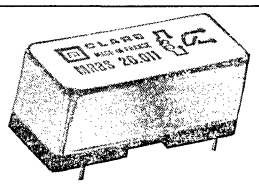
GENERAL INSTRUMENT

RELAY TYPE	TERMINAL TYPE/GRID	CONTACT FORMS AVAILABLE	NOMINAL VOLTAGE	DESCRIPTION
DYAD PRMA	.300 x .100 Dual-in-line Package (DIP)	Form A (1 & 2) Form B (1 only)	5 Vdc 12 Vdc 24Vdc	The new bifurcated DYAD® series yields improvements in speed and contact life reliability. Life at signal load: 250 million operations.
 **PRMA**	.300 x .100 Dual-in-line Package (DIP)	Form A (1 & 2) Form B (1 only) Form C (1 only)	5 Vdc 12Vdc 24Vcd	Molded construction. Diode and electrostatic shield options. Life at rated load: 5 million operations.
 **PRME**	.300 x .100 Dual-in-line Package (DIP)	Form A (1 only)	5 Vdc 12 Vdc 24 Vdc	Low profile molded construction. Available with diode and/or shield. Life at rated load: 5 million operations.
 **MRB/922**	1.00 x .100 1.00 x .150	Form A (1 to 6) Form B (1 & 2) Form A/B (1 & 2) Form C (1 to 4) Form AL (1 & 2)	5 Vdc 6 Vdc 12 Vdc 24 Vdc	Industry standard in "microreed" size reed relays. Metal cover and versatile design. Life at rated load: 10 million operations.
 **MRBT**	1.00 x 0.10	Form A (2 & 3)	5 Vdc 12 Vdc 15 Vdc	Microreed relay designed to minimize thermal voltage errors in low-level circuits. Life at rated load: 10 million operations.
 **951**	1.00 x .100	Form A (1, 2 & 4) 3-pole and 5-pole available	5 Vdc 12 Vdc 24 Vdc	Epoxy-molded equivalent of MRB metal covered relay. Rugged lead frame construction. Life at rated load: 5 million operations.
 **PRB**	.700 x .100	Form A (1 & 2) Form B (1 only)	5 Vdc 6 Vdc 12 Vdc 24 Vdc	Magnetic shielding option with a ferrous cover in a high density package design. Life at rated load: 5 million operations.
DSS3	.7 x .10	1A	5 Vdc 12 Vdc 24 Vdc	Low profile, fully sealed with an insulated metal cover for electromagnetic shielding. RF shield and electrostatic shield options. Low dielectric absorption. Life at low to signal loads: 250 million operations minimum.

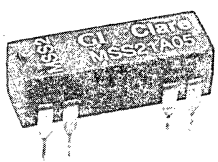
CLARE DIVISION, 3101 W. Pratt Avenue, Chicago, Illinois 60645 • 312/262-7700

CLARE Dry Reed Relays

GENERAL INSTRUMENT

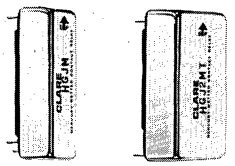
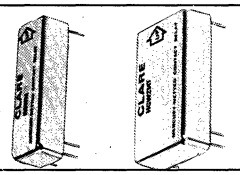
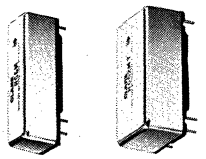
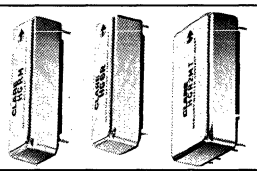
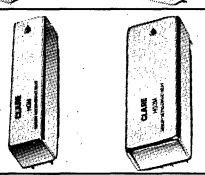
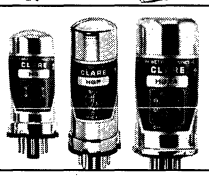
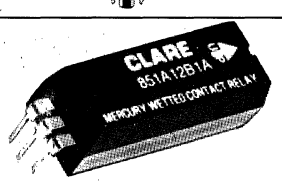
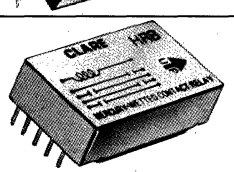
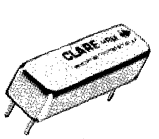
RELAY TYPE	TERMINAL TYPE/GRID	CONTACT FORMS AVAILABLE	NOMINAL VOLTAGE	DESCRIPTION
DSS4	SIP, .2 x .2 x .2	1A	5 Vdc 12 Vdc 15 Vdc 24 Vdc	Molded, single-in-line. Diode option. High isolation input to output. Life at low to signal loads: 250 million operations.
 CUP (1), CUP (V)	Staggered	1A–5A 1B 2B 1AB 1A1B 2AB 1A Latch 2A Latch	5 Vdc 6 Vdc 12 Vdc 24 Vdc 48 Vdc	Open, plastic and metal cover types available. Fully sealed versions available upon request. Staggered pin-out. Life at low to signal loads: 100 million operations. CUP (V) version offers 2000 VRMS Breakdown contact to coil and has British standards approvals.
 MRBS	1 x .10	1A	4 Vdc 5 Vdc 12 Vdc	Can be driven directly from CMOS circuits. A line loop version which allows a permanent and direct loop-control without the need of being disconnected from the circuit is also available. Life at low to signal loads: 20 million operations.

CLARE Mercury-Wetted Contact Relays

RELAY TYPE	TERMINAL TYPE/GRID	CONTACT FORMS AVAILABLE	NOMINAL VOLTAGE	DESCRIPTION
 MSS2	DIP, .3 x .10	1A	5 Vdc 12 Vdc 24 Vdc	Mercury-wetted contact relay that can be mounted in any position. Epoxy-molded construction, dual-in-line package. Life at rated load: 100 million operations with proper contact protection.
CUP (5)	Staggered	1A–5A 1B 2B	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Mercury-wetted contact relay. Staggered pin-out. Life at rated load: 100 million with proper contact protection. 2A, 30VA contact rating.
CUP (6)	Staggered	1A–5A 1B 2B	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Mercury-wetted contact relay that can be mounted in any position. Fully sealed construction, staggered pin-out. Non-conductive plastic cover with internal magnetic shield. Life at rated load: 100 million operations with proper contact protection.
MMRB	1 x .1, 1 x .15	1A–6A	5 Vdc 12 Vdc 24 Vdc	Mercury-wetted contact relay that can be mounted in any position. Electromagnetic shielding standard on a 1 x .10 inch in-line pin-out. Life at rated load: 100 million operations with proper contact protection.
MHC	1 x .10	1C 2C	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Miniature mercury Form C relay. Fully sealed construction, 1 x .10 inch in-line pin-out. Life at rated load: 1 billion operations. 1A, 50VA contact rating.

CLARE Mercury-Wetted Contact Relays

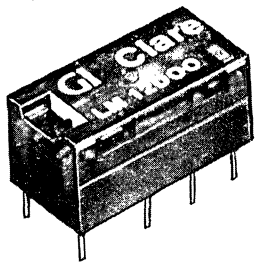
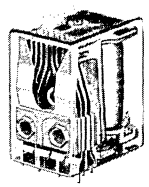
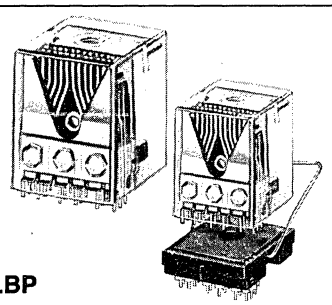
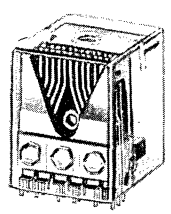
GENERAL INSTRUMENT

RELAY TYPE	TERMINAL TYPE/GRID	CONTACT FORMS AVAILABLE	NOMINAL VOLTAGE	DESCRIPTION
HGJM **HGJ2MT** 	1.400/1.200 x .100 staggered	1C 2C (Break-Before-Make)	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Highest speed mercury-wetted contact relay. Life at 2A, 100VA rated load: 20 billion operations with contact protection. Low noise, high repetition rate. Stable at 200 Hz.
HGWM **HGW2MT** 	1.20 x .100	1C 2C	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Compact package mercury-wetted relay. Life at rated load: 20 billion operations. Same characteristics as HGJM.
HGSM **HGS2MT** 	1.800/1.500 x .200 staggered	1C 1D 2C 2D	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Sensitive mercury-wetted relay. Life at 2A rated load: 20 billion operations with contact protection. 120 Hz repetition rate.
HGRM **HGR2MT** **HGSR** 	1.400/1.200 x .100 staggered	1C 1D 2C 2D	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Small mercury-wetted relay. Life at rated load: 20 billion operations with contact protection. Same contact characteristics of HGSM.
HGM **HG2M** 	3.000/2.400 x .200 staggered	1D 2D (Make-Before-Break)	12 Vdc 24 Vdc 48 Vdc	High current (5.0A, 250VA) mercury-wetted module. Life at rated load: 20 billion operations with contact protection. 80 Hz maximum repetition rate.
HG **HGP** **HG2A** 	8, 11 and 14 Pin Plugs	1D 2D	As Required	Heavy duty (5.0A, 250VA) mercury-wetted plug-in relays. Life at rated load: 20 billion operations with contact protection.
HGS	8 Pin Octal Plug	1C 1D	As Required	Sensitive mercury-wetted plug-in relay. Life at rated load: 20 billion operations with contact protection. 2A, 100VA contact rating.
851 	1.300 x .100	1A 2A 4A (Normally Open)	5 Vdc 12 Vdc 24 Vdc	Mercury-wetted reed, epoxy molded. End lead construction. Life at rated load: 1 billion operations. .5A, 50VA contact rating.
HRB 	1.00 x .150	1A thru 5A	5 Vdc 12 Vdc 24 Vdc	Mercury-wetted reed, metal cover. Standard grid spacing. Life at rated load: 1 billion operations. .5A, 50VA contact rating.
HRM 	.800 x .150	1A	5 Vdc 12 Vdc 24 Vdc	Subminiature form A module for PCB mounting. Life at rated load: 1 billion operations with contact protection. .5A, 50VA contact rating.

CLARE DIVISION, 3101 W. Pratt Avenue, Chicago, Illinois 60645 • 312/262-7700

CLARE Electromechanical Relays

GENERAL INSTRUMENT

RELAY TYPE	TERMINAL TYPE/GRID	CONTACT FORMS AVAILABLE	NOMINAL VOLTAGE	DESCRIPTION
 **LM**	Dual-in-line Package (DIP)	2C 2C Latch	3 Vdc 5 Vdc 6 Vdc 12 Vdc 24 Vdc 48 Vdc	Miniature dual-in-line package. Epoxy sealed. Bifurcated contacts for more reliable switching - 2 coil latching version available. Life at low to signal level loads: 10 million operations.
 **LA**	.100 in-Line	4 Form C	6 Vdc 12 Vdc 24 Vdc 30 Vdc 48 Vdc	Low-cost miniature relays offer high switching capacity and versatility for their size. Bifurcated contacts switch from low level to 2 ampere full rated loads. Life at rated load: 100 thousand operations.
 **LB, LBP**	.100 in-Line	6 Form C	6 Vdc 12 Vdc 15 Vdc 18 Vdc 24 Vdc 30 Vdc 36 Vdc 48 Vdc	Miniature relays offer high switching capacity and versatility at low cost. Bifurcated contacts switch from low level to 2 ampere full rated loads. LB series is designed for direct plug into socket mounting. Life at rated load: 100 thousand operations.
 **LC**	.10 in-Line	12A 6A6C 6B6C 6A6D 6B6D 6A4C2D	As Required	Low-cost relay offering the highest switching capacity—to 12 poles. Bifurcated contacts switch from low level to 2 Amps. Versatility allows combinations of contact forms A, B, C, and D. Life at low to signal loads: 10 million operations.

CLARE DIVISION, 3101 W. Pratt Avenue, Chicago, Illinois 60645 • 312/262-7700

GENERAL INSTRUMENT

CLARE CIRCUIT PROTECTION — Surge Arrester Selection Guide

PRODUCT	VOLTAGE RATINGS	APPROXIMATE SIZE AND MOUNTING METHOD	PHYSICAL CONSTRUCTION	SPECIAL FEATURES
Comgap (CG)	75V-1000Vdc	.265″ L x .380″ Dia. Solder Leads .892″ L	Ceramic/Metal	Small Size
				Rugged Ceramic Construction
		P/C Mtg.		Low Capacitance < 1.5 pF
		Mtg. Clips for Units w/o Leads		High Peak Current Capability > 10kA
Comgap (TG1742)	75-470Vdc	.59″ L x .20″ Dia. Solderable Radial Leads 1.0″ L	Ceramic/Metal	Miniature Size
				Fail-Safe
				Non-Radioactive
				Meets French and British Telecom Specifications
Uni-Imp® (UBD, UBT)	550V-20kVdc	1.0″ L x .560″ Dia.	Glass/Metal	Ultra Fast Protection
		Solder Lugs		No Overshoot (DC to 200kV/μS)
				Life: Thousands of Operations
Spark Gaps (SB & SG)	400V-40kVdc	3.562″ L x 1.202″ Dia.	Glass/Metal	Sub-Microsecond Response Time
		Solder Lugs		Electrical Energy Transfer
		Ferruled Ends for Clip Mtg.		DC Overvoltage Protection
Triggered Spark Gaps (TA & TB)	1.0kV-25kVdc	75″ H x .66″ Dia.	Ceramic/Metal	Command Energy Switching
		Solder Lugs		
		2.10″ H x 2.82″ Dia. Stud Screw Mfg.		DC Overvoltage Protection
				Rugged Construction
DIP Protector (ESP 1)	90-470Vdc	.77″ L x .27″ W x .27″ H	Epoxy-Molded	Dual-in-Line
		DIP with 4 Tinned Pins PCB Mounting		Automatically Insertable
Hybrid Protector Module (ESP 2)	5-150Vdc	1.0″ L x 1.12″ W x .43″ H	Epoxy-Molded	Dual-in-Line
		DIP with Tin-Plated Pins		Combines high current capability of plasma surge arrester with fast operating speed and low voltage clamping of SUPERSORB, to provide *complete* protection
		PCB Mounting		
Transient Suppression Diodes (SUPERSORBS)	6.8-400Vdc	600W: .220″ L x .105″ Dia.	Epoxy-Molded Plastic	Three power ratings: 600 Watts, 1500 Watts, 5000 Watts
		1500W: .330″ L x .200″ Dia.		
		5000W: .350″ L x .350″ Dia.		Fast Response
		Solderable Axial Leads 1.0″ L		

Sales Office Listing

United States

Clare Division
General Instrument Corporation
36 Commerce Way
Woburn, MA 01801
Tel. (617) 938-0666

Clare Division
General Instrument Corporation
2355 S. Arlington Heights Rd.
Arlington Heights, IL 60005
Tel. (312) 981-0630

Clare Division
General Instrument Corporation
3322 S. Memorial Pkwy.
Huntsville, AL 35801
Tel. (205) 883-9130

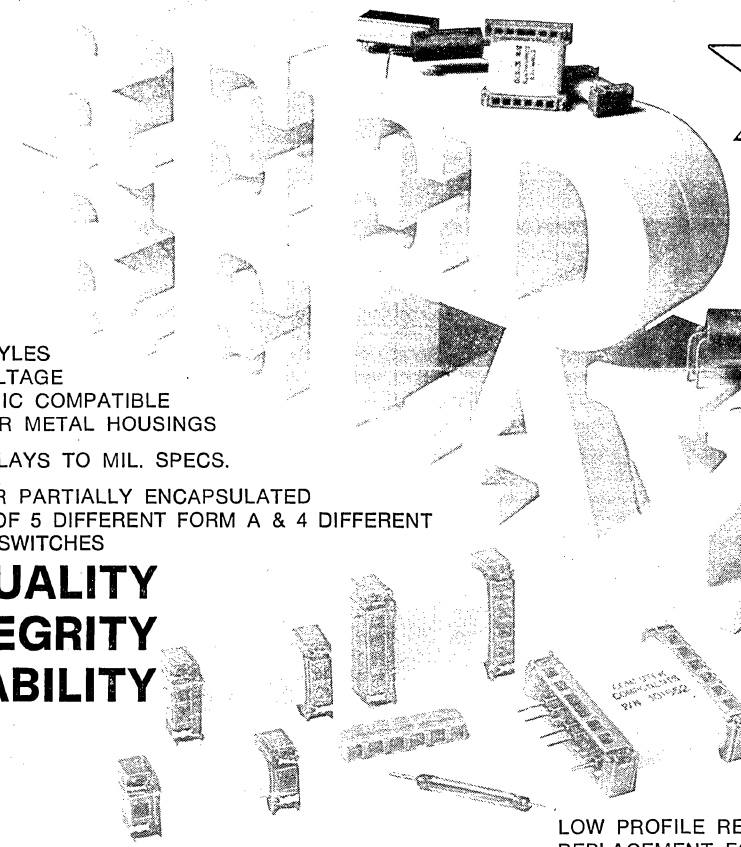
Clare Division
General Instrument Corporation
201 Standard Street
El Segundo, CA 90245
Tel. (213) 322-7745

GENERAL INSTRUMENT

Clare Division
General Instrument Corporation
3101 W. Pratt Ave.
Chicago, IL 60645
1-312-262-7700
TELEX: 25-3775

We Help You Compete®

©Copyright 1985 by Clare Division, General Instrument Corporation. All rights reserved. Printed in U.S.A.



Introducing "REEDLAYS" Solid State Relays Built to Customer Specification

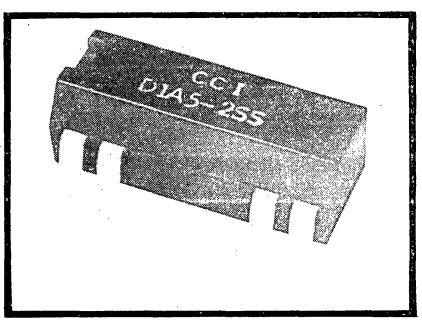
- OPEN STYLES
- HIGH VOLTAGE
- MOLDED IC COMPATIBLE
- EPOXY OR METAL HOUSINGS
- REED RELAYS TO MIL. SPECS.
- FULLY OR PARTIALLY ENCAPSULATED
- CHOICE OF 5 DIFFERENT FORM A & 4 DIFFERENT FORM C SWITCHES

QUALITY INTEGRITY RELIABILITY

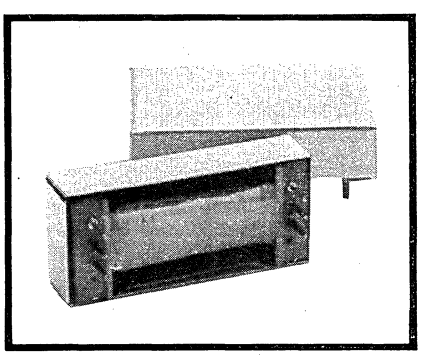
HP (Also 101, 201, 301, & 401 Series)

LOW PROFILE REED RELAY, MECHANICAL & ELECTRICAL REPLACEMENT FOR IBM 766 SERIES PLUG-IN, REPLACE REEDS, NO TOOLS-NO SOLDERING

"D" SERIES



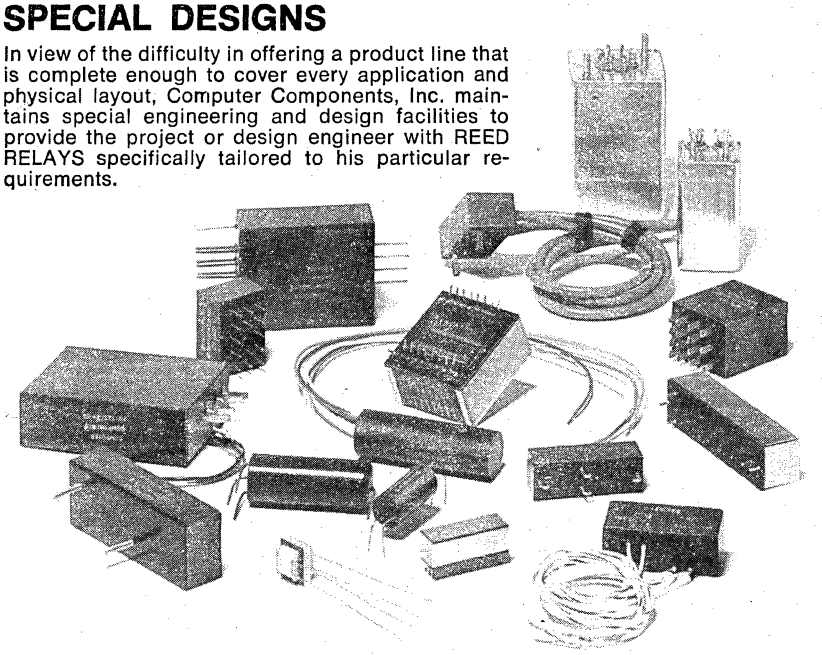
Introducing our "D" series, fully moulded D.I.P. compatible relay. Also formed surface mounting.



"LTE" series—Low Thermal Reed Relays

SPECIAL DESIGNS

In view of the difficulty in offering a product line that is complete enough to cover every application and physical layout, Computer Components, Inc. maintains special engineering and design facilities to provide the project or design engineer with REED RELAYS specifically tailored to his particular requirements.



CALL OR WRITE FOR SALES REPRESENTATIVE OR CATALOGUE

COMPUTER COMPONENTS INC.
629 FIFTH AVENUE, PELHAM, NEW YORK 10803 • (914) 738-1611

eem MINIGLOSSARY ELECTROMECHANICAL RELAYS

RELAYS

Hybrid: Isolated input and output either with a solid-state input and an electromechanical output or vice versa. Typically a reed switch is used to trigger a solid-state output or a solid-state amplifier is used to trigger an electromechanical relay.

Differential: Have multiple windings to function when voltage, current and/or power difference reaches a specific level or value.

Close-differential: The dropout value is specified close to the pickup value.

Frequency sensitive: Operates at a set frequency or within specific frequency bands. A resonant reed, for example.

Hermetically sealed: Totally sealed by glass-to-metal or metal-to-metal seals to ensure very low rates of gas leakage over long time periods.

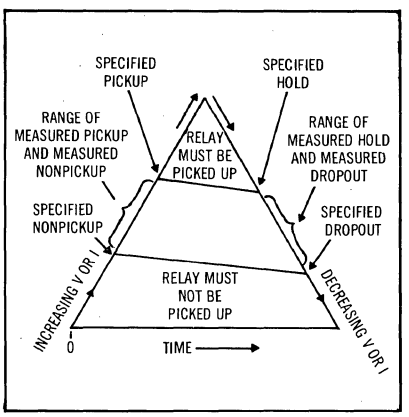
Encapsulated: Imbedded in a suitable potting compound.

Sealed: Enclosed in a relatively airtight cover. (Not the same as hermetically sealed.)

Covered: Unsealed metal or plastic enclosure or housing.

CONTACTS

Dry circuit: contacts that carry current but do not open or close during energizing of the load circuit. Often wrongly used in reference to low level contacts.



Low Level: Contacts controlling relatively low voltages and low currents. Generally below 5 Vdc and 10mA.

OPERATING CHARACTERISTICS

Measured dropout: The value at which all contacts restore to their unoperated position as current or voltage decreases.

Specified dropout: The value at or *above* which all contacts *must* restore to their unoperated position as voltage or current is decreased.

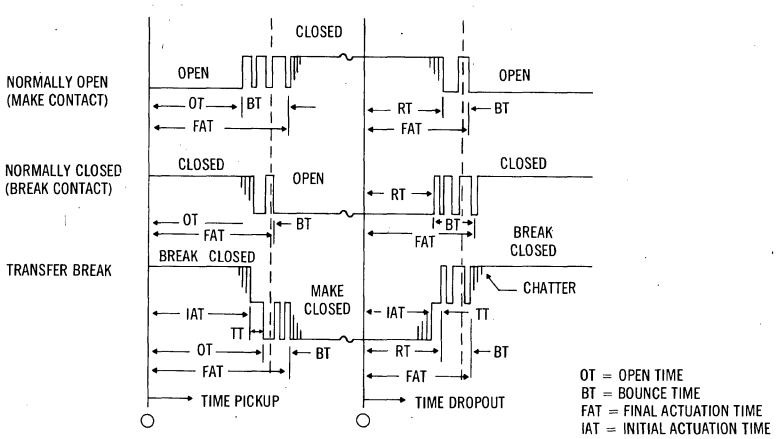


Fig. 2. Typical time vs. current (non-inductive load)

Specified hold: The value that *must* be reached before any contact change occurs as voltage or current is decreased on an operated relay.

Specified nonpickup: The value that *must* be reached before any contact change occurs as voltage or current decreases on an unoperated relay.

Measured pickup: The value at which all contacts function as voltage or current increases on an unoperated relay.

Specified pickup. The value at or *below* which all contacts *must* function as voltage or current increases on an unoperated relay.

Sensitivity: Specified pickup expressed in watts.

Normal bridging: The make-before-break action between adjacent contacts on relays designed for this purpose.

Abnormal bridging: The undesired closing of contacts caused by a metal bridge or protrusion developed by arcing.

Magnetic freezing: Sticking of the armature to the core as a result of residual magnetism.

TIME

Actuation: The interval from coil energization or de-energization to the functioning of a specified contact.

Initial actuation: The interval from coil energization or de-energization to the *first* closing or opening of a previously open or closed contact.

Final actuation: Sum of initial actuation *and* bounce intervals following an actuation.

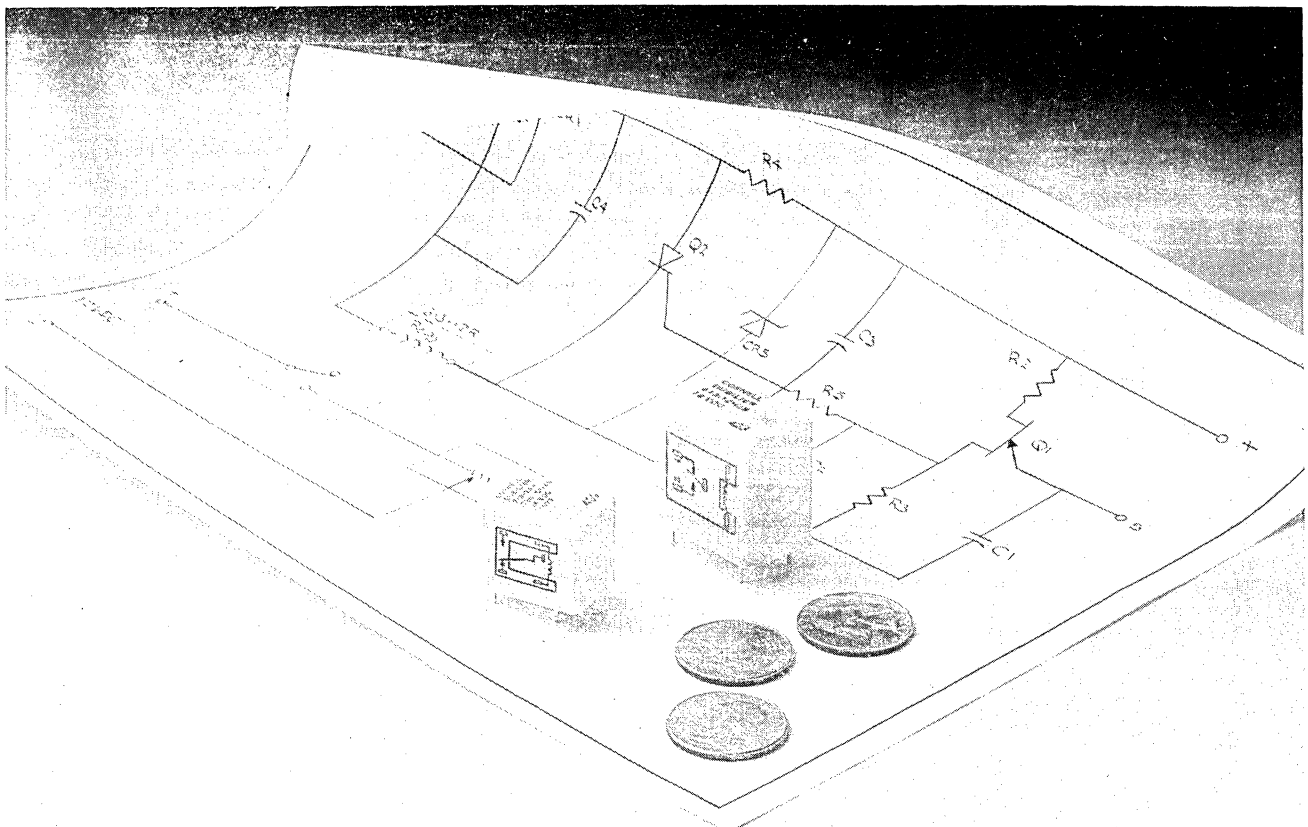
Contact bounce: The interval from close or opening of a contact to the end of the bounce of "chatter."

Chatter: See bounce.

Operate: Normally taken as the interval between energization and the opening or closing of the last contact to function not including bounce.

Release: Normally taken as the interval between de-energization and the opening or closing of the last contact to function excluding bounce.

Transfer: The interval between opening a closed contact and closing an open contact of a break-before-make relay.



WHEN SPECS AND SPACE ARE TIGHT ... SPECIFY CDE RELAYS!

CDE significantly reduces cubic board space...while maintaining all the critical specifications you expect from a quality relay. Specify CDE for: UL and CSA listings, sensitive operation, under 200 M W coil available, a wide range of contact configurations, and a "O" defects Q.C. "Computer Test" that provides verification of individual relay specifications and performance characteristics.

For complete details write or call for the CDE RELAY ENGINEERING MANUAL.
Cornell-Dubilier,
1 Wayne Interchange Plaza, NJ 07470.
(201) 256-2000.

600 SERIES
One Cubic Inch Volume...
Miniature

SPDT/DPDT

2 to 10 Amps Resistive Switching
3 to 48 VDC & 12 to 115 VAC

TV-5 Design
UL & CSA Recognized
Special Coil Sensitivity and Contacts Available
Mechanical Life:
10,000,000 Operations
Electrical Life:
100,000 Operations
Epoxy Seal Available for Wave Solder/Water Wash Operations.

700 SERIES
½ Cubic Inch Volume...
Sub Miniature

High Density Packaging
Printer Circuit Board Design
3 to 10 Amps Resistive
3 to 48 VDC/12 to 115 VAC
Fully Enclosed by Flamex Cover
UL/CSA Recognized
TV-5 Design
SPDT
Mechanical Life
10,000,000 Operation
Electrical Life:
100,000 Operation at Rated Load
UL/CSA
Epoxy Seal Available for Wave Solder/Water Wash Operations.

TYPICAL APPLICATIONS
• Control Circuits in Audio Systems • Visual Aid Devices • Automotive Applications • Medical Electronics • Business Machines • Communication Equipment • Remote Control TV • Burglar Alarms • Smoke and Fire Detectors • Signal and Trigger Functions • Power Amplifiers • Light Sensor Switches • Gas Ignition

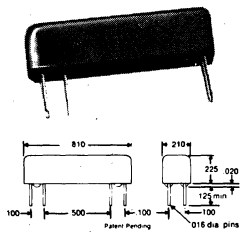
CDE CORNELL DUBILIER

Wayne Interchange Plaza 1 • Wayne, New Jersey 07470

COTO CORPORATION

REED RELAYS

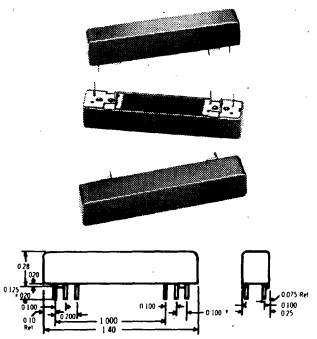
HIGH VOLTAGE, MERCURY-WETTED, LONG-LIFE
MINIATURE, ULTRA-LOW THERMAL EMF AND DIP



2200/2900 SERIES

Microminiature reed relays for maximum versatility and dependability. Encapsulated in epoxy coated magnetically-shielding steel shell. Ideal for switching high-frequency signals. Greater than 10^{12} ohms insulation resistance available.

Model #	Contact Form	Switch Volt	Switch Current	Carry Current
2204	1A Dry	200	0.5A	1.0A
2211	1C Dry	100	0.25A	0.5A
2231	1A Hi-V	200	0.5A	1.0A
2902	1A Dry	200	0.5A	1.5A
2904	1A Dry	200	0.5A	1.5A
2911	1C Dry	150	0.25A	1.0A
2920	1A HG	500	1.0A	2.0A



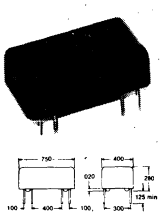
2400 SERIES

Coto's new series 2400 miniature reed relays are ideal for use in Telephone Switching and ATE applications (such as Texas Instruments ATE equipment) or in applications where high sensitivity, high power or high voltage relays are required.

Slightly larger than the Series 2200 microminiature relays, the Series 2400 units are available in a wide variety of custom pin configurations. In addition, wider pin spacing allows better contact to coil isolation on the PCB.

Model* #	Contact Form	Switch Voltage	Switch Current	Feature
2404	1A	200	0.5	Hi sensitivity
2405	1A	200	1.0	Hi power (50W)
2406	1A	200	0.5	ATE
2411	1C	150	0.25	Hi sensitivity
2420	1A**	500	1.0	Hg wetted
2430	1A	250	0.5	Tel. switching
2431	1A	500	0.5	Hi voltage

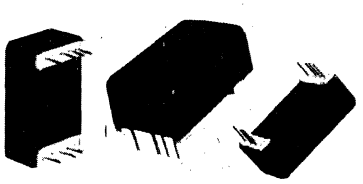
* All Models available w/ 5V or 12V coils
** Vertical mounting required



2600 SERIES

Highly reliable DIP reed relays designed for versatility. Offered in a wide variety of contact types and coil resistances. Excellent for new designs or to retro-fit lesser quality molded DIP relays. Diode coil suppression available.

Model #	Contact Form	Switch Volt	Switch Current	E.S. Shield
2604	1A	200	0.5A	YES
2610	1C	100	0.2A	NO
2611	1C	100	0.25A	YES
2631	1A Hi-V	250	0.5A	NO
2653	2A	100	0.5A	YES



3200/3400 SERIES

Low and ultra-low thermal EMF series. Feature 500 nanovolt thermals and 50 nanovolt stability. Fully encapsulated in magnetically shielding steel shell. For scanning low level analog and digital signals, multiplexing, data acquisition and automatic test equipment.

Model #	Contact Form	Thermal EMF Options (Max)
3201	1A	3μV, 1μV, 500nV
3202	2A	5μV, 3μV, 1μV, 500nV
3203	3A	5μV, 3μV, 1μV
3204	1B	5μV, 3μV, 1μV, 500nV
3205	2B	5μV, 3μV, 1μV
3206	1A/1B	5μV, 3μV, 1μV
3207	1A Latch	1μV, 200nV
3250	3A	5μV, 3μV, 1μV, 500nV
3221	1A Hi-V	5μV, 3μV
3222	2A Hi-V	5μV, 3μV
3402	2A	5μV, 3μV, 1μV, 500nV
3432	2A HG	10μV, 5 μV
3450	3A	5μV, 3μV, 1μV, 500nV
3460	3A	5μV, 3μV, 1μV, 500nV

CALL/WRITE FOR NEW COTO CATALOG CC-85E

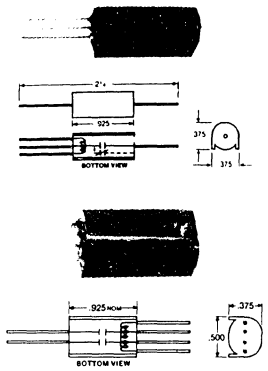
Contact Coto Sales Office in the Manufacturers' Directory.

ONE BILLION LIFETIMES!

COTO reed relays have been life tested for 1 billion operations. This assures you of complete product integrity in your most critical designs.

Each and every COTO reed relay is triple-tested in all operating parameters prior to shipment. You can depend absolutely on COTO quality and reliability.

COTO offers a wide variety of reed relays to meet every requirement.

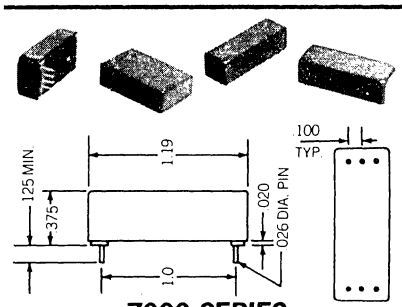


4000/4200 SERIES

Totally encased and sealed reed relays. Manufactured to the highest standards and 100% tested prior to shipment. Available in a wide variety of contact types and terminal configurations. Optional electrostatic or magnetic shield.

Relay Contact Type 4000	Relay Contact Type 4200	Model #	Switch Volt DC Max	Switch Current Max Res
1A Std	2A Std	4003* 4203*	200	0.5
1A Hi-Rel	2A Hi-Rel	4004* 4204*	200	0.5
1A Hi-Pwr		4005	150	1.0
1C Std	2C Std	4011 4211	150	0.25
1A HG		4020	500	2.0
1A Hi-V Low Cost	Low Cost 2A Hi-V	4030 4230	300	0.5
1A Hi-V Std	Std 2A Hi-V	4031* 4231*	500	0.5
1B Std		4240	200	0.5

* Recognized under the component program of Underwriters' Laboratory.

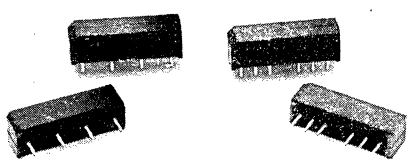


7000 SERIES

Miniature series available in three types: Dry Standard (7100), Mercury Wetted (7200) and High Voltage (7300). Encapsulated in a magnetically shielding steel shell, epoxy coated. 5, 12 or 24 VDC.

Dry Std.	HG Wet	High Volt	Contact Form	Package Width
7101	7201	7301	1A	.410
7102	7202	7302	2A	.500
7103	7203	7303	3A	.660
7104	7204	7304	4A	.760
7121			1B*	.500
7122			2B*	.660
7141			1C	.410
7142			2C	.660
7143			3C	.760
7150			1AL*	.500
7160			1A/1B†	.760

* Polarized. † Make before break not guaranteed.

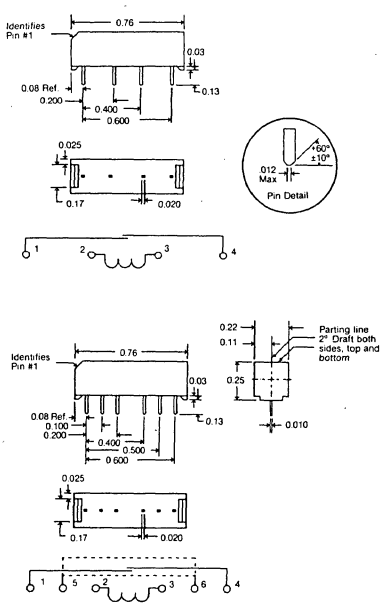


NEW! 9000 SIP SERIES

Announcing the totally new 9000 Series from Coto — a thermoset epoxy-molded package constructed on a lead frame. This new microminiature reed relay incorporates surface mount technology in the construction of an industry-standard SIP format.

The 4-pin design sets a new standard for quality and reliability. The 6-pin design incorporates a coaxial shield for 50 ohm characteristic impedance. This makes it an ideal choice for switching fast digital pulses in applications such as VLSI ATE.

Both Models feature an isolation resistance greater than 10^{12} ohms, and contact reliability tested to one billion cycles, that you can expect only from a Coto reed relay. Call or write for complete 9000 Series performance and engineering data.



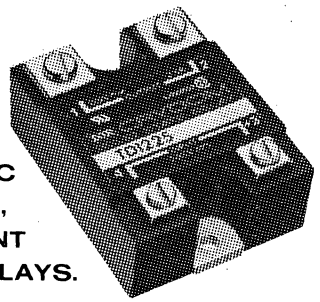
SERIES 9000 OPERATING CHARACTERISTICS		4-Pin SIP Min.	4-Pin SIP Typ.	4-Pin SIP Max.	6-Pin SIP Min.	6-Pin SIP Typ.	6-Pin SIP Max.
COIL RESISTANCE (Ω)	5V	450		550	135		165
	12V	1350		1650	900		1100
NOM COIL VOLTAGE (V)	5V		5			5	
	12V		12			12	
COIL OPERATE VOLTAGE (V)	5V			3.75			3.75
	12V			9.0			9.0
COIL RELEASE VOLTAGE (V)	5V	0.4			0.4		
	12V	1.0			1.0		
SWITCHING VOLTAGE (V) (DC, peak AC, res)				200			200
SWITCHING CURRENT (A) (DC, peak AC, res)				0.5			0.5
CARRY CURRENT (A) (DC, peak AC)				1.0			1.0
CONTACT PWR RATING (W) (DC, peak AC0				10			10
LIFE EXPECTANY (10^6) (Sig level <1V, 10mA load, 1Ω max CR limit). (For >1V, consult factory for life test data at specif. load)		500			500		
STATIC CONTACT RESISTANCE (Ω) (Initial, meas. w/ 0.05V 10mA load)				0.150			0.150
DYNAMIC CONTACT RESISTANCE (Ω) (Initial meas. w/ 5V 50mA load at 100Hz, 1.5 ms after contact closure)				0.200			0.200
OPERATE TIME (msec) (incl bounce at nom voltage)			0.35	1.0		0.35	1.0
RELEASE TIME (msec)	No suppression		0.05	0.10		0.05	0.10
	Diode suppression		0.35	0.50		0.35	0.50
	Diode + zener supp.		0.10	0.20		0.10	0.20

COTO CORPORATION, 55 DUPONT DR., PROVIDENCE, RI 02907 • (401) 943-2686 • TWX: 710-381-8016

IOR CRYDOM
A DIVISION OF INTERNATIONAL RECTIFIER

SOLID-STATE RELAYS AND INPUT/OUTPUT SWITCHES

SERIES 1



2.5 TO 75 AMP, 120, 240 AND 480 VAC SCR AC OUTPUT, PANEL MOUNT SOLID-STATE RELAYS.

These Crydom SSRs make it possible to switch AC power loads up to 36 kw. Output circuit consists of inverse-parallel (back-to-back) dual SCRs to meet the most demanding requirements. Features include zero voltage switching Phase control and normally closed models available Request Bulletin 604.

AC Control Models — SCR Output

Crydom Model No.	Line VAC (47-63 Hz)	Max. Load Current, Amps (RMS)	One-Cycle Surge, Amps (PK)
A1202	24-140	2.5	22.5
A1210	24-140	10	120
A1225	24-140	25	250
A1240	24-140	40	625
A2402	48-280	2.5	22.5
A2410	48-280	10	120
A2425	48-280	25	250
A2440	48-280	40	625
A4808	80-530	8	72
A4812	80-530	12	140
A4825	80-530	25	250
A4840	80-530	40	400
A4875	80-530	75	1000

General Specifications

Isolation Voltage: 4000 VAC Std. (Input to Output)

Operating Temperature Range: -30°C to 80°C.
UL and CSA

DC Input Control Models

Control Signal Range: 3-32VDC
Must Operate Voltage: ..... 3VDC Max
Must Release Voltage: ..... 1VDC Min
Input Current ..... 4mA. max. @ 5VDC

AC Input Control Models

Control Signal Range: ..... 90-280VAC.
Must Operate Voltage: ..... 90VAC Max.
Must Release Voltage: ..... 10VAC Min.
Input Current ..... 2mA. max. @ 120VAC.

DC Control Models — SCR Output

Crydom Model No.	Line VAC (47-63 Hz)	Max. Load Current, Amps (RMS)	One-Cycle Surge, Amps (PK)
D1202	24-140	2.5	22.5
D1210	24-140	10	120
D1225	24-140	25	250
D1240	24-140	40	625
D2402	48-280	2.5	22.5
D2410	48-280	10	120
D2425	48-280	25	250
D2440	48-280	40	625
D2450	48-280	50	625
D2475	48-280	75	1000
D4808	80-530	8	72
D4812	80-530	12	140
D4825	80-530	25	250
D4840	80-530	40	400
D4875	80-530	75	1000

5 THRU 25 AMP/120 AND 240 VAC TRIAC AC OUTPUT SOLID STATE RELAYS

Crydom Triac SSRs are quality-made devices designed for general purpose switching applications where performance requirements are less demanding than those offered by SCR output types. Request Bulletin 603.

General Specifications	DC Input	AC Input
Control Signal Range ...	3 to 32 VDC	90 to 280 VAC
Input Current	4 mA @ 5 VDC	2 mA @ 120 VAC
Isolation Voltage	4000 VRMS	4000 VRMS
Oper. Temp. Range	-30°C to 80°C	-30°C to 80°C

DC Control Models — Triac Output

Crydom Model No.	Line VAC (47-63 Hz)	Max. Load Current, Amps (RMS)	One-Cycle Surge, Amps (PK)
TD1210	24-140	10	100
TD1225	24-140	25	25
TD2410	48-280	10	100
TD2425	48-280	25	250

AC Control Models — Triac Output

TA1210	24-140	10	100
TA1225	24-140	25	250
TA2410	48-280	10	100
TA2425	48-280	25	250

Traffic Control Relay

TC 2623	95-140	10	250

50 TO 90 AMP, 480 VAC AC OUTPUT SOLID-STATE RELAYS. 1000-1200V BLOCKING.

The highest power rated SSRs, up to 43 kw. 4000 V of isolation with the highest available blocking voltages (1.2 KV) below which the SSRs will not mistrigger. The wide margin between operating and blocking voltages permits the proper use of transient-suppression (MOV) devices on the 480 V line. Features include high dV/dt and zero voltage switching. Request Bulletin 1HV for complete data.

General Specifications

Control Signal Range ..... 4 to 32 VDC
Input Current @ 5 VDC ..... 15 mA max.
Isolation Voltage 50/60 Hz ..... 4000 VRMS
Operating Temperature Range ..... 0°C to 80°C

Crydom Model No.	Line VAC (47-63 Hz)	Max. Load Current, Amps (RMS)	One-Cycle Surge, Amps (PK)
H10D4850	180-530	50	500
H10D4890	180-530	90	1000
H12D4850	180-530	50	500
H12D4890	180-530	90	1000

400 Hz RELAYS (D12 AND D24 SERIES ONLY)
High power, photo isolated, solid-state relays are also available in 400 Hz versions for avionic and ground support equipment. Comparable models to the Series 1 DC input types are available for 120 and 240 VAC loads. For 400 Hz types, add prefix **4**; i.e., **4**D2410.

CRYDOM: 1521 E.Grand Ave., El Segundo, CA 90245. (213) 322-4987. **Europe:** Hurst Green, Oxted, Surrey RH8 9BB, England.

CRYDOM
A DIVISION OF INTERNATIONAL RECTIFIER

SOLID-STATE RELAYS AND INPUT/OUTPUT SWITCHES

7.0 TO 40 AMP, 100 TO 500 VDC CMOS DC INPUT SOLID STATE RELAY

This new Crydom series of DC power SSRs incorporates a power MOSFET as the output device in the classic Crydom package. The input can be driven from most logic circuits; requiring less than 1.6 mA at 5 VDC.

General Specifications

Control Signal Range ..... 3.5 to 32 VDC
Input Current @ 5 VDC ..... 1.6mA max.
Isolation Voltage 50/60 Hz ..... 2500 VRMS
Operating Temperature Range ..... 0°C to 80°C

Crydom Model No.	Line VDC	Max. Load Current @ 40° C Amps	One-Cycle Surge Amps (PK)
D1D07	0-100	7.0	15
*D1D12	0-100	12	28
D1D20	0-100	20	42
D1D40	0-100	40	106
*D2D07	0-200	7.0	22
D2D12	0-200	12	27
*D4D07	0-400	7.0	17
*D4D12	0-400	12	36
*D5D07	0-500	7.0	19
*D5D10	0-500	10	29

*Available on special order.

SOFT-START POWER MODULES/RELAYS 90-140 AND 180-280 VAC 10 TO 75 AMPS

A control module is used in combination with a Crydom phase control relay to provide gradual application of power to the load. Request Bulletin SSM-1

General Specifications: All models.

Input Operate Voltage Range ..... 3.5 to 10VDC
Minimum Release Voltage 1VDC
Input Current @ 5VDC 1.6mA*

Crydom Model No.	Output Voltage Range VAC	Max. Load Current Amps
10SST120	90-140	10
25SST120	90-140	25
40SST120	90-140	40
10SST240	180-280	10
25SST240	180-280	25
40SST240	180-280	40
75SST240	180-280	75

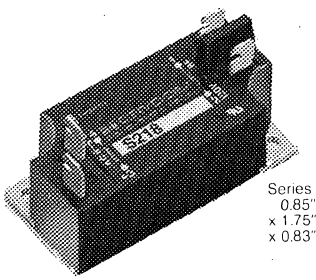
HEAT SINKS FOR SERIES 1 AND 2 RELAYS

Aluminum alloy heat sinks provide excellent heat dissipation and allow solid-state relays to handle maximum power. All current ratings based on use of suitable thermally-conductive component, such as silicone grease, between the SSR (solid-state relay) mounting base and the mounting surface.

SERIES 2 AC OUTPUT, PANEL MOUNT SOLID-STATE RELAYS 8 AMPS, 120 AND 240 VAC

General Specifications

Control Signal Range ..... 3.5 to 8 VDC
Must Operate Voltage ..... 3.5 VDC max.
Must Release Voltage ..... 1 VDC min.
Must Operate Current ..... 12 mA max.
Isolation Voltage ..... 2500 VAC
Operating Temperature Range ..... -30°C to 80°C
Snubber ..... Internal

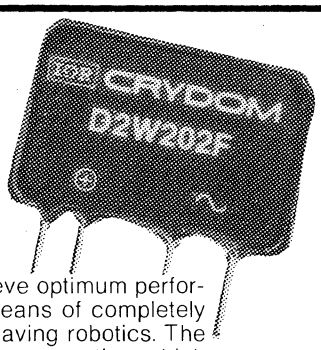


Series 2
0.85"(21.59mm)
x 1.75"(44.5mm)
x 0.83"(21.08mm)

The Crydom Series 2 solid-state relays combine small size, zero voltage switching and high current rating in a package designed for heat sink or panel mounting. Standard 0.187" push-on terminals allow quick connection and are positioned to provide maximum isolation between control and power circuits.

Crydom Model No.	Line VAC (47-63 Hz)	Max. Load Current @ 40 C Amps (RMS)	One-Cycle Surge Amps (PK)
S218	20-140	8	120
S228	40-280	8	120

SERIES D2W LOW COST AC OUTPUT, 60 TO 280 VAC, 2 AMPS SOLID STATE RELAYS



The D2W202F is designed to achieve optimum performance at a record low cost by means of completely automated assembly using labor saving robotics. The package has a hard, skin-tight epoxy coating which provides excellent environmental protection and a pin-out that matches the Series 6.

General Specifications:

Control Signal Range: ..... 3 to 28 VDC
Must Operate Voltage, max. ..... 3 VDC
Must Release Voltage, min. ..... 1 VDC
Input Current @ 5 VDC max. ..... 4 mA
Input Impedence, min. ..... 1500 OHMS
Dielectric Strength: 50/60 HZ ..... 2500 VRMS
Operating Temperature Range ..... -20° to 80°C

Crydom Model No.	Control Voltage Range	Output Ratings	Surge One Cycle
D2W202F	3-32 VDC	2A @ 60-280 VAC	28A pk
Other Factory Available Models			
D2W203F	3-32 VDC	3A @ 60-280 VAC	.....
D2W203F-11	3-32 VDC	3A @ 60-280 VAC	80A pk

CRYDOM: 1521 E.Grand Ave., El Segundo, CA 90245. (213) 322-4987. **Europe:** Hurst Green, Oxted, Surrey RH8 9BB, England.

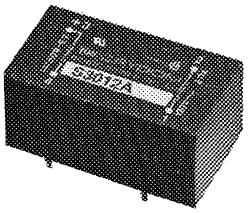
IOR CRYDOM
A DIVISION OF INTERNATIONAL RECTIFIER

SOLID-STATE RELAYS AND INPUT/OUTPUT SWITCHES

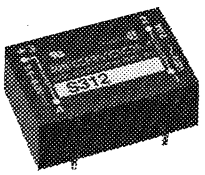
SERIES 3

AC OUTPUT, PC BOARD MOUNT SOLID-STATE RELAYS 0.3 TO 3 AMPS, 120 AND 240 VAC

Case Style 30A



Case Style 3



Small size, maximum current rating and minimum off-state leakage combined in a package designed for PCB applications. Units are 0.4 cu. in. volume and require only 1 sq. in. space on PCB. Overall height of 0.4" (on most models), allows PCB spacing on ½" centers. Square, rigid pins; also suitable for wire wrap or push-on connectors. Rated 40°C ambient. Technical data sheets available on request.

General Specifications

Control Signal Range ..... 3.5 to 8 VDC
(Models S3013A/S3023A ..... 3.5 to 18 VDC)
Must Operate Voltage ..... 3.5 VDC max.
Must Release Voltage ..... 1 VDC min.
Isolation Voltage ..... 2500 VAC
(Models S3013A/S3023A ..... 4000 VAC)
Operating Temperature Range ..... -30°C to 80°C

Crydom Model No.	Line VAC (47-63 Hz)	Max. I @ 40°C A (RMS)	One-Cycle Surge Amps (PK)	Internal Snubbers	Case Style
S310	20-140	0.3	2	No	3
S3010 A	20-140	0.3	2	Yes	30A
S320	40-280	0.3	2	No	3
S3020A	40-280	0.3	2	Yes	30A
S312	20-140	2	55	No	3
S3012A	20-140	2	55	Yes	30A
S3013A	24-140	3	55	Yes	30A
S322	40-280	2	55	No	3
S3022A	40-280	2	55	Yes	30A
S3023A	48-280	3	55	Yes	30A

SERIES 6

AC AND DC MICROPROCESSOR INPUT/OUTPUT MODULES

3.5 AMPS, 60 VDC, 120 and 240 VAC.

General Description

A family of high performance microprocessor interface switches designed to meet the demands of a rapidly expanding industrial control market. These modules provide an electrically clean, photo-isolated (4000 V rms min.), noise-free interface between programmable controllers, microprocessors and computerized machine controls and external elements such as limit switches, thermostats, pressure switches, motor/motor starters, valves, and heaters. The input modules accept power level field control signals and convert them to logic level signals. Output modules accept logic level control signals to switch AC or DC loads up to 3.5 Amps.

General Specifications — All Models

Dielectric (Input/Output) ..... 4000 VRMS
Isolation Resistance (Input/Output @ 500 V) ..... 10^{10} Ohms
Capacitance (Input/Output) ..... 8.0 pF
Operating Temperature Range: ..... -40°C to 80°C

Standard Input/Output Modules (and Equivalents) In compliance with NEMA 2-230 (Noise Immunity)

5 Volt Models P-N	5 Volt Models Equivalent	15 Volt Models P-N	15 Volt Models Equivalent	Type	Input Current vs. Voltage	Maximum Load Voltage	Maximum Load Current
6101/6101A*	IDC5	6131	IDC15	DC/IN	7 mA @ 32 VDC	30 VDC	25 mA @ 80 C
6201A*	IAC5	6231	IAC15	AC/IN	6 mA @ 120 VAC	30 VDC	25 mA @ 80 C
6202A*	IAC5-A	6232	IAC15-A	AC/IN	6 mA @ 240 VAC	30 VDC	25 mA @ 80 C
6301A*	ODC5			DC/OUT	15 mA @ 5 VDC	60 VDC	3ADC@ 45 C
6401A*	OAC5			AC/OUT	15 mA @ 5 VDC	140 VAC	3A RMS @ 45 C
6402A*	OAC5-A			AC/OUT	15 mA @ 5 VDC	280 VAC	3A RMS @ 45 C
6102	—	—	—	DC/IN	6 mA @ 180 VDC	30 VDC	25 mA @ 80 C
6200	—	—	—	AC/IN	6 mA @ 24 VAC	30 VDC	25 mA @ 80 C
6302	ODC5 -A	—	—	DC/OUT	12 mA @ 5 VDC	200 VDC	1.5A @ 45 C

Buffered Output Modules *sink current (non-inverting) **source current (inverting)

Crydom Part Number 5V Models	Crydom Part Number 15V Models	Type	Input Current vs. Voltage 5 Volt Models	Input Current vs. Voltage 15 Volt Models	Maximum Load Voltage	Maximum Load Current
6311	6341	DC/OUT	75 μA @ 0.8 VDC*	175 μA @ 2.0 VDC*	60 VDC	3.5 ADC @ 45 C
6321	6351	DC/OUT	75 μA @ 2.4 VDC**	75 μA @ 8.0 VDC**	60 VDC	3.5 ADC @ 45 C
6411	6441	AC/OUT	75 μA @ 0.8 VDC*	175 μA @ 2.0 VDC*	140 VAC	3.5A RMS @ 45 C
6412	6442	AC/OUT	75 μA @ 0.8 VDC*	175 μA @ 2.0 VDC*	280 VAC	3.5A RMS @ 45 C
6421	6451	AC/OUT	75 μA @ 2.4 VDC**	75 μA @ 8.0 VDC**	140 VAC	3.5A RMS @ 45 C
6422	6452	AC/OUT	75 μA @ 2.4 VDC**	75 μA @ 8.0 VDC**	280 VAC	3.5A RMS @ 45 C

SERIES DMP—AC AND DC INPUT/OUTPUT MODULES 3 AMPS, 30, 60 VDC AND 280 VAC

The DMP Series modules are electrically identical to the Series 6 types. The package is a hard, skin-tight epoxy coating which provides excellent environmental protection while retaining high heat transfer characteristics. The pin-out of these models matches that of Series 6 and is also accepted by MS Series mounting boards.

Crydom Model Number	Module Type	Input Current vs. Voltage	Max. Load Voltage
DMP6101A	DC/IN	32 mA @ 32 VDC	30 VDC
DMP6201A	AC/IN	6 mA @ 120 VAC	30 VDC
DMP6202A	AC/IN	6 mA @ 120 VAC	30 VDC
DMP6301A	DC/OUT	15 mA @ 5 VDC	60 VDC
DMP6402A	AC/OUT	15 mA @ 5 VDC	280 VAC

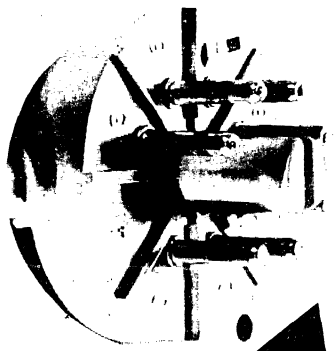
SERIES SP—CHIPSWITCH™ IC SOLID-STATE RELAYS IN A SINGLE-IN-LINE (SIP) PACKAGE

The ChipSwitch integrated-circuit solid-state relay features the same internal structure and technology as the original ChipSwitchpackaged in the dual in-line package. The technology used combines MOS and bipolar processes to eliminate the need for both discrete components and hybrid circuits.

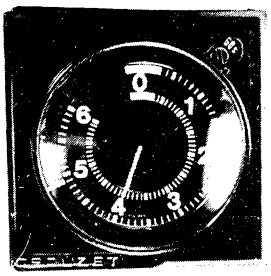
Crydom Model No.	Operating Voltage	DC Input Turn-On	Maximum Load Current with Heat Clip 40°C	Maximum Load Current with Heat Clip 60°C
SP1110	24-140 VAC	5mA	1.2A	1.0A
SP1210		10mA	1.2A	1.0A
SP2110	24-280 VAC	5mA	1.2A	1.0A
SP2210		10mA	1.2A	1.0A

CRYDOM: 1521 E.Grand Ave., El Segundo, CA 90245. (213) 322-4987. **Europe:** Hurst Green, Oxted, Surrey RH8 9BB, England.

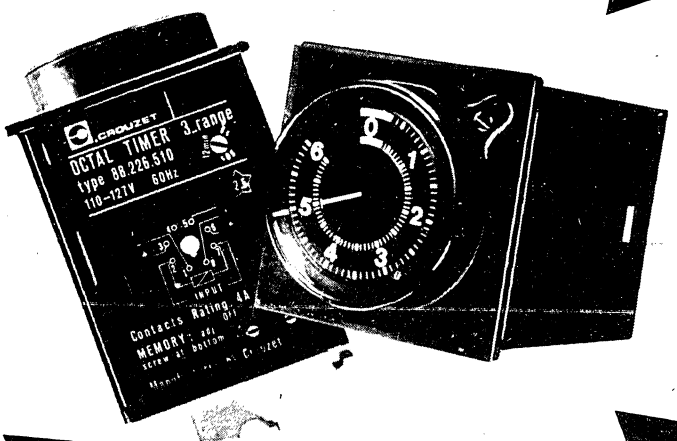
Octal Cycle Progress Timer



OCTAL PLUG-IN interchangeable with most octal timers



CYCLE PROGRESS shows time remaining in the cycle

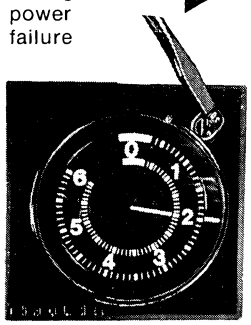


±2% SETTING ACCURACY

MEMORY holds timing position during power failure

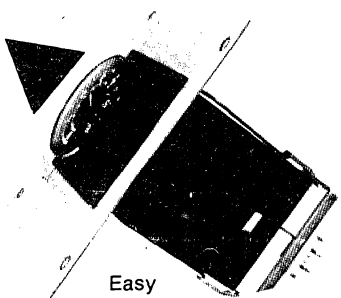
TRANSIENT IMMUNITY built-in

MULTI-FUNCTION on-delay, interval and single shot in one timer!



MULTI-RANGE 2 models cover from 0.3 sec. to 12 hours

OCTAL LOCK prevents module from vibrating out of its socket



Easy **PANEL MOUNT** with no additional hardware

HOW TO ORDER

OCTAL CYCLE PROGRESS TIMER - part no. 88 226.5
(Example - 88 226.5 - 115V 60Hz Model 1)

VOLTAGE	FREQUENCY	TIME RANGES
115V	60Hz	Model 1: 6 sec./60 sec./12 min.
24V	60Hz	Model 2: 6 min./60 min./12 hrs.
240V	60Hz	
220V	50Hz	

CERTIFICATIONS

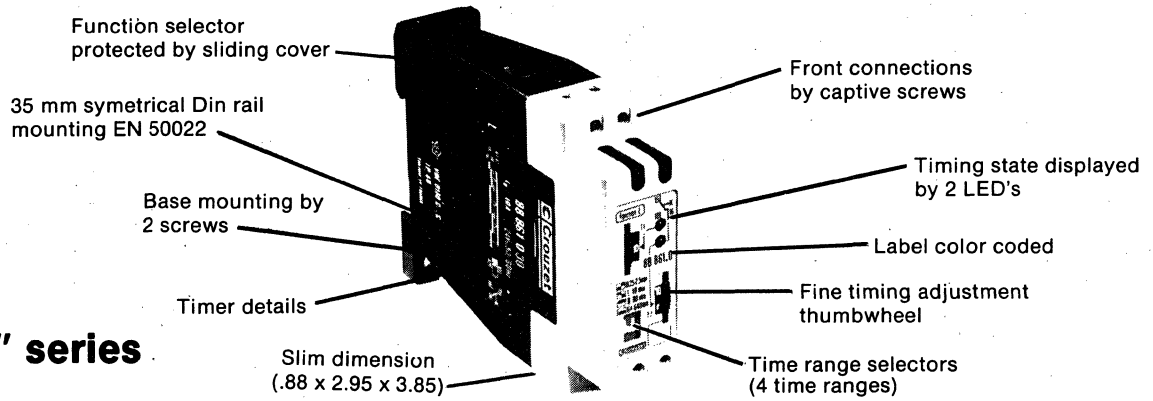
UL and CSA — Most European standards.

Crouzet

Crouzet Controls, Inc.
1083 State Parkway, Schaumburg, IL 60195
Tel: 312/843-2200 - Telex: Crouzet 206 297

Solid State Timers

Multifunction — Multirange



"M" series

Functions Available

MARKING	1 Red label		2 Yellow label		3 Green label	
SELECTABLE POSSIBLE FUNCTIONS	Pulse Generator (I) Pulse Change-over (F) Pulse Monitor (O)		On-delay (A) Interval (H) Repeat Cycle (D) Repeat Cycle (E)		Off-delay (C) Interval (B) Pulse Monitoring (N)	
PART NO.	88 860 01	88 860 03	88 860 21	88 860 23	88 860 81	88 860 83
RANGE OF SELECTABLE TIMES	0.06 to 160 s	0.25 to 640 min.	0.06 to 160 s	0.25 to 640 min.	0.06 to 160 s	0.25 to 640min.

4 Blue label		5 Orange label		6 Pink label	7 Lime green label	8 White label	
Repeat Cycle (L) (T_1 and T_2 Adjustable)		Percentage Timer (G)		Pulse Output (M) Ma Mb Mc	Wye-Delta Motor Start (S)	Relay 88 863 0 SPDT 88 863 1 DPDT	
88 861 01	88 861 03	88 861 21	88 861 23	88 861 41	88 862 01	88 863 0	88 863 1
0.06 to 160 s	0.25 to 640 min.	0.6-2.5-20 and 160 s	2.5-10-80 & 640 min.		3 to 30 s - 6 to 60 s		
		Setting in percentage Adjustable 3 - 97 %		T : 0,5 s ± 0,2 s	t : 0,1 s or t : 0,035 s bridge B1 B2		

Standard supply voltages: 24 or 48V, DC and 50/60 Hz, 110V or 240V, 50/60 Hz, ± 15% nominal
Accuracy: ±.5%— Relay current rating: 10A~(1A —) — Max. admissible current: 15A< 10ms

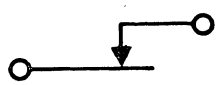
Also available: "S" series timers: multivoltage (10 to 254V AC/DC) — multirange, single function
"SE" series timers: single range, single function, single voltage, custom built

Crouzet
Crouzet Controls, Inc.
1083 State Parkway, Schaumburg, IL 60195
Tel: 312/843-2200 - Telex: Crouzet 206 297

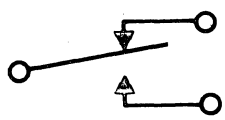
MINIGLOSSARY
RELAY CONTACT FORMS

A
Make
SPST-NO

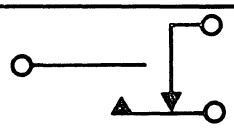
B
Break
SPST-NC



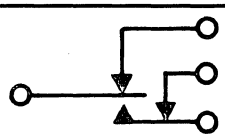
C
Break, Make
(Transfer)
SPDT



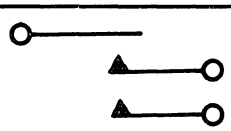
D
Make, Break
(Continuity
Transfer)



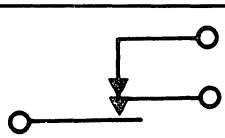
E
Break,
Make,
Break



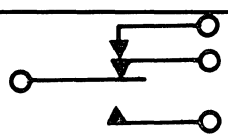
F
Make,
Make



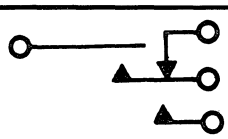
G
Break,
Make



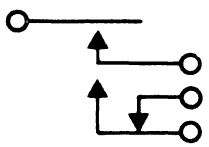
H
Break,
Break,
Make



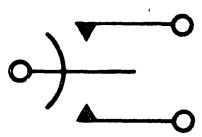
I
Make,
Break,
Make



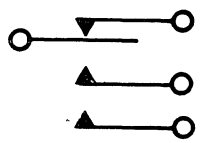
J
Make,
Make,
Break



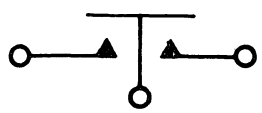
K
Center off
SPDT



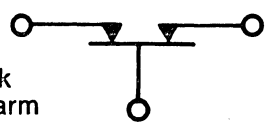
L
Break,
Make,
Make



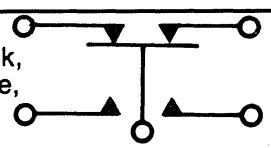
U
Double
make
Contact
on arm



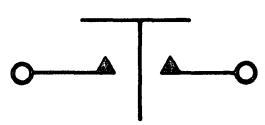
V
Double break
Contact on arm



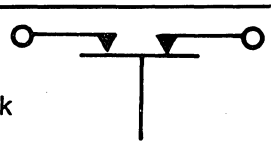
W
Double break,
Double make,
Contact
on arm



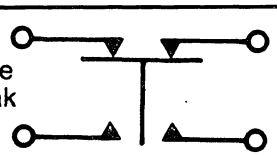
X
Double
make



Y
Double break



Z
Double make
Double break
SPDT-DB



Time Delay Relays

SERIES K4 TIME-DELAY RELAYS

The K4 Series was designed to provide a reliable, low-cost timer for industrial and commercial applications. The units are in a non-metallic housing for complete insulation and have line transient protection. **Output Ratings:** Relay—DPDT. 10 amp resistive, 5 amp inductive; Semiconductor—1 amp at 115 VAC or 24 VDC. **Reset Time:** 50 msec, max. **Recycle Time:** 1 sec during timing cycle; 50 msec after timing cycle. **Repeatability:** ±2%. **Operating Temperature Range:** +32° F to +125° F. **Power Consumption:** 4½ watts. **Reverse Polarity Protection:** Standard on all DC units. **Weight:** 12 ozs. max. **Size:** 3⅛" h × 2" × 2".

ICS No.	Time Range, Sec.	Input Volts	Output Switching	Wiring Fig.	List Price
ON DELAY					
K4115111	.05-.5	115VAC	Relay	1	$42.85
K4125111	.5-5	115VAC	Relay	1	42.85
K4135111	5-50	115VAC	Relay	1	45.90
K4145111	50-500	115VAC	Relay	1	45.90
K4115311	.05-.5	24VDC	Relay	1	42.85
K4125311	.5-5	24VDC	Relay	1	42.85
K4135311	5-50	24VDC	Relay	1	45.90
K4145311	50-500	24VDC	Relay	1	45.90
K4115121	.05-.5	115VAC	Semi.	2	45.90
K4125121	.5-5	115VAC	Semi.	2	45.90
K4135121	5-50	115VAC	Semi.	2	48.45
K4145121	50-500	115VAC	Semi.	2	48.45
K4115321	.05-.5	24VDC	Semi.	2	45.90
K4125321	.5-5	24VDC	Semi.	2	45.90
K4135321	5-50	24VDC	Semi.	2	48.45
K4145321	50-500	24VDC	Semi.	2	47.90
INTERVAL DELAY					
K4215111	.05-.5	115VAC	Relay	1	$45.00
K4225111	.5-5	115VAC	Relay	1	45.00
K4235111	5-50	115VAC	Relay	1	48.25
K4245111	50-500	115VAC	Relay	1	48.25
K4215311	.05-.5	24VDC	Relay	1	46.35
K4225311	.5-5	24VDC	Relay	1	46.35
K4235311	5-50	24VDC	Relay	1	48.95
K4245311	50-500	24VDC	Relay	1	48.95
K4215121	.05-.5	115VAC	Semi.	2	48.25
K4225121	.5-5	115VAC	Semi.	2	48.25
K4235121	5-50	115VAC	Semi.	2	49.70
K4245121	50-500	115VAC	Semi.	2	49.70
K4215321	.05-.5	24VDC	Semi.	2	48.25
K4225321	.5-5	24VDC	Semi.	2	48.25
K4235321	5-50	24VDC	Semi.	2	49.70
K4245321	50-500	24VDC	Semi.	2	49.70
OFF DELAY					
K4315111	.05-.5	115VAC	Relay	3	$47.90
K4325111	.5-5	115VAC	Relay	3	47.90
K4335111	5-50	115VAC	Relay	3	52.50
K4345111	50-500	115VAC	Relay	3	52.50
K4315311	.05-.5	24VDC	Relay	3	46.70
K4325311	.5-5	24VDC	Realy	3	46.70
K4335311	5-50	24VDC	Relay	3	50.00
K4345311	50-500	24VDC	Relay	3	51.60
K4315121	.05-.5	115VAC	Semi.	2	47.90
K4325121	.5-5	115VAC	Semi.	2	47.90
K4335121	5-50	115VAC	Semi.	2	52.50
K4345121	50-500	115VAC	Semi.	2	52.50
K4315321	.05-.5	24VDC	Semi.	2	46.70
K4325321	.5-5	24VDC	Semi.	2	46.70
K4335321	5-50	24VDC	Semi.	2	50.00
K4345321	50-500	24VDC	Semi.	2	51.60
PULSE STRETCHER					
K4815111	.05-.5	115VAC	Relay	3	$47.90
K4825111	.5-5	115VAC	Relay	3	47.90
K4835111	5-50	115VAC	Relay	3	52.50
K4845111	50-500	115VAC	Relay	3	52.50
K4815311	.05-.5	24VDC	Relay	3	46.70
K4825311	.5-5	24VDC	Relay	3	46.70
K4835311	5-50	24VDC	Relay	3	50.00
K4845311	50-500	24VDC	Relay	3	51.60
K4815121	.05-.5	115VAC	Semi.	2	47.90
K4825121	.5-5	115VAC	Semi.	2	47.90
K4835121	5-50	115VAC	Semi.	2	52.50
K4845121	50-500	115VAC	Semi.	2	52.50
K4815321	.05-.5	24VDC	Semi.	2	46.70
K4825321	.5-5	24VDC	Semi.	2	46.70
K4835321	5-50	24VDC	Semi.	2	50.00
K4845321	50-500	24VDC	Semi.	2	51.60

VOLTAGE INPUT

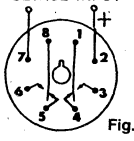


Fig. 1

VOLTAGE INPUT

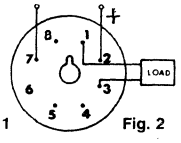


Fig. 2

VOLTAGE INPUT

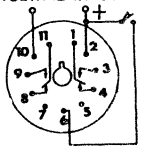
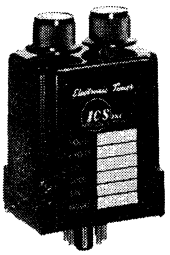
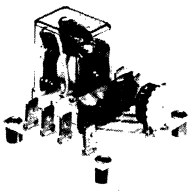


Fig. 3

K4 Series



OP4 Series



KG Series

SERIES OP4 TIME DELAY RELAYS

Hybrid timing circuitry affords the user a broad range of timing functions, timing ranges, and input voltages. Typical applications include commercial food processing, photo processing, motor control, machine tool control, packaging control, and many others. **Output:** DPDT relay rated at 10 amps resistive. **Transient Protection:** ±2000 V for 100 µsec. **Polarity Protection:** Reverse Polarity Protection standard on all DC models. **Operating Temperature Range:** −10° C to +70° C. **Repeat Accuracy:** ±2%. **Overall Tolerance:** ±10%. **Reset Time:** 150 msec. **Recycle Time:** 150 msec. **Size:** On delay, Off delay, and Interval delay—4" h. × 2" w. × 2" d.; Recycle—3⅝" h. × 2⅜" w. × 1¾" d.

ORDERING CODE

OP4 3 1 N♦ 2

Series OP4

Timing Action
1 = On delay
2 = Off delay
3 = Interval delay VAC
4 = Triggered interval delay VAC
5 = Recycle♦

Timing Range
1 = 0.1 to 1 secs
2 = 0.5 to 5 secs
3 = 5 to 50 secs
4 = 30 to 300 secs
5 = 1 to 10 secs
6 = 12 to 120 secs
7 = 3 to 30 secs
8 = 6 to 60 secs

Input Voltage
1 = 120 VAC
2 = 24 VAC
3 = 120 VDC
4 = 24 VDC
5 = 240 VAC
6 = 48 VDC
7 = 12 VAC
8 = 12 VDC

♦Recycle timers require two timing ranges; add the letter N in place of second timing range for other actions.

Time Range Seconds	List Price Each		
	On Delay	Off/Interval Delay Triggered Interval Delay	Recycle
0.1 to 30	$29.40	$36.05	$50.30
30 to 120	31.00	38.15	52.70
120 to 300	33.10	40.30	55.65

KG SERIES TIME DELAY RELAYS

A compact, open-board time-delay relay designed for ease of mounting and fast replacement. All connections are made with .250" × .032" quick-disconnect terminals. **Output:** DPDT relay rated 10 amps. **Transient Protection:** Input, 200 V for 10 µsecs; output, 400 V peak for 25 µsecs. **Operating Temperature Range:** 0 to +60°C. **Repeat Accuracy:** ±3%. **Recycle Time:** 150 msecs. **Reset Time:** 150 msecs. **Polarity Protection:** Standard on all models. **Size:** 1.8" h. × 2.1" w. × 2.1" d.

ORDERING CODE

KG 1 3 2 2

Series KG

Timing Action
1 = On delay
2 = Off delay

Timing Range
1 = 0.1 to 1 secs
2 = 0.5 to 5 secs
3 = 5 to 50 secs
4 = 30 to 300 secs
5 = 1 to 10 secs
6 = 12 to 120 secs
7 = 3 to 30 secs
8 = 6 to 60 secs

Input Voltage
1 = 120 VAC
2 = 24 VAC
3 = 120 VDC
4 = 24 VDC
5 = 240 VAC
6 = 48 VDC
7 = 12 VAC
8 = 12 VDC

Adjustment
1 = Fixed
2 = Adjustment on unit
3 = Remote

Time Range Seconds	LIST PRICE EACH			
	ON DELAY		OFF DELAY	
	12 to 120 VAC or VDC	240 VAC	12 to 120 VAC or VDC	240 VAC
.1-30	$21.80	$24.00	$24.80	$27.00
30-120	22.50	25.00	26.10	28.40
Over 120	24.00	26.20	27.00	29.50

ICS/INSTRUMENTATION AND CONTROL SYSTEMS, INC.
520 Interstate Road ★ Addison, Illinois 60101 ★ 312/543-6200 ★ TWX: 910-991-5945

Time Delay Relays

ECONOMY 3 SERIES TIME-DELAY RELAYS

Economical solid-state, time-delay relays ideally suited for many automated or semi-automated industrial applications. Available as plug-in units for KUP type or octal sockets and with fixed delay, adjustable delay with external resistor, or knob adjustable. **Input Voltage:** ±10%, 50/60 Hz. **Operating Temperature Range:** 0°C to +60°C. **Repeatability:** ±3% at nominal voltage and temperature; +10% over specified voltage and temperature range. **Repeat Recycle Time:** 150 msec. **Reset Time:** 150 msec. **Polarity Protection:** Standard on all models. **Transient Protection:** Input, 2000V for 10 µsec; output, 400V for 25 µsec. **Contacts:** K Series—DPDT, 10 amps, resistive; 0 series—DPDT, 5 amps, resistive. **Size:** 4″ h. × 1½″ w. × 1⅜″ d., max.

ORDERING CODE

K A 3 1 2 1

Socket
K = KUP
O = Octal*

Type
F = Fixed
A = Adjustable
P = Knob adjustable

Series 3

Timing Action
1 = On delay
2 = Off delay
3 = Interval delay VAC
*Off delay requires 11-pin socket.

Timing Range (A or P type)
1 = 0.1 to 1 secs.
2 = 0.5 to 5 secs
3 = 5 to 50 secs
4 = 30 to 300 secs
5 = 1 to 10 secs
6 = 12 to 120 secs
7 = 3 to 30 secs
8 = 6 to 60 secs

Timing Range (F type)
1 = 1 sec
2 = 10 secs
3 = 100 secs
4 = 300 secs

Input Voltage
1 = 120 VAC
2 = 24 VAC
3 = 120 VDC
4 = 24 VDC
5 = 240 VAC
6 = 48 VDC
7 = 12 VAC
8 = 12 VDC

Time Ranges Seconds	List Price Each			
	KF3 KA3*	KP3	OF3 OA3*	OP3
ON DELAY				
1-30	$24.83	$27.45	$29.40	$32.50
30-120	26.70	29.10	30.90	33.20
Over 120	29.40	33.70	32.80	34.00
OFF DELAY AND INTERVAL DELAY				
1-30	$30.15	$32.35	$32.80	$37.45
30-120	34.20	36.15	33.00	39.00
Over 120	38.00	40.50	34.30	41.10

*Without timing resistor; to order with resistor, add suffix R to Model Number and add $1.75 to list price.

EQUA ICSOTIMER SERIES

The Type KE Icsotimer is a highly accurate miniature solid state timer designed for versatile mounting. The flat, equal sided package allows screw on mounting and quick disconnects. Digital circuitary provides accuracy and long time delays. **Output Rating:** 1 amp maximum. **Transient Protection:** ±2000 volts for 100 µsec. **Polarity Protection:** Reverse polarity protection on all DC models. **Operating Temperature Range:** −10°C to +70°C. **Repeat Accuracy:** ±1%. **Overall Tolerance:** ±3%. **Size:** 2″ square ×¾″ high.

ORDERING CODE

KE 1 2 1

Icsotime Series

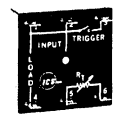
Timing Action
1 = On Delay
2 = Off Delay
3 = Interval

Timing Range
1 = 0.1 secs to 10 secs
2 = 10 secs to 10 min
3 = 10 min to 10 hours

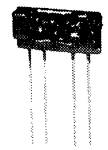
Input Voltage
1 = 120 VAC
2 = 24 VAC
3 = 120 VDC
4 = 24 VDC
5 = 240 VAC
6 = 48 VDC
7 = 12 VAC
8 = 12 VDC

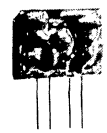
List Price Each	
12 to 120 V AC or DC	240 VAC
$19.75	$21.25

K3 Series



Type KE


Type KH


Type KD

ICSOTIMER SERIES

The Icsotimer is a solid-state time delay package easily adaptable to printed circuit designs, readily incorporated into relay packages, and usable for problem areas where a small timer is required. **Output Rating:** On delay—max. 100 mamps; Off delay—max. 500 mamps. **Transient Protection:** ±2000 V for 100 µsec. **Polarity Protection:** Reverse polarity protection on all DC models. **Operating Temperature Range:** −10° C to +70° C. **Repeat Accuracy:** ±2%. **Overall Tolerance:** ±10%. **Sizes:** On delay—1.25″ lg. × 0.6″ w. × 0.3″ h.; Off delay—1.25″ lg. × 1″ w. × 0.5″ h. U.L. Recognized, 240 VAC not included.

ORDERING CODE

KH 1 2 1

Icsotime Series

Timing Action
1 = On delay
2 = Off delay
3 = Interval delay
4 = Triggered Interval Delay VAC

Timing Range
1 = 0.1 to 1 secs
2 = 0.5 to 5 secs
3 = 5 to 50 secs
4 = 30 to 300 secs
5 = 1 to 10 secs
6 = 12 to 120 secs
7 = 3 to 30 secs
8 = 6 to 60 secs

Input Voltage
1 = 120 VAC
2 = 24 VAC
3 = 120 VDC
4 = 24 VDC
5 = 240 VAC
6 = 48 VDC
7 = 12 VAC
8 = 12 VDC

List Price Each					
1-30 Seconds		30-120 Seconds		Over 120 Secs.	
12 to 120V AC or DC	240 V AC	12 to 120V AC or DC	240V AC	12 to 120V AC or DC	240V AC
ON DELAY					
$11.50	$12.40	$14.49	$15.40	$16.23	$17.07
OFF DELAY/INTERVAL DELAY/TRIGGERED INTERVAL DELAY					
$16.62	.....	$20.16	.....	$22.05	.....

DIGI ICSOTIMER SERIES

The Type KD Icsotimer is similar to the above Type KH, except that it is more accurate and has longer timing periods. **Output Rating:** 1 amp maximum. **Transient Protection:** ±2000 volts for 100 msec. **Polarity Protection:** Reverse polarity protection on all DC models. **Operating Temperature Range:** −10° C to +70° C. **Repeat Accuracy:** ±1%. **Overall Tolerance:** ±3%. **Size:** 1⅜″ square × ½″ thick.

ORDERING CODE

KD 1 2 X 1

Icsotime Series

Timing Action
1 = On delay
2 = Off delay
3 = Interval delay
4 = Triggered interval delay
5 = Recycle delay
6 = Recycle delay (WHERE T_1 & T_2 ARE DIFFERENT)

Timing Range T_1
1 = 0.1 sec. to 10 sec.
2 = 10 sec. to 10 min.
3 = 10 min. to 10 hours

Timing Range T_2
(For Recycle Delay. Only WHERE T_1 & T_2 ARE DIFFERENT Specify timing intervals desired.

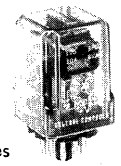
Input Voltage
1 = 120 VAC
2 = 24 VAC
3 = 120 VDC
4 = 24 VDC
5 = 240 VAC
6 = 48 VDC
7 = 12 VAC
8 = 12 VDC

List Price Each	
ON DELAY	
12 to 120 V AC or DC	240 VAC
$15.91	$17.94
OFF DELAY/INTERVAL/TRIGGERED INTERVAL DELAY RECYCLE DELAY (WHERE T_1 & T_2 ARE THE SAME)	
$16.22	$17.94
RECYCLE DELAY (WHERE T_1 & T_2 ARE DIFFERENT)	
$29.40	$30.90

ICS/INSTRUMENTATION AND CONTROL SYSTEMS, INC.
520 Interstate Road ★ Addison, Illinois 60101 ★ 312/543-6200 ★ TWX: 910-991-5945

DELTROL RELAYS

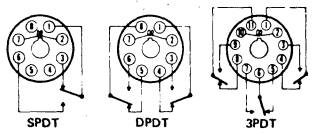
SEE SECTION 4550 FOR SOLENOIDS



105 Series

L = 1-3/8
W = 1-3/8
H = 2

General purpose plug-in relay for continuous duty operation. Plastic cover. Recognized under the Components Program of Underwriters Laboratories, Inc. (File No. E37066).



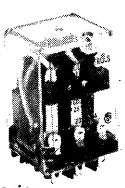
BASE DIAGRAMS FOR 105 SERIES

B-3 HOLD DOWN SPRING
S/N 20171-00

105A Series

L = 1-3/8
W = 1-3/8
H = 2

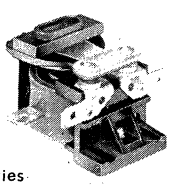
General purpose plug-in relay with a lamp connected across relay coil; indicates voltage applied to coil. Recognized under the components Program of Underwriters Laboratories, Inc. (File No. E37066).



165/166 Series

L = 1-13/32
W = 1-1/2
H = 2-3/16

Plastic covered general purpose plug-in relay. Molded nylon coil. Continuous duty operation. Recognized under the Components Program of Underwriters Laboratories, Inc. (File No. E37066). Also CSA Recognized.



170 Series

L = 1-7/8
W = 1-5/8
H = 1-1/4

High current relays for industrial control applications. Molded nylon encapsulated coil is resistant to fungus and moisture. Recognized under the Components Program of Underwriters Laboratories, Inc. (File No. E37066).

275F Series

General purpose relays with plastic dust cover with flange mounting, barrier-type .250" quick-connect terminals and molded-nylon coil. Recognized under the Components Program of Underwriters Laboratories, Inc. (File No. E37066). CSA Recognized.

105 SERIES

		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20106-82	105	SPDT	10A	24VAC	82	2.0VA
20106-84	105	SPDT	10A	120VAC	2,250	2.0VA
20107-84	105	DPDT	5A	120VAC	1,800	2.2VA
20108-81	105	DPDT	10A	12VAC	19	2.0VA
20108-82	105	DPDT	10A	24VAC	74	2.0VA
20108-84	105	DPDT	10A	120VAC	1,800	2.0VA
20108-85	105	DPDT	10A	240VAC	6,800	2.0VA
20110-82	105	3PDT	10A	24VAC	74	2.2VA
20110-84	105	3PDT	10A	120VAC	1,800	2.2VA
20110-85	105	3PDT	10A	240VAC	6,800	2.2VA
20114-80	105	DPDT	10A	6VDC	30	1.2W
20114-81	105	DPDT	10A	12VDC	120	1.2W
20114-82	105	DPDT	10A	24VDC	472	1.2W
20114-83	105	DPDT	10A	48VDC	1,800	1.2W
20114-84	105	DPDT	10A	110VDC	10,000	1.2W
20116-81	105	3PDT	10A	12VDC	120	1.2W
20116-82	105	3PDT	10A	24VDC	472	1.2W

105A SERIES (w/Indicator Lamp)

		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20117-82	105A	DPDT	10A	24VAC	74	2.2VA
20117-84	105A	DPDT	10A	120VAC	1,800	2.2VA
20117-85	105A	DPDT	10A	240VAC	6,800	2.2VA
20118-84	105A	3PDT	10A	120VAC	1,800	2.2VA

165/166 SERIES

Flange-Mount Versions are Also Available.

		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20307-82	166	DPDT	10A	24VAC	74	2.2VA
20307-84	166	DPDT	10A	120VAC	1,800	2.2VA
20307-85	166	DPDT	10A	240VAC	6,800	2.2VA
20308-82	166	3PDT	10A	24VAC	74	2.2VA
20308-84	166	3PDT	10A	120VAC	1,800	2.2VA
20308-85	166	3PDT	10A	240VAC	6,800	2.2VA
20310-80	166	DPDT	10A	6VDC	30	1.2W
20310-81	166	DPDT	10A	12VDC	120	1.2W
20310-82	166	DPDT	10A	24VDC	472	1.2W
20325-84	165	3PDT	5A	120VAC	1,800	2.2VA
20311-81	166	3PDT	10A	12VDC	120	1.2W
20311-82	166	3PDT	10A	24VDC	472	1.2W
20311-84	166	3PDT	10A	110VDC	9,500	1.2W
20381-82	166A	3PDT	10A	24VAC	74	2.2VA
20381-83	166A	3PDT	10A	120VAC	1,800	2.2VA

170 SERIES

		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20392-82	170	SPST-NO-DM	30A	24VAC	44	4.7VA
20392-83	170		30A	120VAC	1,100	4.7VA
20394-81	170	SPST-NO-DM	30A	12VDC	72	2W
20394-82	170		30A	24VDC	288	2W

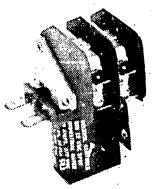
275F SERIES

		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20844-84	275F	DPDT	20A	120VAC	1,670	2.4VA
20848-82	275F	SPST-NO-DM	30A	24VDC	320	1.8W
20852-82	275F	DPDT	20A	24VDC	320	1.8W

DELTROL RELAYS

SEE SECTION 4550 FOR SOLENOIDS

NEW! 20-AMP POWER RELAYS

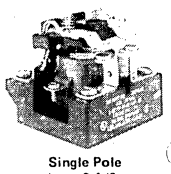


L = 2.07 Max.
W = .940 Max.
H = 2.42 Max.

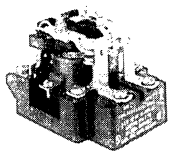
20-Amp Power Relays with molded nylon coils. 0.187 or 0.250 quick-connect terminals. Recognized under the Components Program of Underwriters Laboratories, Inc. (File No. E37066). CSA Certified (File No. 20690).

871 SERIES

Stock No.	Series	Contacts Arrang.	Contacts Rating (Amps)	Coil Input Voltages	Coil Resistance (Ohms)	Coil Nominal Power
20886-82	871	SPDT	20A	24VAC	32	5.0VA
20886-84	871	SPDT	20A	120VAC	800	5.0VA
20886-85	871	SPDT	20A	240VAC	3,000	5.0VA
20887-82	871	DPDT	20A	24VAC	32	5.0VA
20887-84	871	DPDT	20A	120VAC	800	5.0VA
20887-85	871	DPDT	20A	240VAC	3,200	5.0VA
20888-81	871	SPDT	20A	12VDC	50	2.9W
20888-82	871	SPDT	20A	24VDC	200	2.9W
20889-82	871	DPDT	20A	24VDC	128	4.5W



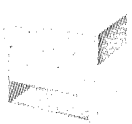
Single Pole
L = 2-1/2
W = 2-1/2
H = 2-3/16



Double Pole
L = 3-11/32
W = 2-1/2
H = 2-3/8

Heavy duty power relay for industrial control applications. Particularly suited for motor controls, heater loads, welder loads, and other power switching applications. Molded nylon coil resists fungus and moisture. Long life, rugged construction. Rating: 25 amps, 1-1/2 hp, 120/240 VAC. Heavy duty screw-type terminals. Mounting: two 3/16" holes on 1-7/8" centers. Listed under the Components Program of Underwriters Laboratories, Inc. (File No. E37066). CSA listed (File No. 20690).

B-5 DUST COVER



L = 5
W = 4
H = 3

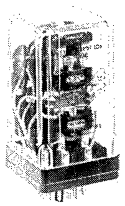
S/N 20257-80

Sealed knock-out holes for standard conduit fittings. Relay mounts on pre-drilled base. Constructed of Aluminum. Snap action cover release. Accommodates relay series 900.

900 SERIES

Auxiliary Switch Models are Also Available.

Stock No.	Series	Contacts Arrang.	Contacts Rating (Amps)	Coil Input Voltages	Coil Resistance (Ohms)	Coil Nominal Power
20237-82	900	SPST-NO	30A	24VAC	12	9.5VA
20237-83	900	SPST-NO	30A	120VAC	290	9.5VA
20238-82	900	SPST NO-DM	30A	24VAC	12	9.5VA
20238-83	900		30A	120VAC	290	9.5VA
20238-84	900		30A	240VAC	1,200	9.5VA
20239-82	900	SPDT	30A	24VAC	12	9.5VA
20239-83	900	SPDT	30A	120VAC	290	9.5VA
20239-84	900	SPDT	30A	240VAC	1,200	9.5VA
20240-82	900	DPST-NO	30A	24VAC	12	9.5VA
20240-83	900	DPST-NO	30A	120VAC	290	9.5VA
20240-84	900	DPST-NO	30A	240VAC	1,200	9.5VA
20241-82	900	DPDT	30A	24VAC	12	9.5VA
20241-83	900	DPDT	30A	120VAC	290	9.5VA
20241-84	900	DPDT	30A	240VAC	1,200	9.5VA
20243-81	900	SPDT	30A	12VDC	72	2W
20244-81	900	DPST-NO	30A	12VDC	72	2W
20244-82	900	DPST-NO	30A	24VDC	290	2W
20245-81	900	DPDT	30A	12VDC	72	2W
20245-82	900	DPDT	30A	24VDC	290	2W
20245-84	900	DPDT	30A	110VDC	6,050	2W



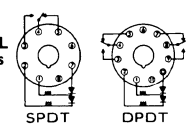
L = 1-15/16
W = 1-15/16
H = 3-1/4

General purpose magnetic latching plug-in relay. Positive snap-action, one-piece armature eliminates interconnections. Standard 8-pin octal-type plug for SPDT, 11-pin for DPDT. Recommended receptacles: Amphenol 77MIP Series, or equivalent.

105ML SERIES

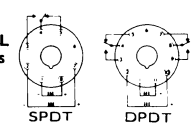
Stock No.	Series	Contacts Arrang.	Contacts Rating (Amps)	Coil Input Voltages	Coil Resistance (Ohms)	Coil Nominal Power
20034-83	105ML	SPDT	10A	120VAC	1,800	3.5VA
20035-83	105ML	DPDT	10A	120VAC	1,800	3.5VA
20038-82	105ML	DPDT	10A	24VDC	300	2W

105ML Series AC



SPDT DPDT

105ML Series DC



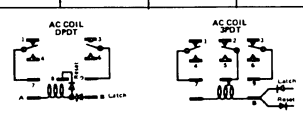
SPDT DPDT

L = 1-13/32
W = 1-1/2
H = 2-3/16

Latching relays especially suited for AC power supplies. Units have moisture and fungus-resistant nylon encapsulated coil. Recognized under the Components Program of Underwriters Laboratories, Inc. (File No. E37066).

166ML SERIES

Stock No.	Series	Contacts Arrang.	Contacts Rating (Amps)	Coil Input Voltages	Coil Resistance (Ohms)	Coil Nominal Power
20525-84	166ML	DPDT	10A	120VAC	1,800	4VA
20527-84	166ML	3PDT	10A	120VAC	1,800	4VA



WIRING DIAGRAMS FOR 166ML SERIES

Diodes are Externally Wired and Supplied by customer. Type IN4005 or equivalent recommended. 3PDT ONLY

All Dimensions are Nominal.

DELTROL controls DIVISION OF DELTROL CORP
2745 S. 19th Street, Milwaukee, Wisconsin 53215 Phone (414) 671-6800, Telex 2-6871

DIVERSIFIED ELECTRONICS, INC.

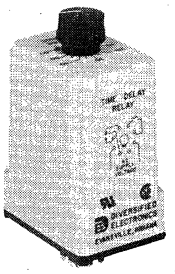
INDUSTRIAL CONTROLS DIVISION

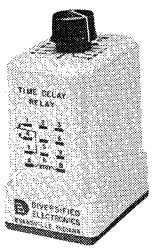
Corporate Headquarters
119 North Morton Avenue
Evansville, IN 47711
(812) 426-2806

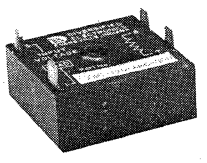
National & International Sales
P.O. Box 207
Leesburg, FL 32748
Toll Free (800) 874-0619
In Florida (904) 787-7259

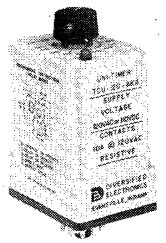
TIME DELAY RELAYS and SOLID STATE TIMERS

	OCTAL TYPE/PLUG IN TD SERIES	BLADE TYPE/PLUG IN TD SERIES	SOLID STATE TS SERIES	UNITIMER TDU SERIES
Delay on Operate	●	●	●	●
Interval on Operate	●	●	●	●
Delay on Release	●	●	●	●
Single Shot	●	●	●	●
Repeat Cycle	●	●	●	
Delayed Interval	●	●	●	
Delayed Single Shot	●	●	●	
Delay on Operate/ Delay on Release	●	●		●
Flasher	●	●		
Energy Conservation	●	●	●	
Percentage Timer	●	●	●	









FEATURES

OCTAL TYPE/PLUG IN TD SERIES
- CMOS CIRCUITRY
- FAST RECYCLE TIME
- VIRTUALLY UNLIMITED DELAYS
- NO FALSE TRANSFER
- CONTINUOUS DUTY CYCLE
- MOST MODELS - UL & CSA
- OCTAL TYPE, PLUG IN BASE
- LEXAN DUST COVER
- FACTORY STOCK

BLADE TYPE/PLUG IN TD SERIES
- CMOS CIRCUITRY
- FAST RECYCLE TIME
- VIRTUALLY UNLIMITED DELAYS
- NO FALSE TRANSFER
- CONTINUOUS DUTY CYCLE
- BLADE TYPE, PLUG IN BASE
- LOW POWER CONSUMPTION
- BOTH AC OR DC TYPES
- FACTORY STOCK

SOLID STATE TS SERIES
- CMOS CIRCUITRY
- NINE (9) OPERATING MODES
- ALL MODELS UL
- TOTALLY SOLID STATE
- DELAYS UP TO 2 HOURS
- SMALL SIZE
- EASY INSTALLATION
- TOTALLY ENCAPSULATED
- FACTORY STOCK

UNITIMER TDU SERIES
- FIELD PROGRAMMABLE
- OPERATES ON AC OR DC VOLTAGES
- FOUR (4) TIMING RANGES
- FIVE (5) OPERATING MODES
- NO FALSE TRANSFER
- LED GLOWS WHEN RELAY IS ENERGIZED
- FACTORY STOCK

DESCRIPTION

The TD Time Delay Relay series features a CMOS integrated circuit consisting of an RC oscillator, a binary counter and an output logic that operates an electro-mechanical relay. The delay period is adjustable by varying the oscillator frequency which is represented by the variable control on the enclosure. A dial is silk screened under the control providing a reference point. Extremely fast recycle times, along with high accuracy and repeatability make the TD series ideally suited for all applications encountered in the industry.

The TD series described here is electrically identical to the octal plug in types. The package and type of termination is the difference. This too features the CMOS integrated circuit providing extremely long delays, fast recycle times, high repeatability and accuracy. As with all other DEI timers, these will not false transfer when power is removed prior to completion of the timing cycle. They plug into standard blade type sockets. Specify QC-11.

The TS series offers a solid state addition to the existing broad line of DEI timers. Their small size and low cost provide an inexpensive alternative to the electro-mechanical types. Nine (9) different operations are offered. The totally encapsulated package features CMOS technology, allowing long timing ranges, 100% solid state circuitry, no moving parts to wear, and quick connect terminals for ease of installation. The same fast recycle times and accuracy employed in the other DEI timers make the TS series also ideally suited for all applications encountered in the industry. All models have UL

The TDU series Unitimer offers the most versatile single timer available today. 1 model replaces 40 standard devices. 4 wide range delays X 5 most common modes of operation X 2 supply voltages, since it will operate on both AC and DC. The CMOS digital circuitry provides high accuracy, repeatability and fast reset times. The long life, heavy duty relay output is rated to carry currents of 10 amps at 24VDC or 120VAC. All programming is easily accomplished externally by using one or more jumpers between designated base pins -no trap doors to open, no switches to set or disassembly required.

SPECIFICATIONS

	OCTAL TYPE/PLUG IN TD SERIES	BLADE TYPE/PLUG IN TD SERIES	SOLID STATE TS SERIES	UNITIMER TDU SERIES
SUPPLY VOLTAGE:	24 or 120 VAC, 50/60 Hz; 24 or 110 VDC	24 or 120 VAC, 50/60 Hz; 24 or 110 VDC	24 or 120 VAC, 50/60 Hz; Some Models Available in DC	24 or 120 VAC, 50/60 Hz; 24 or 110 VDC
TIME DELAYS:	Virtually Unlimited	Virtually Unlimited	Up to 2 Hours	Field Programmable to 1 Hour
TEMPERATURES Operate:	0°C to +55°C	0°C to +55°C	0°C to +55°C	0°C to +55°C
Storage:	-45°C to +85°C	-45°C to +85°C	-45°C to +85°C	-45°C to +85°C
OUTPUT:	DPDT, 10 Amps Resistive; 211 VA Inductive, 1/6 HP @ 120 VAC or 24 VDC	DPDT, 10 Amps Resistive; 211 VA Inductive, 1/6 HP @ 120 VAC or 24 VDC	1 Amp Continuous; 10 Amps Inrush	SPDT, 10 Amps Resistive; 211 VA Inductive, 1/6 HP @ 120 VAC or 24 VDC
REPEATABILITY:	1% Including First Cycle	1% Including First Cycle	1% Including First Cycle	1% Including First Cycle
ACCURACY:	± 10%	± 10%	± 10%	± 10%
RESET TIMES Before Time Out:	100 Milliseconds	100 Milliseconds	100 Milliseconds	100 Milliseconds
After Time Out:	50 Milliseconds	50 Milliseconds	50 Milliseconds	50 Milliseconds
Recycle:	40 Milliseconds	40 Milliseconds	40 Milliseconds	40 Milliseconds
FALSE TRANSFER:	No	No	No	No
REVERSE POLARITY PROTECTED:	Yes	Yes	Yes	Yes
DUTY CYCLE:	Continuous	Continuous	Continuous	Continuous
POWER CONSUMPTION:	3 Watts (Approximately)	3 Watts (Approximately)	3 Watts (Approximately)	3 Watts (Approximately)
LIFE EXPECTANCY Mechanical:	10 Million Operations (Minimum)	10 Million Operations (Minimum)	N/A - No Moving Parts to Wear	10 Million Operations (Minimum)
Electrical	100,000 Operations @ Rated Load	100,000 Operations @ Rated Load	100,000 Operations @ Rated Load	100,000 Operations @ Rated Load
ENCLOSURE STYLE:	"A" Lexan Dust Cover	"B" Lexan Dust Cover	"C" Totally Encapsulated	"A" Lexan Dust Cover
TERMINATIONS:	8 or 11 Pin Octal Plug In; (Use RB-08 or RB-11 Relay Sockets)	11 Pin Blade Plug In; (Use QC-11 Relay Socket)	¼" Quick Disconnect Terminals	11 Pin Octal Plug In; (Use RB-11 Relay Socket)
UL:	Most Models Recognized, File #E55826, Consult Factory	Recognition Forthcoming; Consult Factory	All Models Recognized File #E55826	UL Recognized, File # E55826

DOUGLAS RANDALL
Division of Kidde, Inc.
KIDDE
6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

REED RELAYS

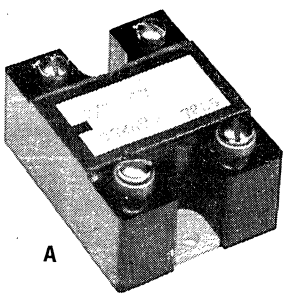
SPECIAL DESIGNS

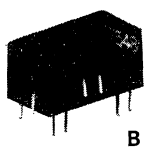
Douglas Randall makes custom designed relays to solve difficult problems. A few models are shown below to illustrate the variety available. Special molding techniques make it possible to manufacture unusual sizes, shapes and terminal arrangements with low tooling costs.

The electrical variations possible with Reed Relays are practically limitless.

Douglas Randall will gladly review your applications and offer rapid engineering and prototype service.

CURRENT SENSING RELAYS



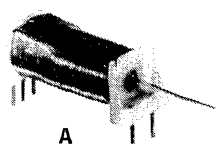


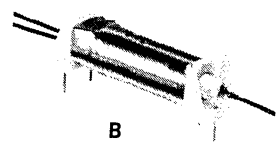
Douglas Randall offers a line of relays with coils capable of handling 25 Amperes DC. Contact arrangements can be Form 1A, Form 1B, or Form 1C.

Relay A has a Form B contact which opens at 1 ADC closes at .5 ADC and can operate continuously at 15 ADC coil current. It has screw terminals and can be bolted to a heat sink.

Relay B has standard DIP terminals. It has a Form B contact which opens at 2.3 ADC and closes at 1.7 ADC.

HIGH INSULATION RESISTANCE RELAYS



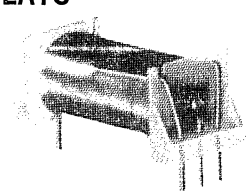


Two typical designs are shown above:

A — A miniature reed relay with a floating lead to maintain high IR.

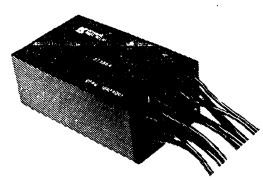
B — This is a relay using Form A and Form B switches timed to provide a Form C (break before make) function with flying leads to maintain 10^{13} ohms. Up to 5 Form A contacts are available @ 10^{13} ohms.

SENSITIVE RELAYS



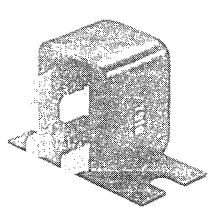
Proper switch selection and tight coil design result in relays operable at lowest coil power. The one shown operates at only 3.5 milliwatts.

SPECIAL HIGH VOLTAGE RELAY



This relay has three separate coils, each containing a 5,000VDC and a 10,000VDC switch. The package is molded with a flame retardant epoxy and constructed to withstand 18,500VDC between the switches and all other conductors. The relay is 3⅞" L x 2⅜" W x 1½" H.

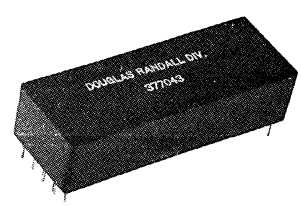
SPECIAL HOUSING



This relay is designed with spade terminals and epoxy molded into a steel case with welded mounting bracket.

DOUBLE COIL RELAY

This is a special Form 2C relay with two coils. Either coil when energized at 90% nominal voltage must be able to cancel the other coil when energized at 110% nominal voltage. The relay must be able to withstand 600VRMS.



DOUGLAS RANDALL

Division of Kidde, Inc.

KIDDE

REED RELAYS

6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

new

Form 1C (SPDT) and Form 2C (DPDT) UL RECOGNIZED REED RELAYS

FILE NO. E/54552; C.C. NRNT2

Fig.	Part No.	Nom. Volt.	DCR Ohms ±10%	Contact Rating
1 & A	377885 377455 377886	6 12-19 24	250 1200 4000	10W, .5A or 200VDC 120VAC @ .275 Amp Use for gating triacs @120VAC
1 & B	377472 375388 377471	6 12-19 24	250 1200 4000	
1 & C	377327 377806 377807	5 12 24	250 1000 4000	240VAC @ .040 Amp. Use for gating triacs @ 240VAC
2 & D	377307 (SP) 377410 377201	6 12 24	175 700 2880	3A @ 17VDC 1A @ 100VDC .3A @ 300VDC For inductive AC loads up to the ratings shown.
	CSA Certified — File LR 34149			
3	377808 377809 377810 373350	6 12 24 48	250 1000 2150 2150	20W, .5A or 500VDC 240VAC @ .040 Amp. Use for triac gating ± 240VAC
4 & B	378510 378511 378512	6 12 24	170 675 2700	10W, .5A or 200VDC 120VAC @ .275A Used for gating triacs @ 120VAC
4 & B	378513 378514 378515	6 12 24	170 675 2700	As above, supplied with dust cover
1 & E	378193 378194 378195	6 12 24	170 675 2700	Form 2C .05A @ 20VAC or VDC
5 & F	378196 378197 378198	6 12 24	250 1000 4000	Form 1C .05A @ 20VAC or VDC

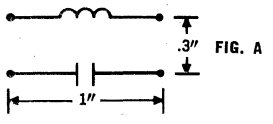


FIG. A

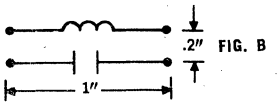


FIG. B

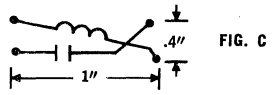


FIG. C

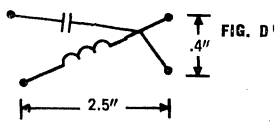


FIG. D

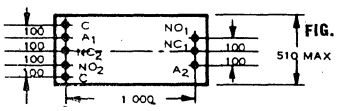


FIG. E

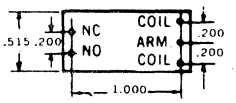


FIG. F

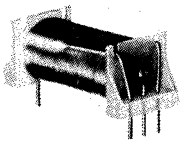


FIG. 1

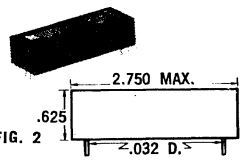


FIG. 2

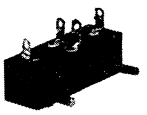


FIG. 3

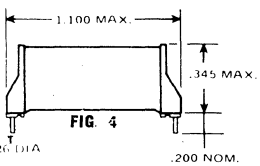
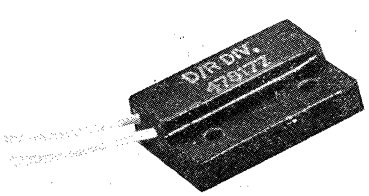


FIG. 4

FIG. 5

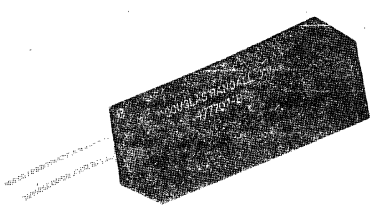
PROXIMITY SWITCHES

STEP MOUNTING



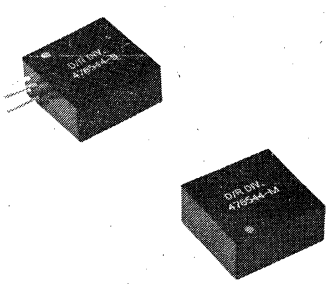
This encapsulated switch is available with Form 1A, Form 1B, Form 1C or Form 2A contacts. It can be supplied with dry reed, mercury wet, high voltage (to 1,000VDC) or high power (to 100VA) contacts. The one shown was designed for low contact resistance and low level switching.

HEAVY DUTY



The proximity switch shown above has heavy duty contacts rated at 100VA. This switch and matching magnet are epoxy encapsulated for heavy duty use on outdoor machinery.

FORM 1A 1B



This is a switch and magnet combination. The switch has Form 1A and Form 1B contacts designed so that one set of contacts is alway open as the magnet approaches it.

DOUGLAS RANDALL
Division of Kidde, Inc.
KIDDE
6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

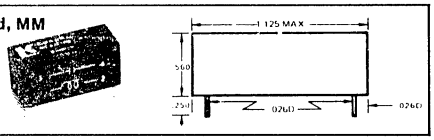
REED RELAYS

MINIATURE REED RELAYS

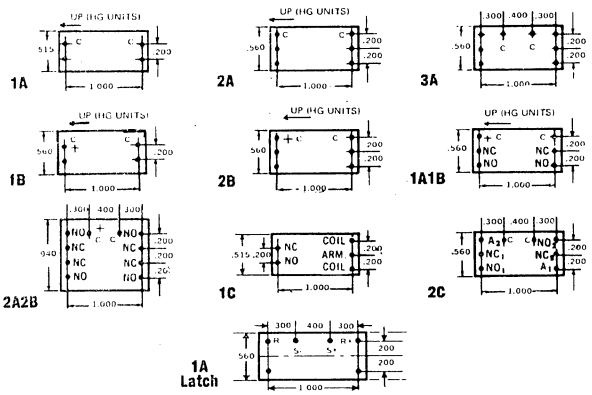
Molded — Series MM Dry, HgM Mercury Wet*
Open — Series MG Dry Reed, HgMG Mercury Wet*

Form	Nominal Voltage	DCR Ohms ±10%	MM Series Part Number	MG Series Part Number
1A	6 12 24	250 1000 4000	6MM1A 12MM1A 24MM1A	6MG1A 12MG1A 24MG1A
2A	6 12 24	170 675 2700	6MM2A 12MM2A 24MM2A	6MG2A 12MG2A 24MG2A
3A	6 12 24	110 450 1800	6MM3A 12MM3A 24MM3A	6MG3A 12MG3A 24MG3A
4A	6 12 24	60 250 1000	— — —	6MG4A 12MG4A 24MG4A
5A	6 12 24	50 200 800	— — —	6MG5A 12MG5A 24MG5A
6A	6 12 24	50 200 800	— — —	6MG6A 12MG6A 24MG6A
1B	6 12 24	170 675 2700	6MM1B 12MM1B 24MM1B	6MG1B 12MG1B 24MG1B
2B	6 12 24	110 450 1800	6MM2B 12MM2B 24MM2B	6MG2B 12MG2B 24MG2B
1A1B	6 12 24	110 450 1800	6MM1A1B 12MM1A1B 24MM1A1B	6MG1A1B 12MG1A1B 24MG1A1B
2A2B	6 12 24	50 200 800	6MM2A2B 12MM2A2B 24MM2A2B	6MG2A2B 12MG2A2B 24MG2A2B
1C	6 12 24	250 1000 4000	6MM1C 12MM1C 24MM1C	6MG1C 12MG1C 24MG1C
2C	6 12 24	170 675 2700	6MM2C 12MM2C 24MM2C	6MG2C 12MG2C 24MG2C
3C	6 12 24	60 250 1000	— — —	6MG3C 12MG3C 24MG3C
4C	6 12 24	50 200 800	— — —	6MG4C 12MG4C 24MG4C
1A Latch	6 12 24	85/85 340/340 1350/1350	6MML1A 12MML1A 24MML1A	6MGL1A 12MGL1A 24MGL1A

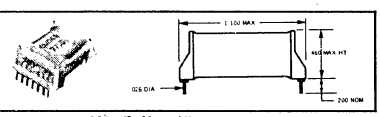
Miniature Molded, MM



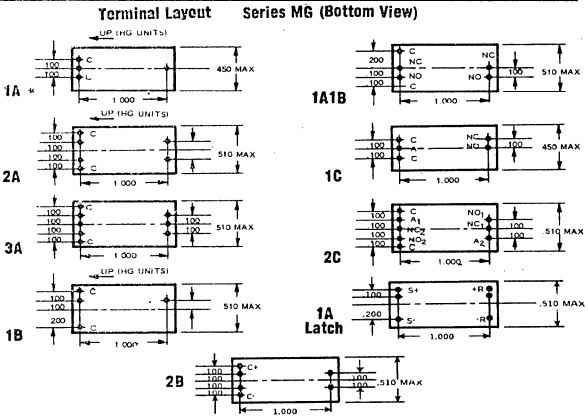
Terminal Layout Series MM (Bottom View)



Miniature Open, MG



Terminal Layout Series MG (Bottom View)



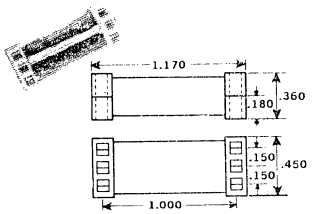
Contact Data — Series MM, SI, MG, XMG and Hg Versions

Contact Type	Contact Rating Form A	Form B	Form C
Dry	10W 12VA .5A 250VDC .15Ω*	10W 12VA .5A 250VDC .15Ω*	3W 3VA .25A 100VDC .2Ω*
Hg Wet	28W — 1A 1000VDC .05Ω*	28W — 1A 1000VDC .05Ω*	14W 14VA .5A 1000VDC .05Ω*
All Position Hg Wet	3W 2.5VA .25A 1000VDC .05Ω*	— — — — —	— — — — —

* Initial Resistance

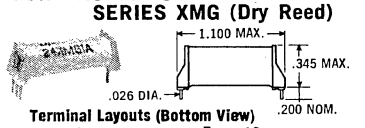
SNAP-IN RELAYS SERIES SI

For use with BERG-PAC 45590 terminals

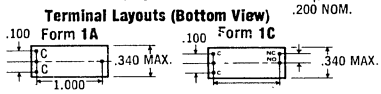


Form	Nominal Voltage	Part Number	DCR Ohms ±10%
1A	6 12 24	6SI1A 12SI1A 24SI1A	250 1000 4000

LOW PROFILE OPEN RELAYS SERIES XMG (Dry Reed)



Terminal Layouts (Bottom View)



Form	Nominal Voltage	Part Number	DCR Ohms ±10%
1A*	6 12 24	6XMG1A 12XMG1A 24XMG1A	168 675 2700
1C*	6 12 24	6XMG1C 12XMG1C 24XMG1C	168 675 2700

Note: Nylon Cover Available.
* Hg wet switches available.

NOTES

1. E/M shields std. all Series MM and all Form B and Form L.
2. E/S shields optional.
3. 1000VDC switches available all Form A and B relays.
4. Premium run-in switches available all models.
5. Ultra sensitive relays available.
6. Series MML/1A, have internal diodes.

*Hg Wet, Form C, & Non-Position Sensitive available

OPERATING DATA — All Series

Must Operate — 70% Nominal
Must Release — 10% Nominal
Maximum Voltage —
Form A and C — 200% Nominal
Form B and Latching — 130% Nominal
Environmental Data: −20°C to +65°C; vibration 35g to 2000cps: shock, 30g.

DOUGLAS RANDALL

Division of Kidde, Inc.

KIDDE

6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

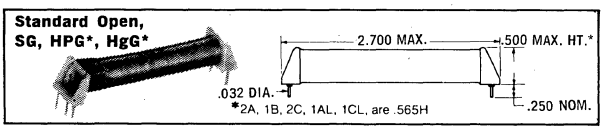
REED RELAYS

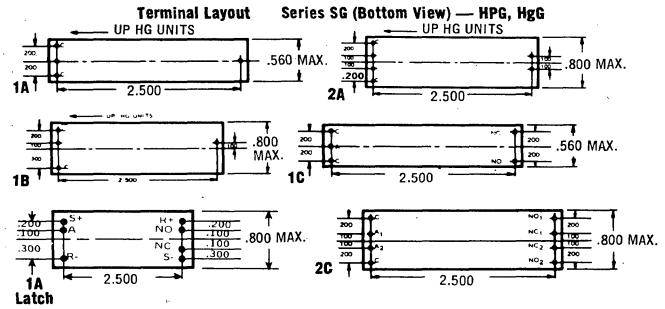
STANDARD SIZE REED RELAYS

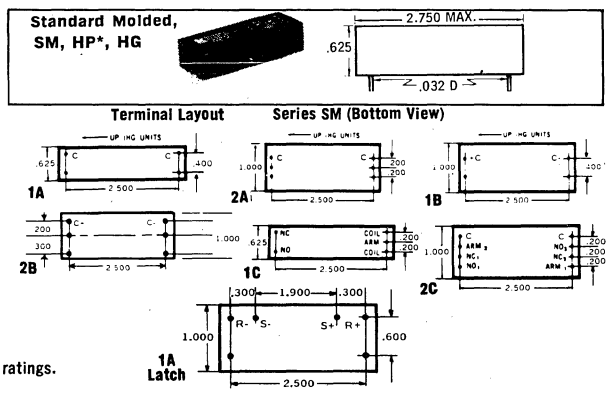
Molded — Series SM, HP*, Hg*
Open — Series SG, HPG*, HgG*

		SM Series	Molded	SG Series	Open
Form	Nominal Voltage	Part Number	DCR Ohms ±10%	Part Number	DCR Ohms ±10%
1A	6	6SM1A	180	6SG1A	180
	12	12SM1A	725	12SG1A	720
	24	24SM1A	2900	24SG1A	2880
2A	6	6SM2A	175	6SG2A	110
	12	12SM2A	700	12SG2A	440
	24	24SM2A	2750	24SG2A	1760
1B	6	6SM1B	175	6SG1B	110
	12	12SM1B	700	12SG1B	440
	24	24SM1B	2750	24SG1B	1760
2B	6	6SM2B	140		
	12	12SM2B	550		
	24	24SM2B	2200		
1C	6	6SM1C	180	6SG1C	180
	12	12SM1C	725	12SG1C	720
	24	24SM1C	2900	24SG1C	2880
2C	6	6SM2C	175	6SG2C	110
	12	12SM2C	700	12SG2C	440
	24	24SM2C	2750	24SG2C	1760
1A Latch	6	6SML1A	85/85	6SGL1A	85/85
	12	12SML1A	340/340	12SGL1A	340/340
	24	24SML1A	1350/1350	24SGL1A	1350/1350

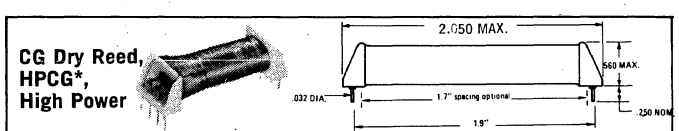
*For part numbers and DCR values contact factory. See specification table for contact ratings.







COMPACT OPEN REED RELAYS



Form	Nom. Volt.	Part Number	DCR Ohms ±10%	Part Number	DCR Ohms ±10%	Terminal Layout (Bottom View)
1A	6	6CG1A	165	6HPCG1A	105	
	12	12CG1A	660	12HPCG1A	420	
	24	24CG1A	2640	24HPCG1A	1680	
2A	6	6CG2A	100	6HPCG2A	65	
	12	12CG2A	400	12HPCG2A	260	
	24	24CG2A	1600	24HPCG2A	1040	
1B	6	6CG1B	100	6HPCG1B	65	
	12	12CG1B	400	12HPCG1B	260	
	24	24CG1B	1600	24HPCG1B	1040	
1C	6	6CG1C	165	6HPCG1C	105	
	12	12CG1C	660	12HPCG1C	420	
	24	24CG1C	2640	24HPCG1C	1680	
2C	6	6CG2C	100	6HPCG2C	65	
	12	12CG2C	400	12HPCG2C	260	
	24	24CG2C	1600	24HPCG2C	1040	
1A Latch	6	6CGL1A	60/60			
	12	12CGL1A	250/250			
	24	24CGL1A	1000/1000			

Common Specifications, All Series

OPERATING DATA
Must Operate — 70% Nominal
Must Release — 10% Nominal
Max. Voltage — Form A & C — 200% Nominal
Form B & Latch — 130% Nominal

ENVIRONMENTAL DATA
Temperature — 20°C to +65°C
Shock — 30g
Vibration — 35g to 2000 Hz

CONTACT RATINGS
Series SM, SG, CG (Standard)

Form	Max. Res. Load	Initial Contact Resistance
A & B	15W, 1.0A, 400VDC	.100Ω
C	10W, .5A, 200VDC	.150Ω

Series HG*, HgG* (Mercury Wet)

A & B	50W, 3.0A, 400VDC	.050Ω

Series HP*, HPG*, HPCG*

Form	Suffix	Max. Res. Load	Initial Contact Resistance
A & B	−25	25W, 1.0A, 1000VDC	.100Ω
A & B	−50	50W, 3.0A, 1000VDC	.200Ω
A & B	−100	110VA, 3.0A, 110VAC	—
C	—	20W. 1.5A, 500VDC	.200Ω

DOUGLAS RANDALL

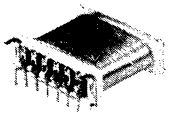
Division of Kidde, Inc.

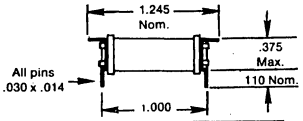
KIDDE

REED RELAYS

6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

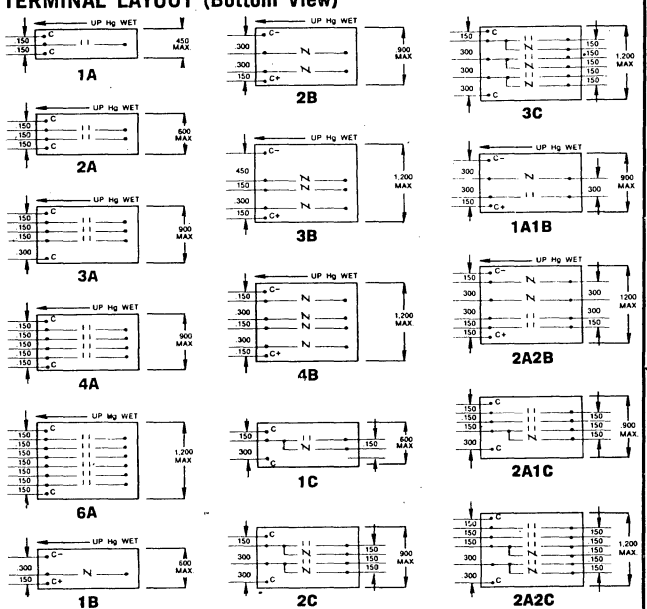
LOW PROFILE — LP, HgLP SERIES





Form	Nominal Voltage	Part Number	DCR Ohms ±10%	Form	Part Number	DCR Ohms ±10%
1A	6	6LP1A	240	4B	6LP4B	45
	12	12LP1A	950		12LP4B	180
	24	24LP1A	3800		24LP4B	700
2A	6	6LP2A	155	1C	6LP1C	155
	12	12LP2A	625		12LP1C	625
	24	24LP2A	2500		24LP1C	2500
3A	6	6LP3A	80	2C	6LP2C	80
	12	12LP3A	325		12LP2C	325
	24	24LP3A	1300		24LP2C	1300
4A	6	6LP4A	80	3C	6LP3C	45
	12	12LP4A	325		12LP3C	180
	24	24LP4A	1300		24LP3C	700
6A	6	6LP6A	45	1A1B	6LP1A1B	80
	12	12LP6A	180		12LP1A1B	325
	24	24LP6A	700		24LP1A1B	1300
1B	6	6LP1B	155	2A2B	6LP2A2B	45
	12	12LP1B	625		12LP2A2B	180
	24	24LP1B	2500		24LP2A2B	700
2B	6	6LP2B	80	2A1C	6LP2A1C	80
	12	12LP2B	325		12LP2A1C	325
	24	24LP2B	1300		24LP2A1C	1300
3B	6	6LP3B	45	2A2C	6LP2A2C	45
	12	12LP3B	180		12LP2A2C	180
	24	24LP3B	700		24LP2A2C	700

TERMINAL LAYOUT (Bottom View)

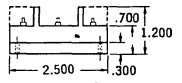


CONTACT DATA — Series LP, and Hg Versions

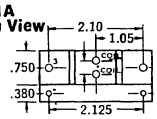
Contact Type	Contact Rating Form A	Form B	Form C
Dry	10W 12VA .5A 250VDC .15Ω*	10W 12VA .5A 250VDC .15Ω*	3W 4VA .25A 28VDC .2Ω*
Hg Wet	28W — 1A 1000VDC .05Ω*	28W — 1A 1000VDC .05Ω*	14W — .5A 1000VDC .05Ω*
All Position Hg Wet	3W 2.5VA .25A 1000VDC .05Ω*	— — — — —	— — — — —

OPERATING DATA — Series LP, HgLP
Must Operate — 70% Nom. Must Release — 10% Nom.
Maximum Voltage — Form A & C — 200% Nominal
Form B — 130% Nominal

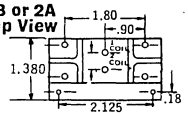
HIGH VOLTAGE RELAYS — HV SERIES



1A Top View



1B or 2A Top View



Form	Nom. Volt.	Part Number	DCR Ohms ±10%
1A (1B*)	6	6HV1A	25
	12	12HV1A	100
	24	24HV1A	400
2A	6	6HV2A	20
	12	12HV2A	80
	24	24HV2A	320

OPTION:
* Relays available in Form B up to 7,500V.

Note: To order, specify as follows: 6HV1A 35 is a 6HV1A relay with 3,500VDC switch.

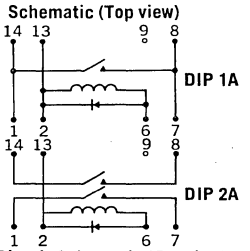
CONTACT DATA

Series	Maximum Resistive Rating			Breakdown Voltage (min.)	Initial Resistance
35	3,500VDC	3.0A	50W	5,000VDC	.100 Ohms
75	7,500VDC	3.0A	50W	10,000VDC	.100 Ohms
100	10,000VDC	3.0A	50W	12,500VDC	.100 Ohms

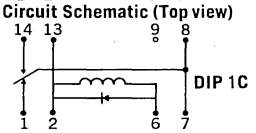
SERIES DIP RELAYS

Fit all standard DIP sockets.
Compatible with logic inputs.
Packaged for Automatic Insertion.

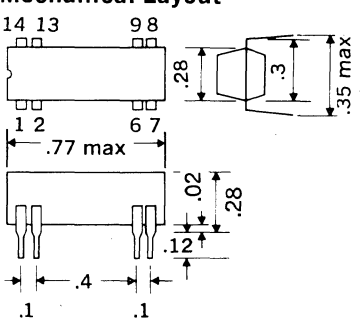
Schematic (Top view)



Circuit Schematic (Top view)



Mechanical Layout



SERIES DIP RELAYS

Contact Form	Nominal Voltage	DCR Ω±10%	*Part Number
1A	5 VDC	500	5 DIP 1A
	12 VDC	800	12 DIP 1A
	24 VDC	2000	24 DIP 1A
2A	5 VDC	140	5 DIP 2A
	12 VDC	400	12 DIP 2A
	24 VDC	1300	24 DIP 2A
1C	5 VDC	200	5 DIP 1C
	12 VDC	500	12 DIP 1C
	24 VDC	1500	24 DIP 1C

*Clamp Diode Available, add D to Part Number e.g. 5 DIP 1AD.

Contact Rating — 1A & 2A 10 VA @ .3A or 100 VDC
1C 3 VA @ .2A or 30 VDC
Initial Control Resistance — 1A & 2A .150Ω
1C .150Ω
Must Operate — 75% Nominal
Must Release — 10% Nominal

DOUGLAS RANDALL SOLID STATE COMPONENTS

Division of Kidde, Inc.
KIDDE
STOCKED FOR IMMEDIATE DELIVERY
6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

SOLID STATE RELAYS SERIES K
DC OUTPUT / DC CONTROL SIGNAL

NEW Output to 250 VDC

Douglas Randall Series K are SPST (NO) or (NC) relays which will switch loads of 4, 8 or 12 Amps to 250 VDC. They provide rapid switching and opto-isolation between input and output. The sensitive inputs are compatible with DTL or TTL logic. Arc-free switching makes these relays suitable for hazardous atmospheres.

MODEL NUMBERS

Output Voltage	Current	Model
2-32VDC	4 Amp	K04A
	8 Amp	K08A
	12 Amp	K12A
2-55VDC	4 Amp	K04B
	8 Amp	K08B
	12 Amp	K12B
2-250 VDC	6 Amp	K06D

*Inductive loads must be diode suppressed.
† Normally closed add — (NC) K04A-NC.

INPUT SIGNAL DATA

Range	3-32VDC
Must Operate	3VDC
Must Release	1VDC
Input Impedance	1000Ω Min.
Isolation	
Signal to Load	1500V
Signal to Base	1500V
Temperature	−30°C to +80°C

MECHANICAL ARRANGEMENT

See AC output relays on page 7

OUTPUT DATA

Continuous Current	4A, 8A, or 12A
DC Line Voltage	2-32VDC or 2-55VDC
Off State Leakage	2mA DC
Turn On Time	50 Micro Sec.
Turn Off Time	500 Micro Sec.
Voltage Drop @ Rate Current	1.5VDC Max.
Isolation Load to Base	1500V

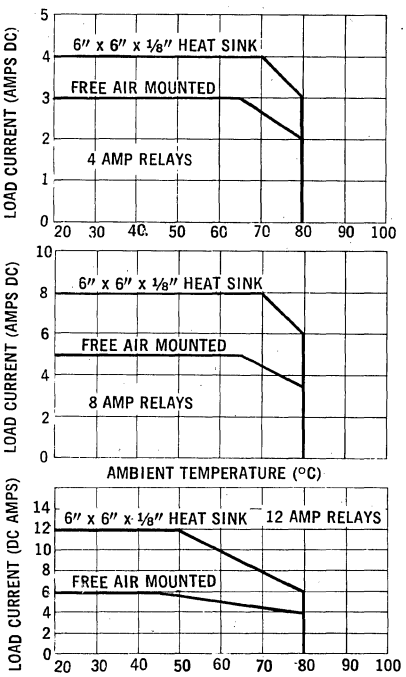
SIZE:
2¼L x 1¾W x 1⅛H Max.

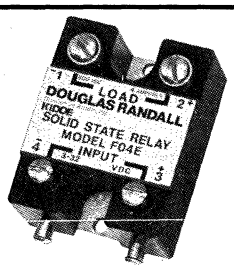
WEIGHT:
4 Ounces Max.

TERMINATION:
Standard Models —
Control Signal:
6-32 Screws
Output:
8-32 Screws

Special Models can be provided with lead wires or other types of termination in OEM quantities. Consult the factory & see pg.7 for mechanical details.

LOAD CURRENT VS TEMPERATURE





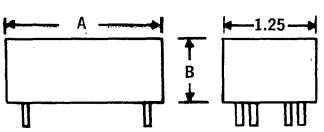
500 VDC SWITCHING

Series F Relays are available SPST (NO) or SPST (NC). They provide rapid switching of loads up to 8 amperes DC. Inputs are opto-isolated and compatible with DTL or TTL logic signals. Arc-free switching makes them suitable for hazardous atmospheres as well as machine tool process control equipment.

MODEL	CURRENT	OUTPUT VOLTAGE	SURGE CURRENT (MAX.) 100μs @ 2% DUTY CYCLE
F04E	4 Amp	25-500 VDC	30 Amp
F08E	8 Amp	25-500 VDC	60 Amp

Note: To designate normally closed relays, add suffix "NC"; e.g., F04E-NC.

SOLID STATE RELAYS — SERIES CV
PC MOUNTED —



INPUT DATA			OUTPUT DATA	
	CV1	CV2		CV1 & CV2
Nominal Voltage	5.5VDC	28VDC	Current	3A RMS
Voltage Range	4-10VDC	10-32VDC	Surge Current	80A Peak
Must Operate	4VDC	10VDC	Minimum Current	50mA
Must Release	.4VDC	.4VDC	Off State Leakage	8mA
Impedance	1000Ω	4000Ω	Voltage	24 to 240VAC
Isolation (Input to Output)	1500V	1500V		@ 47 to 63 Hz
Capacitance	15pF	15pF	Voltage Drop	2.0VAC
			Offstate dv/dt	100V/μsec.
			Turn On Time	8.3msec.
			Turn Off Time	16 msec.

INPUT DATA			OUTPUT DATA	
	CV3	CV6		CV3 & CV6
Nominal Voltage	5.5VDC	28VDC	Maximum Current	3A DC
Voltage Range	4-10VDC	10-32VDC	Voltage Range	4-55VDC
Must Operate	4VDC	10VDC	Voltage Drop	1.6VDC
Must Release	.4VDC	.4VDC	Off State Leakage	10mA DC
Impedance	1000Ω	4000Ω	Turn On Time	500μsec.
			Turn Off Time	1.5msec.

INPUT DATA			OUTPUT DATA	
	CV4	CV5		CV4 & CV5
Voltage Range	10-55VDC	90-130VAC	Voltage	30VDC
Current	10mA	10mA	Current	16mA Max.
Must Not Operate	3mADC	.8mA RMS	Leakage	100μA
Isolation	1500V	1500V	Voltage Drop	.4VDC
Capacitance	10pF	10pF	Logic Supply Volt.	4-5-6VDC
Impedance	—	40KΩ	Logic Supply Cur.	10mA @ 6VDC

MODELS CV-1 & CV-2

3 Amp output @ 120/240 VAC
Zero crossover, Opto-isolation
Dim. A — 2.00″ Max, B — .650″ Max.

MODELS CV-3 & CV-6

3 Amp output @ 4 to 55 Volts DC
Opto-isolation
Dim. A — 2.00″, B — .75″

MODELS CV-4 & CV-5

Convert 10-55 VDC (CV-4)
Convert 90-130 VAC (CV-5)
to Logic Level outputs
Opto-isolation
Dim. A — 1.25″, B — .50″

AC Output CV-1 & CV-2 U/L Recognized, File E60556, C.C.NMFT2
CSA Certified File LR34149

DOUGLAS RANDALL SOLID STATE COMPONENTS

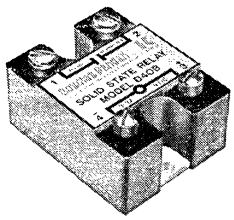
Division of Kidde, Inc.
KIDDE

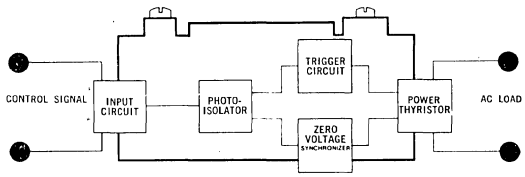
STOCKED FOR IMMEDIATE DELIVERY

6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

SOLID STATE RELAYS RATINGS TO 40 AMPS

AC OUTPUT / DC OR AC CONTROL UL RECOGNIZED / FILE NO. E60556 / C.C. NMFT2 CSA CERTIFIED FILE LR34149





Douglas Randall's line of solid state AC output relays are UL recognized for resistive, lamp and motor loads. Featuring opto-isolation and zero-voltage switching models are available to handle up to 40 Amp. DC or AC control signals can be specified and Form A or B output.

INPUT SIGNAL DATA (AC OR DC)

	DC	AC
Range	3-32V[5]	90-240VAC (80-140VDC)
Must Operate	3VDC	90VAC (80VDC)
Must Release	1VDC	10VAC (10VDC)
Input Impedance	1000Ω Min., 40KΩ Min.	
Isolation		
Signal to Load	1500V, 10^{10}Ω DC	
Signal to Base	1500V, 10^{10}Ω DC	
Capacitance	15 pF Signal to Load	
Temperature Range	−30°C to +80°C	

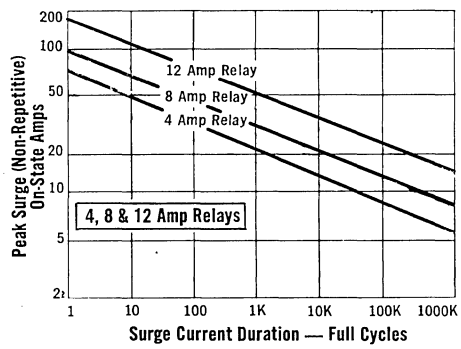
MODEL NUMBERS (NOTE 4)

Output Rating	Current	DC Signal	AC Signal
90-140VAC	4A	D04A	A04A
	8A	D08A	A08A
	12A	D12A	A12A
	25A	D25A	A25A
	40A	D40A	A40A
200-280VAC	4A	D04B	A04B
	8A	D08B	A08B
	12A	D12B	A12B
	25A	D25B	A25B
	40A	D40B	A40B
400-480VAC*	12A	D12D	A12D
	25A	**D25D**	**A25D**
	40A	**D40D**	**A40D**

* Not U/L Recognized
No Internal Snubber

Not CSA Certified

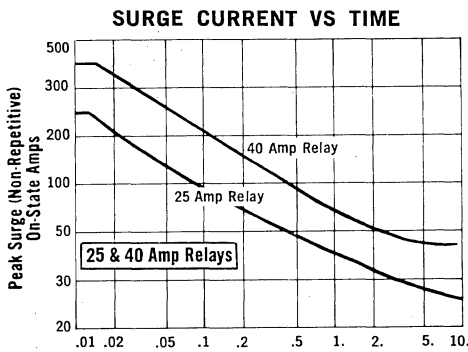
SURGE CURRENT VS TIME



OUTPUT DATA (AC OUTPUT)

Maximum Current	4A	8A	12A	25A	40A
One Cycle Surge Current	75A	100A	150A	250A	400A
Overload (1 sec., RMS)	20A	30A	50A	40A	75A
Minimum Holding Current	50mA Typ.	50mA Typ.	50mA Typ.	50mA Typ.	50mA Typ.

SURGE CURRENT VS TIME



AC Line Voltage: 90/140V or 200/280V[1] @ 47-63 Hz[2]
Voltage Drop @ Rated Current: 1.6V Max.
Typical Turn-on Voltage: 5V
Response Time (DC Signal): ½ Cycle Max.
dv/dt[6] Off State: 100V/μsec.
Commutating: 5V/μsec.

Off State Leakage Current:
90/140VAC — 4.5mA Typ.
200/280VAC — 5.5mA Typ.
400/480VAC — 1.5mA Typ.
Isolation Output to Base: 1500V, 10^{10}Ω DC[3]
Contact Form: SPST (NO)[4]

NOTES AND OPTIONS

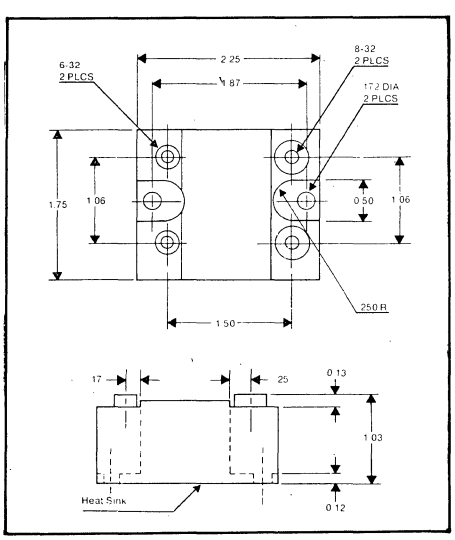
1. Special wide range models can be made which will switch loads from 18V to 140V. These relays can handle either 24VAC or 120VAC loads.
2. 2500VAC isolation between input and output.
3. Form A (SPST-NO) relays are standard. Form B (SPST-NC) switching is optional. Models incorporating this feature are designated by NC. e.g. A40B-NC.
4. All DC models are TTL compatible over the full operating temperature range.
5. All relays except 480VAC Models incorporate an RC snubber network which prevents false operation from transients up to the dv/dt level shown. More severe transients may require additional external protection. We will review your application and recommend the additional protection needed.

MECHANICAL SPECIFICATIONS

Size: 2¼"L x 1¾"W x 1⅛" maximum.

Weight: 4 ounces maximum.

Termination: Standard Models — Control Signal: 6-32 screws. Output: 8-32 screws.
Special Models can be provided with lead wires or other types of termination in OEM quantities. Consult the factory for details.



SPECIAL DESIGNS

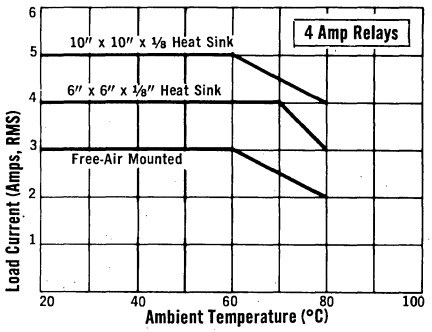
Douglas Randall has designed many special solid state relays, such as a polarized, latching, SPDT unit which will switch 12A at 28VDC. We also have the capability of making special package sizes and terminal arrangements for our solid state relays at moderate tool cost. Your inquiries will be reviewed promptly.

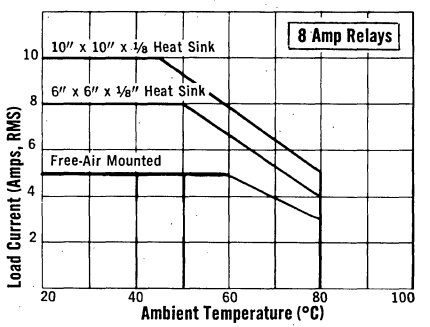
DOUGLAS RANDALL SOLID STATE COMPONENTS

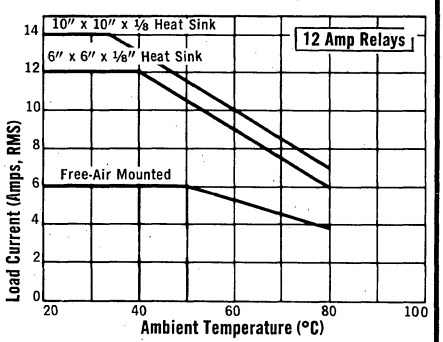
Division of Kidde, Inc.
KIDDE
STOCKED FOR IMMEDIATE DELIVERY
6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

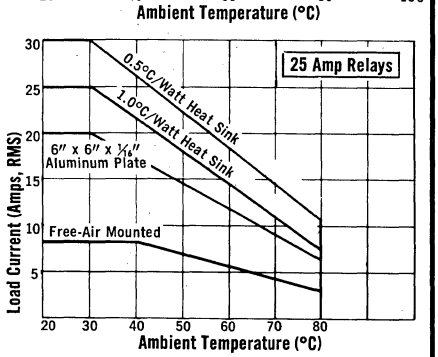
AC OUTPUT (Cont'd)

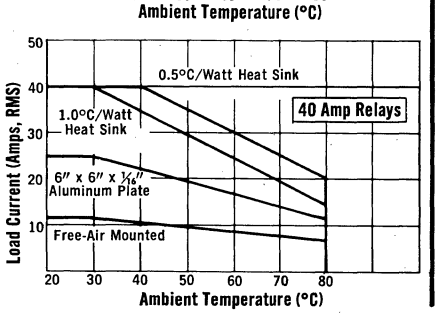
LOAD CURRENT VS TEMPERATURE











PROPOSITIONAL CONTROLS

40 AMP @ 480 VDC

Douglas Randall Proportional Control vary loads up to 40 Amp @ 480 VAC from 0 to 99%.

SERIES R — RESISTOR CONTROLS

These controls operate by connecting a variable resistor to the input terminals. See Figs. 1 & 2.

Mechanical Specifications on page 7

INPUT*

Variable Resistor (150,000Ω, 1 watt) — For 120VAC
Variable Resistor (1 Megohm, ½ watt) — For 240VAC, 277VAC or 480VAC

Output Voltage		CURRENT 5A	10A	15A	25A	40A
90-130 VAC	Models	R05A	R10A	R15A	R25A	R40A
200-240 VAC	Models	R05B	R10B	R15B	R25B	R40B
400-480 VAC	Models*	R05D	R10D	R15D	R25D	R40D

OUTPUT DATA

Maximum Current	5A	10A	15A	25A	40A
One Cycle Surge Current	75A	100A	150A	225A	400A
Overload (1 Sec., RMS)	20A	30A	50A	70A	150A
Minimum Holding Current	.05A	.05A	.07A	.08A	.09A
AC Line: 90/130 VAC, 200/240 VAC, 250/300 VAC or 400/480 VAC					
Typical Leakage: 90/130 VAC — 10 mA; 200-240 VAC — 7 mA; 250-300 VAC — 6 mA; 400-480 VAC — 3 mA*					

* Models R05D, R10D, R15D, R25D and R40D have no snubbers.

SERIES RD / LOGIC INPUT CONTROL

Series RD provide full control from 0% to 99% when energized by 0-10 VDC or 0-15m ADC signals.

MODEL RD04A AND MODEL RD04B

INPUT SIGNAL	0-10 VDC or 0-15 ma DC[2]	
OUTPUT DATA	RD04A	RD04B
Maximum Current	4A	4A
One Cycle Surge Current	100A	100A
One Second Overload Current	40A	40A
Minimum Holding Current	.05A	.05A
AC Line Voltage	90-130 VAC @ 47-63 Hz	200-240 VAC
Off State Leakage	.01A (typical)	.01A (typical)
Response Time	150 m sec @ 10 VDC (typical)	300 m sec @ 10 VDC
Isolation (Input to Output)	500 VRMS	500 VRMS

Notes: 1. All data is measured at 25°C.
2. The input is not polarity sensitive, but **must be protected against voltages above 10 VDC.**

INPUT MODULES RDA, RDB & RDD

These modules accept 0-10 VDC signals. Their output is connected to the input terminals of Series R — Resistor Modules, which in turn controls loads up to 40 Amp @ 480 VAC. See Fig. 3.

NOMINAL PERCENTAGES OUTPUT VS INPUT RESISTANCE @ 25°C

Models R05 to R40A

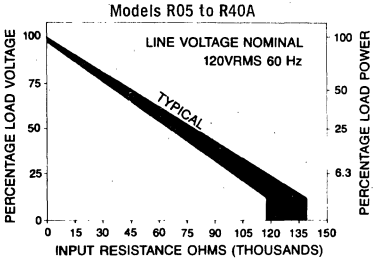


Fig. 1

Models R05 to R40B, R05 to R40D

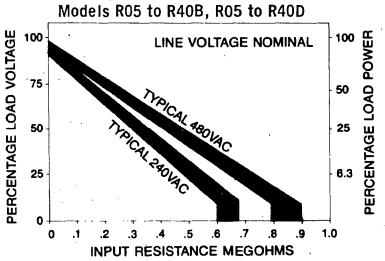


Fig. 2

PERCENT OUTPUT VOLTAGE VS INPUT VOLTAGE

Models RDA, RDB, RDD, RD04A, RD04B

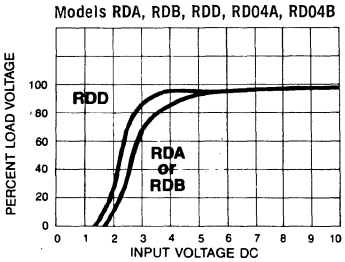


Fig. 3

DOUGLAS RANDALL SOLID STATE COMPONENTS
Division of Kidde, Inc.
KIDDE
STOCKED FOR IMMEDIATE DELIVERY
6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

CONSTANT CURRENT CONTROLS

Constant Current Controls combined with Series R Proportional Controls eliminate current fluctuations regardless of changes in AC voltages or changing load demands. They control loads up to 40 Amps @ 120 or 240 VAC and are available in five ranges listed in the Table.

These controls will maintain uniform current and light intensity for lamp loads as shown in Figures A and B, as well as for resistive loads as shown in Figure C. The Constant Current Controls will also maintain a constant speed in universal and other types of AC motors regardless of changing line voltage.

Constant Current Controls provide overload protection by limiting the current to a preset maximum. This makes them especially useful for keeping motor current at a safe level even under lock or stall rotor conditions (see Figure E).

The controls are encapsulated in small-sized packages for use in harsh environments.

Control Range*	Proportional Control 120 VAC	Proportional Control 240 VAC	Fixed Resistor @ Terminals1-2
2-4 Amp	R05A	R05B	None
4-8 Amp	R10A	R10B	6.65K ±1%
6-12 Amp	R15A	R15B	3.40K ±1%
10-20 Amp	R25A	R25B	1.74K ±1%
16-32 Amp	R40A	R40B	953 ±1%

* The lower end of the control range can be extended by additional loops of wire.

FIG. A

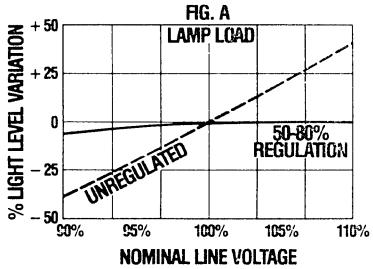


FIG. B

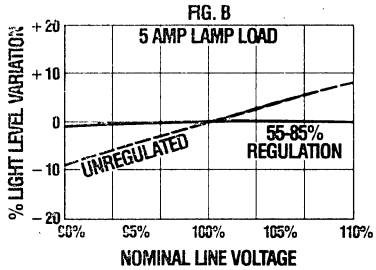


FIG. C

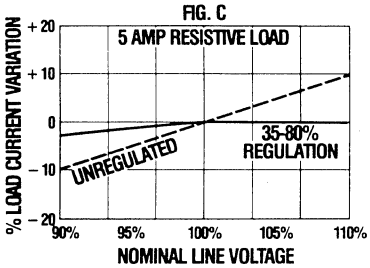


FIG. D

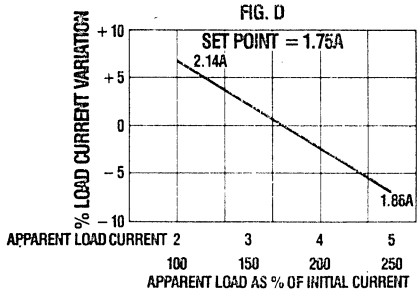
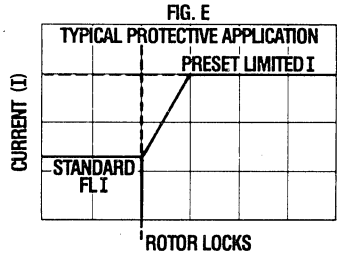


FIG. E



TIME BASE PROPORTIONAL DRIVERS

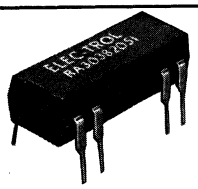
Control Range*	Proportional Control 120 VAC	Proportional Control 240 VAC	Fixed Resistor @ Terminals1-2
2-4 Amp	R05A	R05B	None
4-8 Amp	R10A	R10B	6.65K ±1%
6-12 Amp	R15A	R15B	3.40K ±1%
10-20 Amp	R25A	R25B	1.74K ±1%
16-32 Amp	R40A	R40B	953 ±1%

* The lower end of the control range can be extended by additional loops of wire.

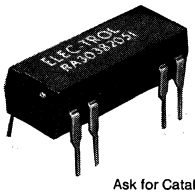
Time based proportional drivers transform any conventional DC-input solid state relay into a proportional controller. The driven relay may be a DC or AC output type. External power is derived from the controlled source. If the driven relay is a zero cross-over device, zero cross-over characteristics are maintained to reduce EMI caused by switching transients. Applications for time base proportional drivers include proportional control of heaters, platers, DC motors, universal wound DC-operated motors and certain AC motors. They are compact, epoxy encapsulated in the standard hockey puck design to withstand harsh environments. Two hole mounting is provided.

Shown at approximately 70 percent of full value is the load current and PDM control signal voltage of a typical time base proportional control of a zero cross-over relay, such as Douglas Randall D25B.

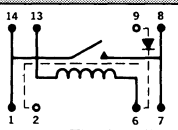
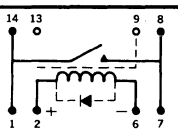
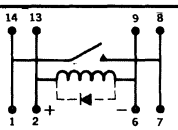
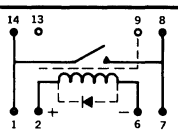
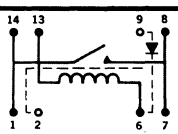
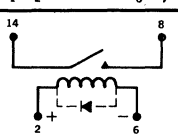
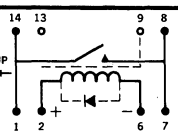
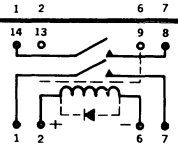
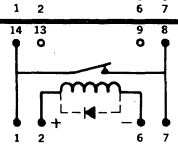
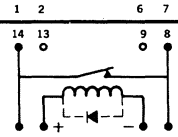
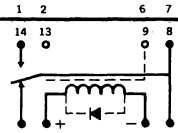
PDMA accepts external power from a 120 VAC controlled source, PDMB accepts power from a 240 VAC source and PDMD accepts power from a 10-32 VDC source.



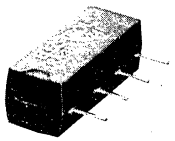
ELECTROL
DIP REED RELAYS



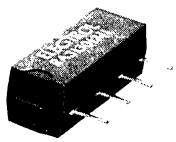
Ask for Catalog No. 103

CONTACT FORM	CONTACT RATING MAX. LOAD (Resistive)	PART NUMBER NO DIODE	PART NUMBER WITH DIODE	COIL V.D.C.	COIL RES. (ohms) @20°C ±10%	MAX. PICK-UP V.D.C. @ 20°C	MIN. DROP-OUT V.D.C. @20°C	PHYSICAL HEIGHT	PHYSICAL NO. TERM.	E.S. OPTION *	CIRCUIT DIAGRAM (Top View of Relay)
1A SPST-NO	10W .5A 200V	RA30921051	RA31201051	5	500	3.8	1.0	.225"	8 Pin DIP	YES	
		RA30921061	RA31201061	6	500	4.0	1.0				
		RA30921121	RA31201121	12	500	8.0	2.0				
		RA30921241	RA31201241	24	1400	16.0	4.0				
		RA30381051	RA30391051	5	500	3.8	1.0	.225"	8 Pin DIP	YES	
		RA30381061	RA30391061	6	500	4.0	1.0				
		RA30381121	RA30391121	12	500	8.0	2.0				
		RA30381241	RA30391241	24	1400	16.0	4.0				
		RA30231051	RA31191051	5	500	3.8	1.0	.225"	8 Pin DIP	NO	
		RA30231061	RA31191061	6	500	4.0	1.0				
		RA30231121	RA31191121	12	500	8.0	2.0				
		RA30231241	RA31191241	24	1400	16.0	4.0				
	10W .5A 100V	RA30451051	RA30461051	5	500	3.8	1.0	.275"	8 Pin DIP	YES	
		RA30451061	RA30461061	6	500	4.0	0.5				
		RA30451121	RA30461121	12	500	8.0	1.0				
		RA30451241	RA30461241	24	2150	16.0	2.0				
		RA31541051	RA31551051	5	500	3.8	1.0	.275"	8 Pin DIP	YES	
		RA31541061	RA31551061	6	500	4.0	1.0				
		RA31541121	RA31551121	12	500	8.0	2.0				
		RA31541241	RA31551241	24	2150	16.0	4.0				
		RA31151051	RA31171051	5	500	3.8	1.0	.275"	4 Pin DIP	NO	
		RA31151061	RA31171061	6	500	4.0	0.5				
		RA31151121	RA31171121	12	500	8.0	1.0				
		RA31151241	RA31171241	24	2150	16.0	2.0				
1A Mercury Wetted	50W 1.0A 100V	RA31501051	RA31511051	5	55	3.8	0.5	.275"	8 Pin DIP	YES	
		RA31501061	RA31511061	6	55	4.5	0.5				
		RA31501121	RA31511121	12	300	9.0	1.0				
		RA31501241	RA31511241	24	1100	18.0	2.0				
2A DPST-NO	10W .5A 200V	RA30982051	RA31232051	5	200	3.8	1.0	.275"	8 Pin DIP	YES	
		RA30982061	RA31232061	6	200	4.0	1.0				
		RA30982121	RA31232121	12	500	8.0	2.0				
		RA30982241	RA31232241	24	2150	16.0	4.0				
1B SPST-NC	10W .5A 200V	RA31001051	RA31251051	5	500	3.8	1.0	.225"	8 Pin DIP	NO	
		RA31001061	RA31251061	6	500	4.0	0.5				
		RA31001121	RA31251121	12	500	8.0	1.0				
		RA31001241	RA31251241	24	1400	16.0	2.0				
	10W .5A 200V	RA30511051	RA30521051	5	500	3.8	1.0	.275"	8 Pin DIP	NO	
		RA30511061	RA30521061	6	500	4.0	0.5				
		RA30511121	RA30521121	12	500	8.0	1.0				
		RA30511241	RA30521241	24	2150	16.0	2.0				
1C SPDT	3W .25A 100V	RA30421051	RA30441051	5	200	4.0	0.5	.275"	8 Pin DIP	YES	
		RA30421061	RA30441061	6	80	4.0	0.5				
		RA30421121	RA30441121	12	500	8.0	1.0				
		RA30421241	RA30441241	24	2000	16.0	2.0				

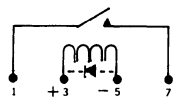
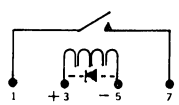
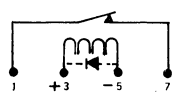
*For electrostatic shielding add –02 to P/N



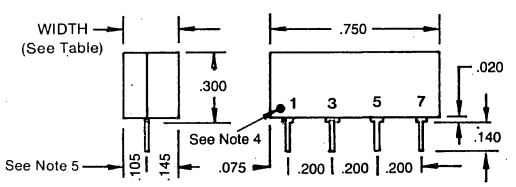
ELECTROL
SIP REED RELAYS



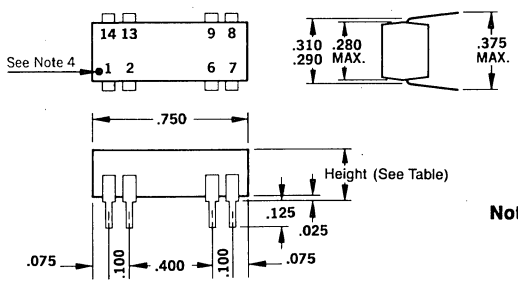
Ask for Catalog No. 103

CONTACT FORM	CONTACT RATING MAX. LOAD (Resistive)	PART NUMBER NO DIODE	PART NUMBER WITH DIODE	COIL V.D.C.	COIL RES. (ohms) @20°C ±10%	MAX. PICK-UP V.D.C. @ 20°C	MIN DROP-OUT V.D.C. @20°C	PHYSICAL WIDTH	PHYSICAL NO. TERM.	E.S. OPTION *	CIRCUIT DIAGRAM (Top View of Relay)
1A SPST-NO	10W .5A 100V	RA32041051	RA32051051	5	500	3.8	1.0	.200"	4 Pin SIP	NO	
		RA32041061	RA32051061	6	500	4.0	0.5				
		RA32041121	RA32051121	12	500	8.0	1.0				
		RA32041241	RA32051241	24	2150	16.0	2.0				
		RA31301051	RA31311051	5	500	3.8	1.0	.250"	4 Pin SIP	NO	
		RA31301061	RA31311061	6	500	4.0	0.5				
		RA31301121	RA31311121	12	500	8.0	1.0				
		RA31301241	RA31311241	24	2150	16.0	2.0				
1B SPST-NC		RA31321051	RA31331051	5	500	3.8	1.0	.250"	4 Pin SIP	NO	
		RA31321061	RA31331061	6	500	4.0	0.5				
		RA31321121	RA31331121	12	500	8.0	1.0				
		RA31321241	RA31331241	24	2150	16.0	2.0				

SIP PHYSICAL



DIP PHYSICAL



DIP/SIP Part Number Description

RA3045 1 05 1 – 02

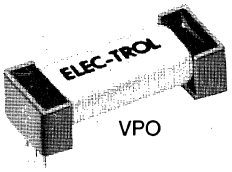
- Series # — RA3045
- Number of Poles — 1
- Coil Voltage – 05, 06, 12, 24 — 05
- Contact Options — 1
  - 1 – Standard Contact
  - 2 – Contact Preconditioning
  - 3 – Low Level Contact
- Shielding Options — 02
  - Omit – No Shielding
  - 02 – Electrostatic Shield

Notes:
1. All dimensions are in inches.
2. Tolerances unless otherwise specified are ±.015".
3. Terminals are .010" ±.005" X .020" ±.005"; solderable.
4. Dot indicates terminal No. 1.
5. RA3204/RA3205 Series, leads are centered on relay body.

DIP and SIP RATINGS

CONTACT FORM	RATING WATTS D.C.	LIFE (X10⁶ Operations) RATED LOAD	LIFE (X10⁶ Operations) LOW LEVELS	MAX. INITIAL CONTACT RES. (ohms)	MINIMUM BREAKDOWN VDC OPEN CONTACTS	MINIMUM BREAKDOWN VDC INSULATED TERMINALS	MIN. INS. RES. @20°C (ohms)	ACTUATE TIME MAX. (Millisec.)	DE-ACTUATE TIME SUPPRESSED MAX (Millisec.)	BOUNCE TIME MAX. (Millisec.)
A or B	3 / 10	10	200	0.2	200	1500	10^{10}	.5	.5	.5
C	3	5	50	0.2	200	1500	10^{9}	.5	.5	NO 1.0 NC 2.0
A – Mercury Wetted	50	100	1000	0.1	1000	1500	10^{10}	2.0	2.0	0

CONTACT FORM		OPERATING TEMPERATURE	STORAGE TEMPERATURE	VIBRATION	SHOCK	ORIENTATION
A, B or C	DIP	–40 to +85°C	–55 to +105°C	20G to 2000 Hz	50G	Any Position
	SIP			10G to 2000 Hz	20G	
A – Mercury Wetted		–30 to +85°C	–30 to +105°C	Not Applicable	Not Applicable	±30° Max. from vertical



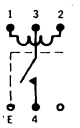
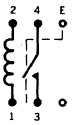
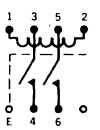
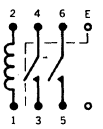
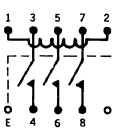
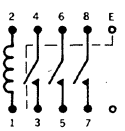
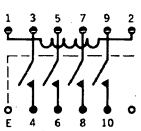
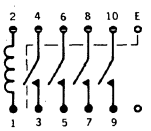
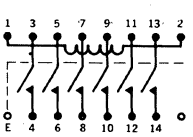
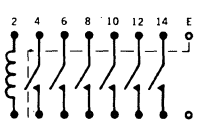
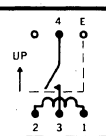
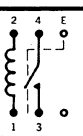
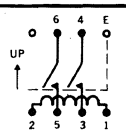
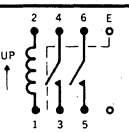
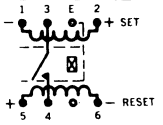
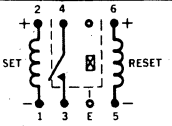
VPO

ELECTROL
VARI-PACK REED RELAYS

General Description:
Elec-Trol Vari-Pack Reed Relays are specially designed to meet high performance and quality standards at low cost. They are available in both open and sealed versions and with coil terminals at the same end or opposite ends of the relay. The sealed version is the open version placed within a polyester cover then encapsulated. Optional features include magnetic shielding, electrostatic shielding and contact preconditioning.

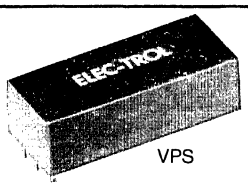
The relay body is made of durable molded polyester with the reed contacts and terminals securely held in place at each end of the relay with epoxy. These relays are available with contact forms 1A through 6A, 1A and 2A mercury wetted, 1A latching, 1B, 2B, 1A1B, 2A2B and 1C through 4C. Consult factory for other coil or switch configurations.

Ask for Catalog No. 121

CONTACT FORM	CONTACT RATING (Resistive)	PART NUMBER		COIL V.D.C.	COIL RES. (ohms) @20°C ±10%	MAX. PICK-UP V.D.C. @ 20°C	MIN DROP-OUT V.D.C. @20°C	WIDTH		CIRCUIT DIAGRAM (Top View of Relay) Replace "X" in Part No.	
		OPEN	SEALED					OPEN	SEALED	A	B
1A*	10W .5A 200V	VPO1A05X10	VPS1A05X10	5	500	3.8	0.5	.36	.41		
		VPO1A06X10	VPS1A06X10	6	125	4.0	0.5				
		VPO1A12X10	VPS1A12X10	12	500	8.0	1.0				
		VPO1A24X10	VPS1A24X10	24	2000	16.0	2.0				
		VPO1A48X10	VPS1A48X10	48	8000	32.0	4.0				
2A*		VPO2A05X10	VPS2A05X10	5	200	3.8	0.5	.44	.49		
		VPO2A06X10	VPS2A06X10	6	110	4.0	0.5				
		VPO2A12X10	VPS2A12X10	12	440	8.0	1.0				
		VPO2A24X10	VPS2A24X10	24	1750	16.0	2.0				
		VPO2A48X10	VPS2A48X10	48	7000	32.0	4.0				
3A*		VPO3A05X10	VPS3A05X10	5	200	3.8	0.5	.55	.60		
		VPO3A06X10	VPS3A06X10	6	85	4.0	0.5				
		VPO3A12X10	VPS3A12X10	12	340	8.0	1.0				
		VPO3A24X10	VPS3A24X10	24	1350	16.0	2.0				
		VPO3A48X10	VPS3A48X10	48	5400	32.0	4.0				
4A*		VPO4A05X10	VPS4A05X10	5	120	3.8	0.5	.66	.71		
		VPO4A06X10	VPS4A06X10	6	60	4.0	0.5				
		VPO4A12X10	VPS4A12X10	12	250	8.0	1.0				
		VPO4A24X10	VPS4A24X10	24	1000	16.0	2.0				
		VPO4A48X10	VPS4A48X10	48	4000	32.0	4.0				
6A*		VPO6A05X10	VPS6A05X10	5	70	3.8	0.5	.86	.91		
		VPO6A06X10	VPS6A06X10	6	35	4.0	0.5				
		VPO6A12X10	VPS6A12X10	12	135	8.0	1.0				
		VPO6A24X10	VPS6A24X10	24	550	16.0	2.0				
		VPO6A48X10	VPS6A48X10	48	2200	32.0	4.0				
1A MERCURY WETTED	50W 1.0A 100V	VPO1M06X10	VPS1M06X10	6	75	4.0	0.5	.44	.49		
		VPO1M12X10	VPS1M12X10	12	300	8.0	1.0				
		VPO1M24X10	VPS1M24X10	24	1200	16.0	2.0				
		VPO1M48X10	VPS1M48X10	48	4800	32.0	4.0				
2A MERCURY WETTED		VPO2M06X10	VPS2M06X10	6	45	4.0	0.5	.55	.60		
		VPO2M12X10	VPS2M12X10	12	175	8.0	1.0				
		VPO2M24X10	VPS2M24X10	24	700	16.0	2.0				
		VPO2M48X10	VPS2M48X10	48	2800	32.0	4.0				
1AL* MAGNETIC LATCH	10W .5A 200V	VPO1L05X10	VPS1L05X10	5	500 ea	3.8	1.5 MS MIN. PULSE WIDTH	.44	.49		
		VPO1L06X10	VPS1L06X10	6	300 ea	4.0					
		VPO1L12X10	VPS1L12X10	12	1200 ea	8.0					
		VPO1L24X10	VPS1L24X10	24	4800 ea	16.0					

*UL Recognized

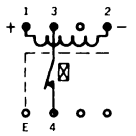
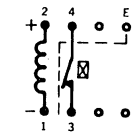
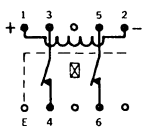
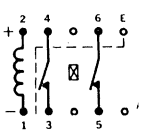
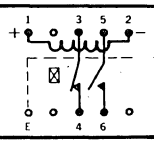
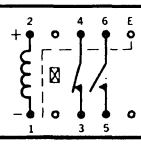
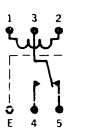
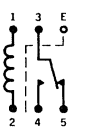
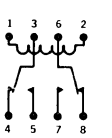
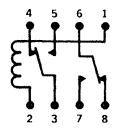
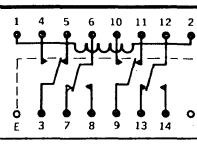
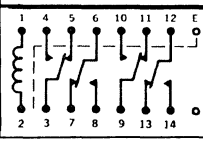
Elec-Trol, Inc. • 26477 N. Golden Valley Rd., Saugus, CA 91350 • (818) 788-7292 • (805) 252-8330 • Telex: 18-1151



VPS

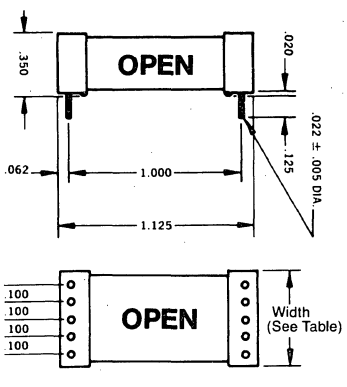
ELECTROL
VARI-PACK REED RELAYS

Ask for Catalog No. 121

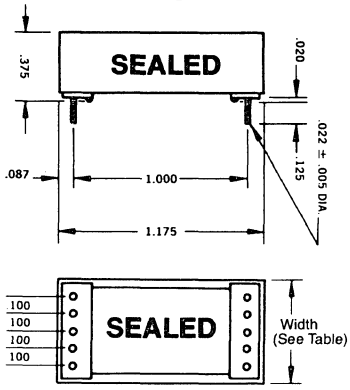
CONTACT FORM	CONTACT RATING (Resistive)	PART NUMBER OPEN	PART NUMBER SEALED	COIL V.D.C.	COIL RES. (ohms) @20°C ±10%	MAX. PICK-UP V.D.C. @ 20°C	MIN DROP-OUT V.D.C. @20°C	WIDTH OPEN	WIDTH SEALED	CIRCUIT DIAGRAM (Top View of Relay) Replace "X" in Part No. A	CIRCUIT DIAGRAM (Top View of Relay) Replace "X" in Part No. B
1B*	10W .5A 200V	VPO1B05X10	VPS1B05X10	5	200	3.8	0.5	.44	.49		
		VPO1B06X10	VPS1B06X10	6	110	4.0	0.5				
		VPO1B12X10	VPS1B12X10	12	440	8.0	1.0				
		VPO1B24X10	VPS1B24X10	24	1750	16.0	2.0				
		VPO1B48X10	VPS1B48X10	48	7000	32.0	4.0				
2B*		VPO2B05X10	VPS2B05X10	5	200	3.8	0.5	.55	.60		
		VPO2B06X10	VPS2B06X10	6	110	4.0	0.5				
		VPO2B12X10	VPS2B12X10	12	440	8.0	1.0				
		VPO2B24X10	VPS2B24X10	24	1750	16.0	2.0				
		VPO2B48X10	VPS2B48X10	48	7000	32.0	4.0				
1A1B*		VPO1F06X10	VPS1F06X10	6	110	4.0	0.5	.55	.60		
		VPO1F12X10	VPS1F12X10	12	440	8.0	1.0				
		VPO1F24X10	VPS1F24X10	24	1750	16.0	2.0				
		VPO1F48X10	VPS1F48X10	48	7000	32.0	4.0				
1C	3W .25A 100V	VPO1C05X10	VPS1C05X10	5	500	3.8	0.5	.44	.49		
		VPO1C06X10	VPS1C06X10	6	125	4.0	0.5				
		VPO1C12X10	VPS1C12X10	12	500	8.0	1.0				
		VPO1C24X10	VPS1C24X10	24	2000	16.0	2.0				
		VPO1C48X10	VPS1C48X10	48	8000	32.0	4.0				
2C		VPO2C05X10	VPS2C05X10	5	200	3.8	0.5	.55	.60		
		VPO2C06X10	VPS2C06X10	6	80	4.0	0.5				
		VPO2C12X10	VPS2C12X10	12	310	8.0	1.0				
		VPO2C24X10	VPS2C24X10	24	1250	16.0	2.0				
		VPO2C48X10	VPS2C48X10	48	5000	32.0	4.0				
4C		VPO4C06X10	VPS4C06X10	6	30	4.0	0.5	.86	.91		
		VPO4C12X10	VPS4C12X10	12	125	8.0	1.0				
		VPO4C24X10	VPS4C24X10	24	500	16.0	2.0				
		VPO4C48X10	VPS4C48X10	48	2000	32.0	4.0				

*UL Recognized

VPO



VPS



Notes: 1. All dimensions are in inches.
2. Tolerance unless otherwise specified is ±.015".
3. Unused terminals are omitted.

VARI-PACK Part Number Description

VPO 1 A 05 A 1 0

VPO – Open
VPS – Sealed

Number of Poles

Contact Form

Coil Voltage – 05, 06, 12, 24, 48

Coil Termination
A – End Coil
B – Side Coil

Contact Options
1 – Standard Contact
2 – Contact Preconditioning
3 – Low Level Contact

Shielding Options
0 – No Shielding
1 – Magnetic Shield (MS)
2 – Electrostatic Shield (ES)
3 – MS & ES Shield

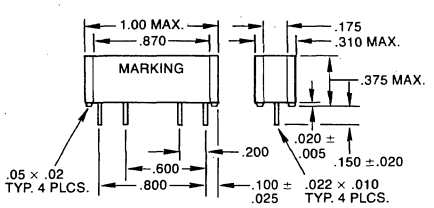
Elec-Trol, Inc. • 26477 N. Golden Valley Rd., Saugus, CA 91350 • (818) 788-7292 • (805) 252-8330 • Telex: 18-1151

ELECTROL
BLUE BOY REED RELAYS

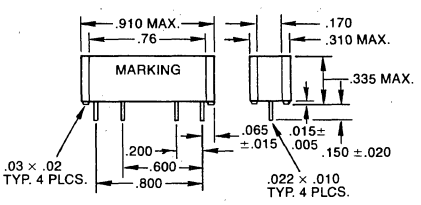
PART NUMBER	COIL V.D.C	COIL RES. OHMS @20°C ±10%	MAX. OPERATE V.D.C. @20°C	MIN. RELEASE V.D.C. @20°C	NOMINAL TIMING MILLISECONDS		MAX. COIL V.D.C.	MINIMUM BREAKDOWN V.D.C.		MAXIMUM D.C. RESISTIVE CONTACT RATING			CIRCUIT DIAGRAM (TOP VIEW)
					OPERATE/ BOUNCE	SUPP. RELEASE/ BOUNCE		OPEN CONTACTS	INSULATED TERMINALS	WATTS	AMPS	VOLTS	
BBS1A SERIES													
BBS1A05A10	5-6	500	3.8	0.5	0.4/0.3	0.1/—	8.0	300	1500	10	0.5	200	
BBS1A06A10	5-6	125	3.8	0.5	0.4/0.3	0.1/—	8.0	300	1500	10	0.5	200	
BBS1A12A10	12	500	8.0	1.0	0.4/0.3	0.1/—	16.0	300	1500	10	0.5	200	
BBS1A24A10	24	2000	16.0	2.0	0.4/0.3	0.1/—	32.0	300	1500	10	0.5	200	
BBS1A48A10	48	8000	32.0	4.0	0.4/0.3	0.1/—	64.0	300	1500	10	0.5	200	
BBL1A SERIES													
BBL1A05A10	5-6	500	3.8	0.5	0.4/0.3	0.1/—	8.0	300	1500	10	0.5	200	
BBL1A06A10	5-6	125	3.8	0.5	0.4/0.3	0.1/—	8.0	300	1500	10	0.5	200	
BBL1A12A10	12	500	8.0	1.0	0.4/0.3	0.1/—	16.0	300	1500	10	0.5	200	
BBL1A24A10	24	2000	16.0	2.0	0.4/0.3	0.1/—	32.0	300	1500	10	0.5	200	
BBL1A48A10	48	8000	32.0	4.0	0.4/0.3	0.1/—	64.0	300	1500	10	0.5	200	
BBS1C SERIES													
BBS1C05A10	5-6	200	4.0	0.5	0.6/0.4	0.5/1.2	8.0	200	1500	3.0	0.25	100	
BBS1C06A10	5-6	125	4.0	0.5	0.6/0.4	0.5/1.2	8.0	200	1500	3.0	0.25	100	
BBS1C12A10	12	500	8.0	1.0	0.6/0.4	0.5/1.2	16.0	200	1500	3.0	0.25	100	
BBS1C24A10	24	2000	16.0	2.0	0.6/0.4	0.5/1.2	32.0	200	1500	3.0	0.25	100	
BBW1A SERIES													
BBW1A05B30	5-6	400	3.8	0.5	0.7/0.3	0.3/—	8.0	600	1500	50	1.0	200	
BBW1A06B30	5-6	100	3.8	0.5	0.7/0.3	0.3/—	8.0	600	1500	50	1.0	200	
BBW1A12B30	12	400	8.0	1.0	0.7/0.3	0.3/—	16.0	600	1500	50	1.0	200	
BBW1A24B30	24	1600	16.0	2.0	0.7/0.3	0.3/—	32.0	600	1500	50	1.0	200	
BBW1A48B30	48	6400	32.0	4.0	0.7/0.3	0.3/—	64.0	600	1500	50	1.0	200	
BBV1A SERIES													
BBV1A05A10	5-6	500	3.8	0.5	0.4/0.3	0.1/—	8.0	300	5000	10	0.5	200	
BBV1A06A10	5-6	280	3.8	0.5	0.4/0.3	0.1/—	8.0	300	5000	10	0.5	200	
BBV1A12A10	12	1120	8.0	1.0	0.4/0.3	0.1/—	16.0	300	5000	10	0.5	200	
BBV1A24A10	24	4480	16.0	2.0	0.4/0.3	0.1/—	32.0	300	5000	10	0.5	200	
BBV1A05A30	5-6	500	3.8	0.5	0.4/0.3	0.1/—	8.0	500	5000	10	0.5	350	
BBV1A06A30	5-6	280	3.8	0.5	0.4/0.3	0.1/—	8.0	500	5000	10	0.5	350	
BBV1A12A30	12	1120	8.0	1.0	0.4/0.3	0.1/—	16.0	500	5000	10	0.5	350	
BBV1A24A30	24	4480	16.0	2.0	0.4/0.3	0.1/—	32.0	500	5000	10	0.5	350	

UL and CSA Recognized
Random Vibration 10G, 20 to 2000 Hz
Maximum Shock 25G
Maximum Initial Contact Resistance 200 Milliohms except BBW1A and BBV1AXXA30 Series of 500 Milliohms
Minimum Insulation Resistance $10^{10}\Omega$ except BBS1C Series of $10^{9}\Omega$

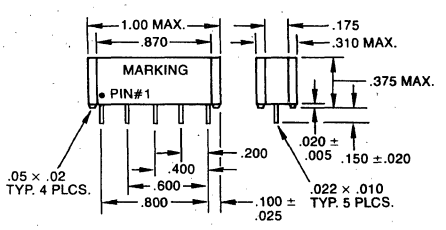
BBS1A Series



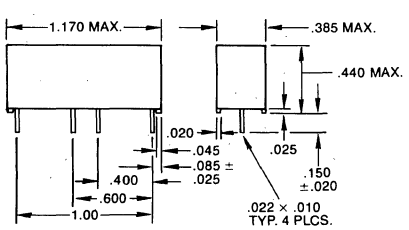
BBL1A Series



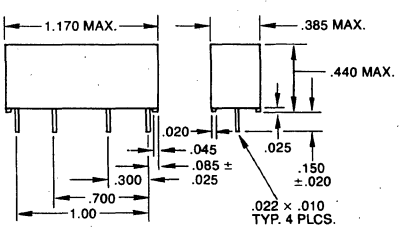
BBS1C Series



BBV1A Series

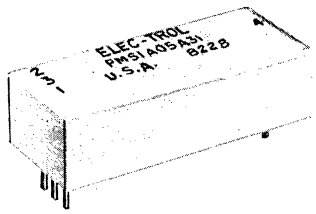


BBW1A Series

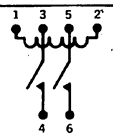


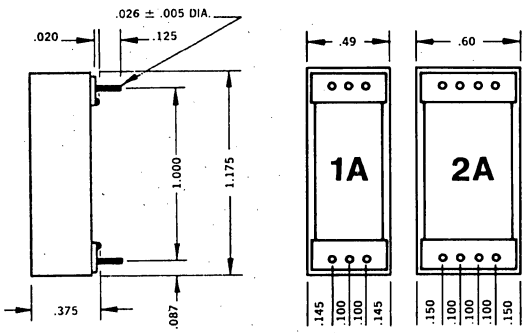
ELECTROL
POWERMITE REED RELAYS

All Powermite Reed Relays are totally epoxy encapsulated in a five-sided metal cover providing magnetic shielding. There are five contacts available to meet almost any switching requirements. Other package styles and contact configurations are available upon request. Please contact the factory for further information.



Ask for Catalog No. 200103

CONTACT FORM	PART NUMBER (X DESIGNATES CONTACT SYMBOL)	COIL V.D.C.	COIL RES. (ohms) @ 20°C	MAX. PICK-UP V.D.C. @ 20°C	MIN. DROP-OUT V.D.C. @ 20°C	CIRCUIT DIAGRAM (Top View of Relay)
1A	PMS1A05AX1	5/6	75	3.8	0.5	
	PMS1A12AX1	12	300	9.0	1.0	
	PMS1A24AX1	24	1200	18.0	2.0	
	PMS1A48AX1	48	4800	36.0	4.0	
2A	PMS2A05AX1	5/6	45	3.8	0.5	
	PMS2A12AX1	12	175	9.0	1.0	
	PMS2A24AX1	24	700	18.0	2.0	
	PMS2A48AX1	48	2800	36.0	4.0	

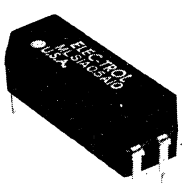


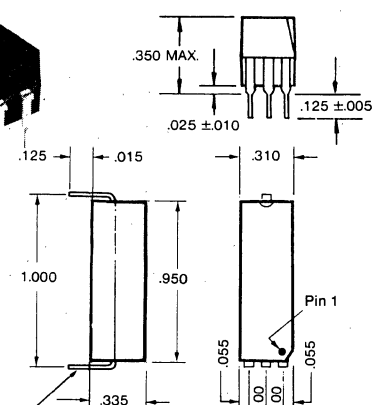
Notes: 1. All dimensions are in inches.
2. Tolerance unless otherwise specified is ±.015".
3. Unused terminals are omitted.

CONTACT RATINGS

CONTACT SYMBOL NEXT TO LAST DIGIT OF P/N	CONTACT RATINGS (RES. LOAD) WATTS DC	MAX. AMP.	MAX. VDC	MAX. VAC	MAX. INITIAL CR (OHMS)	MIN. BREAKDOWN VDC	SWITCH STYLE	RECOMMENDED APPLICATION
1	50	1.0	200	240	.5	600	Pressurized Rhodium	General Purpose
2	50	1.0	200	240	.2	600	Pressurized Rhodium	Low CR
3	100	1.0	200	240	.5	600	Pressurized Tungsten	Hi Inrush
4	50	0.75	1000	700	.2	2500	Vacuum Rhodium	Hi Voltage
5	100	1.0	—	240	.2	600	RF Pressurized	RF Switching

ELECTROL
MOLDED-LINE REED RELAYS





CONTACT FORM	NEW PART NUMBER	REPLACES OLD PART NUMBER	COIL V.D.C.	COIL RES. (ohms) @ 20°C	MAX. PICK-UP V.D.C. @ 20°C	MIN. DROP-OUT V.D.C. @ 20°C	CIRCUIT DIAGRAM (Top View of Relay)
1A 10W .5A 200V	MLS1A05A10	RA31571051	5	500	3.8	0.5	
	MLS1A06A10	RA31571061	6	125	4.0	0.5	
	MLS1A12A10	RA31571121	12	500	7.	1.0	
	MLS1A24A10	RA31571241	24	2000	15.0	2.0	
	MLS1A48A10	RA31571481	48	8000	30.0	4.0	

Note: Also available in a 2FA configuration.

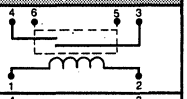
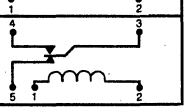
Ask for Catalog No. 200105 (was No. 114)

Terminals are .010" ± .005"x .020" ± .005"; solderable.
All dimensions are in inches.
Tolerance unless otherwise specified is ± .015".

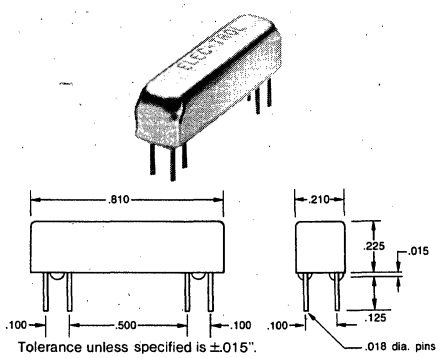
Elec-Trol, Inc. • 26477 N. Golden Valley Rd., Saugus, CA 91350 • (818) 788-7292 • (805) 252-8330 • Telex: 18-1151

ELECTROL
MICRO MINIATURE REED RELAYS

Standard features include metal cover, epoxy encapsulated and electrostatic shielding.

CONTACT FORM	CONTACT RATING MAX. LOAD	PART NUMBER X DESIGNATES CONTACT SYMBOL	COIL V.D.C.	COIL RES. (ohms) @ 20°C	MAX. PICK UP V.D.C. @ 20°C	MIN. DROP OUT V.D.C. @ 20°C	CIRCUIT DIAGRAM BOTTOM VIEW
1A	See Table Below	MMS1A05AX3	5/6	150	3.7	0.4	
		MMS1A12AX3	12	900	9.0	1.0	
		MMS1A24AX3	24	3600	18.0	2.0	
1C	3W 0.25A 100VDC	MMS1C05A11	5/6	150	3.7	0.4	
		MMS1C12A11	12	900	9.0	1.0	
		MMS1C24A11	24	3600	18.0	2.0	

FORM A CONTACT SYMBOL NUMBERS	RATINGS (Res. Load) WATTS D.C	MAX. AMPS	MAX. VOLTS	LIFE (x10⁶ Operations) RATED LOAD	LOW LEVELS	MAX. INITIAL CONTACT RES. (ohms)	MIN. BREAK-DOWN V.D.C.	RECOMMENDED APPLICATION
1	10	0.5	100	5	20	.2	200	Standard
2	5	0.1	100	1	50	.2	300	Dry/Low Level
3	5	0.5	100	5	20	.2	200	RF Loads

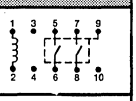
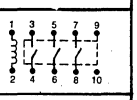
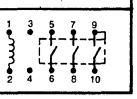


Tolerance unless specified is ±.015".

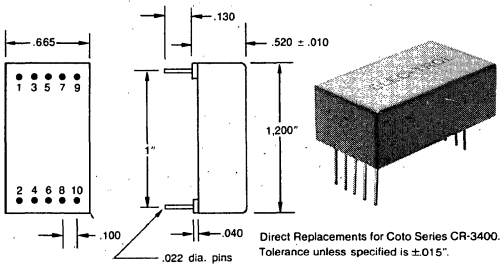
The Micro Miniature relays can be driven directly from TTL logic and have very fast operating time. High density packaging is possible since each relay is completely magnetically shielded. Electrostatic shielding is also featured in the standard package. Encapsulation provides protection from the environment as well as water wash systems.

ELECTROL LOW THERMAL REED RELAYS

Ask for Catalog No. 200104

CONTACT FORM	CONTACT RATING	PART NUMBER	COIL V.D.C.	COIL RES. (ohms) @ 20°C	MAX. PICK UP V.D.C. @ 20°C	CIRCUIT DIAGRAM BOTTOM VIEW
2A	1W 200V 25A	LTS2A05BX3	5	350	3.8	
		LTS2A12BX3	12	2000	9.0	
3A		LTS3A05BX3	5	350	3.8	
		LTS3A12BX3	12	2000	9.0	
3A		LTS3A05CX3	5	350	3.8	
		LTS3A12CX3	12	2000	9.0	

x indicates Thermal EMF rating @ 20°C, measured at pins 5 & 7 with pins 6 & 8 shorted.
1 = < 1μV, 2 = < 3μV, 3 = < 5μV, 4 = < 10μV.



Direct Replacements for Coto Series CR-3400.
Tolerance unless specified is ±.015".

The LTS series of relays are designed for switching low level signals such as thermocouples and strain gauges. The low thermal offset of these relays assures minimum system errors and high signal accuracy. Magnetic shielding as well as electrostatic shielding are offered as standard features to maintain low noise. Two pole and three pole (with guard) models are shown.

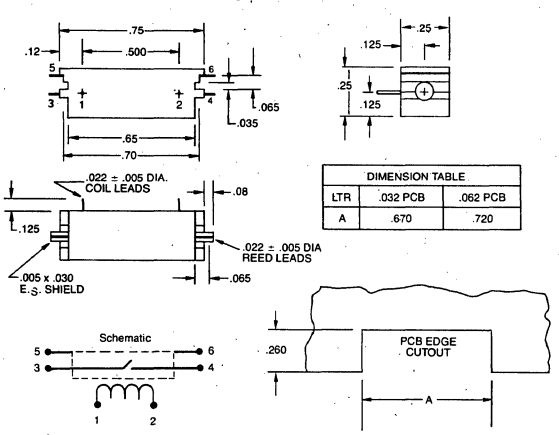
ELECTROL MICRO STRIP RF REED RELAYS

Ask for Catalog No. 200109

The new low cost Elec-Trol GHz Reed Relays with SPST-NO contacts will switch radio frequency and fast rise time pulse signals whose components extend into the GHz range with minimum signal degradation. A special reed switch designed for optimum performance at high frequencies and incorporated in a tubular shield to form a 50 ohms coaxial structure is uniquely packaged for low-loss GHz switching and ease of mounting. Input and output terminations are specifically designed to maintain low VSWR. The RFS series is designed for microstrip applications in both .032" and .062" circuit boards.

PART NUMBER	REPLACES OLD PART NUMBER	COIL V.D.C.	COIL RES. (ohms) @ 20°C	MAX. PICK-UP @ 20°C	MIN. DROP OUT V.D.C. @ 20°C
RFS1A05B12	RA31481051	5	125	3.8	.5
RFS1A06B12	RA31481061	6	125	4.0	.5
RFS1A12B12	RA31481121	12	500	8.0	1.0
RFS1A24B12	RA31481241	24	2000	16.0	2.0

Isolation—20 dB @ 1GHz
Insertion Loss—0.1 dB @ 1GHz
VSWR—Less than 1.15:1



DIMENSION TABLE		
LTR	.032 PCB	.062 PCB
A	.670	.720

Elec-Trol, Inc. • 26477 N. Golden Valley Rd., Saugus, CA 91350 • (818) 788-7292 • (805) 252-8330 • Telex: 18-1151

ELECTROL
OPTO ELECTRONICS

SUBMINIATURE OPTICALLY COUPLED
SC6 SERIES SOLID STATE RELAYS (0.5 AMP)
FOR AC LOADS AND DIRECT OPERATION FROM LOW-LEVEL LOGIC CIRCUITS

The SC6 Series offers complete opto-coupled solid state relays capable of switching .5 ampere loads from 120VAC or 240VAC line voltages with DC input currents of 10mA or 20mA.

The input circuit consists of a Ga Al As LED; the output circuit consists of a pair of back-to-back SCRs controlled by proprietary IC circuits. Upon activating the input, the LED emits infra-red light which is transmitted through an optically transparent media to the output circuit. The ICs detect the zero crossing of the AC voltage and enable the photo sensitive SCRs for the duration of the input. This arrangement is more resistant to line borne transients than conventional circuits and eliminates the use of an AC bridge rectifier. The dual SCR output provides better commutation and improved power dissipation over single thyristor output stages. The component count is significantly reduced, improving reliability.

The SC6 may be used to drive a triac for switching higher current loads. This combination retains the advantage of high transient immunity and a tight zero cross window.

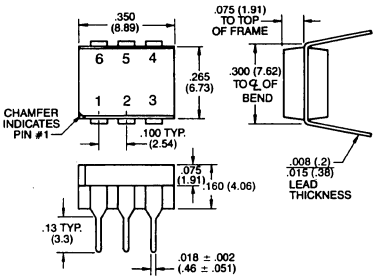
PART NO.	INPUT	OUTPUT	
	OPERATE CURRENT	RATED VOLTAGE	RATED CURRENT
SC610 **SC612**	15mA 5mA	140Vrms	0.5 Amp
SC620 **SC622**	15mA 5mA	280Vrms	0.5 Amp

U.L. File 55863

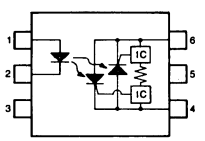
ELECTRICAL CHARACTERISTICS
(25°C free air unless otherwise specified)

INPUT	Max. Must Operate Current SC610, SC620 SC612, SC622	 15.0mA* 5.0mA*
	Nominal Input Current SC610, SC620 SC612, SC622	 20mA 10mA
	Max. Input Current	40mA
	Must Release Current	0.1mA
	Max. Forward Voltage Drop Vf	1.5VDC (If = 20mA)
	Max. Reverse Voltage Vr	3.0VDC
OUTPUT	Rated Voltage SC610, SC612 SC620, SC622	 12-140Vrms 24-280Vrms
	Continuous Current Range	.010 to 0.5A rms*
	Peak ½ Cycle Current	5.0A
	Max. Power Dissipation @ 50°C	600mW
	Derate Linearly from 50°C	9mW/°C
	Min. Peak Repetitive Off-State Voltage SC610, SC612 SC620, SC622	 400V 500V
	Max. Off-State Leakage Current SC610, SC612 SC620, SC622	 300μA rms 350μA rms
	Max. Peak On-State Voltage VTM	1.2V (IT = 500mA rms)
	Turn-on Time (60Hz)	8.4msec
	Turn-off Time (60Hz)	8.4msec
	Max. Zero Cross Voltage Turn-on	±5V
	Min. dv/dt Rating (Off-State)	100V/μsec
ISOLATION	Min. Input to Output Breakdown Voltage	2500Vrms
	Min. Input to Output Isolation Resistance	10^{11} Ohms
	Typical Input to Output Coupling Capacitance	3pF
TEMP.	Storage Temperature	−40 to +125°C
	Operating Temperature	−20 to +85°C
	Max. Lead Soldering Time @ 260°C	7 sec

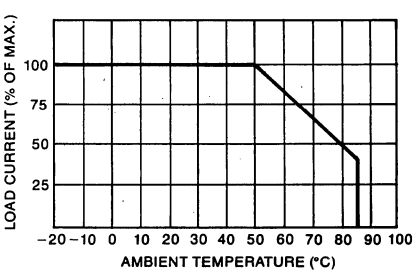
*.5 Power Factor Inductive Load



Maximum Dimension and Pin Designation SC6 Series (mm)

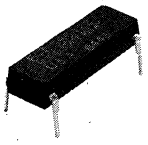


CIRCUIT DIAGRAM (Top View)
SC6 Series



Maximum Load Current vs. Ambient Temperature

Elec-Trol, Inc. • 26477 N. Golden Valley Rd., Saugus, CA 91350 • (818) 788-7292 • (805) 252-8330 • Telex: 18-1151

Actual Size 

ELECTROL
OPTO ELECTRONICS

SUBMINIATURE OPTICALLY COUPLED
SB SERIES SOLID STATE RELAY (1.0 AMP)
FOR AC LOADS AND DIRECT OPERATION FROM LOW-LEVEL LOGIC CIRCUITS

The SB Series offers complete opto-coupled solid state relays capable of switching 1 ampere loads from 120VAC or 240VAC line voltages with input voltages ranging from 3 to 32VDC. The SB5421V and SB5422V meet the physical and electrical input/output isolation requirements of VDE.

The input circuit consists of a Ga Al As LED in series with a proprietary current limiter circuit which allows the input to operate over a range of 3-32VDC. The output circuit consists of a pair of back-to-back SCRs controlled by proprietary IC circuits. These IC circuits provide precise control of the SCRs so that .3 power factor inductive loads may be switched. Upon activating the input, the LED emits infra-red light which is transmitted through an optically transparent media to the output circuit. The ICs detect the zero crossing of the AC voltage and enable the photo sensitive SCRs for the duration of the input. This arrangement is more resistant to line borne transients than conventional circuits and eliminates the use of an AC bridge rectifier. The dual SCR output provides better commutation and improved power dissipation over single thyristor output stages. The component count is significantly reduced, improving reliability.

The SB units perform the same circuit functions as the Teledyne 645-1 and 645-2 units.

PART NO.	INPUT	OUTPUT	
	OPERATE VOLTAGE	RATED VOLTAGE	RATED CURRENT
SB5421 **SB5421V***	3.8-32VDC	140Vrms	1.0A
SB5422 **SB5422V***	3.8-32VDC	280Vrms	1.0A

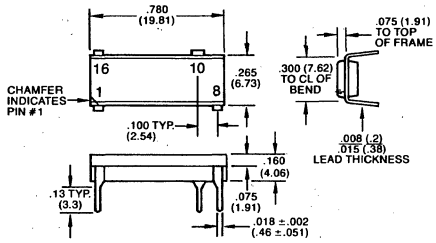
U.L. File 55863

*Designed to Meet VDE Requirements

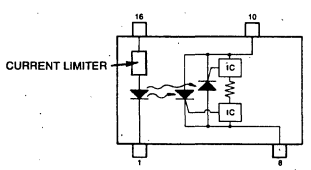
ELECTRICAL CHARACTERISTICS
(25°C free air unless otherwise specified)

INPUT	Input Voltage Range	3.8 to 32VDC
	Max. Input Current @ 32 VDC	14mA
	Typical Input Current @ 5VDC	11mA
	Min. Release Voltage	1.0VDC
	Max. Reverse Voltage Vr	35VDC
OUTPUT	Rated Voltage SB5421, SB5421V SB5422, SB5422V	 140Vrms 280Vrms
	Continuous Current Range	.010 to 1.0A rms**
	Peak ½ Cycle Current	8.0A
	Max. Power Dissipation @ 35°C	1.4W
	Derate Linearly from 35°C	1.4mW/°C
	Min. Peak Repetitive Off-State Voltage SB5421, SB5421V SB5422, SB5422V	 400V 500V
	Max. Off-State Leakage Current SB5421, SB5421V SB5422, SB5422V	 300μA rms 350μA rms
	Max. Peak On-State Voltage V_{TM}	1.4V (I_T = 1.0A rms)
	Turn-on Time (60Hz)	8.4msec
	Turn-off Time (60Hz)	8.4msec
	Max. Zero Cross Voltage Turn-on	±5V
	Min. dv/dt Rating (Off-State)	100V/μsec
ISOLATION	Min. Input to Output Breakdown Voltage SB5421, SB5422 SB5421V, SB5422V	 2500Vrms 3750Vrms
	Min. Input to Output Isolation Resistance	10^{11} Ohms
	Typical Input to Output Coupling Capacitance	3pF
TEMP.	Storage Temperature	−40 to +125°C
	Operating Temperature	−20 to +85°C
	Max. Lead Soldering Time @ 260°C	7 sec

**.3 Power Factor Inductive Load

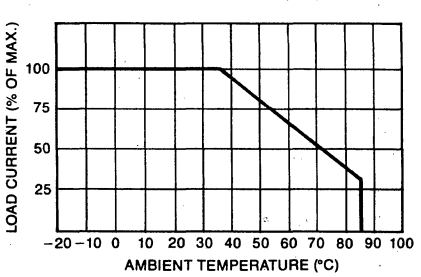


Maximum Dimension and Pin Designation SB Series (mm)

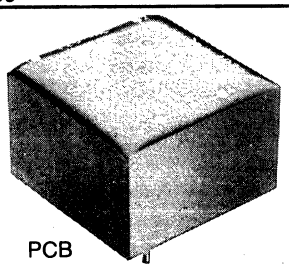


CIRCUIT DIAGRAM
(Top View)

SB 5421/SB5422 Series



Maximum Load Current vs. Ambient Temperature

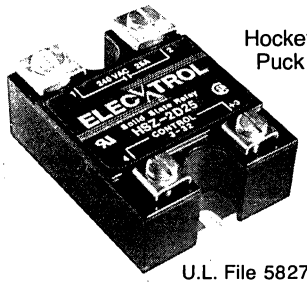


PCB

U.L. File 58275

ELECTROL
OPTO ELECTRONICS

PCB AND HOCKEY PUCK OPTICALLY COUPLED SOLID STATE RELAYS



Hockey Puck

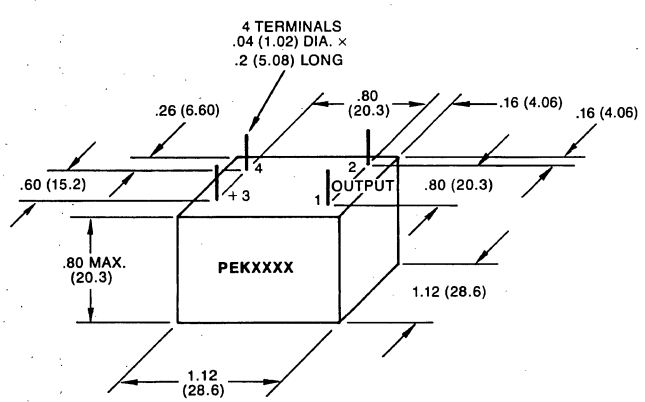
U.L. File 58275

The PCB printed circuit board mounted solid state relays offer zero crossover switcing of AC loads with photo isolation between the input and output. These DC input relays are capable of being driven directly from TTL logic. Totally epoxy encapsulated, these small relays occupy only 1.27 square inches of PC board area, switch up to 3 amperes at 120 or 240VAC, and provide trouble-free operation in hostile environments.

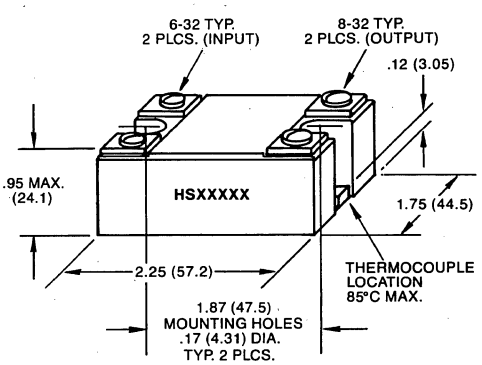
The Hockey Puck solid state relays offer zero crossover switching of high power AC loads with pnoto isolation between the input and output. Capable of being driven from TTL logic, DC models include reverse polarity protection. Available with AC or DC input, these totally solid state relays are epoxy encapsulated to provide trouble-free operation in hostile environments. The HSV models are designed to meet the physical and electrical input/output isolation requirements of VDE.

ELECTRICAL CHARACTERISTICS

PACKAGE AND TERMINAL CONFIGURATION	CIRCUIT TYPE	PART NUMBER	INPUT VOLTAGE	RESISTIVE LOAD (AMPS)	BLOCKING VOLTAGE (PEAK)	NOMINAL LINE VOLTAGE (Vrms)	MOTOR LOAD (AMPS)	ONE CYCLE NON-REPETITIVE PEAK AMPS	MAXIMUM OFF-STATE LEAKAGE (mA)	ISOLATION VOLTAGE	MAXIMUM OPERATE CURRENT
PRINTED CIRCUIT BOARD MOUNT	Opto-Isolated Zero-Cross DC Input	**PEK-1D03**	3-18VDC	3	400	120	2	80	4	2500Vrms	14mA@ 18VDC
		PEK-2D03	3-18VDC	3	500	240	2	80	8	2500Vrms	
HOCKEY PUCK	Opto-Isolated Zero-Cross DC Input	**HSZ-1D10**	3-32VDC	10	400	120	4.4	80	4	2500Vrms	10mA@ 3VDC
		HSZ-1D25	3-32VDC	25	400	120	11	175	4	2500Vrms	
		HSZ-2D10	3-32VDC	10	500	240	4.4	80	8	2500Vrms	20mA@ 32VDC
		HSZ-2D25	3-32VDC	25	500	240	11	175	8	2500Vrms	
	Opto-Isolated Zero-Cross DC Input VDE Spacing	**HSV-1D10**	3-32VDC	10	400	120	4.4	80	4	3750Vrms	
		HSV-1D25	3-32VDC	25	400	120	11	175	4	3750Vrms	
		HSV-2D10	3-32VDC	10	500	240	4.4	80	8	3750Vrms	
		HSV-2D25	3-32VDC	25	500	240	11	175	8	3750Vrms	
	Opto-Isolated Zero-Cross AC Input	**HSZ-1A10**	90-280Vrms	10	400	120	4.4	80	4	2500Vrms	5mA@ 280Vrms
		HSZ-1A25	90-280Vrms	25	400	120	11	175	4	2500Vrms	
		HSZ-2A10	90-280Vrms	10	500	240	4.4	80	8	2500Vrms	
		HSZ-2A25	90-280Vrms	25	500	240	11	175	8	2500Vrms	



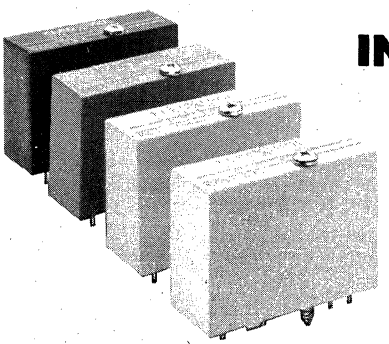
PCB (mm)
Maximum Dimensions and Terminal Designations

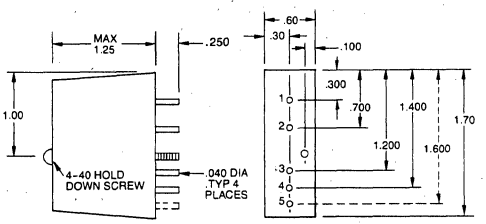


HOCKEY PUCK (mm)
Maximum Dimensions and Terminal Designations

ELECTROL
OPTO ELECTRONICS

INPUT/OUTPUT MODULES





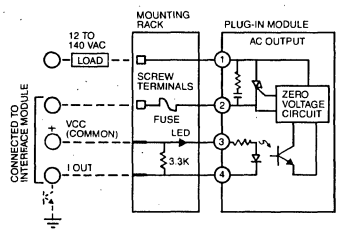
Pin 5 on Input Modules only.

AC INPUT MODULES	IAC5	IAC15	IAC24	IAC5A	IAC15A	IAC24A
Output Characteristics						
Logic Supply Voltage DC	4.5-6V	12-18V	20-30V	4.5-6V	12-18V	20-30V
Maximum Logic Supply Current	18mA @5V	15mA @15V	12mA @24V	18mA @5V	15mA @15V	12mA @24V
Output Transistor Breakdown Voltage, DC	30V					
Output Current	50mA					
Output Leakage @ 30VDC No Input	100μA					
Output Voltage Drop	0.4V @ 50mA					
Input Characteristics						
Input Line Voltage AC/DC	90-140VAC/DC			180-280VAC/DC		
Input Current, Max.	11mA @ 140V			6.5ma @ 280V		
Allowable Input for No Output	3.0mA* (45V)			.5mA* (80V)		
Isolation Characteristics						
Isolation Input to Output	4000Vrms					
Capacitance Input to Output	Resistance $10^{10}\Omega$ Min., 5 pF Max.					
Timing Characteristics						
Turn-On	20mS Max.					
Turn-Off	20mS Max.					

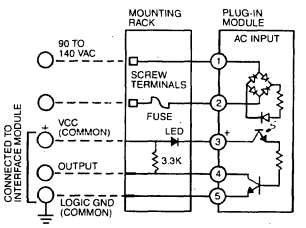
*Leakage Current of Limit Switches, etc.

DC INPUT MODULES	IDC5	IDC15	IDC24
Output Characteristics			
Logic Supply Voltage DC	4.5-6V	12-18V	20-30V
Maximum Logic Supply Current	18mA @5V	15mA @15V	12mA @24V
Output Transistor Breakdown Voltage, DC	30V		
Output Current	50mA		
Output Leakage @ 30VDC No Input	100μA		
Output Voltage Drop	0.4V @ 50mA		
Input Characteristics			
Input Line Voltage AC/DC	10-32VDC, 15-32VAC		
Input Current, Max.	25mA		
Allowable Input for No Output	1mA* (3V)		
Isolation Characteristics			
Isolation Input to Output	4000Vrms		
Capacitance Input to Output	Resistance $10^{10}\Omega$ Min., 5 pF Max.		
Timing Characteristics			
Turn-On	5mS Max.		
Turn-Off	5mS Max.		

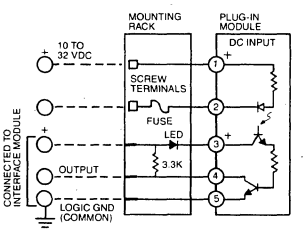
*Leakage Current of Limit Switches, etc.



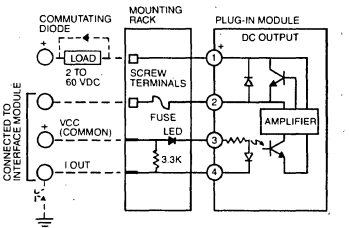
AC OUTPUT MODULES
Case Color: Black



AC INPUT MODULES
Case Color: Yellow



DC INPUT MODULES
Case Color: White



DC OUTPUT MODULES
Case Color: Red

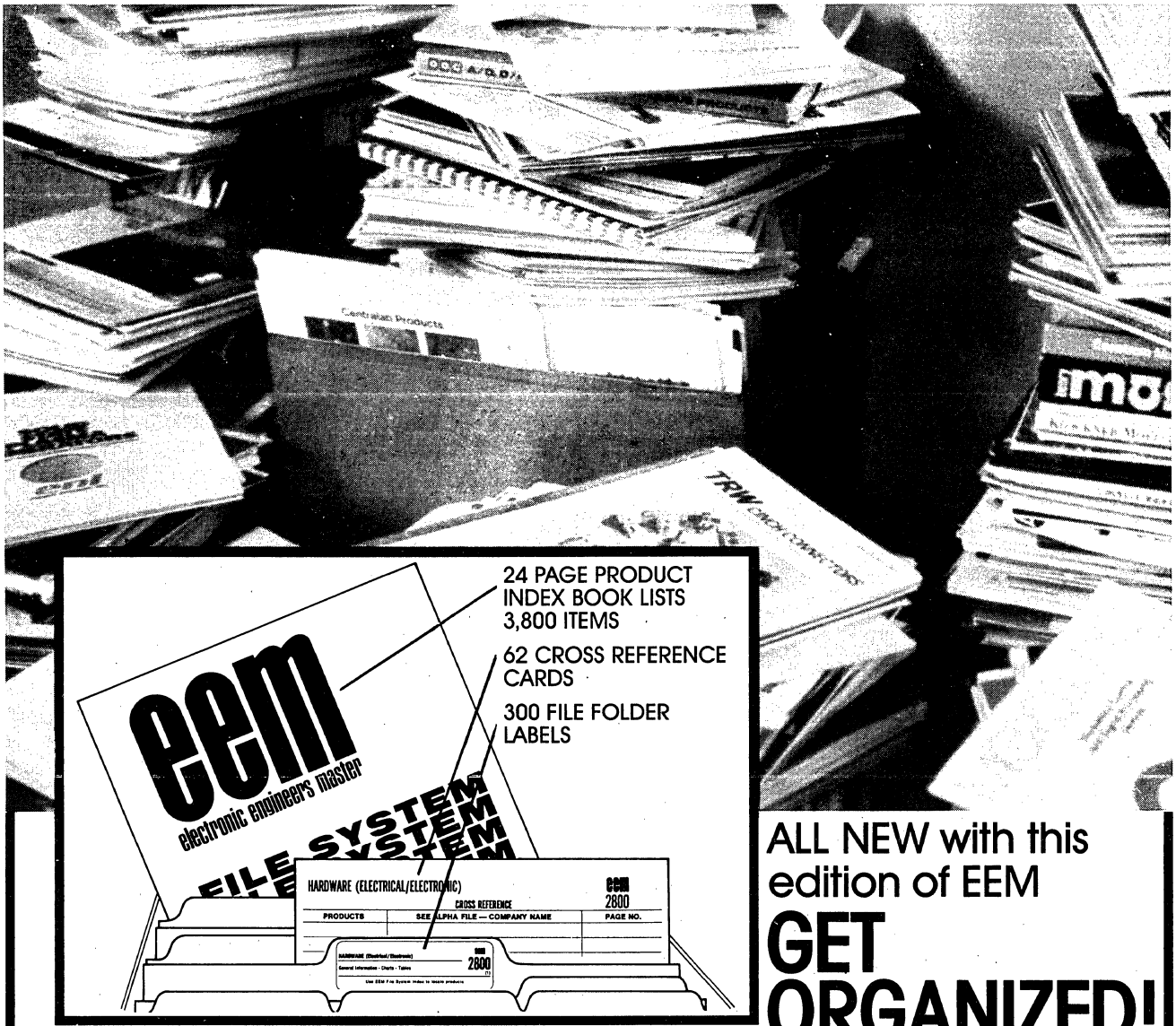
AC OUTPUT MODULES	OAC5	OAC15	OAC24	OAC5A	OAC15A	OAC24A
Input Characteristics						
Input Voltage DC	2.5-8V	9-16V	18-32V	2.5-8V	9-16V	18-32V
Maximum Input Current	18mA @5V	15mA @15V	12mA @24V	18mA @5V	15mA @15V	12mA @24V
Nominal Impedance (Ohms)	220	1000	2200	220	1000	2200
Signal Pick-Up Voltage DC	2.5V	9V	18V	2.5V	9V	18V
Signal Drop-Out Voltage DC	1V	1V	1V	1V	1V	1V
Output Characteristics						
Switching Voltage	12-140VAC			24-280VAC		
Peak Repetitive V Blocking	500V					
Off-State Leakage	5mA rms					
Line Frequency	50/60 Hz					
Current Rating	3A rms @.5 power factor*					
One Cycle Surge	80A Peak					
Minimum Load Current	20mA rms					
Max. Peak Output V-Drop	1.6V					
Isolation Characteristics						
Isolation Input to Output	4000Vrms					
Capacitance Input to Output	Resistance $10^{10}\Omega$ Min., 5 pF Max.					
Timing Characteristics						
Turn-On	½ Cycle					
Turn-Off	½ Cycle					

*Derate .05A/°C above 40°C.

DC OUTPUT MODULES	ODC5	ODC15	ODC24
Input Characteristics			
Input Voltage DC	2.5-8V	9-16V	18-32V
Maximum Input Current	18mA @5V	15mA @15V	12mA @24V
Nominal Impedance (Ohms)	220	1000	2200
Signal Pick-Up Voltage DC	2.5V	9V	18V
Signal Drop-Out Voltage DC	1V	1V	1V
Output Characteristics			
Load Voltage Rating DC	5-60V		
Output Current DC	3A* Max.		
Off-State Leakage	1mA Max.		
1-Second Surge	5A Peak		
Max. Output V-Drop	1.6V		
Isolation Characteristics			
Isolation Input to Output	4000Vrms		
Capacitance Input to Output	Resistance $10^{10}\Omega$ Min., 5 pF Max.		
Timing Characteristics			
Turn-On	100 μS Max.		
Turn-Off	750 μS Max.		

*Derate .05A/°C above 40°C.
Inductive loads must be diode suppressed.

All Models: Operating Ambient Temperature: −30°C to +70°C.



ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

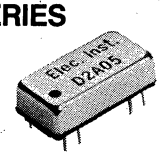
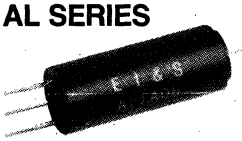
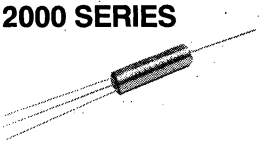
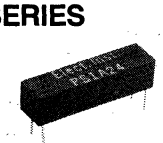
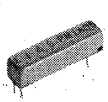
The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

EI&S

Miniature Reed Relays

PRODUCT TYPES	PACKAGE DESCRIPTION	DATA SHEET	FEATURES & OPTIONS
DL SERIES	MOLDED DIP IC Compatible	201	• 14 Pin DIP Mounting • Electrostatic Shield • Diode • Dry or Mercury Wetted Contacts
D SERIES 	ENCAPSULATED DIP Complements DL Series With Added Capabilities	202	• Magnetically Shielded • Electrostatic Shield • Diode • DPDT (2C) Switching • Metal or Plastic Cover
MS SERIES	ENCAPSULATED IN-LINE (1.00 × 0.10 Grid Spacing)	203	• Multiple Switch Arrangement • High IR to 10^{13} • High Voltage Switching • EMI/RFI Shielding
BV SERIES	OPEN FRAME IN-LINE Low Cost	204	• Multiple Switch Arrangement • High Voltage Switching • Electrostatic Shielding
AL SERIES 	MOLDED AXIAL Low Cost	205	• High Voltage Switching • Lead Forming • 50 Watt Switching (Mercury Switch) • Low Contact Resistance
2000 SERIES 	ENCAPSULATED AXIAL Micro-Miniature Magnetically Shielded	206	• Electrostatic Shielding • Fast Operation • Low Contact Resistance
PS SERIES 	MOLDED PICO (0.1 × 0.7 Grid)	207	• Ideal For Low Power High Density Switching
PM SERIES 	ENCAPSULATED PICO (0.1 × 0.7 Grid)	208	• Magnetically Shielded • Electrostatic Shielding • Epoxy Coated Metal Cover

CUSTOM	SPECIALTY DESIGNS TO MEET YOUR APPLICATION.

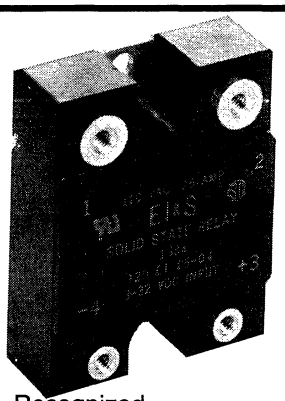
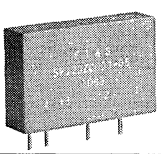
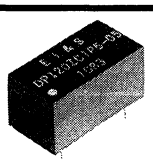
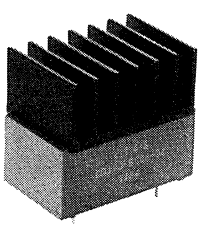
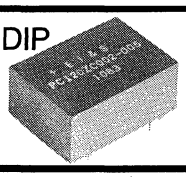
EI&S

EI&S . . . Where Innovation Sets Design Standards.

Electronic Instrument & Specialty Corp., 42 Pleasant Street, Stoneham, MA 02180 (617) 438-5300

EI&S

AC Solid State Relays

PRODUCT TYPE	DESCRIPTION	DATA SHEET		FEATURES & OPTIONS
CHASSIS MOUNT	**EI SERIES**—Optically Isolated Zero-Voltage Turn-On INPUT: 3-32 V dc / 24, 120 V ac OUTPUT: 6,10,25 A @ 120/240 V rms	INPUT-OUTPUT DC–AC AC–AC	NO. 101 102	• AC or DC Inputs • For Resistive and Moderate Inductive Loads
 UL Recognized CSA CERTIFIED EI, SS Series	**SS SERIES**—SURGELESS™ 90° Phase Angle Turn-On INPUT: 3-32 V dc, Optically Isolated OUTPUT: 6,10,25 A @ 120/240 V rms	DC–AC	103	• For Highly Inductive Loads —Transformers —Motors —Contactors —Solenoids
	400 HZ SERIES—50-800Hz Zero-Voltage Turn-On INPUT: 3-32 V dc, Optically Isolated OUTPUT: 6,10,20 A @ 120/240 V rms	DC–AC	104	• For. . . ☆ Military 400 Hz Applications
	FB SERIES—Normally Closed Zero-Voltage Turn-On INPUT: 3-32 V dc / 24, 120 V ac Optically Isolated OUTPUT: 6,10,25 A @ 120/240 V rms	DC–AC AC–AC	105 106	• AC or DC Inputs • For In-Circuit Protection on: —Medical Inst. —Machine Tools —Temp. Controllers
PRINTED CIRCUIT MOUNT	**OPTICALLY ISOLATED—ZERO-VOLTAGE TURN-ON**			
SIP 	**SP SERIES**—Single-In-Line Standard SIP and I/O Pin Spacing INPUT: 5 V, 12 V, 24 V, 3-32 V dc OUTPUT: 3.0 A @ 120/240 V rms	DC–AC	107	• Space Saving PC Board Package
DIP 	**DP SERIES**—Dual-In-Line INPUT: 5 V, 12 V, 24 V dc OUTPUT: 1.5 A @ 120/240 V rms	DC–AC	108	• Ultra-Reliable Discrete Design • Internal RC Snubber Optional
Double DIP 	**DD SERIES**—Custom Standard 0.600 Pin Spacing With Output Pins Offset INPUT: 5V, 12V, 24V, 3-32 V dc OUTPUT: Up to 6 A @ 120/240 V rms CIRCUIT FUNCTION EI . . . . . .Zero Cross ± 6V SS. . . . . .Surgeless FB. . . . . .SPST-NC (Form B) 2A. . . . . .Dual Channel (2 Form A)	 DC–AC DC–AC DC–AC DC–AC	 109 110 111 112	• Inputs: 5, 12, 24, 3–32 Vdc • Outputs: Up to 6 AMPS @ 120/240 Vrms
Double DIP 	**PC SERIES** Standard 0.600 Pin Spacing With Input Pins Offset. INPUT: 5 V, 12 V, 24 V dc OUTPUT: 2.0 A @ 120/240 V rms	DC–AC	113	• Alternate Double DIP Package
CUSTOM	**SPECIALTY DESIGNS TO MEET YOUR APPLICATION.**			

EI&S

EI&S . . . Where Innovation Sets Design Standards.

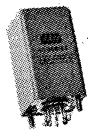
Electronic Instrument & Specialty Corp., 42 Pleasant Street, Stoneham, MA 02180 (617) 438-5300

ELECTRONIC SPECIALTY DIVISION
ELECSPEC CORP. / 14511 N.E. 13th Ave., Vancouver, WA 98668-3501 / (Area Code 206) 574-5000 / TWX 910-444-0005

The Nation's Most Advanced Facility for the Development, Production and Testing of Relays

With over 25 years of relay experience our product line now consists of more than 20 standard relays. Within the 67,000 square feet of manufacturing space we service the switching needs for major military and industrial accounts. Quality Control is not an accident here. We believe in and practice total control of all factors which could affect the end quality of our product. Continual emphasis is placed on utilizing state-of-the-art in new designs. We encourage all of our customers to visit our facility and view the operation first hand.

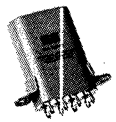
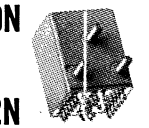
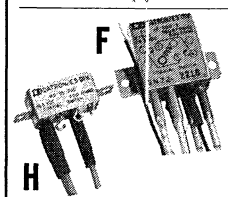
STANDARD HERMETIC SEALED RELAY SPECIFICATION

	General Information	Contact Form	Contact Rating	Size	Sensitivity	Shock	Vibration	Coil Voltage	Coil Resistance ± 10%	Max. Pick Up/ Latch Voltage/ Current @ +25°C	Min. Drop Out Voltage/ Current @ +25°C	Operate Time Max.	Release Time Max.
40 	Especially designed for low power input, as low as 15 mw, with dry circuit to 5 amps switching capability.	1PDT or 2PDT	Dry Circuit to 5 Amp 28 VDC Resistive	.970 x .970 x 1.781	20 mw 1PDT 40 mw 2PDT	50 G's 11±1.0 ms	10 G's 40 to 500 Hz	6.0 VDC 12.0 VDC 26.5 VDC	200 Ohms 1000 Ohms 5000 Ohms	14 MADC 6.3 MADC 2.8 MADC	5 MADC 2.3 MADC 1.0 MADC	35.0 ms	15.0 ms
50	Qualified to M5757/9 and M39016/6.	2PDT	D/C to 2A 28 VDC Resistive	.4 x .41 x .800	250 mw Pick Up	100 G's 10 ms ±2.0 ms	30 G's 56 to 3000 Hz	6.0 VDC 12.0 VDC 26.5 VDC	40 Ohms 150 Ohms 700 Ohms	3.0 VDC 6.0 VDC 13.0 VDC	0.6 VDC 1.2 VDC 2.3 VDC	4.0 ms	4.0 ms
55N	½ size sensitive latching relay qualified to MIL-R-39016/46 and /47, all dash numbers.	2PDT	D/C to 2A 28 VDC Resistive	.4 x .41 x .800	90 mw Latch/Reset	100 G's 10 ms ±2.0 ms	30 G's 56 to 3000 Hz	6.0 VDC 12.0 VDC 26.5 VDC	100 Ohms 500 Ohms 1800 Ohms	3.0 VDC 6.7 VDC 12.7 VDC	N/A	5 ms	N/A
68N	Crystal can "Lazy S" header.	2PDT	D/C to 2A 28 VDC Resistive	.359 x .797 x .875	300 mw Pick Up	20 G's 10 ±2 Amps	30 G's 56 to 3000 Hz	6.0 VDC 12.0 VDC 26.5 VDC	35 Ohms 140 Ohms 552 Ohms	3.2 VDC 6.5 VDC 13.0 VDC	0.5 VDC 1.1 VDC 2.3 VDC	5 ms	5 ms
71N	Sensitive crystal can relay.	2PDT	D/C to 2A 28 VDC Resistive	.4 x .8 x 1.280	40 mw Pick Up	50 G's 10 ±2 ms	10 G's 10 to 500 Hz	6.0 VDC 12.0 VDC 26.5 VDC	200 Ohms 1000 Ohms 5000 Ohms	14.2 MADC 6.3 MADC 2.8 MADC	1.42 MADC 0.63 MADC 0.28 MADC	15 ms	10 ms
77R	Crystal can. Sensitive latching relay.	2PDT	Dry Circuit to 3 Amps 28 VDC Resistive	.4 x .8 x .875	90 mw Latch/Reset	50 G's 11 ±1 ms	50 G's 56-2000 Hz	6.0 VDC 12.0 VDC 26.5 VDC	100 Ohms 500 Ohms 1800 Ohms	3.0 VDC 6.7 VDC 12.7 VDC	N/A	5 ms	5 ms

Note: Contact factory for specific mounting or header style.

ELECTRONIC SPECIALTY DIVISION
ELECSPEC CORP. / 14511 N.E. 13th Ave., Vancouver, WA 98668-3501 / (Area Code 206) 574-5000 / TWX 910-444-0005

STANDARD HERMETIC SEALED RELAY SPECIFICATION

	General Information	Contact Form	Contact Rating	Size	Sensitivity	Shock	Vibration	Coil Voltage	Coil Resistance ± 10%	Max. Pick Up/ Latch Voltage/ Current @ +25°C	Min. Drop Out Voltage/ Current @ +25°C	Operate Time Max.	Release Time Max.
79N	Crystal can. Non-latching relay.	2PDT	Dry Circuit to 3 Amps 28 VDC Resistive	.4 x .8 x .875	250 mw Pick Up	100 G's 11 ±2 ms	20 G's 56-2000 Hz	6.0 VDC 12.0 VDC 26.5 VDC	35 Ohms 140 Ohms 600 Ohms	3.0 VDC 5.9 VDC 12.5 VDC	0.3 VDC 0.6 VDC 1.5 VDC	5 ms	5 ms
80N 	Sensitive — double seal construction. Coils are in hermetically sealed compartments, separate from contact chamber.	2PDT	Dry Circuit to 3 Amps 28 VDC Resistive	.41 x .915 x 1.281	40 mw Pick Up	50 G's 11 ±1 ms	20 G's 56-2000 Hz	6.0 VDC 12.0 VDC 26.5 VDC	200 Ohms 1000 Ohms 5000 Ohms	14.2 MADC 6.3 MADC 2.8 MADC	1.42 MADC 0.63 MADC 0.28 MADC	15 ms	10 ms
90N	90N Series — Non-latching.	4PDT	Dry Circuit to3 Amps 28 VDC Resistive	.602 x 1.032 x 1.278	80 mw Pick Up	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	500 Ohms 2000 Ohms	12.6 MADC 6.3 MADC	1.26 MADC 0.63 MADC	20 ms	5 ms
92N	92N Series — Latching.				80 mw Latch/Reset	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	500 Ohms 2000 Ohms	6.3 VDC 12.6 VDC	N/A	9 ms	N/A
93	93 Series — Non-latching.	2PDT	10 Amps 28 VDC Resistive	.515 x 1.032 x 1.300	500 mw Pick Up	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	65 Ohms 300 Ohms	5.8 VDC 12.5 VDC	1.1 VDC 2.3 VDC	7 ms	3 ms
94	94 Series — Latching.				150 mw Latch/Reset	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	240 Ohms 1000 Ohms	6.0 VDC 12.3 VDC	N/A	10 ms	N/A
100N 	100N Series — Non-latching.	6PDT	Dry Circuit to 3 Amps 28 VDC Resistive	.852 x 1.032 x 1.278	150 mw Pick Up	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	200 Ohms 1000 Ohms	27.4 MADC 12.2 MADC	2.74 MADC 1.22 MADC	18 ms	5 ms
102N	102N Series — Latching.				150 mw Latch/Reset	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	250 Ohms 1000 Ohms	6.1 VDC 12.3 VDC	N/A	8 ms	N/A
103	103 Series — Non-latching.	4PDT	10 Amps 28 VDC Resistive	.852 x 1.032 x 1.3	1000 mw Pick Up	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	32 Ohms 150 Ohms	5.8 VDC 12.5 VDC	1.1 VDC 2.3 VDC	8 ms	5 ms
104	104 Series — Latching.				300 mw Latch/Reset	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	125 Ohms 500 Ohms	6.1 VDC 12.3 VDC	N/A	9 ms	N/A
F  **H**	Miniature coaxial relays with 8" min. RG178 B/U cables attached. Welded sealing.	1PDT RF Plus Auxiliary 1PDT or 2PDT RF	RF to 1.5 Amps 50 Watt Max.	Frequency Range to 500 MHz VSWR — 1:1.1 Typical. Characteristic Impedance — 50 Ohm Typical. Cross Talk — 50 dB Typical.				12.0 VDC 26.5 VDC	140 Ohms 600 Ohms	5.9 VDC 12.5 VDC	1.0 VDC 2.3 VDC	5 ms	5 ms
								12.0 VDC 26.5 VDC	150 Ohms 700 Ohms	6.0 VDC 13.0 VDC	1.2 VDC 2.3 VDC	5 ms	5 ms

Note: Contact factory for specific mounting or header style.

FIFTH DIMENSION, INC.

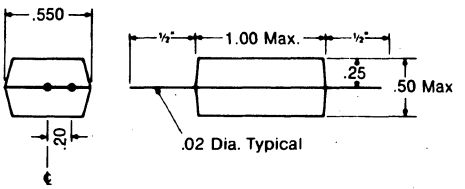
The Ultimate Modem Relay

Fifth Dimension mercury film relays exhibit excellent load-handling capabilities, 2-billion cycle reliability and operate in any position. These characteristics are augmented with features such as bounceless operation, compatibility with solid state circuitry and 2500 volts coil-to-contact breakdown which meets US and European lightning-surge standards. These are just a few of the reasons Fifth Dimension relays are repeatedly used in FCC-tested systems and in modem applications.

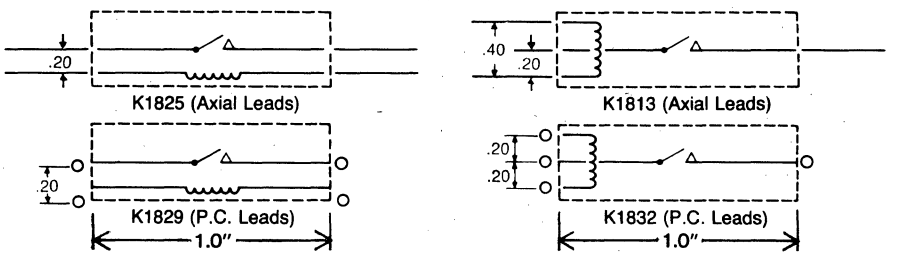
Since modems and autodialers are mounted in all sorts of positions — on walls, in racks or simply lying on a desk or table — the Series K is an ideal choice as an off-hook relay and line-pulsing relay because of its insensitivity to position. Unlike mercury-wetted reed relays (which cannot function if more than 30 degrees from vertical), there is no pool of mercury to bridge contacts or become separated from the contact parts. Instead, mercury on the contacts is replenished each operating cycle from a continuous film of mercury which covers the interior walls of the switch.

The Series K is bounceless and thus produces clean, square-wave pulses that cannot be misinterpreted by phone company dial receiver circuits. When contacts open, the mercury between the contact parts is drawn out into a thin thread by surface tension and ruptures, creating a clean break action which assures reliable dialing.

Series K Relays
Epoxy sealed, these miniature relays are available with axial leads or pins for PCB mounting.



Series K Relay Footprints
Axial distance between pins, all models, 1 inch nominal.



Specifications

Contact Form	SPST-NO	Contact Res. Stability	±0.02 Ohms
Bounce Time	None	Contact Breakdown Volts	1000 VAC PEAK
Life	Indefinite	Operational Temp. Range	−38°C to +85°C
Load Current to 52 VDC	0.25 Amperes	Storage Temp. Range	−55°C to +105°C
Load Current to 200 VDC	0.1 Amperes	Arc Suppression Suggested	Yes
Contact Resistance	0.20 Ohms*		

	Nominal Coil Volts	Coil Resistance (±10%)	Must Operate Volts	Must Release Volts	Operate Time (ms)	Release Time (ms)	Reliability (MCBF)	Coil to Contact Breakdown Volts	Vibration to 3000 CPS	Shock 11ms Sawtooth	Epoxy Sealed Package	Magnetic Shield Standard/Optional (St) (Op)
K18XX-3-5	5	67	4	0.5	4	4	10^9	2500 Vac Rms ↓	30g ↓	40g ↓	Yes ↓	St
K18XX-3-12	12	384	9.6	1.2	4	4	10^9					St
K18XX-3-24	24	1536	19.2	2.4	4	4	10^9					St

(XX indicates footprint)

Reliability is based upon tests conducted on over 200 relays which were exercised a total of over 34 billion operations. Specified values should not be considered as a guaranteed performance for a single relay, but rather a prediction of the performance of the cumulative results of a universe of units.

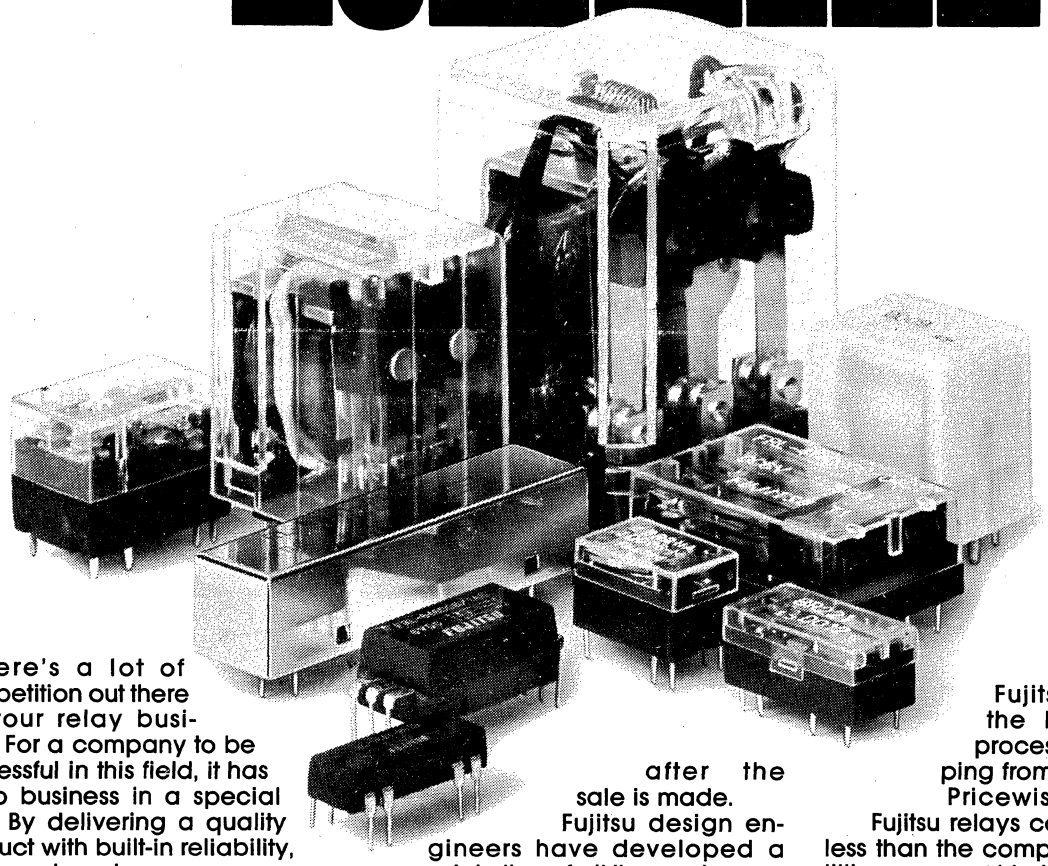
*Contact resistance is measured at end of switching capsule and does not include terminal lead resistance.
All specifications typical and subject to change without notice.

But not only for modems

Series K mercury film relays are particularly well suited for use in microprocessor input interfaces, telephone line switching test systems, touch-tone converters, automatic test equipment, data acquisition and industrial control systems and, in fact...in any application requiring low-noise, bounceless-switch, position-insensitive, outstandingly-reliable relays.

FIFTH DIMENSION, INC.
801 New York Avenue, Trenton, NJ 08638 • Tel: 609-393-8350 • TWX: 510-681-8412

FUJITSU: RELAYS



There's a lot of competition out there for your relay business. For a company to be successful in this field, it has to do business in a special way. By delivering a quality product with built-in reliability, price and service.

Fujitsu relays have it all. Our relays meet or surpass the quality of those made by the competition. They're built to do a job and do it right. And Fujitsu relays are compatible with most relays on the market.

As far as service, Fujitsu considers it a point of pride, as well as good business to cater to your company's needs before, during and after the sale is made.

Fujitsu design engineers have developed a complete line of all the most popular relays in use today. A supply of these standard relays is always readily available. We also offer a customizing service where we work with your engineers to design relays tailored specifically to your needs.

Our warehouse is stocked to supply your company with samples of our fine products. Quantity orders come directly from the factory. And Fujitsu can match the lead time for processing and shipping from any source.

Pricewise, you'll find Fujitsu relays cost the same or less than the competition, leaving little reason not to try us.

For general purpose to flat package relays, for Mercury-wetted contacts to molded inline package (regular reed) and DIPs (latched reed), it pays to switch to Fujitsu where quality, reliability, price and service are part of our product.

For more information on our superior components, call or write us today.

FUJITSU

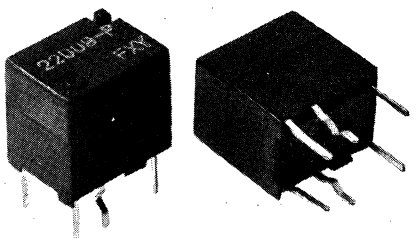
FUJITSU AMERICA, INC.
Component Sales Division
918 Sherwood Drive, Lake Bluff, IL 60044
(312) 295-2610, Telex: 206196, TWX 910-651-2259

FUJITSU

RELAYS

MICROMINIATURE RELAYS FOR P.C. BOARDS

FBR20 SERIES

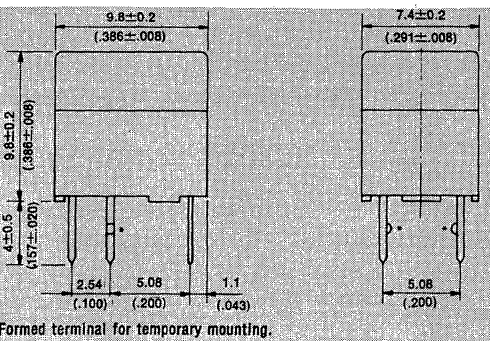


Fujitsu FBR20 series relays are designed for PC board mounting with 1A contact ratings — perfect for microminiature applications.

FEATURES

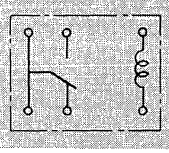
- **Microminiature size**
  Two FBR20 series relays can be mounted in the space now required for a single FBR210 series relay.
- **1A contact rating**
  Despite their microminiature size, FBR20 series relays have contact rating of 1A at 24 VDC for convenient installation.
- **Gold overlay bifurcated contact**
  Contact reliability is assured in low level applications by contact shapes and materials especially designed for signal switching applications.
- **Low power consumption**
  With a rated power consumption of only 0.3W, today's expensive energy costs can be reduced significantly.
- **Wide range of drive voltages**
  Drive voltages from 1.5 VDC to 24 VDC are available for a wide range of applications.
- **Strong shock resistance**
  Even with a 50G shock, FBR20 series relays never miss a switch.
- **Easy to pattern-design**
  Separate terminal connection with drive and output sections allow easy pattern design.
- **Formed terminal available for temporary lock**
  The unique design of the forming terminal allows FBR20 series relays to be temporary mounted for greater design flexibility.
- **Automatic soldering provision**
  The terminal is sealed to prevent flux from entering during automatic soldering.

DIMENSIONS

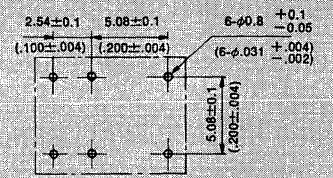


* Formed terminal for temporary mounting.

SCHEMATIC



MOUNTING HOLE LAYOUT



ENGINEERING DATA

Item	Specifications
Contact Arrangement	SPDT (1 Form C)
Contact Shape	Single contact (FBR21), Bifurcated contact (FBR22)
Contact Material	Gold overlay silver, Gold overlay silver-palladium alloy (—P)
Contact Rating	24 VDC-1A, 120 VAC-0.5A (resistive load)
Maximum Carrying Current	2A
Maximum Switching Voltage	125 VDC, 125 VAC
Maximum Switching Power	24 WDC, 60 VA AC (resistive load)
Initial Contact Resistance	100mΩ max. (measured at 6V DC-0.1A)
Coil Power	0.3W (at rated voltage, 20°C)
Coil Temperature Rise	45°C (at rated voltage, 20°C)
Insulation Resistance	1,000MΩ min. (at 500 VDC)
Withstanding Voltage	Between contacts: 500 VAC for 1 minute Between contact and coil: 750 VAC for 1 minute
Vibration	20G, 10 ~ 300 Hz (dual amplitude, maximum 3.0 mm). No contact chatter longer than 1.0 ms.
Shock	Operation error: 50G (sine half-wave of 11 ms). No contact chatter longer than 1.0 ms.
Operate Time	5 ms max. (at rated voltage)
Release Time	3 ms max. (after rated operation)
Life Expectancy	Mechanical: 5 x 10^6 cps. min. Electrical: Gold-overlay silver contacts: 100 x 10^3 ops. min. Gold-overlay silver-palladium alloy contacts: 200 x 10^3 ops. min. (at rated contact load)
Maximum Switching Frequency	Mechanical: 18,000 operations/hour Electrical: 1,800 operations/hour (at contact rated load)
Ambient Temperature	−30°C ~ +65°C (at rated operation)
Ambient Humidity	45 ~ 85% RH
Weight	1.7 g (approx.)

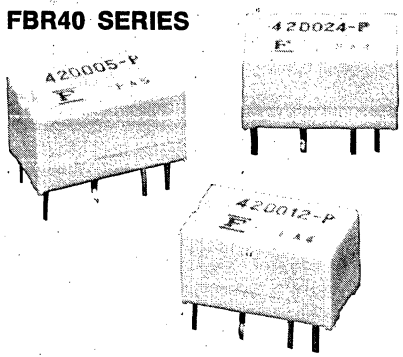
SELECTION TABLE

Type	Voltage Specifications	Coil Rated Voltage	Coil resistance (±10%)	Coil Current (at Rated Voltage)	Pick-Up Voltage	Drop-Out Voltage	Maximum Voltage Allowance	Rated Power Consumption	Coil Temperature Rise	FBR21D01		RFBR21D01-P	
										Designation	Price	Designation	Price
Standard Type	D01	DC 1.5V	7.5Ω	approx. 200 mA	Less than 80% of rated voltage	More than 5% of rated voltage	160% of rated voltage	Approx. 300 mW (at rated voltage)	Approx. 45°C (at rated voltage)	FBR21D01	$1.98	FBR21D01-P	$2.32
	D03	DC 3 V	30 Ω	approx. 100 mA						FBR21D03	1.98	FBR21D03-P	2.32
	D05	DC 5 V	83 Ω	approx. 60 mA						FBR21D05	1.98	FBR21D05-P	2.32
	D06	DC 6 V	120 Ω	approx. 50 mA						FBR21D06	1.98	FBR21D06-P	2.32
	D09	DC 9 V	270 Ω	approx. 33 mA						FBR21D09	1.98	FBR21D09-P	2.32
	D12	DC 12 V	480 Ω	approx. 25 mA						FBR21D12	1.98	FBR21D12-P	2.32
	D18	DC 18 V	1,080 Ω	approx. 17 mA						FBR21D18	2.12	FBR21D18-P	2.46
	D24	DC 24 V	1,920 Ω	approx. 13 mA						FBR21D24	2.26	FBR21D24-P	2.60

Note: Measured at 20°C.

ULTRA-MINIATURE RELAYS FOR P.C. BOARD

FBR40 SERIES

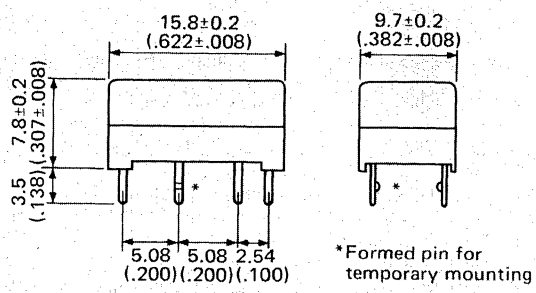


The Fujitsu FBR40 Series relay with a pick-up power consumption reduced to 85 mW is an extremely small DPDT CONTACT relay designed for PC board mounting.

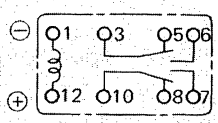
FEATURES

- **Ultra-miniature low-profile design**
  At half the size of the conventional FBR240 relay and requiring only three quarters of the board area, a drastic reduction is size has been achieved in the design of the FBR40.
  15.8 (L) x 9.7 (W) x 7.8 (H) mm.
- **High dielectric strength**
  Dielectric withstanding voltage between contacts and coil is over 1,000 VAC and with the ability to withstand a surge voltage of over 1,500 V, it conforms to FCC 68.302 standard.
- **High-shockproof type**
  Even a shock force of 30 G will not result in a malfunction.
- **Low power consumption**
  With a high efficiency built-in permanent magnet, operating power consumption is only 85 mW. (Rated power consumption is 150 mW.)
- **Formed terminal for temporary lock**
  The terminals of the FBR40 are specially formed so that they can be temporarily attached to the PC board.
- **Pattern design is easy**
  The terminal connections are designed so that the drive portion (coil) and the output portion (contacts) are isolated, which simplifies pattern design.

DIMENSIONS Unit: mm (inch)

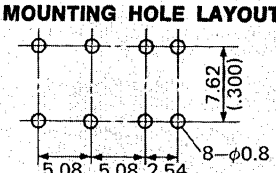


SCHEMATIC



tolerance ±0.1 (.004)
(bottom view)

MOUNTING HOLE LAYOUT



Note 1. This relay is polarized. Please refer to the schematic when designing a circuit.
Note 2. An abbreviated designation is marked on the top surface of the dust cover as follows:
(Ex.) Designation: FBR42D012-P
Marking: 42D012-P
Note 3. Terminal numbers are not shown on the relay.

ENGINEERING DATA

Item	Specifications
Contact Arrangement	DPDT (2 Form C) bifurcated contact
Contact Material	No code: Gold overlay silver –P types: Gold overlay silver-palladium alloy
Initial Contact Resistance	100 mΩ max. measured at 6V DC, 0.1A
Insulation Resistance	100 mΩ min. at 500V DC
Dielectric Withstanding Voltage	Between open contacts 500V AC for 1 min. Between contact and coil and between adjacent contacts 1,000V AC for 1 min.
Surge Voltage (FCC 68.302)	1,500V/10μsec/700μsec 1,500V Between coil and contact 750V Between adjacent contacts 10μsec 700μsec
Electrostatic Capacitance Between Contacts (Reference)	Between open contacts approx. 1 pF Between coil and contact approx. 2 pF
Vibration	Operation malfunction 10-55 Hz (Dual amplitude 1.5 mm) Durability 10-55 Hz (Dual amplitude 1.5 mm)
Shock	Operation malfunction 30 G (11 msec) Durability 100 G (11 msec)
Operate Time	5 msec max. (bounce time not included)
Release Time	5 msec max. (bounce time not included)
Life Expectancy	Mechanical: 10 x 10^6 ops. min. Electrical: 100 x 10^3 ops. min. (At contact rated load)
Maximum Switching Frequency	Mechanical: 18 x 10^3 times/hour Electrical: 1,800 times/hour (At contact rated load)
Operating Temperature Range	–30°C–+70°C (See Figure 2)
Operating Humidity Range	45-85% RH
Weight	3 g approx.

SELECTION TABLE

Type	Rated Coil Voltage	Coil Resistance (±10%)	Rated Current (for rated operation, approx.)	Pick-up Voltage	Drop-out Voltage	Rated Power Consumption	Pick-up Power Consumption	Coil Temperature Rise	Designation	Price
Standard Type	DC 3V	60Ω	50 mA	Less than 75% of rated voltage	More than 5% of rated voltage	150 mW approx. (When rated voltage is applied.)	Less than 85 mW	25 deg. approx.	FBR42D003	$2.90
	DC 5V	167Ω	30 mA						FBR42D005	2.90
	DC 6V	240Ω	25 mA						FBR42D006	2.90
	DC 9V	540Ω	17 mA						FBR42D009	2.90
	DC 12V	960Ω	13 mA						FBR42D012	2.90
	DC 24V	2,880Ω	8 mA			200 mW approx.	Approx. 112 mW max.	30 deg. approx.	FBR42D024	3.06

Note: Measured at 20°C

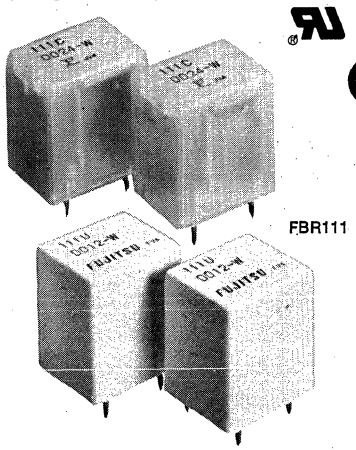
FUJITSU

RELAYS

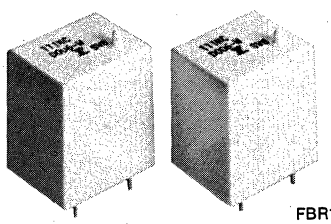
MINIATURE RELAYS FOR P.C. BOARDS

FBR111 AND FBR111N SERIES

SPDT 3A-28V DC/120V AC, 6A-28V DC/120V AC



FBR111



FBR111N

The Fujitsu FBR111 and FBR111N Series are low cost SPDT relays with a versatile switching capability. The contact is rated 3A, 28V DC; 3A 120V AC for standard contact, or up to 6A, 28V DC; 6A, 120V AC for special heavy duty contact.

These small size, sensitive relays, designed to be mounted on printed circuit boards, feature simplified construction and a low power dissipation.

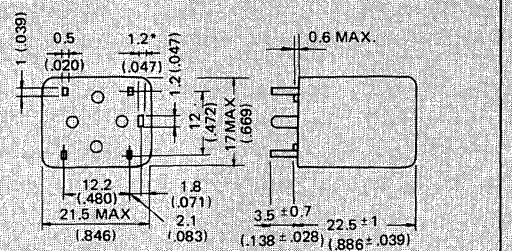
It is ideal for use in audio equipment, business machines, vending machines, security systems, game machines and automotive applications.

The FBR111N Series is the immersion cleanable version where printed circuit board cleaning is required.

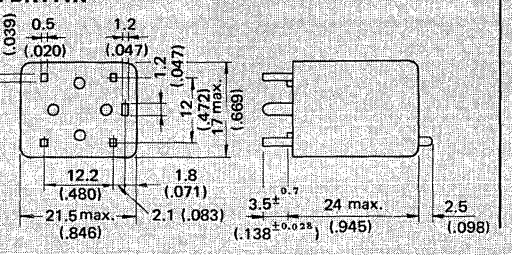
The relay specified FBR111U is UL recognized for office equipment and business machines. (File No. E63615.) CSA certified.

DIMENSIONS Unit: mm (inch)

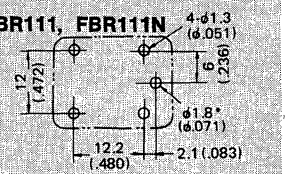
FBR111



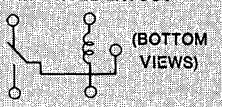
FBR111N



FBR111, FBR111N



MOUNTING HOLE LAYOUT



1 FORM C

SCHEMATICS

Notes:
1. Cut-off nib must be removed after relay soldering and board cleaning.
2. Although the plastic cover is bonded to the relay base, it is not hermetically sealed. Therefore, when the board on which the relay is soldered is cleaned by immersion, cleaning time must not exceed 2 minutes. Please use alcohol, freon or water for cleaning (water temperature is less than 50°C).

ENGINEERING DATA

Item	Specifications		
Contact Arrangement	SPDT		
Contact Ratings		Rating	UL Rating
Contact Materials	Contact Materials	28V DC or 120V AC (Resistive)	28V DC or 120V AC (Resistive)
	No suffix Silver	3A	3A
	—K Silver-Cadmium Oxide	3A	3A
	—M Gold-Plated Silver	3A	1A
	—W Special Alloy	6A	8.5A (0.8 pF @ 120V AC)
Initial Contact Resistance	100mΩ max. (at 6V DC 0.5A for No mark or -M, 6V DC 1A for -K or -W)		
Rated Coil Voltage	5, 6, 9, 12, 24V DC		
Coil Power Dissipation	Standard: 0.36W approx. at rated voltage UL Type: 0.50W approx. at rated voltage		
Coil Temperature Rise	Standard: 30°C max. at rated voltage UL Type: 40°C max. at rated voltage		
Insulation Resistance Dielectric Withstanding Voltage	100MΩ min. at 500V DC 500V AC tor 1 minute		
Operate Time Release Time	20 ms max. at rated voltage 10 ms max.		
Life Expectancy — Mechanical Electrical	10×10^6 ops. min. 100×10^3 ops. min. at rated load		
Vibration	10 to 50Hz (Dual amplitude: 1.5mm)		
Shock	10G (11 ms)		
Temperature Range	Standard, −30°C ~ +65°C — UL Type, −30°C ~ +55°C		
Weight	15 gr. approx.		

SELECTION TABLES

FBR111 Type	Contacts Arrangement	Contacts Materials*	Rated Voltage in V DC	Coil Resistance in Ω ±10% at 20°C	Pick-up Voltage at 20°C	Designation	Price
Standard	SPDT	No Suffix	5	70	Less Than	FBR111CD005	$1.70
		—K	6	100	80% of	FBR111CD006	1.70
		—M	9	225	Rated	FBR111CD009	1.70
		—W	12	400	Voltage	FBR111CD012	1.70
			24	1600		FBR111CD024	1.84
UL Type	SPDT	No Suffix	5	50	Less Than	FBR111UD005	$1.84
		—K	6	72	75% of	FBR111UD006	1.84
		—M	9	160	Rated	FBR111UD009	1.84
		—W	12	290	Voltage	FBR111UD012	1.84
			24	1150		FBR111UD024	1.96

FBR111N Type	Contacts Arrangement	Contacts Materials*	Rated Voltage in V DC	Coil Resistance in Ω ±10% at 20°C	Pick-up Voltage at 20°C	Designation	Price
Standard	SPDT	No Suffix	5	70	Less Than	FBR111NCD005	$2.04
		—K	6	100	80% of	FBR111NCD006	2.04
		—M	9	225	Rated	FBR111NCD009	2.04
		—W	12	400	Voltage	FBR111NCD012	2.04
			24	1600		FBR111NCD024	2.18
UL Type	SPDT	No Suffix	5	50	Less Than	FBR111NUD005	$2.18
		—K	6	72	80% or	FBR111NUD006	2.18
		—M	9	160	Rated	FBR111NUD009	2.18
		—W	12	290	Voltage	FBR111NUD012	2.18
			24	1150		FBR111NUD024	2.32

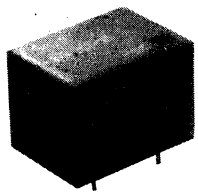
Note 1. 48V rated voltage relays are available on special order.
2. Each product bears its own designation on the top of the cover, but initial code 'FBR' is omitted.

* Add $0.14 to price for —K, $0.28 for —M, $0.14 for —W.

For CSA certified relays, —CSA suffix must be added to part number of UL type. Price is same as UL type.

SMALL CONTROL RELAYS FOR P.C. BOARDS

FBR160 SERIES

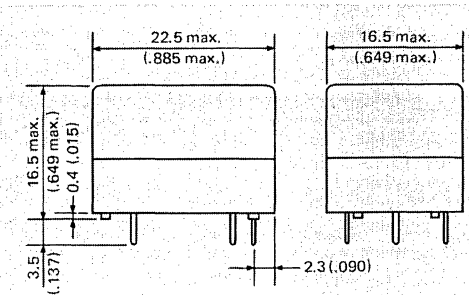


Fujitsu FBR160 series small control relays are PC board mounted and have excellent cost performance.

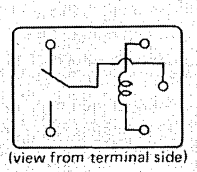
FEATURES

- **Same terminal array as FBR100**
  These relays have the same foot print as Fujitsu's conventional FBR100 series.
- **Lower profile**
  Since their profile is 7 mm lower than that of the FBR100 series relays, they can be used in smaller equipment.
- **Flux-prevention structure**
  The contacts are located on the top of the relay to protect them from solder flux from the terminals.
- **Meets major safety standards**
  The relays structure is designed to meet the Japan Electric Appliance Control Law (150V or less) and UL standards (114).
- **Choices of contact materials**
  Two different kinds of contact materials can be specified according to the load.

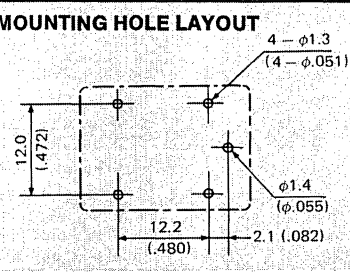
DIMENSIONS



SCHEMATICS



MOUNTING HOLE LAYOUT



ENGINEERING DATA

Item	Specifications
Contact Arrangement	SPDT or SPST — NO (Form A)
Contact Material	See Selection Table
Initial Contact Resistance	100 mΩ max. Silver contacts: Measured at 6 VDC, 0.5A Other contacts: Measured at 6 VDC, 1.0A
Insulation Resistance	100 mΩ min. (at 500 VDC)
Withstanding Voltage	Between open contacts: 500 VAC for 1 minute Between contact and coil: 1,500 VAC for 1 minute
Vibration	10 to 55 Hz (dual amplitude: 1.5 mm)
Shock	Operation malfunction: Less than 0.1 ms at 10G (11 ms) Durability: 100G (11 ms)
Operate Time	10 ms max. (at rated voltage, bounce time not included)
Release Time	5 ms max. (after operation at rated voltage, bounce time not included)
Life Expectancy	Mechanical: 10 x 10^6 ops. min. (maximum switching frequency: 18 x 10^3/hour) Electrical: 100 x 10^3 ops. min. (at rated contact load, maximum switching frequency: 18 x 10^2/hour)
Ambient Temperature	−30°C to +60°C
Ambient Humidity	45% to 85% RH
Weight	11 gr. (approx.)

SELECTION TABLE

FBR161 Type	Contacts		Rated Voltage in VDC	Coil Resistance in Ω ±10% at 20°C	Pick-Up Voltage at 20°C	Designation	Price
	Arrangement	Materials*					
Standard	SPDT	No Suffix: Silver −K: Silver Cad Oxide	5	70	Less than 80% of rated voltage	FBR161ED005	$1.70
			6	100		FBR161E0006	1.70
			9	225		FBR161ED009	1.70
			12	400		FBR161ED012	1.70
			24	1,600		FBR161ED024	1.84

* Add $0.14 to price for −K contacts.

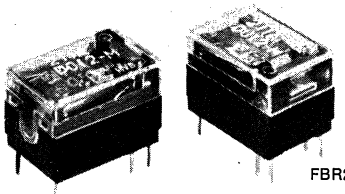
FUJITSU

RELAYS

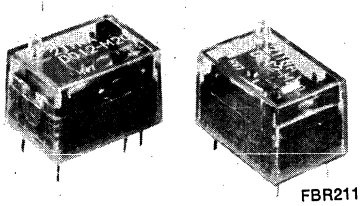
ULTRA-MINIATURE RELAYS FOR P.C. BOARDS

FBR211 AND FBR211N SERIES

SPDT 1A-28V DC, 0.5A-120V AC



FBR211



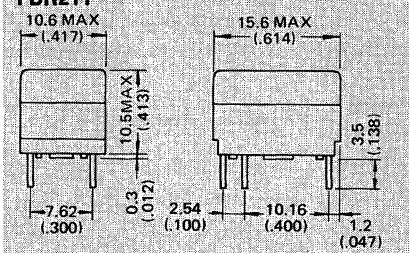
FBR211N

The FBR211 and FBR211N Series of ultra-miniature relays allow high component densities for savings in both equipment size and cost for the printed circuit board. The FBR-211N Series is suitable for immersion cleaning in freon and aqueous systems.

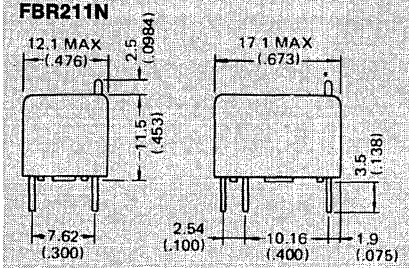
These highly sensitive relays with gold-clad SPDT contact arrangements are ingeniously designed so as to offer flux-contamination-immunity and load handling capabilities of 1A at 28V DC or 0.5A at 120V AC under a resistive load. The 0.1″ grid spacing of terminals makes these relays ideally suited for printed circuit board applications requiring high density mounting and for use in audio and wireless communications, office and vending machines, automobiles and various control applications.

DIMENSIONS Unit: mm (inch)

FBR211

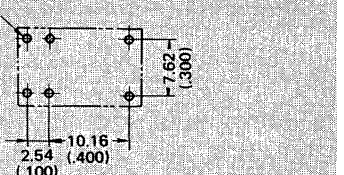


FBR211N

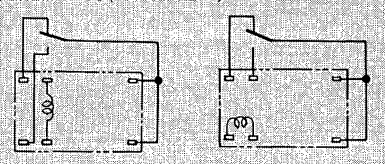


FBR211, FBR211N

MOUNTING HOLE LAYOUT



SCHEMATICS (BOTTOM VIEWS)



Notes:
1. For low level or dry circuit switching, use of gold thick-overlay silver-palladium alloy contact relays are recommended.
2. *Cut-off nib must be removed after relay soldering and board cleaning.
3. Although the plastic cover is bonded to the relay board, it is not hermetically sealed. Therefore when the board on which the relay is soldered is cleaned by immersion, cleaning time must not exceed 2 minutes. Please use alcohol, freon or water for cleaning.

ENGINEERING DATA

Item	Specifications	
	Standard Model	High Sensitivity Model
Contact Arrangement	SPDT	
Contact Ratings	1A at 28V DC, 0.5A at 120V AC (resistive)	
Initial Contact Resistance	100mΩ max. at 6V DC, 0.5A	
Contact Materials	Standard: Gold overlay silver (—M) — Low Level: Gold overlay silver-palladium alloy (—P)	
Rated Coil Voltage	1.5, 3, 5, 6, 9, 12, 24V DC	
Coil Power Dissipation	0.45W at rated voltage	0.20W at rated voltage
Coil Temperature Rise	45°C approx. at rated voltage	25°C approx. at rated voltage
Insulation Resistance	100MΩ min. at 500V DC (at 20°C 65% RH)	
Dielectric Withstanding Voltage	500V AC for 1 minute	
Operate Time	5 ms approx. (at rated voltage, 20°C)	
Release Time	5 ms approx.	
Life Expectancy — Mechanical	5 x 16^6 ops. min.	
Electrical	300 x 10^3 ops. min. at 1A 28V DC, resistive 100 x 10^3 ops. min. at 0.5A 120V AC, resistive	
Vibration	10 to 40Hz (Dual amplitude: 1.5mm)	
Shock	10G (11 ms)	6G (11 ms)
Temperature Range	—25°C to +55°C	—25°C to +75°C
Weight	4 gr. approx.	

SELECTION TABLE

Type	Contact: Arrangement	Contact: Materials	Schematics	Rated Voltage in V DC	Coil Resistance in Ω ±10% at 20°C	Pick-up Voltage at 20°C	FBR211 Designation	FBR211 Price* —M Type	FBR211N Designation	FBR211N Price* —M Type
Standard	SPDT	Gold Overlay Silver (M) or Gold Overlay Silver-Palladium Alloy (P)*	A	1.5	5	Less Than 70% of Rated Voltage	FBR211AD001—M or P	$1.82	FBR211NAD001—M20 or P20	$2.30
				3	20		FBR211AD003—M or P	1.82	FBR211NAD003—M20 or P20	2.30
				5	56		FBR211AD005—M or P	1.82	FBR211NAD005—M20 or P20	2.30
				6	80		FBR211AD006—M or P	1.82	FBR211NAD006—M20 or P20	2.30
				9	180		FBR211AD009—M or P	1.82	FBR211NAD009—M20 or P20	2.30
				12	320		FBR211AD012—M or P	1.82	FBR211NAD012—M20 or P20	2.30
				24	1280		FBR211AD024—M or P	1.98	FBR211NAD024—M20 or P20	2.46
Standard	SPDT	Gold Overlay Silver (M) or Gold Overlay Silver-Palladium Alloy (P)*	B	1.5	5	Less Than 70% of Rated Voltage	FBR211BD001—M or P	$1.82	FBR211NBD001—M20 or P20	$2.30
				3	20		FBR211BD003—M or P	1.82	FBR211NBD003—M20 or P20	2.30
				5	56		FBR211BD005—M or P	1.82	FBR211NBD005—M20 or P20	2.30
				6	80		FBR211BD006—M or P	1.82	FBR211NBD006—M20 or P20	2.30
				9	180		FBR211BD009—M or P	1.82	FBR211NBD009—M20 or P20	2.30
				12	320		FBR211BD012—M or P	1.82	FBR211NBD012—M20 or P20	2.30
				24	1280		FBR211BD024—M or P	1.98	FBR211NBD024—M20 or P20	2.46
High Sensitivity	SPDT	Gold Overlay Silver (M) or Gold Overlay Silver-Palladium Alloy (P)*	C	1.5	12	Less Than 70% of Rated Voltage	FBR211CD001—M or P	$1.96	FBR211NCD001—M20 or P20	$2.44
				3	45		FBR211CD003—M or P	1.96	FBR211NCD003—M20 or P20	2.44
				5	120		FBR211CD005—M or P	1.96	FBR211NCD005—M20 or P20	2.44
				6	180		FBR211CD006—M or P	1.96	FBR211NCD006—M20 or P20	2.44
				9	400		FBR211CD009—M or P	1.96	FBR211NCD009—M20 or P20	2.44
				12	700		FBR211CD012—M or P	1.96	FBR211NCD012—M20 or P20	2.44
				24	2800		FBR211CD024—M or P	2.12	FBR211NCD024—M20 or P20	2.60
High Sensitivity	SPDT	Gold Overlay Silver (M) or Gold Overlay Silver-Palladium Alloy (P)*	E	1.5	12	Less Than 70% of Rated Voltage	FBR211ED001—M or P	$1.96	FBR211NED001—M20 or P20	$2.44
				3	45		FBR211ED003—M or P	1.96	FBR211NED003—M20 or P20	2.44
				5	120		FBR211ED005—M or P	1.96	FBR211NED005—M20 or P20	2.44
				6	180		FBR211ED006—M or P	1.96	FBR211NED006—M20 or P20	2.44
				9	400		FBR211ED009—M or P	1.96	FBR211NED009—M20 or P20	2.44
				12	700		FBR211ED012—M or P	1.96	FBR211NED012—M20 or P20	2.44
				24	2800		FBR211ED024—M or P	2.12	FBR211NED024—M20 or P20	2.60

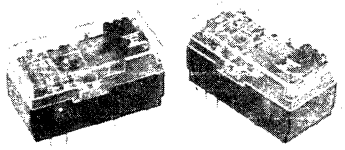
Note: Each product bears its own designation on the top of the cover, but initial code 'FBR' is omitted.
* To get price to —P type add $0.44.

FUJITSU AMERICA, INC. / COMPONENT DIV. / 918 Sherwood Drive, Lake Bluff, IL 60044 / (312) 295-2610, Telex 206196, TWX 910-651-2259

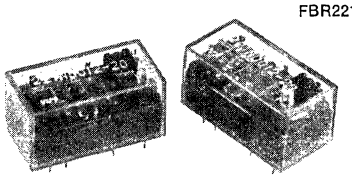
ULTRA-MINIATURE RELAYS FOR P.C. BOARDS

FBR221 AND FBR221N SERIES

DPDT 1A-28V DC, 0.5A-120V AC



FBR221



FBR221N

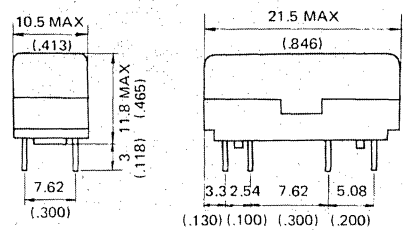
The FBR221 and FBR221N Series of ultra-miniature relays are designed to provide high component densities for savings in both equipment size and cost.

These highly sensitive relays with gold-clad DPDT contact arrangements can switch loads up to 1A at 28V DC or 0.5A at 120V AC.

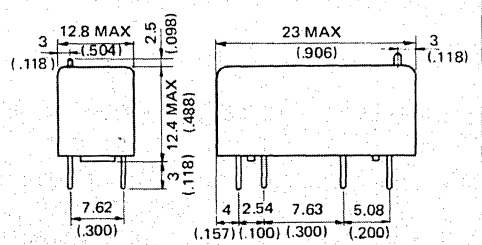
The .1″ grid spacing of terminals makes these relays ideally suited for printed circuit board applications requiring high density mounting — and for use in audio and wireless communications, office machines, various control applications and automobiles.

DIMENSIONS Unit: mm (inch)

FBR221



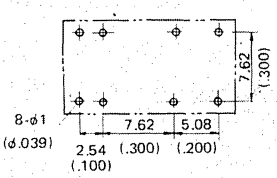
FRB221N



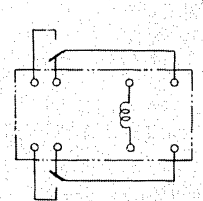
Notes:
1. For low level or dry circuit switching, use of gold thick-overlay silver-palladium alloy contact relays is recommended.
2. Cut-off nib must be removed after relay soldering and board cleaning.
3. Although the plastic cover is bonded to the relay base, it is not hermetically sealed. Therefore when the board on which the relay is soldered is cleaned by immersion, cleaning time must not exceed 2 minutes. Please use alcohol, freon or water for cleaning.

FBR221, FRB221N

MOUNTING HOLE LAYOUT



SCHEMATIC



(BOTTOM VIEW)

ENGINEERING DATA

Item	Specifications
Contact Arrangement	DPDT
Contact Rating	1A at 28V DC, 0.5A at 120V AC (resistive)
Initial Contact Resistance	100mΩ max. at 6V DC, 0.1A initial
Contact Materials	Standard: Gold overlay silver — Low Level Type: Gold overlay silver-palladium alloy
Rated Coil Voltage	3, 5, 6, 9, 12, 24V DC
Coil Power Dissipation	Typical 0.5W at rated coil voltage at 20°C
Coil Temperature Rise	50°C approx. at rated voltage at 20°C
Insulation Resistance	100MΩ min. at 500V DC (at 20°C 65% RH)
Dielectric Withstanding Voltage	500V RMS (60Hz) for 1 minuate
Operate Time	10 ms max. at rated voltage at 20°C
Release Time	5 ms max.
Life Expectancy — Mechanical	5×10^6 ops. min.
Electrical	300×10^3 ops. min. at 28V DC, 1A, resistive 100×10^3 ops. min. at 120V AC, 0.5A, resistive
Vibration	10 to 55Hz (Dual amplitude: 1.5mm)
Shock	10G (11 ms)
Temperature Range	−25°C to +50°C
Weight	5 gr. approx.

SELECTION TABLE

Type	Contact Arrangements	Rated Voltage in V DC	Coil Resistance in Ω ±10% at 20°C	Pick-Up Voltage at 20°C	FBR221 Designation	FBR221 Price	FBR221N Designation	FBR221N Price
Standard	DPDT (Gold Overlay Silver)	3	18	Less Than 75% of Rated Voltage	FBR221D003	$3.06	FBR221ND003—20	$3.54
		5	50		FBR221D005	3.06	FBR221ND005—20	3.54
		6	72		FBR221D006	3.06	FBR221ND006—20	3.54
		9	162		FBR221D009	3.06	FBR221ND009—20	3.54
		12	290		FBR221D012	3.06	FBR221ND012—20	3.54
		24	1150		FBR221D024	3.22	FBR221ND024—20	3.70
Low Level Load	DPDT (Gold Overlay Silver-Palladium Alloy)	3	18	Less Than 75% of Rated Voltage	FBR221D003—P	$3.76	FBR221ND003—P20	$4.24
		5	50		FBR221D005—P	3.76	FBR221ND005—P20	4.24
		6	72		FBR221D006—P	3.76	FBR221ND006—P20	4.24
		9	162		FBR221D009—P	3.76	FBR221ND009—P20	4.24
		12	290		FBR221D012—P	3.76	FBR221ND012—P20	4.24
		24	1150		FBR221D024—P	3.92	FBR221ND024—P20	4.40

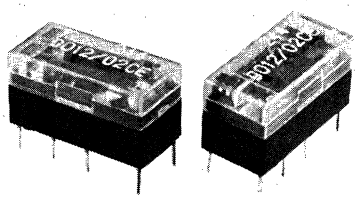
Note: Each product bears its own designation on the top of the cover, but initial code 'FBR' is omitted.

FUJITSU

RELAYS

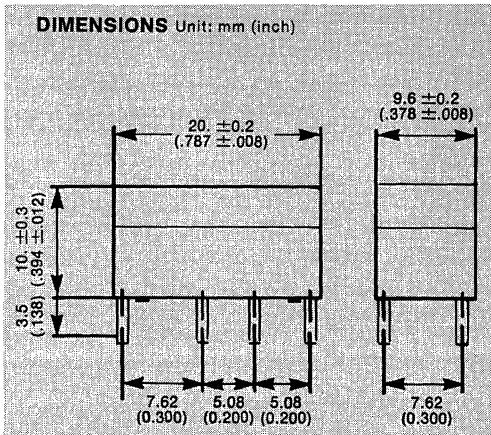
LOW PROFILE RELAYS FOR P.C. BOARDS

FBR244 AND FBR244N SERIES

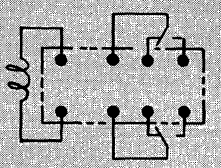


FBR244 and FBR244N Series Relays are low profile, P.C. board relays with 2 Form C (DPDT) contact arrangements in D.I.P.-compatible plastic housing and have a 2.54mm pinout grid spacing to provide 16-pin-DIP-socket compatibility. Watertight terminal sealing prevents relay from contamination by soldering flux and N type allows automatic wave soldering and board washing without relay damage. Single or bifurcated contacts switch 1A at 28V DC or 0.5A at 120V AC and have a rated-load life-time of 5×10^5 operations. These relays are suitable for telecommunication equipment, audio equipment and business machines.

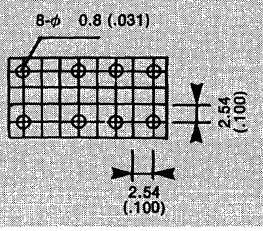
DIMENSIONS Unit: mm (inch)



SCHEMATICS



MOUNTING HOLE LAYOUT



ENGINEERING DATA

Item	Specifications
Contact Arrangement	2 Form C
Contact Material	Gold overlay silver Gold overlay silver-palladium alloy
Contact Rating	1A at 28V DC (resistive) 0.5A at 120V AC (resistive)
Initial Contact Resistance	100mΩ max. at 6V DC 0.1A
Coil Power Dissipation	Typical 0.5W at rated coil voltage
Coil Temperature Rise	50°C approx. at rated voltage 20°C
Insulation Resistance	100MΩ min. at 500V DC
Dielectric Withstanding Voltage	500V AC for 1 minute
Vibration	10 to 55 Hz (Dual amplitude: 1.5mm)
Shock	10G (11 ms)
Operate Time	10 ms max. at rated coil voltage
Release Time	5 ms max.
Life Expectancy — Mechanical	10^7 ops. min.
Electrical	5×10^5 ops. min. at 1A 28V DC (resistive) — 0.3A 120V AC (resistive) 10^5 ops. min. at 0.5A 120V AC (resistive)
Ambient Temperature Range	−30°C to +50°C
Weight	4.5 gr approx.

SELECTION TABLE

Contact Materials*	Rated Voltage in V CD	Coil Resistance in Ω ±10% at 20°C	Pick-Up Voltage at 20°C	FBR244 Designation	FBR244 Price	FBR244N Designation	FBR244N Price
S: Single Gold overlay silver P: Single Gold overlay silver-palladium alloy T: Bifurcated Gold overlay silver E: Bifurcated Gold overlay silver-palladium alloy	3	18	Less Than 75% of Rated Voltage	FBR244D003/02CS	$2.66	FBR244ND003/02CS	$3.14
	5	50		FBR244D005/02CS	2.66	FBR244ND005/02CS	3.14
	6	72		FBR244D006/02CS	2.66	FBR244ND006/02CS	3.14
	9	162		FBR244D009/02CS	2.66	FBR244ND009/02CS	3.14
	12	290		FBR244D012/02CS	2.66	FBR244ND012/02CS	3.14
	24	1150		FBR244D024/02CS	2.80	FBR244ND024/02CS	3.28

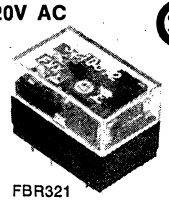
* Substitute S with P, T or E for alternate contact materials and add $0.70 to price for P, $0.32 for T or $1.00 for E.
For 48V relays add $0.60 to the prices of the 24V relays.

MINIATURE RELAYS FOR P.C. BOARDS

FBR311 (SPDT) AND FBR321 (DPDT) SERIES

3A-28V DC, 3A-120V AC

FBR311

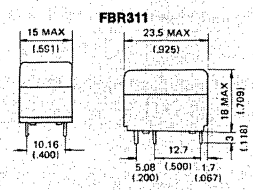


FBR321

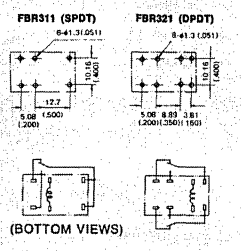
The FBR311 (SPDT) and FBR321 (DPDT) Series miniature relays were designed to provide 3 amps ratings contacts, accommodated in truly compact packages for P.C. boards.

These sensitive miniature relays, featuring high density mounting, flux-contamination immunity, versatile switching performance from signal level to handling 3 amps, are ideally suited for such applications as audio equipment, office machines, vending machines and automotive or other control application. These relays are UL Recognized (E63615) and CSA Certified (add —CSA suffix to P/N).

DIMENSIONS Unit: mm (inch)



SCHEMATICS



ENGINEERING DATA FBR311, 321

Item	Specifications
Contact Arrangement	SPDT (FBR311) DPDT (FBR321)
Contact Rating	3A at 28V DC, resistive — 3A at 120V AC, (resistive)
Initial Contact Resistance	100mΩ max. at 6V DC, 0.5A
Contact Material	Gold overlay silver
Rated Coil Voltage	5, 6, 9, 12, 24V DC
Coil Power Dissipation	0.45W approx. at rated voltage
Coil Temperature Rise	35°C approx. at rated voltage
Insulation Resistance	100MΩ min. at 500V DC (initial)
Dielectric Withstanding Voltage	500V AC for 1 minute
Operate Time	20 ms max. at rated voltage
Release Time	10 ms max.
Life Expectancy — Mechanical	10×10^6 ops. min.
Electrical	100×10^3 ops. min. at rated load
Vibration	10 to 55Hz (Dual amplitude: 1.5mm)
Shock	10G (11ms)
Temperature Range	−30°C to +50°C
Weight	12 gr. approx.

SELECTION TABLE

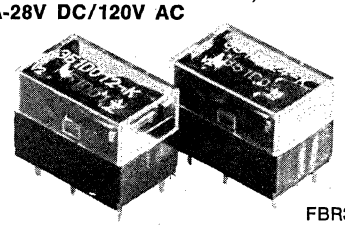
Contact Arrangement	Rated Voltage in V DC	Coil Resistance in Ω ±15% at 20°C	Pick-Up Voltage at 20°C	Designation	Price
SPDT	5	58	Less Than 80% of Rated Voltage	FBR311D005	$2.12
	6	85		FBR311D006	2.12
	9	180		FBR311D009	2.12
	12	300		FBR311D012	2.12
	24	1250		FBR311D024	2.26
DPDT	5	42	Less Than 80% of Rated Voltage	FBR321D005	$3.36
	6	60		FBR321D006	3.36
	9	135		FBR321D009	3.36
	12	230		FBR321D012	3.36
	24	960		FBR321D024	3.50

Note: Each product bears its own designation on the top of the cover, but initial code 'FBR' is omitted.
For 48V relays add $0.28 to prices of 24V relays.

MINIATURE RELAYS FOR P.C. BOARDS

FBR351 SERIES

SPDT 3A-28V DC/120V AC, 6A-28V DC/120V AC

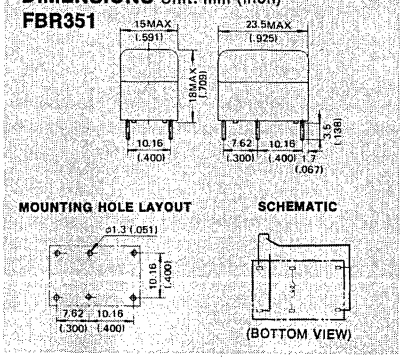


FBR351

FBR351 Series miniature relays are 1 Form C compact relays which can be used for a wide range of current switching from low levels to heavy loads. Two types are available: gold overlay contacts with contact ratings of 3A, 28V DC or 120V AC, and silver cadmium oxide contacts in 6A, 28V DC or 120V AC. These relays can be easily mounted on a PC board and use 3 pitch (7.62mm) pin arrangements. What's more, FBR351 Series relays endure 6KV at 40μ second in lightening. They are ideal for use in audio equipment, business machines, game machines and automotive applications.

DIMENSIONS Unit: mm (inch)

FBR351



ENGINEERING DATA FBR351

Item	Specifications	
	Standard	High-power Type
Contact Arrangement	1 Form C (SPDT)	
Contact Ratings	3A at 28V DC or 120V AC (resistive)	6A at 28V DC or 120V AC (resistive)
Contact Materials	Gold overlay	Silver-cadmium oxide
Initial Contact Resistance	100mΩ max. at 6V DC, 0.5A	100mΩ max. at 6V DC, 1A
Rated Coil Voltage	5, 6, 9, 12, 24V DC	
Coil Power Dissipation	0.45W approx. at rated voltage	
Coil Temperature Rise	35°C approx. at rated voltage	
Insulation Resistance	100MΩ min. at 500V DC	
Dielectric Withstanding Voltage	Between open contacts: 750V AC for 1 minute Between coil and contact: 2000V AC for 1 minute	
Lightening	6KV at 1 x 40 μs	
Operate Time	8 ms approx. at rated voltage	
Release Time	2.5 ms approx.	
Life Expectancy — Mechanical	10×16^6 ops. min.	
Electrical	200×10^3 ops. min. at 28V DC, 3A 100×10^3 ops. min. at 120V AC, 3A	100×10^3 ops. min. at 28V DC, 6A 50×10^3 ops. min. at 120V AC, 6A
Vibration	10~50Hz (Dual amplitude: 1.5mm)	
Shock	10G (11 ms)	
Temperature Range	−40°C~+70°C at 2A carrying current −40°C~+50°C at 5A carrying current (without freezing) −40 C~+40°C at 6A carrying current	
Weight	12 gr. approx.	

SELECTION TABLE

Type	Contact Rating	Contact Materials	Rated Voltage in V DC	Coil Resistance in Ω ±10% at 20°C	Pick-Up Voltage at 20°C	Designation	Price
Standard	3A at 28V DC or 120V AC, resistive	Gold Overlay	5	58	Less Than 80% of Rated Voltage	FBR351D005	$2.32
			6	85		FBR351D006	2.32
			9	180		FBR351D009	2.32
			12	300		FBR351D012	2.32
			24	1250		FBR351D024	2.46
High-Power Type	6A at 28V DC or 120V AC, resistive	Silver-Cadmium Oxide	5	58	Less Than 80% of Rated Voltage	FBR351D005—K	$2.46
			6	85		FBR351D006—K	2.46
			9	180		FBR351D009—K	2.46
			12	300		FBR351D012—K	2.46
			24	1250		FBR351D024—K	2.60

Note: Each product bears its own designation on the top of the cover, but initial code 'FBR' is omitted.
For 48V relays add $0.28 to prices of 24V relays.

FUJITSU AMERICA, INC. / COMPONENT DIV. / 918 Sherwood Drive, Lake Bluff, IL 60044 / (312) 295-2610, Telex 206196, TWX 910-651-2259

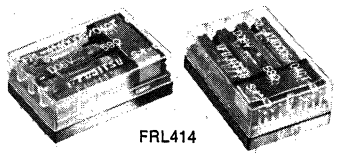
FUJITSU

RELAYS

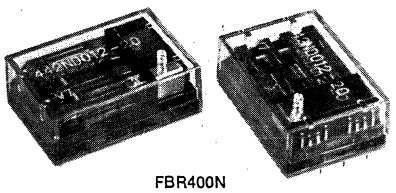
FLAT PACKAGE RELAYS

FRL-414 AND FBR400N SERIES

4PDT, DPDT 1A-30V DC, 1A-120V AC



FRL414



FBR400N

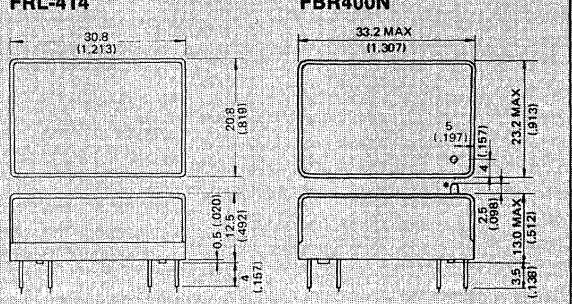
The Fujitsu FRL-414 and FBR400N (immersion cleanable) Series Flat Package Relays have been designed for P.C. board mounting and are ingeniously constructed so as to offer the advantages of flux-contamination-immunity.

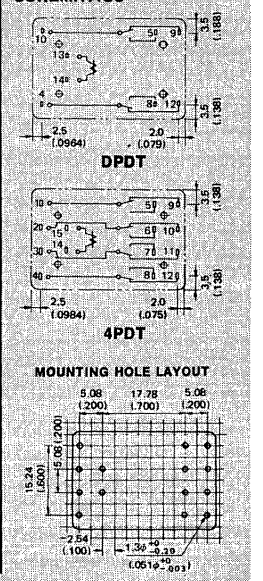
The low power consumption relays are available in both DPDT and 4PDT contact arrangements and in coil voltage ratings to 48V DC. The wide selection is useful for numerous demanding applications, including communications, data processing and controls.

Bifurcated contacts assure high reliability. These relays are capable of handling resistive loads of up to 1A at 30V DC or 120V AC.

A low level load version with gold overlay silver-palladium alloy contacts is also available. Electrical life expectancy is more than three million operations at 1A-50V DC resistive load.

DIMENSIONS Unit: mm (inch)





Notes:

1. For low level or dry circuit switching, use of gold overlay silver-palladium alloy contact relays is recommended.
2. *Cut-off nib must be removed after relay soldering and board cleaning.
3. Although the plastic cover is bonded to the relay base, it is not hermetically sealed. Therefore when the board on which the relay is soldered is cleaned by immersion, cleaning time must not exceed 2 minutes. Please use alcohol, freon or water for cleaning.

ENGINEERING DATA

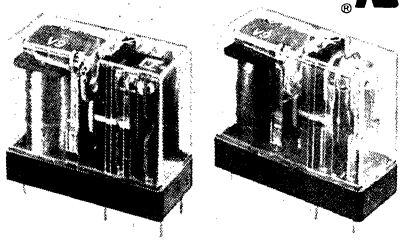
Item	Characteristics
Contact Arrangement	DPDT and 4PDT with bifurcated contacts
Contact Rating	1A at 120V AC (resistive) — 1A at 30V DC (resistive)
Initial Contact Resistance	100mΩ max. at 3V DC, 0.5A initial
Contact Materials	Standard: Gold-overlay silver — Low-level Load: Gold-overlay silver-palladium alloy
Rated Coil Voltage	5, 6, 12, 24, 48V DC
Coil Power Dissipation	DPDT: 0.45W — 4PDT: 0.60W at rated voltage at 20°C
Coil Temperature Rise	DPDT: 30°C approx. — 4PDT: 40°C approx. at rated voltage at 20°C
Insulation Resistance	100MΩ min. at 500V DC (at 20°C 65% RH)
Dielectric Withstanding Voltage	500V rms (60 Hz) for 1 minute
Operate Time	15 ms max. at rated coil voltage at 20°C
Release Time	5 ms max.
Life Expectancy — Mechanical	30 x 10^6 ops. min.
Electrical	3 x 10^6 ops. min. at 30V DC, 1A (resistive) 100 x 10^3 ops. min. at 120V AC, 1A (resistive)
Shock	10G
Temperature Range	−30°C to +50°C (without freezing)
Weight	15 gr. approx.

SELECTION TABLES

Load	Contact Materials	Contact Arrangements	Rated Voltage in V	Pick-Up Voltage at 20°C	Coil Resistance in Ω ±15%	FRL-414 Designation	FRL-414 Price	FBR400N Designation	FBR400N Price
Standard	Gold Overlay Silver	DPDT	5	Less Than 80% of Rated Voltage	56	FRL-414D005/02CT	$4.44	FBR422ND005—20	$5.04
			6		78	FRL-414D006/02CT	4.44	FBR422ND006—20	5.04
			12		320	FRL-414D012/02CT	4.44	FBR422ND012—20	5.04
			24		1250	FRL-414D024/02CT	4.44	FBR422ND024—20	5.04
			48		4000	FRL-414D048/02CT	5.04	FBR422ND048—20	5.64
Standard	Gold Overloy Silver	4PDT	5	Less Than 80% of Rated Voltage	42	FRL-414D005/04CT	$4.84	FBR442ND005—20	$5.44
			6		58	FRL-414D006/04CT	4.84	FBR442ND006—20	5.44
			12		220	FRL-414D012/04CT	4.84	FBR442ND012—20	5.44
			24		960	FRL-414D024/04CT	4.84	FBR442ND024—20	5.44
			48		2800	FRL-414D048/04CT	5.44	FBR442ND048—20	6.04
Low-Level Load	Gold Overlay Silver-Palladium Alloy	DPDT	5	Less Than 80% of Rated Voltage	56	FRL-414D005/02CE	$4.84	FBR422ND005—P20	$5.44
			6		78	FRL-414D006/02CE	4.84	FBR422ND006—P20	5.44
			12		320	FRL-414D012/02CE	4.84	FBR422ND012—P20	5.44
			24		1250	FRL-414D024/02CE	4.84	FBR422ND024—P20	5.44
			48		4000	FRL-414D048/02CE	5.44	FBR422ND048—P20	6.04
Low-Level Load	Gold Overlay Silver-Palladium Alloy	4PDT	5	Less Than 80% of Rated Voltage	42	FRL-414D005/04CE	$6.16	FBR442ND005—P20	$6.76
			6		58	FRL-414D006/04CE	6.16	FBR442ND006—P20	6.76
			12		220	FRL-414D012/04CE	6.16	FBR442ND012—P20	6.76
			24		960	FRL-414D024/04CE	6.16	FBR442ND024—P20	6.76
			48		2800	FRL-414D048/04CE	6.76	FBR442ND048—P20	7.36

MINIATURE HIGH-POWER RELAYS

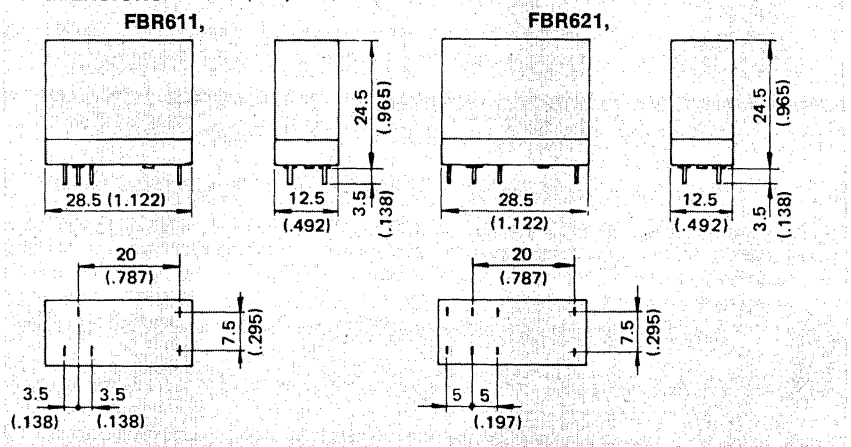
FBR600 SERIES



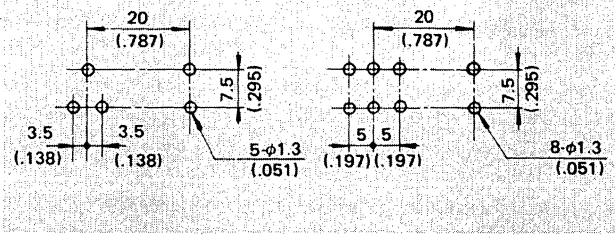
The FBR600 Series are miniature high-power relays with a switching capability of 10A, 30V DC or 240V AC for 1 Form C contact; and 5A, 30V DC or 240V AC for 2 Form C contacts. These relays, conforming to VDE, UL and CSA standards, are designed for mounting on printed circuit boards. Dielectric withstanding voltage is 500V AC for 1 minute and creeping distance is 8mm. These FBR600 Series relays are ideal for use in audio equipment, TV, vending machines, control machines, etc.

UL recognized (E63615) for industrial control equipment per UL508.

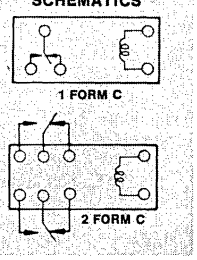
DIMENSIONS Unit: mm (inch)



MOUNTING HOLE LAYOUT



SCHEMATICS



ENGINEERING DATA

Item	Specifications
Contact Arrangement	FBR611, 1 Form C — FBR621, 2 Form C
Contact Ratings	FBR611, 10A at 30V DC or 240V AC — FBR621, 5A at 30V DC or 240V AC
Carrying Current	FBR611, 10A — FBR621, 5A
Contact Material	Silver-alloy
Initial Contact Resistance	100mΩ max. at 6V DC, 1A
Rated Coil Voltage	5, 6, 9, 12, 18, 24, 48, 60V DC
Coil Power Dissipation	FBR611/621, 0.5W at 20°C
Coil Temperature Rise	FBR611/621, 35°C at rated voltage at 20°C
Insulation Resistance	1000Ω min. at 500V DC (initial) at 20°C, 65% RH
Dielectric Withstanding Voltage	
Between Coil and Contact	5000V AC for 1 minute at 20°C, 65% RH
Between Open Contacts	1000V AC for 1 minute at 20°C, 65% RH
Between Adjacent Contacts	FBR621, 3000V AC for 1 minute at 20°C, 65% RH
Lightening (1 x 40μ sec)	
Between Coil and Contact	10,000V min
Between Adjacent Contacts	FBR621, 6000V min.
Operate Time	8 ms approx. at rated voltage at 20°C
Release Time	2.5 ms approx. at 20°C
Life Expectancy — Mechanical	20 x 10^6 ops. min.
Electrical	100 x 10^3 ops. min. at rated voltage
Vibration	10~55 Hz (Dual amplitude: 1.5mm)
Shock	10G (11 ms)
Temperature Range	FBR611/621, −40°C~+70°C
Weight	16 gr. approx.

SELECTION TABLE

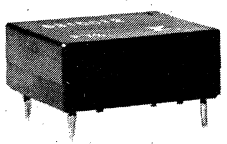
Contact Material	Rated Voltage in V DC	Coil Resistance in Ω at 20°C	Pick-Up Voltage at 20°C	Open Voltage at 20°C	FBR611 Designation	FBR611 Price	FBR621 Designation	FBR621 Price
Silver-Alloy	5	50	Less Than 70% of Rated Voltage	More Than 10% of Rated Voltage (reference)	FBR611D005	$3.74	FBR621D005	$4.00
	6	72			FBR611D006	3.74	FBR621D006	4.00
	9	160			FBR611D009	3.74	FBR621D009	4.00
	12	285			FBR611D012	3.74	FBR621D012	4.00
	18	640			FBR611D018	3.74	FBR621D018	4.00
	24	1150			FBR611D024	3.86	FBR621D024	4.12
	48	4600			FBR611D048	4.56	FBR621D048	4.82
	60	7200			FBR611D060	4.96	FBR621D060	5.24

FUJITSU

RELAYS

LOW PROFILE RELAYS FOR P.C. BOARDS

FBR630 SERIES



Fujitsu's compact FBR630-series relays are only 10 mm in height, but they provide a remarkable contact rating of 10A.

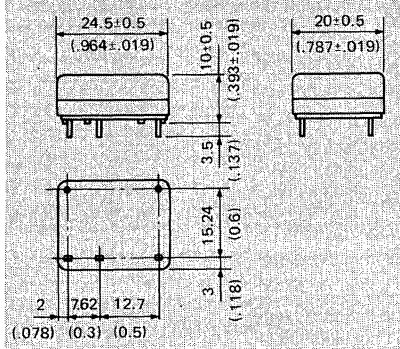
Compactness and high capacity make these low-profile power relays ideally suited to mounting on PC boards.

FEATURES

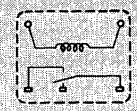
- Low profile — only 10 mm high
- 5 kV minimum lightning surge (between coil and contact)
- 2.5 kV minimum dielectric withstanding voltage (between coil and contact)
- Sealed terminals to protect against flux
- Input/output isolated terminal arrangement for easy pattern design
- Wide operating temperature range— −30°C to +70°C
- Maximum contact rating: 10A (30 VDC/ 120 VAC)
- High-reliability design meeting various safety standards:

  Japan Electric Appliance Control Law
  UL508 Standard
  CSA-Class 3211 Standard
  FCC 68-302 Standard

DIMENSIONS



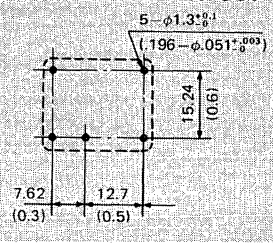
SCHEMATICS



Unit: mm (inch)

(BOTTOM VIEW)

MOUNTING HOLE LAYOUT



ENGINEERING DATA

Item	Specification
Contact Arrangement	SPDT (1 Form C)
Contact Rating	10A 30 VDC/120 VAC, 8A 240 VAC
Contact Configuration	Single
Contact Material	Silver alloy
Initial Contact Resistance	100 mΩ max. at 6 VDC, 1A
Insulation Resistance	100 MΩ min. at 500 VDC
Dielectric Withstanding Voltage	Between open contacts: 1,000 VAC for 1 minute Between coil and contact: 2,500 VAC for 1 minute
Lightning	5,000 V/1 μs/40 μs 5,000V (Between coil and contact) 2,500V 1 μsec 40 μsec
Vibration	10 to 55 Hz (Dual amplitude: 1.5 mm)
Shock	Operating malfunction: 10G (11 ms) Durability: 100G (11 ms)
Operate Time	15 ms max. (excluding bounce time)
Release Time	5 ms max. (excluding bounce time)
Life Expectancy	Mechanical: 10 x 10^6 ops/min. Electrical: 100 x 10^3 ops/min. at rated contact load
Maximum Switching Frequency	Mechanical: 18,000 ops//hr Electrical: 1,800 ops//hr (at rated contact load)
Operating Temperature	−30°C to +70°C
Operating Humidity	45% to 85% RH
Weight	Approx. 10 g

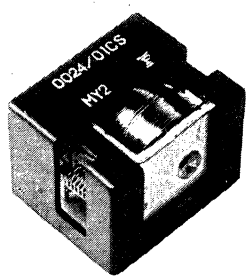
Remarks: The table shows characteristic values at 20°C.

SELECTION TABLE

Rated Coil Voltage	VOLTAGE Specifications	Coil Resistance (±10%)	Coil Current (at Rated Voltage)	Pick-up Voltage	Drop-out Voltage (Reference Value)	Maximum Voltage Allowance	Rated Power Consumption	Coil Temperature Rise	Designation	Price
DC 5V	D005	50Ω	100 mA	Less than 75% of rated voltage	More than 10% of rated voltage	Refer to reference data	Approx. 500 mW (at rated voltage)	Approx. 35 deg. (at rated voltage)	FBR631D005	$2.50
DC 6V	D006	72Ω	83 mA						FBR631D006	2.50
DC 9V	D009	160Ω	56 mA						FBR631D009	2.50
DC 12V	D012	288Ω	42 mA						FBR631D012	2.50
DC 18V	D018	650Ω	28 mA						FBR631D018	2.50
DC 24V	D024	1,150Ω	21 mA						FBR631D024	2.66
DC 48V	D048	4,600Ω	10 mA						FBR631D048	3.34

P.C. BOARD RELAYS FOR AUTOMOTIVE APPLICATIONS

FRL270 SERIES



Fujitsu FRL270 series power relays are for PC board mounting and are designed especially for automotive applications.

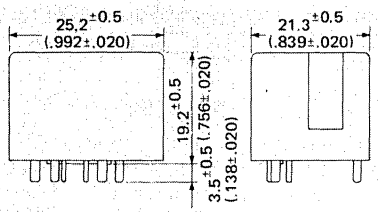
FEATURES

- **Maximum current: 30A**
  The relays are designed for high ambient and storage temperatures to ensure the contacts will endure continuous current of up to 30A.
- **Rigid, shock-resistant construction**
- **1 mm-gap contacts**
  1 mm-gap contacts are also available for controlling 24V motors in trucks and other large vehicles.
- **Welding resistant contact materials**
  Three types of welding resistant contact materials are available as standard.
- Choice of wide terminal model (−01 and −11 suffix) for maximum heat/power transfer or standard terminal model (no suffix or −10) for conventional hole/conductor sizes, at no extra charge.
- Available with case as shown (no suffix and −01) or without case (−10 and −11 suffix).

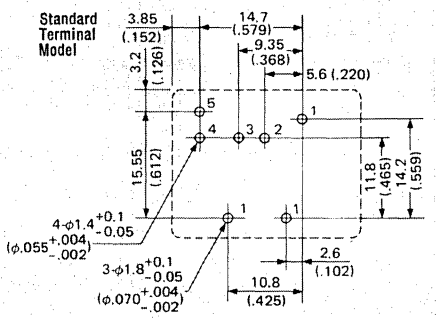
Main Uses

- **Engine control**
  Electronic fuel injection units
- **Lamp control**
  Flasher control units
  Headlight control units
- **Motor, solenoid, and heater controls**
  Windshield wiper control units for trucks
  Automatic door-lock control units
  Defogger control units
  Other various control units

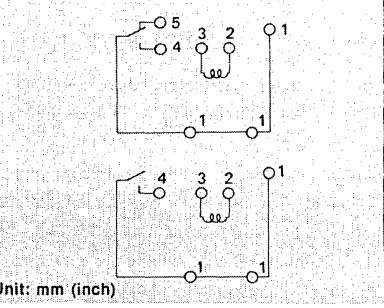
DIMENSIONS

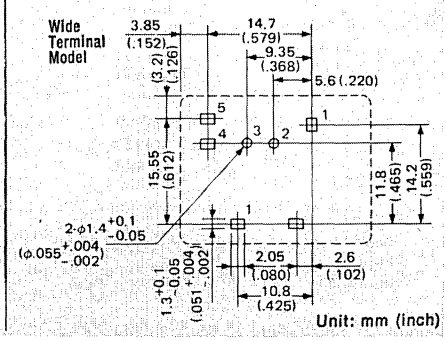


MOUNTING HOLE LAYOUT



SCHEMATICS (BOTTOM VIEWS)





Unit: mm (inch)

Unit: mm (inch)

ENGINEERING DATA

Item	Specifications
Contact Arrangement	SPDT (1 Form C) or SPST (1 Form A)
Contact Material	Silver-copper alloy (S) Silver-cadmium oxide (K) Silver-tin oxide (Y)
Contact Gap	01 type (Standard gap) 51 type (1 mm gap)
Contact Rating	N.O. contact: 12 VDC, 15A or 24 VDC, 10A N.C. contact: 12 VDC, 10A or 24 VDC, 7A (resistive load)
Rated Current	15A (Continuous)
Maximum Current	30A (Overload current when motor locks)
Voltage Drop Across Contacts	Initial: 0.3V max. After life testing: 0.5V max. (after several operations at rated current)
Coil Power	Standard coil. 1.7W approx. Low-power coil: 0.6W approx. (with rated voltage applied at 20°C)
Coil Temperature Rise	Standard coil: 75 deg. approx. Low-power coil: 35 deg. approx. (with rated voltage applied at 20°C)
Insulation Resistance	100 MΩ min. (at 500 VDC)
Withstanding Voltage	500 VAC for 1 minute
Vibration	Operation error: With 1.5 mm vibration applied at full amplitude at 10 ~ 55 Hz, contact chatter lasts less than 1 ms.
Shock	Operation error: 10G (11 ms sine half-wave) Durability: 100G (11 ms sine half-wave)
Operate Time	10 ms max. (Standard coil with 01-type contact gap)
Release Time	5 ms max. (01-type contact gap) 8 ms max. (51-type contact gap)
Life Expectancy	Mechanical: 100 x 10^6 operations or more Electrical: 250 x 10^3 operations or more (Silver-copper alloy under the rated contact load)
Ambient Temperature	−30°C ~ +80°C
Storage Temperature	−40°C ~ +100°C
Weight	20 g approx.

SELECTION TABLE

Type of Coil (Spec. Code)	Rated Voltage (Spec. Code)	Contact Gap (Spec. Code)	Coil Resistance (±10%)	Rated Power Consumption	Pick-Up Voltage	Drop-Out Voltage	All case/terminal suffix codes: none, −01, −10 or −11	
							Designation	Price
Standard (D)	12 VDC (012)	Standard (01)	85	1.7W approx.	Less than 6.5 VDC	More than 1.0 VDC	FRL274 D12/01AS (or CS)	$2.56 (or $2.66)
		1 mm (51)	85	1.7W approx.	Less than 6.5 VDC	More than 1.0 VDC	FRL274 D12/51AS (or CS)	$2.56 (or $2.66)
Low Power (H)		Standard (01)	240	0.6W approx.	Less than 8.4 VDC	More than 0.8 VDC	FRL274 H12/01AS (or CS)	$2.56 (or $2.66)
Standard (D)	24 VDC (024)	Standard (01)	340	1.7W approx.	Less than 13.0 VDC	More than 2.0 VDC	FRL274 D24/01AS (or CS)	$2.56 (or $2.66)
		1 mm (51)	340	1.7W approx.	Less than 13.0 VDC	More than 2.0 VDC	FRL274 D24/51AS (or CS)	$2.56 (or $2.66)
Low Power (H)		Standard (01)	960	0.6W approx.	Less than 16.8 VDC	More than 1.6 VDC	FRL274 H24/01AS (or CS)	$2.56 (or $2.66)

Notes: 1. Values listed in the table are measured at 20°C.
2. For silver cadmium oxide contacts (code "K") add $0.10.
3. For silver-tin oxide contact (code "Y") add $0.18.

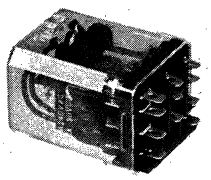
FUJITSU

RELAYS

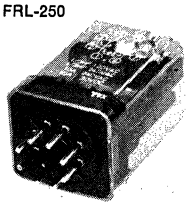
HEAVY DUTY GENERAL PURPOSE RELAYS

FRL-250 AND FRL-256 SERIES

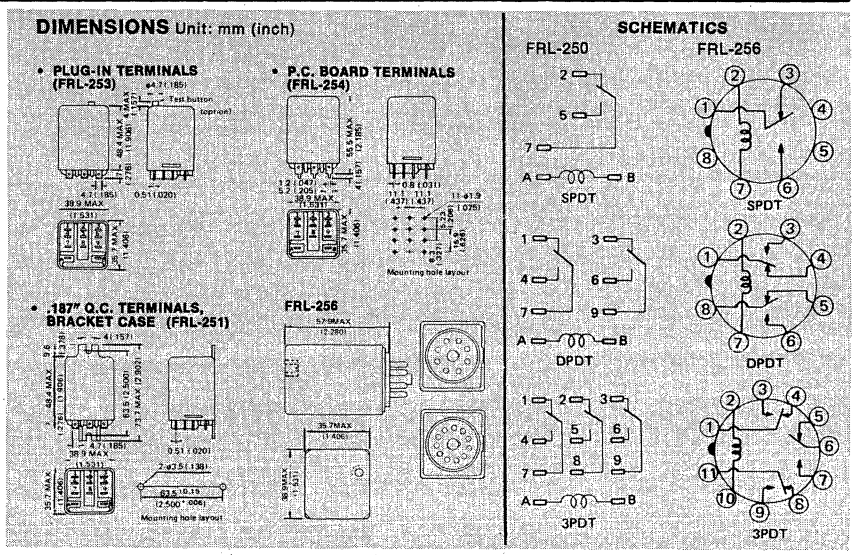
SPDT, DPDT, 3PDT 10A-30V DC, 10A-240V AC



FRL-250



FRL-256



The FRL-250 Series Relays have been designed with particular attention to reliability, cost performance and versatility of application. These heavy duty general purpose relays provide SPDT, DPDT or 3PDT contacts with switching ability of 10A at 30V DC or 240V AC. The FRL-250 Series Relays provide various mounting styles such as plug-in, bracket case, tapped core, stud or P.C. board, and their terminals are convenient quick-connect/solder or P.C. board. The optional features are with or without test button for manual circuit checking and indicator lamp to indicate whether power is reaching relay.

These relays are particularly desirable for use in automation control, communication circuit and many other applications where high power switching and rugged construction are required.

The FRL-250 Series relays are UL recognized (File No. E63614) and C.S.A. certified (File No. LR40304).

ENGINEERING DATA

Item	Specifications
Contact Arrangement	SPDT, DPDT, 3PDT
Contact Rating	10A at 30V DC (resistive) — 10A at 240V AC (resistive) ⅓ HP at 120V AC, ½ HP at 240V AC
Initial Contact Resistance	100mΩ max. at 6V DC, 1A
Contact Material	Gold flashed silver-cadmium oxide
Rated Coil Voltage	6, 12, 24, 48, 110V DC — 12, 24, 48, 120, 240V AC
Coil Power Dissipation	DC: 1.2W, AC: 3PDT — 2.7VA, DPDT, SPDT — 2VA at rated voltage, 60 Hz
Coil Temperature Rise	DC: 40°C max., AC: 60° max.
Insulation Resistance	100MΩ min. at 500V DC
Dielectric Withstanding Voltage	2000V AC for 1 minute (1000V AC between open contacts)
Operate Time	30 ms max. at rated coil voltage
Release Time	30 ms max.
Life Expectancy — Mechanical	10 x 10^6 ops. min.
Electrical	100 x 10^3 ops. min. at rated load
Vibration	600 to 1500 rpm (Dual amplitude: 1mm)
Shock	10G (11 ms)
Temperature Range	DC: −45°C to +70°C/AC: 3PDT: −45°C to +45C°/DPDT, SPDT: −45°C to +55°C
Weight	80 gr. approx.

SELECTION TABLES

DC RELAYS

Contacts	Coil: Rated V DC	Coil: Resistance Ohms	Coil: Power Watts	Fujitsu Number QC/Solder Bracket Case*	Price	Fujitsu Number Plug-In	Price	Fujitsu Number PC Board	Price	Fujitsu Number Plug-In	Price
SPDT	6	32	1.2	FRL-251D006/01CS-0C	$6.32	FRL-253D006/01CS	$6.32	FRL-254D006/01CS	$6.32	FRL-256D006/01CS	$7.80
	12	120	1.2	FRL-251D012/01CS-0C	6.32	FRL-253D012/01CS	6.32	FRL-254D012/01CS	6.32	FRL-256D012/01CS	7.80
	24	470	1.2	FRL-251D024/01CS-0C	6.32	FRL-253D024/01CS	6.32	FRL-254D024/01CS	6.32	FRL-256D024/01CS	7.80
	48	1800	1.2	FRL-251D048/01CS-0C	6.32	FRL-253D048/01CS	6.32	FRL-254D048/01CS	6.32	FRL-256D048/01CS	7.80
	110	10000	1.2	FRL-251D110/01CS-0C	6.82	FRL-253D110/01CS	6.82	FRL-254D110/01CS	6.82	FRL-256D110/01CS	8.52
DPDT	6	32	1.2	FRL-251D006/02CS-0C	$6.86	FRL-253D006/02CS	$6.86	FRL-254D006/02CS	$6.86	FRL-256D006/02CS	$8.74
	12	120	1.2	FRL-251D012/02CS-0C	6.86	FRL-253D012/02CS	6.86	FRL-254D012/02CS	6.86	FRL-256D012/02CS	8.74
	24	470	1.2	FRL-251D024/02CS-0C	6.86	FRL-253D024/02CS	6.86	FRL-254D024/02CS	6.86	FRL-256D024/02CS	8.74
	48	1800	1.2	FRL-251D048/02CS-0C	6.86	FRL-253D048/02CS	6.86	FRL-254D048/02CS	6.86	FRL-256D048/02CS	8.74
	110	10000	1.2	FRL-251D110/02CS-0C	7.36	FRL-253D110/02CS	7.36	FRL-254D110/02CS	7.36	FRL-256D110/02CS	9.46
3PDT	6	32	1.2	FRL-251D006/03CS-0C	$8.00	FRL-253D006/03CS	$8.00	FRL-254D006/03CS	$8.00	FRL-256D006/03CS	$10.88
	12	120	1.2	FRL-251D012/03CS-0C	8.00	FRL-253D012/03CS	8.00	FRL-254D012/03CS	8.00	FRL-256D012/03CS	10.88
	24	470	1.2	FRL-251D024/03CS-0C	8.00	FRL-253D024/03CS	8.00	FRL-254D024/03CS	8.00	FRL-256D024/03CS	10.88
	48	1800	1.2	FRL-251D048/03CS-0C	8.00	FRL-253D048/03CS	8.00	FRL-254D048/03CS	8.00	FRL-256D048/03CS	10.88
	110	10000	1.2	FRL-251D110/03CS-0C	8.50	FRL-253D110/03CS	8.50	FRL-254D110/03CS	8.50	FRL-256D110/03CS	11.60

AC RELAYS

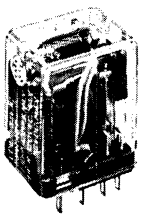
Contacts	Coil: Rated V AC	Coil: Current mA	Coil: Power VA	Fujitsu Number QC/Solder Bracket Case*	Price	Fujitsu Number Plug-In	Price	Fujitsu Number PC Board	Price	Fujitsu Number Plug-In	Price
SPDT	12	168	2.0	FRL-251A012/01CS-0C	$6.32	FRL-253A012/01CS	$6.32	FRL-254A012/01CS	$6.32	FRL-256A012/01CS	$7.80
	24	84	2.0	FRL-251A024/01CS-0C	6.32	FRL-253A024/01CS	6.32	FRL-254A024/01CS	6.32	FRL-256A024/01CS	7.80
	48	42	2.0	FRL-251A048/01CS-0C	6.32	FRL-253A048/01CS	6.32	FRL-254A048/01CS	6.32	FRL-256A048/01CS	7.80
	120	18	2.0	FRL-251A120/01CS-0C	6.86	FRL-253A120/01CS	6.82	FRL-254A120/01CS	6.82	FRL-256A120/01CS	8.52
	240	9	2.0	FRL-251A240/01CS-0C	7.12	FRL-253A240/01CS	7.12	FRL-254A240/01CS	7.12	FRL-256A240/01CS	9.32
DPDT	12	168	2.0	FRL-251A012/02CS-0C	$6.86	FRL-253A012/02CS	$6.86	FRL-254A012/02CS	$6.86	FRL-256A012/02CS	$ 8.74
	24	84	2.0	FRL-251A024/02CS-0C	6.86	FRL-253A024/02CS	6.86	FRL-254A024/02CS	6.86	FRL-256A024/02CS	8.74
	48	42	2.0	FRL-251A048/02CS-0C	6.86	FRL-253A048/02CS	6.86	FRL-254A048/02CS	6.86	FRL-256A048/02CS	8.74
	120	18	2.0	FRL-251A120/02CS-0C	7.36	FRL-253A120/02CS	7.36	FRL-254A120/02CS	7.36	FRL-256A120/02CS	9.46
	240	9	2.0	FRL-251A240/02CS-0C	7.66	FRL-253A240/02CS	7.66	FRL-254A240/02CS	7.66	FRL-256A240/02CS	10.26
3PDT	12	230	2.7	FRL-251A012/03CS-0C	$8.00	FRL-253A012/03CS	$8.00	FRL-254A012/03CS	$8.00	FRL-256A012/03CS	$10.88
	24	115	2.7	FRL-251A024/03CS-0C	8.00	FRL-253A024/03CS	8.00	FRL-254A024/03CS	8.00	FRL-256A024/03CS	10.88
	48	57	2.7	FRL-251A048/03CS-0C	8.00	FRL-253A048/03CS	8.00	FRL-254A048/03CS	8.00	FRL-256A048/03CS	10.88
	120	24	2.7	FRL-251A120/03CS-0C	8.50	FRL-253A120/03CS	8.50	FRL-254A120/03CS	8.50	FRL-256A120/03CS	11.30
	240	12	2.7	FRL-251A240/03CS-0C	8.80	FRL-253A240/03CS	8.80	FRL-254A240/03CS	8.80	FRL-256A240/03CS	12.40

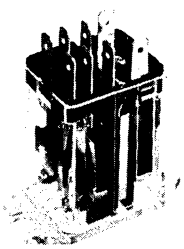
* To order No. 6-32 tapped core mounting style, change suffix, **-0C** to **-0A-01** and add $0.90 to price shown; to order No. 6-32 stud mounting style, change suffix **-0C** to **-0B-01** and add $0.80 to price shown.

GENERAL PURPOSE RELAYS

FRL-260 SERIES

4PDT-3A, 3PDT-5A, DPDT-10A, SPDT-15A





The FRL-260 series relays with proven performance and top quality have been designed with emphasis on reliability, safety, cost performance and applicability to a wide range of uses.

These relays provide SPDT to 4PDT contacts, which are offered for contact ratings from 1 amp to 15 amps at 30V DC or 240V AC, resistive. Moreover, they are also available with 4 transfer bifurcated contacts that enable them to meet signal level or other light loads.

The FRL-260 series relays are available in both DC- and AC-rated coils, and with a selection of mountings, such as solder, plug-in, P.C. boards and quick connect terminals.

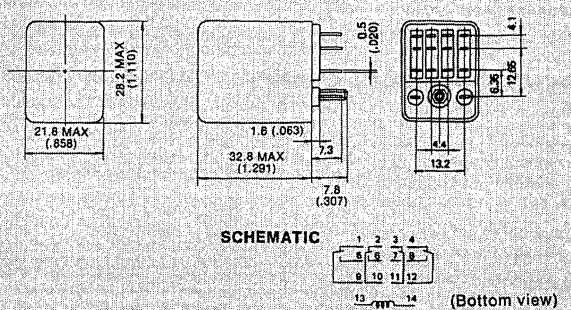
The FRL-260 series is UL recognized (File No. E63614/E63615) and C.S.A. certified.

ENGINEERING DATA

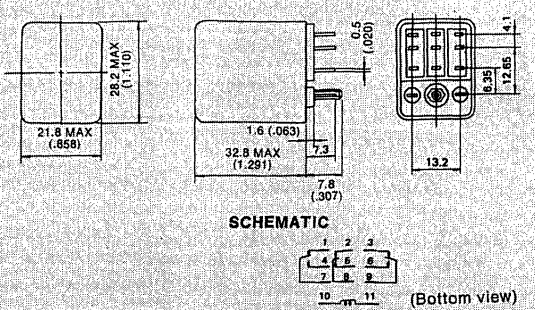
Item	Specifications
Contact Ratings (Resistive Load).	As per SELECTION TABLE
Initial Contact Resistance	General (S, K, V Contact): 100mΩ max. (at 6V DC, 1A) Low Level (T, L Contact): 50mΩ max. (at 6V DC, 0.1A)
Operate Time Release Time	25 ms max. (at rated coil voltage) 25 ms max.
Coil Power Dissipation	DC: 0.9W (at rated coil voltage) AC: 1.2 VA (120V max.) at rated coil voltage of 60 Hz 1.4 VA (200V min.) at rated coil voltage of 60 Hz
Coil Temperature Rise	DC: 50° max. AC: 60°C max.
Life Expectancy — Mechanical Electrical	50 x 10^6 ops. min. (at rated load) Medium Load SPDT: 500 x 10^3 ops. min. DPDT: 500 x 10^3 ops. min. 3PDT: 500 x 10^3 ops. min. 4PDT: 200 x 10^3 ops. min. 4PST: 100 x 10^3 ops. min. Heavy Load SPDT: 200 x 10^3 ops. min. SPST: 200 x 10^3 ops. min. DPDT: 500 x 10^3 ops. min.
Insulation Resistance	100MΩ min. (at 500V DC)
Dielectric Withstanding Voltage	1500V AC (1000V AC between open contacts) for 1 minute
Vibration	50 Hz (Dual Amplitude: 0.5mm)
Shock	10G (11 ms)
Temperature Range	−30°C to +55°C
Weight	35 gr. approx.

DIMENSIONS Unit: mm

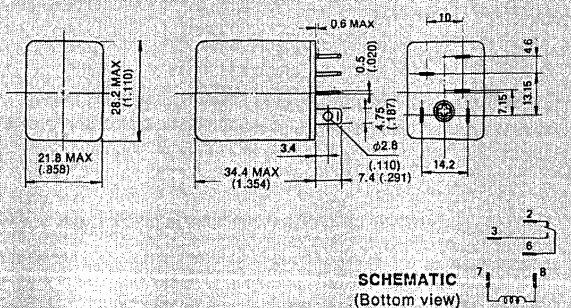
04CL: DIMENSION AND CONSTRUCTION
04CS: DIMENSION AND CONSTRUCTION
04CT: DIMENSION AND CONSTRUCTION
04CV: DIMENSION AND CONSTRUCTION



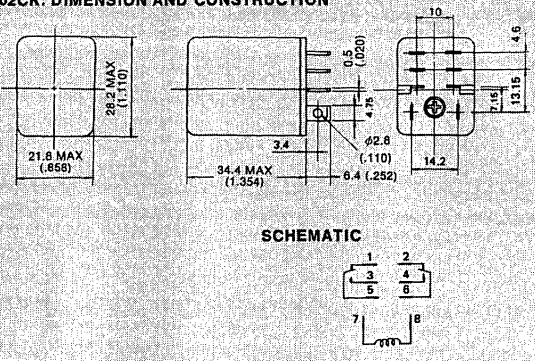
03CS: DIMENSION AND CONSTRUCTION



01CK: DIMENSION AND CONSTRUCTION



02CK: DIMENSION AND CONSTRUCTION



FUJITSU

RELAYS

FRL260 SERIES RELAYS SELECTION TABLE — DC COIL

Contact Arrangement and Material	Contact Ratings		Rated Voltage V DC 50/60 Hz	Coil Resistance ±15% Ohms @ 20°C	Pick-Up Voltage @ 20°C	Fujitsu Part Numbers (Plug-In)*	Price
	Resistive	Horsepower					
SPDT AgCdO	15A @ 30V DC or 150V AC 10A @ 240V AC	1/3 HP @ 120V AC 1/2 HP @ 240V AC	6	40	4.5	FRL263D006/01CK	$4.66
			12	160	9	FRL263D012/01CK	4.66
			24	650	18	FRL263D024/01CK	4.66
			48	2600	36	FRL263D048/01CK	4.66
			110	13300	82.5	FRL263D110/01CK	5.80
DPDT AgCdO	10A @ 30V DC or 240V AC	1/3 HP @ 120V AC 1/2 HP @ 240V AC	6	40	4.5	FRL263D006/02CK	$4.84
			12	160	9	FRL263D012/02CK	4.84
			24	650	18	FRL263D024/02CK	4.84
			48	2600	36	FRL263D048/02CK	4.84
			110	13300	82.5	FRL263D110/02CK	5.98
3PDT AgCdO	5A @ 30V DC or 240V AC	1/6 HP @ 120V AC	6	40	4.5	FRL263D006/03CS	$4.84
			12	160	9	FRL263D012/03CS	4.84
			24	650	18	FRL263D024/03CS	4.84
			48	2600	36	FRL263D048/03CS	4.84
			110	13300	82.5	FRL263D110/03CS	5.98
4PDT Ag + Au Clad	3A @ 30V AC or 120V AC	1/10 HP @ 120V AC	6	40	4.5	FRL263D006/04CL	$5.18
			12	160	9	FRL263D012/04CL	5.18
			24	650	18	FRL263D024/04CL	5.18
			48	2600	36	FRL263D048/04CL	5.18
			110	13300	82.5	FRL263D110/04CL	6.32
4PDT Ag	3A @ 30V AC or 120V AC	1/10 HP @ 120V AC	6	40	4.5	FRL263D006/04CS	$4.84
			12	160	9	FRL263D012/04CS	4.84
			24	650	18	FRL263D024/04CS	4.84
			48	2600	36	FRL263D048/04CS	4.84
			110	13300	82.5	FRL263D110/04CS	5.98
4PDT (Bifurcated) Ag + Au Clad	1A @ 30V AC or 120V AC	1/10 HP @ 120V AC	6	40	4.5	FRL263D006/04CT	$5.64
			12	160	9	FRL263D012/04CT	5.64
			24	650	18	FRL263D024/04CT	5.64
			48	2600	36	FRL263D048/04CT	5.64
			110	13300	82.5	FRL263D110/04CT	6.78
4PDT AgCdO	5A @ 30V AC or 240V AC	1/6 HP @ 120V AC	6	40	4.5	FRL263D006/04CV	$5.18
			12	160	9	FRL263D012/04CV	5.18
			24	650	18	FRL263D024/04CV	5.18
			48	2600	36	FRL263D048/04CV	5.18
			110	13300	82.5	FRL263D110/04CV	6.32

For CSA Certified Relays, —CSA suffix must be added to part number. Price is same.
* For PCB type terminals change prefix to FRL264

FRL260 SERIES RELAYS SELECTION TABLE — AC COIL

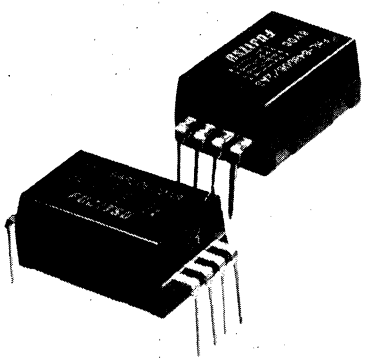
Contact Arrangement and Material	Contact Ratings		Rated Voltage V AC 50/60 Hz	Coil Resistance ±15% Ohms @ 20°C	Pick-Up Voltage @ 20°C	Fujitsu Part Numbers (Plug-In)*	Price
	Resistive	Horsepower					
SPDT AgCdO	15A @ 30V DC or 150V AC 10A @ 240V AC	1/3 HP @ 120V AC 1/2 HP @ 240V AC	6	9.5	4.8	FRL263A006/01CK	$4.66
			12	40	9.6	FRL263A012/01CK	4.66
			24	165	19.2	FRL263A024/01CK	4.66
			48	630	38.4	FRL263A048/01CK	4.66
			120	4400	96.0	FRL263A120/01CK	5.00
			240	13000	192.0	FRL263A240/01CK	6.66
DPDT AgCdO	10A @ 30V DC or 240V AC	1/3 HP @ 120V AC 1/2 HP @ 240V AC	6	9.5	4.8	FRL263A006/02CK	$4.84
			12	40	9.6	FRL263A012/02CK	4.84
			24	165	19.2	FRL263A024/02CK	4.84
			48	630	38.4	FRL263A048/02CK	4.84
			120	4400	96.0	FRL263A120/02CK	5.18
			240	13000	192.0	FRL263A240/02CK	6.84
3PDT AgCdO	5A @ 30V DC or 240V AC	1/6 HP @ 120V AC	6	9.5	4.8	FRL263A006/03CS	$4.84
			12	40	9.6	FRL263A012/03CS	4.84
			24	165	19.2	FRL263A024/03CS	4.84
			48	630	38.4	FRL263A048/03CS	4.84
			120	4400	96.0	FRL263A120/03CS	5.18
			240	13000	192.0	FRL263A240/03CS	6.84
4PDT Ag + Au Clad	3A @ 30V AC or 120V AC	1/10 HP @ 120V AC	6	9.5	4.8	FRL263A006/04CL	$5.18
			12	40	9.6	FRL263A012/04CL	5.18
			24	165	19.2	FRL263A024/04CL	5.18
			48	630	38.4	FRL263A048/04CL	5.18
			120	4400	96.0	FRL263A120/04CL	5.52
			240	13000	192.0	FRL263A240/04CL	7.18
4PDT Ag	3A @ 30V AC or 120V AC	1/10 HP @ 120V AC	6	9.5	4.8	FRL263A006/04CS	$4.84
			12	40	9.6	FRL263A012/04CS	4.84
			24	165	19.2	FRL263A024/04CS	4.84
			48	630	38.4	FRL263A048/04CS	4.84
			120	4400	96.0	FRL263A120/04CS	5.18
			240	13000	192.0	FRL263A240/04CS	6.84
4PDT (Bifurcated) Ag + Au Clad	1A @ 30V AC or 120V AC	1/10 HP @ 120V AC	6	9.5	4.8	FRL263A006/04CT	$5.64
			12	40	9.6	FRL263A012/04CT	5.64
			24	165	19.2	FRL263A024/04CT	5.64
			48	630	38.4	FRL263A048/04CT	5.64
			120	4400	96.0	FRL263A120/04CT	5.98
			240	13000	192.0	FRL263A240/04CT	7.64
4PDT AgCdO	5A @ 30V AC or 240V AC	1/6 HP @ 120V AC	6	9.5	4.8	FRL263A006/04CV	$5.18
			12	40	9.6	FRL263A012/04CV	5.18
			24	165	19.2	FRL263A024/04CV	5.18
			48	630	38.4	FRL263A048/04CV	5.18
			120	4400	96.0	FRL263A120/04CV	5.52
			240	13000	192.0	FRL263A240/04CV	7.18

For CSA Certified Relays, —CSA suffix must be added to part number. Price is same.
* For PCB type terminals change prefix to FRL264

FUJITSU AMERICA, INC. / COMPONENT DIV. / 918 Sherwood Drive, Lake Bluff, IL 60044 / (312) 295-2610, Telex 206196, TWX 910-651-2259

MICRO REED RELAYS FOR P.C. BOARDS

FRL-648 SERIES



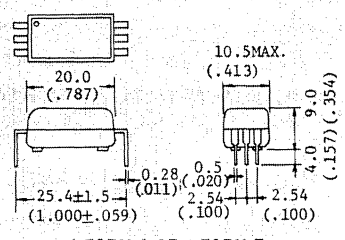
The FRL-648 Series Micro Reed Relays offer a wide selection and outstanding performance to meet those demanding on-board switching requirements and high density packaging applications.

These relays, available in 1 Form A/B and 2 Form A/B, feature a standard contact rating of 50VA/10W for S type/K type, compact size with a mounting height of only 9mm (.354"), epoxy-molded construction for immersion cleaning safety, low power consumption, and the option of magnetic shielding for isolation from the effects of adjacent relays.

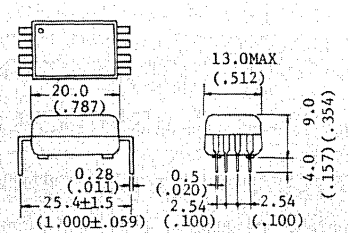
These relays are ideally used for various applications for audio equipment, data processing systems, communications, measuring and control equipment.

Fujitsu field proven dry reed switches are employed as the switching element in the relays in order to offer an excellent low resistance contact and low noise characteristics.

DIMENSIONS Unit: mm (inch)

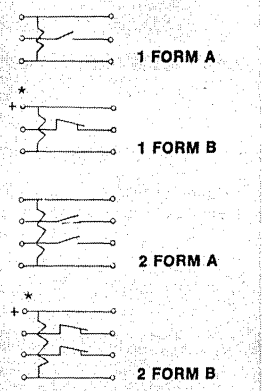


1 FORM A OR 1 FORM B



2 FORM A OR FORM B

SCHEMATICS (TOP VIEW)



*: dotted mark
Positive voltage should be applied at the terminal signed with (+) for correct operation.

ENGINEERING DATA

Item	Characteristics
Contact Arrangement	1 Form A/B, 2 Form A/B
Contact Rating	Type K: 50VA max. (100V AC, 0.5A max.) 30W max. (100V DC, 0.7A max.) Type S: 10W max. (100V DC, 0.5A max.)
Initial Contact Resistance	150mΩ max. at rated voltage
Contact Materials	Rhodium
Rated Coil Voltage	5, 6, 12, 24V DC
Coil Temperature Rise	20°C max.
Insulation Resistance	100MΩ min. at 100V DC
Dielectric Withstanding Voltage	500V DC (200V DC between open contacts)
Operate Time	1.0 ms max. including bounce time
Release Time	Form A: 0.1 ms max. including bounce time Form B: 1.0 ms max. including bounce time
Life Expectancy	K type 1 x 10^6 min at rated load S type: 5 x 10^6 min. at rated load
Vibration	10 to 55Hz (Dual amplitude: 1.5mm)
Shock	30G
Temperature Range	Form A: −10°C to +70°C Form B: −10°C to +50°C
Weight	6 gr. approx.

SELECTION TABLE

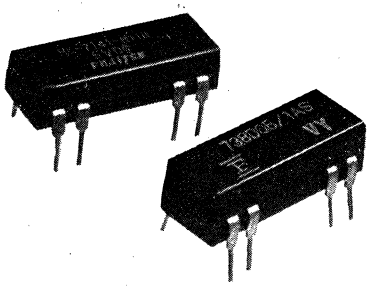
Type	Contact: Materials	Contact: Arrangements	Rated Voltage in V DC	Pick-Up Voltage in V DC at 20°C	Coil Resistance in Ohm ±15% at 20°C	Coil Power Dissipation in mW	Designation	Price
Standard	Rhodium	1 Form A (Make)	5	3.8	550	45	FRL-648D05/1AS	$1.82
			6	4.5	550	65	FRL-648D06/1AS	1.82
			12	9.0	1050	140	FRL-648D12/1AS	1.82
			24	18.0	2800	200	FRL-648D24/1AS	2.12
Standard	Rhodium	1 Form B (Break)	5	3.8	300	85	FRL-648D05/1BS	$3.48
			6	4.5	300	120	FRL-648D06/1BS	3.48
			12	9.0	1300	110	FRL-648D12/1BS	3.48
			24	18.0	3800	150	FRL-648D24/1BS	3.78
Standard	Rhodium	2 Form A (Make)	5	3.8	210	120	FRL-648D05/2AS	$2.42
			6	4.5	210	170	FRL-648D06/2AS	2.42
			12	9.0	800	180	FRL-648D12/2AS	2.42
			24	18.2	2600	220	FRL-648D24/2AS	2.72
Standard	Rhodium	2 Form B (Break)	5	3.8	80	300	FRL-648D05/2BS	$4.10
			6	4.5	105	340	FRL-648D06/2BS	4.10
			12	9.0	460	310	FRL-648D12/2BS	4.10
			24	18.0	1500	380	FRL-648D24/2BS	4.40
Heavy Load	Rhodium	1 Form A (Make)	5	3.8	550	45	FRL-648D05/1AK	$1.96
			6	4.5	550	65	FRL-648D06/1AK	1.96
			12	9.0	1050	140	FRL-648D12/1AK	1.96
			24	18.0	2800	200	FRL-648D24/1AK	2.28
Heavy Load	Rhodium	1 Form B (Break)	5	3.8	300	85	FRL-648D05/1BK	$3.64
			6	4.5	300	120	FRL-648D06/1BK	3.64
			12	9.0	1300	110	FRL-648D12/1BK	3.64
			24	18.0	3800	150	FRL-648D24/1BK	3.94
Heavy Load	Rhodium	2 Form A (Make)	5	3.8	210	120	FRL-648D05/2AK	$2.58
			6	4.5	210	170	FRL-648D06/2AK	2.58
			12	9.0	800	180	FRL-648D12/2AK	2.58
			24	18.0	2600	220	FRL-648D24/2AK	2.88
Heavy Load	Rhodium	2 Form B (Break)	5	3.8	80	300	FRL-648D05/2BK	$4.24
			6	4.5	105	340	FRL-648D06/2BK	4.24
			12	9.0	460	310	FRL-648D12/2BK	4.24
			24	18.0	1500	380	FRL-648D24/2BK	4.54

FUJITSU

RELAYS

D.I.P. REED RELAYS

FRL-730 SERIES

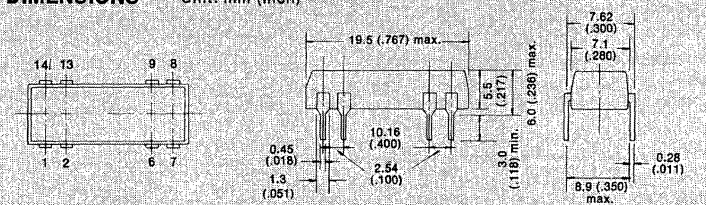


The FRL-730 Series D.I.P. Reed Relays are available in 1 Form A contact with contact rating capability of up to 10VA.

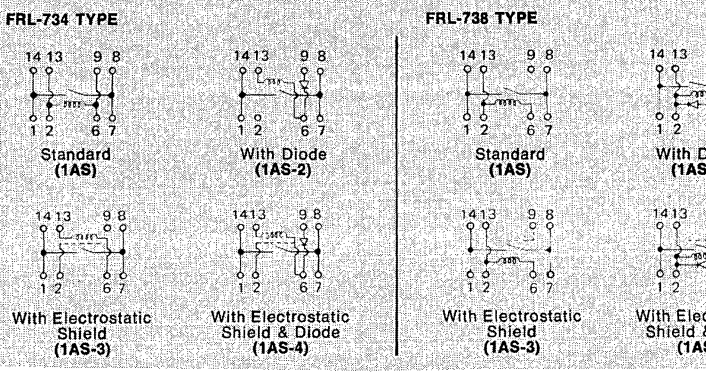
These relays can be mounted in the standard 14-pin dual-in-line package with epoxy-molded construction for safe immersion cleaning. Models with diode and/or electrostatic shield are available.

These FRL-730 D.I.P. reed relays are ideal for use in data processing systems and communications, measuring and control equipment.

DIMENSIONS Unit: mm (inch)



SCHEMATICS (TOP VIEW)



ENGINEERING DATA

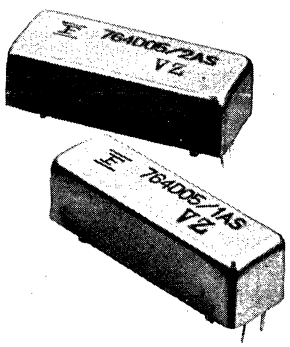
Item	Characteristics
Contact Arrangement	1 Form A
Contact Rating	10 VA max. (100V DC or peak AC max., 0.5A max.) 2.0A max. carry only
Initial Contact Resistance	150mΩ max.
Contact Material	Rhodium
Rated Coil Voltage	5, 6, 12V DC
Coil Temperature Rise	20°C max.
Insulation Resistance	10^{10}Ω min. at 100V DC, +20°C, 40% RH
Dielectric Withstanding Voltage	250V DC min. across open contacts 500V DC min. (between other mutually insulated terminals)
Operate Time	1.0 ms max. including bounce time
Release Time	0.1 ms max.
Life Expectancy	1 x 10^6 min. at rated load (resistive)
Vibration	10 to 55 Hz (Dual amplitude: 1.5mm)
Shock	50G
Temperature Range	−10°C to +70°C
Weight	4 gr. approx.

SELECTION TABLE

Contact Arrangement	Rated Coil Voltage in V DC	Coil Resistance at 20°C in Ω ±15%	Must Operate Voltage at 20°C in V DC	FRL-734 Type		FRL-738 Type	
				Designation	Price	Designation	Price
1A Standard	5	380	3.8	FRL-734D05/1AS	$3.12	FRL-738D05/1AS	$3.12
	6	380	4.5	FRL-734D06/1AS	3.12	FRL-738D06/1AS	3.12
	12	530	9.0	FRL-734D12/1AS	3.42	FRL-738D12/1AS	3.42
1A With Diode	5	380	3.8	FRL-734D05/1AS-2	$3.90	FRL-738D05/1AS-2	$3.90
	6	380	4.5	FRL-734D06/1AS-2	3.90	FRL-738D06/1AS-2	3.90
	12	530	9.0	FRL-734D12/1AS-2	4.22	FRL-738D12/1AS-2	4.22
1A With Electrostatic Shield	5	380	3.8	FRL-734D05/1AS-3	$3.42	FRL-738D05/1AS-3	$3.42
	6	380	4.5	FRL-734D06/1AS-3	3.42	FRL-738D06/1AS-3	3.42
	12	530	9.0	FRL-734D12/1AS-3	3.72	FRL-738D12/1AS-3	3.72
1A With Electrostatic Shield & Diode	5	380	3.8	FRL-734D05/1AS-4	$4.22	FRL-738D05/1AS-4	$4.22
	6	380	4.5	FRL-734D06/1AS-4	4.22	FRL-738D06/1AS-4	4.22
	12	530	9.0	FRL-734D12/1AS-4	4.52	FRL-738D12/1AS-4	4.52

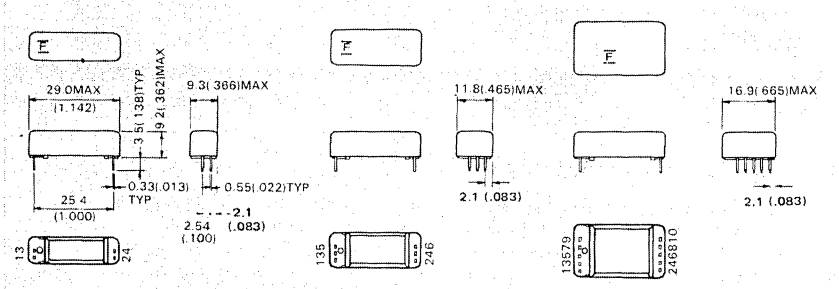
MICRO REED RELAYS FOR P.C. BOARDS

FRL-764 and 768 SERIES



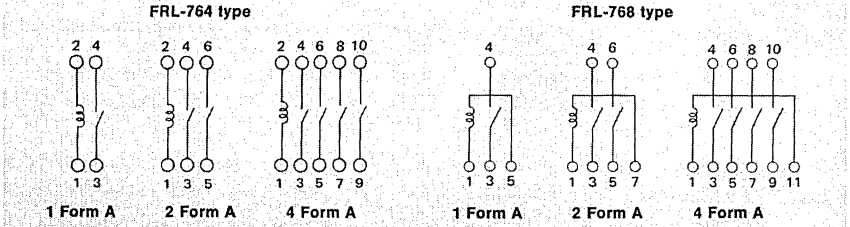
FRL-764 and 768 Series Micro Reed Relays offer excellent operating characteristics such as fast operating time, high reliability and long life. Available in a choice of contact arrangements (1 Form A, 2 Form A and 4 Form A) and contact rating capabilities (10W for standard type and 30W DC, 50VA AC for heavy load type), they are potted by polyurethane resin. These low-profile relays are compatible with 1 x .1 inch grid spacing for P.C. board mounting. These micro reed relays are ideal for use in telecommunications, audio equipment, process control systems and vending machines.

DIMENSIONS Unit: mm (inch)



1 FORM A 2 FORM A 4 FORM A

SCHEMATICS



1 Form A 2 Form A 4 Form A 1 Form A 2 Form A 4 Form A

ENGINEERING DATA

Item	Characteristics
Contact Arrangement	1 Form A, 2 Form A, 4 Form A
Contact Rating Power	Standard: 10W max. (resistive) — Heavy Load Type: 30W DC, 50VA AC max. (resistive)
Voltage	Standard: 100V DC max. (resistive) — Heavy Load Type: 100V DC/100V AC max. (resistive)
Current	Standard: 0.5A DC switched max. (resistive) — Heavy Load Type: 0.5A AC switched max. 2.0A carry only max. (resistive)
Initial Contact Resistance	150mΩ max.
Contact Material	Rhodium
Rated Coil Voltage	5, 6, 12, 24V DC
Coil Temperature Rise	30°C max.
Insulation Resistance	10^{10}Ω min. at 100V DC at 20°C, 40% RH
Dielectric Withstanding Voltage	200V DC min. across open contacts 500V DC min. between other mutually insulated terminals
Operate Time	1.0 ms max. including bounce
Release Time	0.1 ms max.
Life Expectancy	K type: 1 x 10^6 min. at rated load S type: 5 x 10^6 min. at rated load
Vibration	10~55 Hz (Dual amplitude: 1.5mm)
Shock	30G, 11 ms half-sinewave
Temperature Range	−10°C~+70°C
Weight	8.5 gr. approx. (2 Form A)

SELECTION TABLES

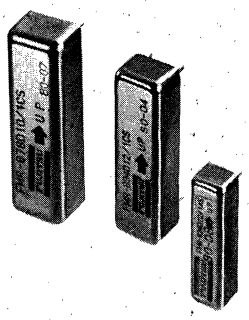
Type	Contact Arrangement	Coil Rated Voltage in V DC	Must Operate Voltage in V DC at 20°C	Coil Resistance in Ω ±15% at 20°C	Coil Power Dissipation in mW	Designation FRL-764	Price	Designation FRL-768	Price
Standard	1 Form A	5	3.8	310	80	FRL-764D05/1AS	$2.88	FRL-768D05/1AS	$2.88
		6	4.5	310	116	FRL-764D06/1AS	2.88	FRL-768D06/1AS	2.88
		12	9.0	1500	96	FRL-764D12/1AS	2.88	FRL-768D12/1AS	2.88
		24	18.0	4400	131	FRL-764D24/1AS	3.18	FRL-768D24/1AS	3.18
Standard	2 Form A	5	3.8	150	167	FRL-764D05/2AS	$3.64	FRL-768D05/2AS	$3.64
		6	4.5	150	240	FRL-764D06/2AS	3.64	FRL-768D06/2AS	3.64
		12	9.0	730	198	FRL-764D12/2AS	3.64	FRL-768D12/2AS	3.64
		24	18.0	2500	231	FRL-764D24/2AS	3.94	FRL-768D24/2AS	3.94
Standard	4 Form A	5	3.8	60	417	FRL-764D05/4AS	$6.00	FRL-768D05/4AS	$6.00
		6	4.5	90	400	FRL-764D06/4AS	6.00	FRL-768D06/4AS	6.00
		12	9.0	330	436	FRL-764D12/4AS	6.00	FRL-768D12/4AS	6.00
		24	18.0	1300	443	FRL-764D24/4AS	6.30	FRL-768D24/4AS	6.30
Heavy Load	1 Form A	5	3.8	310	80	FRL-764D05/1AK	$3.04	FRL-768D05/1AK	$3.04
		6	4.5	310	116	FRL-764D06/1AK	3.04	FRL-768D06/1AK	3.04
		12	9.0	1500	96	FRL-764D12/1AK	3.04	FRL-768D12/1AK	3.04
		24	18.0	4400	131	FRL-764D24/1AK	3.34	FRL-768D24/1AK	3.34
Heavy Load	2 Form A	5	3.8	150	167	FRL-764D05/2AK	$3.94	FRL-768D05/2AK	$3.94
		6	4.5	150	240	FRL-764D06/2AK	3.94	FRL-768D06/2AK	3.94
		12	9.0	730	198	FRL-764D12/2AK	3.94	FRL-768D12/2AK	3.94
		24	18.0	2500	231	FRL-764D24/2AK	4.24	FRL-768D24/2AK	4.24
Heavy Load	4 Form A	5	3.8	60	417	FRL-764D05/4AK	$6.60	FRL-768D05/4AK	$6.60
		6	4.5	90	400	FRL-764D06/4AK	6.60	FRL-768D06/4AK	6.60
		12	9.0	330	436	FRL-764D12/4AK	6.60	FRL-768D12/4AK	6.60
		24	18.0	1300	443	FRL-764D24/4AK	6.90	FRL-768D24/4AK	6.90

FUJITSU

RELAYS

MERCURY WETTED CONTACT RELAYS

FMR-800 SERIES

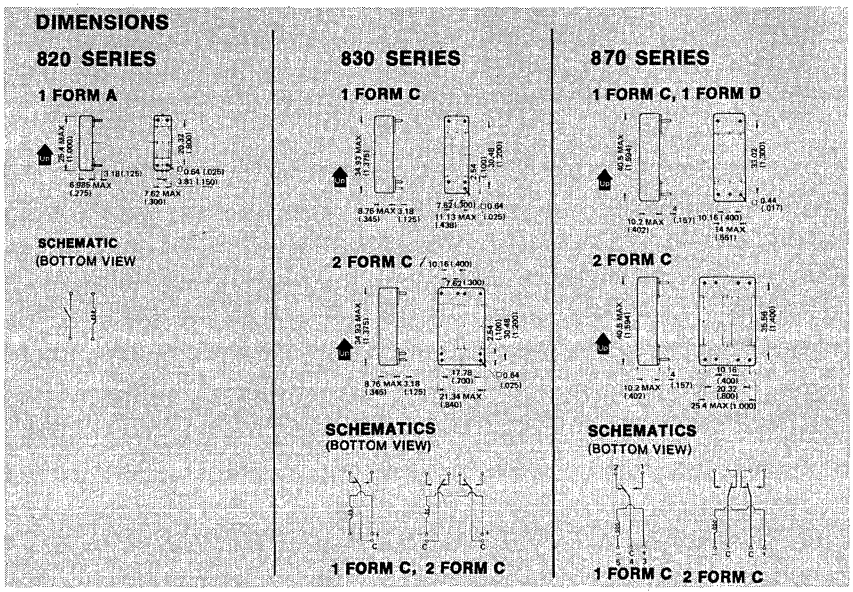


Fujitsu FMR-800 Series mercury wetted contact relays are compact for P.C. board mounting.

Highly stable, they can be used for a wide range of current switching from very low levels to heavy loads. Conventional flux cleaning can be used after P.C. board mounting as these relays are potted with polyurethane resin. The mercury switching gives these relays a bounce-free contact and an extremely long operating life. Therefore, Fujitsu mercury wetted contact relays are ideal for use in measuring equipment, communications systems, computer systems, automatic control systems etc.

FEATURES

- Extremely long life expectancy (10 x 10^9 operations)
- Short operate/release time (2 ms) and no contact bounce
- Stable, low contact resistance
- Available for wide current range switching from low level signals to 2 amps
- Contacts are independent from atmospheric conditions



SELECTION TABLE

Series	Contact Arrangement	Rated Voltage in V DC	Coil Resistance in Ω at 20°C	Coil Power Dissipation in mW	Operate in V DC at 20°C	Release in V DC at 20°C	Designation	Price
820 Series	1 Form A	5	350	72	4.0	0.5	FMR-824D05/1AS	$ 8.86
		6	350	103	4.8	0.6	FMR-824D06/1AS	8.86
		12	950	152	9.6	1.2	FMR-824D12/1AS	8.86
		24	2742	210	19.2	2.4	FMR-824D24/1AS	9.46
830 Series	1 Form C	5	117	214	2.9	0.52	FMR-834D05/1CS	$14.36
		6	196	184	3.5	0.66	FMR-834D06/1CS	14.36
		12	720	200	7.0	1.3	FMR-834D12/1CS	14.36
		24	2730	211	14.0	2.6	FMR-834D24/1CS	15.16
		48	10,000	231	28.0	5.2	FMR-834D48/1CS	15.94
830 Series	2 Form C	5	56	447	2.9	0.52	FMR-834D05/2CS	$23.90
		6	90	400	3.5	0.66	FMR-834D06/2CS	23.90
		12	392	368	7.0	1.3	FMR-834D12/2CS	23.90
		24	1440	400	14.0	2.6	FMR-834D24/2CS	24.72
		48	5460	422	28.0	5.2	FMR-834D48/2CS	25.52
830 Series	2 Form C (with C.O.T.)	5	56	447	2.9	0.52	FMR-834D05/2CT	$25.52
		6	90	400	3.5	0.66	FMR-834D06/2CT	25.52
		12	392	368	7.0	1.3	FMR-834D12/2CT	25.52
		24	1440	400	14.0	2.6	FMR-834D24/2CT	26.30
		48	5460	422	28.0	5.2	FMR-834D48/2CT	27.12
870 Series*	1 Form C	5	125	200	2.9	0.61	FMR-874D05/1CS	$13.88
		6	125	290	3.5	0.75	FMR-874D06/1CS	13.88
		12	685	210	7.1	1.5	FMR-874D12/1CS	13.88
		24	2650	220	14.0	3.0	FMR-874D24/1CS	14.68
870 Series*	1 Form D	5	125	200	2.9	0.61	FMR-874D05/1DS	$13.88
		6	125	290	3.5	0.75	FMR-874D06/1DS	13.88
		12	685	210	7.1	1.5	FMR-874D12/1DS	13.88
		24	2650	220	14.0	3.0	FMR-874D24/1DS	14.68
870 Series*	2 Form C	5	55	455	2.6	0.55	FMR-874D05/2CS	$23.12
		6	55	655	3.4	0.7	FMR-874D06/2CS	23.12
		12	370	390	6.7	1.4	FMR-874D12/2CS	23.12
		24	1370	421	13.0	2.7	FMR-874D24/2CS	24.40
870 Series*	2 Form C (with C.O.T.)	5	55	455	2.6	0.55	FMR-874D05/2CT	$24.72
		6	55	655	3.4	0.7	FMR-874D06/2CT	24.72
		12	370	390	6.7	1.4	FMR-874D12/2CT	24.72
		24	1370	421	13.0	2.7	FMR-874D24/2CT	26.00

* FMR-878 Series is available with .093 inch grid spacing instead of .100 inch grid. Price is same as FMR-874 Series.

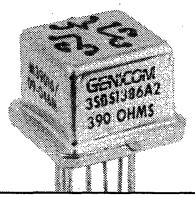
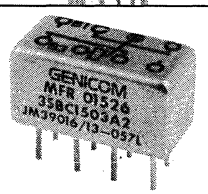
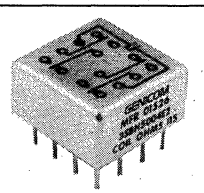
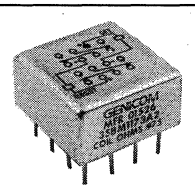
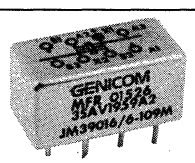
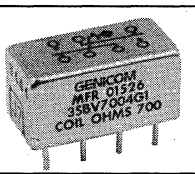
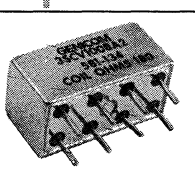
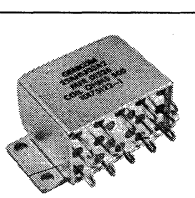
ENGINEERING DATA

	FMR-820	FMR-830			FMR-870			
Contact Arrangements	1 Form A	1 Form C	2 Form C	2 Form C (with C.O.T.)	1 Form C	1 Form D	2 Form C	2 Form C (with C.O.T.)
Contact Ratings — Switching / Carry Current	50 VA max. 1A max. 350V DC max. 2A max.	100 VA max. 2A max., 500V DC max. 5A max.						
Initial Contact Resistance	50 mΩ max.	30 mΩ max.	30 mΩ max.	30 mΩ max.	30 mΩ max.	30 mΩ max.	30 mΩ max.	30 mΩ max.
Operate Time / Release Time	2.0 ms max. / 2.0 ms max.	2.0 ms max. / 2.0 ms max.	2.0 ms max. / 2.0 ms max.	2.0 ms max. / 2.0 ms max.	2.0 ms max. / 2.0 ms max.	2.0 ms max. / 2.0 ms max.	2.0 ms max. / 2.0 ms max.	2.0 ms max. / 2.0 ms max.
Insulation Resistance	1000 MΩ min. (500V DC)	100 MΩ min. (500V DC)	100 MΩ min. (500V DC)	100 MΩ min. (500V DC)	100 MΩ min. (500V DC)	100 MΩ min. (500V DC)	1000 MΩ min. (500V DC)	1000 MΩ min. (500V DC)
Dielectric Withstanding Voltage	1000V AC min.	1000V AC min.	1000V AC min.	1000V AC min.	1000V AC min.	1000V AC min.	1000V AC min.	1000V AC min.
C.O.T. (Common Open Type)	—	—	—	50 μs min. (100 Hz, 50% duty)	—	—	—	50 μs min. (100 Hz, 50% duty)
Operating Temptrature Range	−38°C to +90°C (include coil temperature rise)							
Vibration	10 Hz to 55 Hz (Dual amplitude: 1.5mm)							
Shock	30G							

EEM PRODUCT SELECTION GUIDES

Use the EEM Product Selection Guides. There are 34 Guides in this edition of EEM. See page 2 (A•2, B•2, C•2, D•2) of each volume to locate the Product Selection Guides that pertain to your needs.

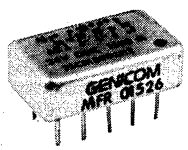
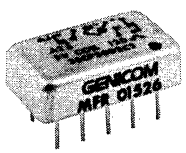
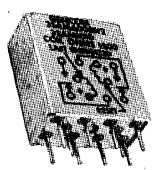
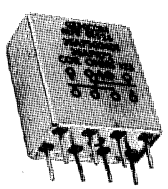
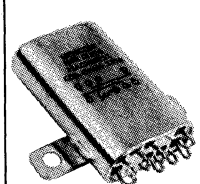
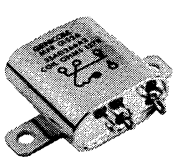
SEALED RELAY Selection Guide

RELAY TYPE	PICTURE	CONTACT ARRANGEMENT	CONTACT LIFE: CURRENT LEVELS AT 28 VDC, AT 115 VAC*	CONTACT LIFE: OPERATIONS	SIZE NO MOUNT L" × W" × H" & WEIGHT (OZ.)	OPERATE SENSITIVITY (MILLIWATTS)	APPLICABLE MIL SPEC MIL-R-	SHOCK	VIBRATION	TEMPERATURE RANGE
3SBS Transistor Size Relay		2PDT	1A DC Res .2A DC Ind Low Level	$\frac{10^5}{10^6}$	Size .37 × .37 × .275 Weight 0.09	120 mW	39016/9 39016/15 39016/20	100G @ 11ms	30G 55-3000 Hz	−65C +125C Special +200C
3SBC ¼ Size Two Pole 150 Grid Hybrid **3SCC** Long Life		2PDT 1PDT 1A, 1B	2A DC Res .5A DC Ind .5-AC Low Level	$\frac{10^5}{10^6}$	Size .61 × .31 × .32 Weight 0.13	135 mW	39016/13 39016/37 39016/38	100G @ 11 ms	30G 55-3000 Hz	−65C +125C Special +200C
3SBH ¼ Size Four Pole 150 Grid Hybrid		4PDT	2A DC Res .5A DC Ind .5A-AC Low Level	$\frac{10^5}{10^6}$	Size .61 × .61 × .32 Weight 0.24	250 mW	39016/14	100G @ 11 ms	30G 3000 Hz	−65C +125C Special +200C
3SBM ¼ Size 150 Grid Latching Hybrid		4PDT	2A DC Res .5A DC Ind .5A-DC Low Level	$\frac{10^5}{10^6}$	Size .61 × .61 × .32 Weight 0.28	100mW Single Coil or 180mW Dual Coil	39016/31 39016/35 39016/36	150G @ 11 ms	30G 3000 Hz	−65C +125C Special +200C
3SAV Half-Size Sensitive R.F.		2PDT	2A DC Res .5A DC Ind .75 A-AC Low Level	$\frac{10^5}{10^6}$	Size .80 × .40 × .40 Weight 0.30	100mW to 260mW	39016/6 39016/22 39016/33 39016/44	100G @ 11ms	30G 3000 Hz	−65C +125C Special +200C
3SBV Industrial Half-Size		2PDT	2A DC Res .5A-AC Low Level	$\frac{10^5}{10^6}$	Size .88 × .48 × .49 Weight 0.30	285 mW				−45C +71C
3SCV Long Life Half-Size		2PDT	2A DC Res .5A DC Ind .5A-AC Low Level	$\frac{10^5}{100 \times 10^6}$	Size .80 × .40 × .40 Weight .30	340mW				−55C +125C
3SAH Four Pole Grid		4PDT	2A DC Res .5A DC Ind 1A-AC Low Level	$\frac{4 \times 10^5 \text{ at 1A DC at 0.5A ac} \quad 2 \times 10^5 \text{ at 2A dc at 1A AC}}{2 \times 10^6}$	Size 1.01 × .61 × .81 Weight 1.0	400 mW	39016/39	50G @ 11ms	30G 55-3000 Hz	−65C +125C Special +200C

*Single-phase load, case not grounded

GENICOM®

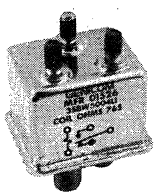
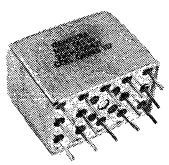
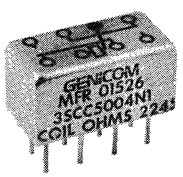
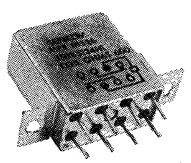
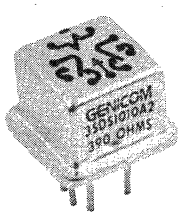
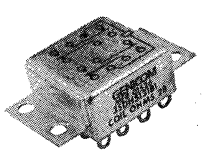
GENICOM Corporation, GENICOM Relays,
Waynesboro,VA 22980, 1-703-949-1471

RELAY TYPE	PICTURE	CONTACT ARRANGEMENT	CONTACT LIFE: CURRENT LEVELS AT 28 VDC AT 115 VAC	CONTACT LIFE: OPERATIONS	SIZE L" × W" × H" & WEIGHT (OZ.) NO MOUNT	OPERATE SENSITIVITY (MILLIWATTS)	APPLICABLE MIL SPEC MIL-R-	SHOCK	VIBRATION	TEMPERATURE RANGE
3SCM DeciGrid® Mag-Latch 1/10 Size		2PDT	.5A DC .1A DC Ind Low Level	10^5 5×10^5	Size .350 × .535 × .170 Weight .075	2.0 mW at 5ms (Jun 6)	39016/47	100G @ 6ms	50G- 3000 Hz	−65C +125C
3SCP DeciGrid® Mono-stable 1/10 Size		2PDT	.5A DC .1A DC Ind Low Level	10^5 5×10^5	Size .350 × .575 × .170 Weight 2. Grams	68 mW	39016/48	100G @ 6ms	50G- 3000 Hz	−65C +125C
3SAM Mag-Latch Grid-Space		2PDT	2A DC Res .5A DC Ind 1A-AC Low Level	10^5 at 2A DC at 1A AC 10^6	Size .80 × .40 × .90 Weight 0.60	50mW Single Coil 75mW Dual Coil	39016/32	150G @ 11ms	30G 3000 Hz	−65C +125C Special +200C
3SAF Grid Spaced Micro Crystal Can		2PDT 1PDT	2A DC Res 1A DC Ind 1A-AC Low Level	10^5 at 2A DC 10^6	Size .80 × .40 × .90 Weight 0.50	300 mW	5757/10	100G @ 11 ms	30G 55- 2000 Hz	−65C +125C
3SAC Crystal Can "S" Header		2PDT 1PDT	2A DC Res 1A DC Ind 1A-AC Low Level	10^5 at 2A DC at 2A AC 10^6	Size .797 × .359 × 1.187 Weight .090	200 mW	5757/10	50G @ 11ms	10G 55- 500 Hz	−65C +125C
3SAE Crystal Can "S" Header		2PDT	2A DC Res 1A DC Ind 1A-AC Low Level	10^5 at 2A DC at 2A AC 10^6	Size .797 × .359 × .875 Weight 0.45	330mW	5757/10	100G @ 11ms	20G 55- 2000 Hz	−65C +125C
3SCA Miniature Industrial Relays		2PDT 4PDT 6NO	5A DC Res 2A DC Ind 5A-AC Low Level	10^5 at 5A DC 10^6	1.67 × 1.48 × 2.1 Weight 4.5	600mW				OC +71C

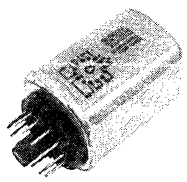
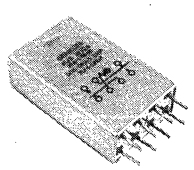
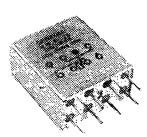
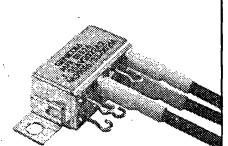
*Single-phase load, case not grounded

Continued on next page.

SEALED RELAY Selection Guide

RELAY TYPE	PICTURE	CONTACT ARRANGEMENT	CONTACT LIFE: CURRENT LEVELS AT 28 VDC AT 115 VAC*	CONTACT LIFE: OPERATIONS	SIZE NO MOUNT L" × W" × H" & WEIGHT (OZ.)	OPERATE SENSITIVITY (MILLIWATTS)	APPLICABLE MIL SPEC MIL-R-	SHOCK	VIBRATION	TEMPERATURE RANGE
3SBW RF Relay		1PDT	15 Watts RF	2×10^5 at RF	1.150 × .950 × .840 Weight 1.0	250mW			10G 500 Hz	−65C +85C
3SCH		4PDT	2A Res .5A DC Ind 1A-AC Low Level	4×10 at 1A DC at 0.5A ac 2×10 at 2A dc at 1A AC 75×10^6	Size 1.01 × .61 × .81 Weight 1.0	400 mW		50G @ 11ms	30G 55-3000Hz	−40C +125C
3SCC		2PDT 1PDT 1A, 1B	2A DC Res .5A DC Ind .5-AC Low Level	$\frac{.0^5}{100 \times 10^6}$	Size .61 × .31 × .32 Weight 0.13	135 mW		100G @ 11ms	30G 55-3000Hz	−40C +125C
3SBK		2PDT	5A DC 2A AC 2A DC Ind Low Level	$\frac{10^5}{10^6}$	Size .80 × .40 × .90 Weight 0.7 max	300 mW	5757	90G @ 11ms	30G 55-3000Hz	−65C +125C
3SDS		2PDT	1A DC .5A AC Low Level	$\frac{10^5}{75 \times 10^6}$	Size .61 × .31 × .32 Weight 0.13	135 mW		100G @ 11ms	30G 55-3000Hz	−40C +125C
3SDH		4PDT	2A DC .5A AC Low Level	$\frac{10^5}{100 \times 10^6}$	Size .61 × .61 × .32 Weight 0.24	250 mW		100G @ 11ms	30G 3000Hz	−40C +125C

*Single-phase load, case not grounded

RELAY TYPE	PICTURE	CONTACT ARRANGEMENT	CONTACT LIFE: CURRENT LEVELS AT 28 VDC AT 115 VAC*	CONTACT LIFE: OPERATIONS	SIZE L" × W" × H" & WEIGHT (OZ.)	OPERATE SENSITIVITY (MILLIWATTS)	APPLICABLE MIL SPEC MIL-R-	SHOCK	VIBRATION	TEMPERATURE RANGE
3SAA		1Pole to 6 Poles	Low Level to 10 Amps	Depends on Rating	Size 1.67 × 1.48 × 2.1 Weight 4.5	600 mW	6106	30G @ 11ms	10G to 500Hz	−65C +125C
3SAT		2PDT 1PDT	2A DC 1A AC / Low Level	10^5 / 10^6	Size .80 × .400 × 1.125 Weight .95	40 mW & 25 mW	5757/13	90G @ 11ms ½ size	20G 55-3000Hz	−65C +125C Special 200C
3SBF		2PDT 1PDT	2A DC 1A AC / Low Level	10^5 / 10^6	Size .80 × .40 × .90 Weight .50	75 mW & 50 mW	5757	90G @ 11ms	25G 55-2500Hz	−65C +125C Special 200C
3SAV-RF		2PDT 1PDT	25 Watts 10 Watts	10^5 / 10^6	Size .86 × .40 × .46 Weight .35 oz. max	260 mW 100 mW	39016/22	100G @ 11ms	30G 55-3000Hz	−65C +125C

*Single-phase load, case not grounded

For additional publications and product information contact:
GENICOM Corporation, GENICOM Relays
Waynesboro, VA 22980, 1-703-949-1471

GENICOM®
Relays You Can Rely On.

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C
CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J
JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K
kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L
LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P
PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

Y
YIG yttrium iron garnet

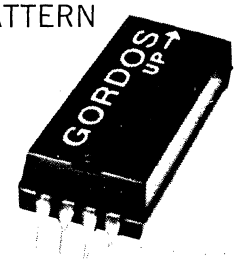
Z
ZIF zero insertion force

GORDOS CORPORATION

REED RELAYS
.100" x 1.000" PCB grid pattern

66 SERIES

MOLDED EPOXY REED RELAY
.100" x 1.000" PCB GRID PATTERN



- Dry reed, high-voltage, and mercury wetted versions available
- Designed to meet various packaging requirements
- Logic-compatible
- Environmental immunity assured

CONTACT RATINGS

Type	Maximum Switching D.C. Watts	Maximum Switching D.C. Volts	Maximum Current (Amps) Switch	Maximum Current (Amps) Carry	Maximum[1] Initial Contact Resistance (Ohms)	Minimum Breakdown Voltage VAC Across Contacts	Minimum Breakdown Voltage VAC Contacts Coil	Insulation Resistance (Typical)[3] (Ohms)
1A	10	200	.5	1.5	.200	300	1000	10^{10}
1A Mercury	50	500	1.0[2]	2.0	.070	1000	1000	10^{10}
1C	3	28	.250	1.0	.200	200	1000	10^{10}
1C Mercury	50	500	1.0[2]	2.0	.070	1000	1000	10^{10}

NOTES: [1]Measured at nominal coil voltage applied (Except Series 66, Form B)
[2]Derate to .050A at 500 volts
[3]Measured at 25°C and 50% relative humidity using 100 VDC

OPERATING CHARACTERISTICS

Series	Operate Time (Typical) Form A	Operate Time (Typical) Form B	Operate Time (Typical) Form C N/O	Operate Time (Typical) Form C N/C	Release Time (Typical) Coil Unsuppressed Form A	Release Time (Typical) Coil Unsuppressed Form B	Storage Temperature Range
Standard Dry Contacts							
66	.5	.35	1.5	1.0	.05	.5	−40°C to 85°C
Mercury-Wetted Contacts							
66	1.8		1.8	1.0			−30°C to 85°C

NOTES: 1. All times measured in milliseconds at nominal coil voltage at a test frequency of 15 Hz.
2. Consult factory for electrostatic and/or magnetic shield requirements.

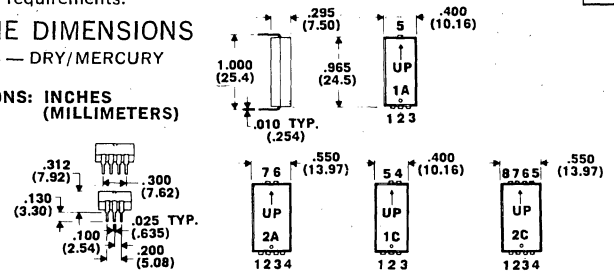
MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C
5	3.8	0.5
12	9.0	1.2
24	18.0	2.4

OUTLINE DIMENSIONS

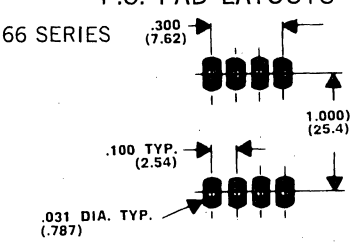
66 SERIES — DRY/MERCURY

DIMENSIONS: INCHES (MILLIMETERS)



P.C. PAD LAYOUTS

66 SERIES



REED RELAY SELECTION CHART (To specify diode add "D" after part number. All schematics show location of diode)

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohms (±10%)	Part Number End Termination	Part Number Side Termination	Schematics (Top View) End Termination	Schematics (Top View) Side Termination
1A	5 12 24	150 575 2150	661A051-1 661A121-1 661A241-1	661A052-1 661A122-1 661A242-1	Orientation arrow for mercury wetted models	Orientation arrow for mercury wetted models
1A MERCURY	5 12 24	70 320 1600	661A051-5 661A121-5 661A241-5			
1B (See Note 1)	5 12 24	80 320 1500	661B051-1 661B121-1 661B241-1	661B052-1 661B122-1 661B242-1		
1C	5 12 24	100 450 1750	661C051-1 661C121-1 661C241-1	661C053-1	Orientation arrow for mercury wetted models	Orientation arrow for mercury wetted models
1C MERCURY	5 12 24	70 320 1600	661C051-5 661C121-5 661C241-5	661C053-5		
2A	5 12 24	80 320 1500	662A051-1 662A121-1 662A241-1	662A052-1 662A122-1 662A242-1	Orientation arrow for mercury wetted models	Orientation arrow for mercury wetted models
2A MERCURY	5 12 24	40 170 725	662A051-5 662A121-5 662A241-5			
2C	5 12 24	60 280 1000	662C051-1 662C121-1 662C241-1			

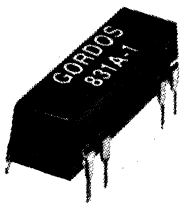
NOTES: 1. Excessive voltage (maximum of 7.5 VDC for 5 VDC model, 15.0 VDC for 12 VDC model, and 32.0 VDC for 24 VDC model) may cause reclosure on form B models.
2. To specify diode add "D" after model number.
3. For operation above 40°C ambient temperature, consult Gordos Corporation.
4. Mercury wetted models must be mounted ±30° from vertical.

GORDOS CORPORATION

DIP DRY REED RELAYS

83 SERIES

MOLDED EPOXY DIP (Dual In-Line Package)



- All Gordos molded reed relays are molded of glass filled, non-burning epoxy with an Underwriters Laboratory certified yellow card number UL94STD (V-O classification).
- Environmental immunity assured
- Logic compatible
- Compatible with automatic insertion equipment

CONTACT RATINGS

Model No.	Maximum Switching[2] (DC) Watts	Volts	Maximum Current (Amps) Switch	Carry	Typical Initial Contact Resistance[1] (Ohms)	Min. Breakdown Voltage (VAC) Across Contacts	Contacts Coil	Capacitance (Typical) (pF) Across Contacts	Contacts Coil	Insulation Resistance (Typ.) (Ohms)
831A	10	100	.250	1.5	.200	250	1000	.8	2	10^{10}
831B	10	100	.250	1.5	.200	250	1000	—	3.8	10^{10}
832A	3	28	.250	1.0	.200	150	1000	.8	2	10^{10}
831C	3	28	.250	1.0	.200	200	1000	1.5	3	10^{9}
835C	4	100	.110	1.0	.250	200	1000	.8	2	10^{9}
836C	4	100	.110	1.0	.250	200	1000	.8	2	10^{9}

NOTES: [1]Measured with nominal coil voltage applied (Except Form B)
[2]Higher voltages and/or current may be switched with life expectancy reduced. Consult factory for these ratings.

MUST OPERATE/RELEASE CHARACTERISTICS

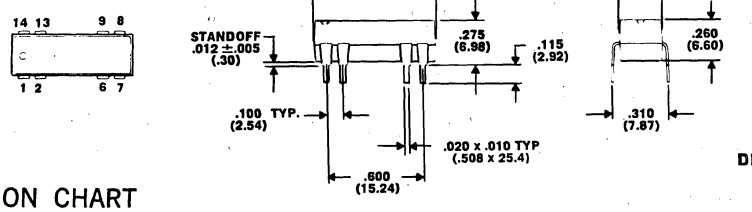
Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C
5	4.0	0.5
12	9.6	1.2
24	19.2	2.4

OPERATING CHARACTERISTICS

Series	Operate Time* (Typical) Form A	Form B	Form C N/O	N/C	Release Time (Typical) Coil Unsuppressed Form A	Form B	Coil Suppressed Form A	Form B	Storage Temperature Range
83	.50	.5	1.0	1.5	.05	.50	.5	.50	−40°C to 85°C

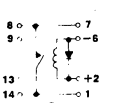
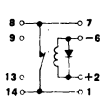
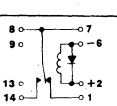
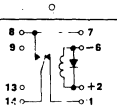
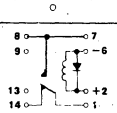
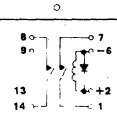
* Operate and Release Times (including bounce) in milliseconds.

OUTLINE DIMENSIONS



DIMENSIONS: INCHES (MILLIMETERS)

REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance (Ohms) ±10% @ 25°C	Clamp Diode	Part Number	Schematics (Top View)
1A	5	380	No	831A-1	
			Yes	831A-2	
		500	No	831A-3	
			Yes	831A-4	
	12	500	No	831A-5	
			Yes	831A-6	
	24	1750	No	831A-7	
			Yes	831A-8	
1B (See Note 1)	5	150	No	831B-1	
			Yes	831B-2	
		450	No	831B-3	
			Yes	831B-4	
	12	450	No	831B-5	
			Yes	831B-6	
	24	1750	No	831B-7	
			Yes	831B-8	
1C	5	150	No	831C-1	
			Yes	831C-2	
	12	450	No	831C-3	
			Yes	831C-4	
	24	1750	No	831C-5	
			Yes	831C-6	
1C	5	150	No	835C-1	
			Yes	835C-2	
	12	450	No	835C-3	
			Yes	835C-4	
	24	1750	No	835C-5	
			Yes	835C-6	
1C	5	200	No	836C-1	
			Yes	836C-2	
	12	500	No	836C-3	
			Yes	836C-4	
	24	2200	No	836C-5	
			Yes	836C-6	
2A	5	150	No	832A-1	
			Yes	832A-2	
	12	450	No	832A-3	
			Yes	832A-4	
	24	1750	No	832A-5	
			Yes	832A-6	

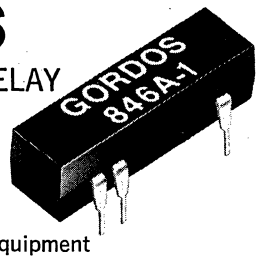
NOTES: 1. Excessive voltage (maximum of 7.0 VDC for 5 VDC model, 15.0 VDC for 12 VDC model, and 30.0 VDC for 24 VDC model), may cause contact reclosure on Form B models.
2. Consult factory for electrostatic shield and/or magnetic shield requirements.

GORDOS CORPORATION

HIGH VOLTAGE AND MERCURY DIP REED RELAYS

846 SERIES

HIGH VOLTAGE REED RELAY MOLDED EPOXY DIP



- High-Voltage Form A
- Environmental Immunity Assured
- Logic-Compatible
- Compatible with Auto-Insertion Equipment
- All Gordos molded devices are molded of glass filled, non-burning epoxy with an Underwriters Laboratory certified yellow card, UL94STD, V-0 classification

High-voltage 6-pin DIP reed relays with Form A contacts for applications where high-voltage isolation is required and space is at a premium.

REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohms (±10%)	Clamp Diode	Part Number
1A	5	150	No	846A-1
			Yes	846A-2
	12	575	No	846A-3
			Yes	846A-4
	24	1750	No	846A-5
			Yes	846A-6

NOTES: Consult factory for electrostatic shield and/or magnetic shield requirements.

MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C	Maximum Voltage (VDC)
5	4.0	0.5	7.5
12	9.6	1.2	15.0
24	19.2	2.4	32.0

CONTACT RATINGS

Model No.	Maximum Switching (DC)		Maximum Current[2] (Amps)		Typical Initial Contact Resistance[1] (Ohms)	Min. Breakdown Voltage (VAC)		Capacitance (Typical) (pF)		Insulation Resistance (Typ.) (Ohms)
	Watts	Volts	Switch	Carry		Across Conts.	Conts. Coil	Across Conts.	Conts. Coil	
846A	10	800	.5	2	.200	1200	1500	.8	2	10^{10}

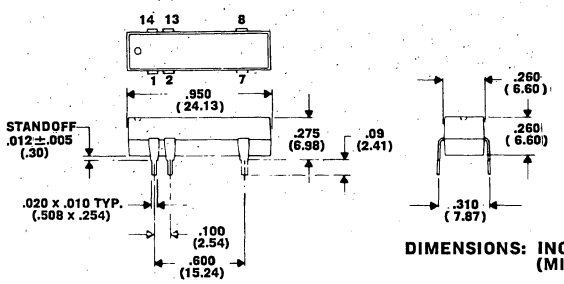
NOTES:
1. Measured with nominal coil voltage applied (Except Form B)
2. Derate to .006A at 800V

OPERATING CHARACTERISTICS

Series	Operate Time* (Typical) Form A	Release Time (Typical) Coil Unsuppressed Form A	Release Time (Typical) Coil Suppressed Form A	Storage Temperature Range
846	.50	.05	.5	−40°C to +85°C

* Operate and Release Times (including bounce) in milliseconds.

OUTLINE DIMENSIONS

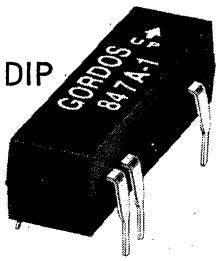


DIMENSIONS: INCHES (MILLIMETERS)

846 SERIES AND 847 SERIES

847 SERIES

MERCURY WETTED REED RELAY MOLDED SILICONE DIP



- Mercury-Wetted (Forms A, C) Versions
- Environmental Immunity Assured
- Logic-Compatible
- Compatible with Auto-Insertion Equipment
- All Gordos molded devices are molded of glass filled, non-burning epoxy with an Underwriters Laboratory certified yellow card, UL94STD, V-0 classification

Mercury-wetted 6-pin DIP reed relays with Form A or Form C contacts, offering the advantages of speed, no bounce, stability, extremely long life, and small size.

REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohms (±10%)	*Clamp Diode	Part Number
1A	5	150	No	847A-1
			Yes	847A-2
	12	575	No	847A-3
			Yes	847A-4
	24	1750	No	847A-5
			Yes	847A-6
1C	5	70	No	847C-1
			Yes	847C-2
	12	320	No	847C-3
			Yes	847C-4
	24	1600	No	847C-5
			Yes	847C-6

NOTES: Consult factory for electrostatic shield and/or magnetic shield requirements.

MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C	Maximum Voltage (VDC)
5	4.0	0.5	7.5
12	9.6	1.2	15.0
24	19.2	2.4	32.0

CONTACT RATINGS

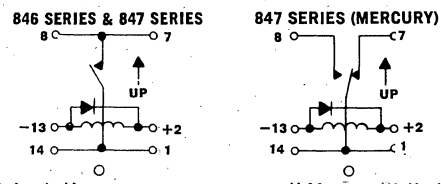
Model No.	Maximum Switching[3] (DC)		Maximum Current (Amps)		Typical Initial Contact Resistance[1] (Ohms)	Min. Breakdown Voltage (VAC)		Capacitance (Typical) (pF)		Insulation Resistance (Typ.) (Ohms)
	Watts	Volts	Switch	Carry		Across Conts.	Conts. Coil	Across Conts.	Conts. Coil	
847A	50	500	1.0[2]	2	.050	1000	1500	1.1	2	10^{10}
847C	50	500	1.0[2]	2	.050	1000	1500	1.3	6	10^{9}

NOTES:
1. Measured with nominal coil voltage applied
2. Derate to .002A @ 500 volts
3. Higher voltages and/or currents may be switched with life expectancy reduced. Consult factory for these ratings.

OPERATING CHARACTERISTICS

Series	Operate Time (Typical) Form A	Operate Time (Typical) Form C N/O	Operate Time (Typical) Form C N/C	Release Time (Typical) Coil Unsuppressed Form A	Release Time (Typical) Coil Suppressed Form A	Storage Temperature Range
847	2.5	2.00	1.5	2.0	2.0	−30°C to +85°C

SCHEMATICS (TOP VIEW)



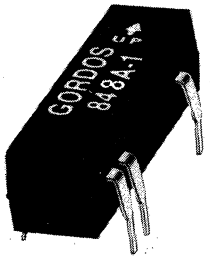
NOTE: Orientation arrow appears on all Mercury Wetted Models. These relays must be mounted ±30° from vertical.

GORDOS CORPORATION/250 GLENWOOD AVE., BLOOMFIELD, NJ 07003 USA/TELEPHONE (201) 743-6800/TWX: 710-994-4787

GORDOS CORPORATION

DRY REED RELAYS

848 SERIES



DRY REED RELAYS
MOLDED EPOXY DIP

- Contact Form A
- Environmental Immunity Assured
- Logic-Compatible
- Compatible with Auto-Insertion Equipment
- All Gordos molded devices are molded of glass filled non-burning epoxy with an Underwriters Laboratory certified yellow card, UL94STD, V-O classification

Special Single-pole 6-pin DIP reed relays with Form A contacts for applications requiring high isolation between contacts and coil.

REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohm (±10%)	Clamp Diode	Part Number
1A	5	150	No	848A-1
			Yes	848A-2
	12	575	No	848A-3
			Yes	848A-4
	24	1750	No	848A-5
			Yes	848A-6

NOTES:
1. Consult factory for electrostatic shield and/or magnetic shield requirements.

MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C	Maximum Voltage (VDC)
5	4.0	0.5	7.5
12	9.6	1.2	15.0
24	19.2	2.4	32.0

CONTACT RATINGS

Model No.	Maximum Switching[2] (DC)		Maximum Current (Amp)		Typical Initial Contact Resistance[1] (Ohms)	Min. Breakdown Voltage (VAC)		Capacitance (Typical) (pF)		Insulation Resistance (Typ Ohms)
	Watt	Volts	Switch	Carry		Across Conts.	Conts. Coil	Across Conts.	Conts. Coil	
848A	10	100	.250	1.5	.200	250	2000	.8	2	10^{10}

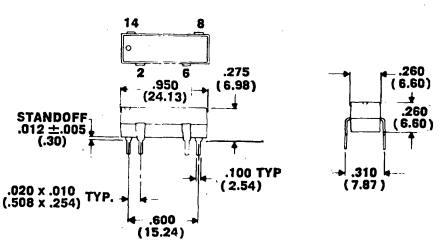
NOTES:
1. Measured with nominal coil voltage applied.
2. Higher voltage and/or currents may be switched with life expectancy reduced. Consult factory for these ratings.

OPERATING CHARACTERISTICS

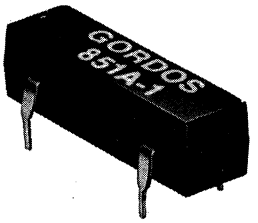
Series	Operate* Time (Typical) Form A	Release Time (Typical) Coil Unsuppressed Form A	Release Time (Typical) Coil Suppressed Form A	Storage Temperature Range
848	.50	.05	.5	−40°C to +85°C

* Operate and Release Times (including bounce) in milliseconds.

OUTLINE DIMENSIONS



851 SERIES



DRY REED RELAYS
MOLDED EPOXY DIP

- Contact Forms A and B
- Environmental Immunity Assured
- Logic-Compatible
- Compatible with Auto-Insertion Equipment
- All Gordos molded devices are molded of glass filled, non-burning epoxy with an Underwriters Laboratory certified yellow card, UL94STD, V-O classification

Special single-pole 4-pin DIP reed relays with Form A or B contacts for applications requiring high isolation between contacts and coil.

REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohms (±10%)	Clamp Diode	Part Number
1A	5	380	No	851A-1
			Yes	851A-2
		500	No	851A-5
			Yes	851A-6
	12	500	No	851A-3
			Yes	851A-4
	24	1750	No	851A-7
			Yes	851A-8
1B (See Note 1)	5	150	No	851B-3
			Yes	851B-4
	12	450	No	851B-5
			Yes	851B-6
	24	1750	No	851B-7
			Yes	851B-8

NOTES:
1. Excessive voltage (maximum of 7.5 VDC for 5 VDC model, 15.0 VDC for 12 VDC model, and 32.0 VDC for 24 VDC model) may cause reclosure on form B models.
2. Consult factory for electrostatic shield and/or magnetic shield requirements.

MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C	Maximum Voltage (VDC)
5	4.0	0.5	7.5
12	9.6	1.2	15.0
24	19.2	2.4	32.0

CONTACT RATINGS

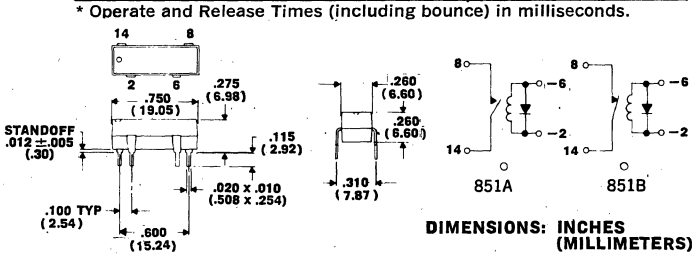
Model No.	Maximum Switching[2] (DC)		Maximum Current (Amps)		Typical Initial Contact Resistance[1] (Ohms)	Min. Breakdown Voltage (VAC)		Capacitance (Typical) (pF)		Insulation Resistance (Typ.) (Ohms)
	Watts	Volts	Switch	Carry		Across Conts.	Conts. Coil	Across Conts.	Conts. Coil	
851A	10	100	.250	1.5	.200	250	2000	.8	2	10^{10}
851B	10	100	.250	1.5	.200	250	2000	.8	3.8	10^{10}

NOTES:
1. Measured with nominal coil voltage applied (Except Form B)
2. Higher voltages and/or currents may be switched with life expectancy reduced. Consult factory for these ratings.

OPERATING CHARACTERISTICS

Series	Operate Time* Typical) Form A	Operate Time* Typical) Form B	Release Time (Typical) Coil Unsuppressed Form A	Release Time (Typical) Coil Unsuppressed Form B	Release Time (Typical) Coil Suppressed Form A	Release Time (Typical) Coil Suppressed Form B	Storage Temperature Range
851	.50	.5	.05	.50	.5	.50	−40°C to +85°C

* Operate and Release Times (including bounce) in milliseconds.



DIMENSIONS: INCHES (MILLIMETERS)

GORDOS CORPORATION

DRY REED RELAY

47 SERIES

MINI-SIP
Reed Relays Designed for ATE Applications

- Transfer Molded Construction
- 35% Less Board Space Than Standard DIP Package
- Power Consumption < 50 Milliwatts
- Operate Times < 300 Microseconds
- Capacitance < 0.5 pF
- Insulation Resistance > $10^{12}\Omega$ @ 40°C. 95% RH
- Initial Contact Resistance < 100 Milliohms
- Load vs. Life Performance

Contact Load		Minimum Operations
25 mV	10 mA	30 Million
5V	100 mA	50 Million
10V	4 mA	30 Million
16V	10 mA	2.5 Million

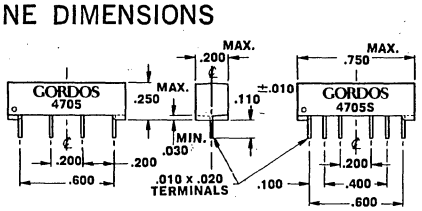
- RF Characteristics
  - Insertion Loss: 0.3 dB Typ. from 10 to 500 MHz
  - Isolation: 30 dB Typ. from 10 to 300 MHz
  - Characteristic Impedance: 50 Ohms Nominal

SPECIFICATIONS @ 25°C

Parameter		4705	4712	4704S	4705S	4721S
Coil Resistance Ohms ±10%		500	1200	150	380	800
Nom. Coil Voltage VDC		5	12	4	5	12
Nom. Coil Power Milliwatts		50	120	106	66	180
Must Operate VDC		4	9.6	3.2	4	9.6
Must Release VDC		0.5	1.2	0.5	0.5	1.2
Initial Contact Res. Milliohms		100	100	100	100	100
Min. Breakdown Voltage AC Vrms	Across Contacts	300	300	300	300	300
	Coil to Contact	1000	1000	1000	1000	1000
	Coil to Shield	—	—	1000	1000	1000
	Contact to Shield	—	—	1000	1000	1000
Capacitance Max. P.F. @ 10 KHz	Across Contacts[1]	1.0	1.0	1.0	1.0	1.0
	Coil to Contact[2]	1.5	1.5	1.5	1.5	1.5
	Contact to Shield[2]	—	—	1.8	1.8	1.8
Capacitance Max. P.F. @ 10 KHz (Grounded Meas.)	Across Contact	—	—	0.3	0.3	0.3
	Coil to Contact	—	—	0.5	0.5	0.5
Insulation Res.	25°C 40% RH	10^{14}	10^{14}	10^{14}	10^{14}	10^{14}
Min. @ 100 VDC	40°C 95% RH	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}
Operate Time Microseconds (Including Bounce)		300	300	300	300	300
Release Time Microseconds (Diode Suppressed)		50	50	50	50	50
Max. Switching Voltage (DC)		50	50	50	50	50
Max. Switching Current (DC)		.250	.250	.250	.250	.250
Max. Carry Current (DC)		1.5	1.5	1.5	1.5	1.5

[1] Capacitance (Across Contacts) — Coil and Shield Tied Together and Floating.
[2] Capacitance — Contacts Open.

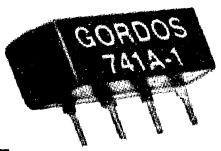
OUTLINE DIMENSIONS



SCHEMATICS

741 SERIES

MOLDED EPOXY
Single In-Line Package



REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohms (±10%)	Clamp Diode	Part Number
1A	5	380	No	741A-1
			Yes	741A-2
		500	No	741A-9
			Yes	741A-10
	12	500	No	741A-3
			Yes	741A-4
	24	1750	No	741A-7
			Yes	741A-8
1B (See Note 1)	5	150	No	741B-3
			Yes	741B-4
		450	No	741B-9
			Yes	741B-10
	12	450	No	741B-5
			Yes	741B-6
	24	1750	No	741B-7
			Yes	741B-8

NOTES:
1. Excessive voltage (maximum of 7.0 VDC for 5 VDC model, 15.0 VDC for 12 VDC model, and 30.0 VDC for 24 VDC model) may cause contact reclosure on Form B models.
2. Consult factory for electrostatic and/or magnetic shield requirements

MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C	Maximum Voltage (VDC)
5	4.0	0.5	7.5
12	9.6	1.2	15.0
24	19.2	2.4	32.0

CONTACT RATINGS

Model No.	Maximum Switching[2] (DC) Watts	Volts	Maximum Current (Amps) Switch	Carry	Typical Initial Contact Resistance[1] (Ohms)	Min. Breakdown Voltage (VAC) Across Conts.	Coil	Capacitance (Typical) (pF) Across Conts.	Coil	Insulation Resistance (Typ.) (Ohms)
741A	10	100	.250	1.5	.200	250	1000	.8	1.5	10^{10}
741B	10	100	.250	1.5	.200	250	1000	.8	3.8	10^{10}

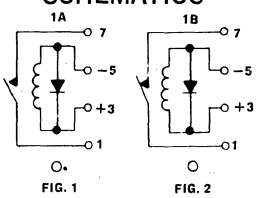
NOTES:
1. Measured with nominal coil voltage applied (Except Form B)
2. Higher voltages and/or currents may be switched with life expectancy reduced. Consult factory for these ratings.

OPERATING CHARACTERISTICS

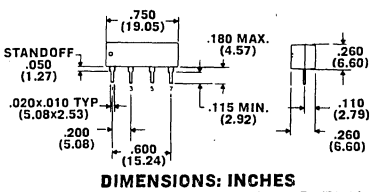
Series	Operate Time* (Typical) Form A	Form B	Release Time (Typical) Coil Unsuppressed Form A	Form B	Coil Suppressed Form A	Form B	Storage Temperature Range
741	.50	.5	.05	.50	.5	.50	−40°C to +85°C

* Operate and Release Times (including bounce) in milliseconds.

SCHEMATICS



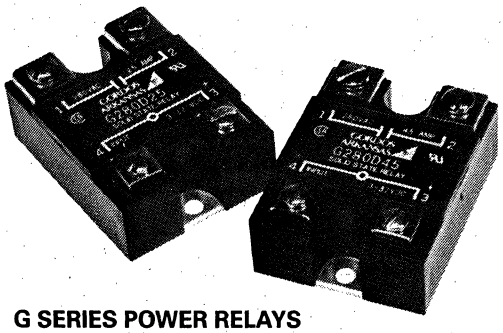
OUTLINE DIMENSIONS



DIMENSIONS: INCHES (MILLIMETERS)

GORDOS ARKANSAS

PANEL MOUNT SOLID STATE RELAYS



Gordos Arkansas offers the most comprehensive line of panel mountable solid state relays. The G Series relays employ back-to-back SCR technology that will handle a wide variety of harsh load applications. For less severe load requirements, we also supply the GA and GZ economy series which employ triacs in their power output stages.

G SERIES POWER RELAYS

- Back-to-back (dual) SCR output for switching highly inductive AC loads
- VDE approval on many models
- Superior turn-on immunity and positive turn-off ability at high dv/dt.
- Optical coupling
- Zero-voltage turn-on
- 10 to 45 Arms current ratings
- Output RC snubber network
- 3-32 VDC and 90-280 VAC input ratings
- 24 to 480 VAC line voltages
- UL recognized; CSA certified

Output Voltage Rating (VAC)				Output Current Rating (AMPS)	Control Voltage
120	240	280	480		
G120A10	G240A10	G280A10	G480A10	10	90-280VAC
G120A25	G240A25	G280A25	G480A25	25	90-280VAC
G120A45	G240A45	G280A45	—	45	90-280VAC
G120D10*	G240D10*	G280D10*	G480D10	10	3-32VDC
G120D25*	G240D25*	G280D25*	G480D25	25	3-32VDC
G120D45*	G240D45*	G280D45*	—	45	3-32VDC
G120E10	G240E10	G280E10	—	10	18-32VAC
G120E25	G240E25	G280E25	—	25	18-32VAC
G120E45	G240E45	G280E45	—	45	18-32VAC

** VDE approved versions optional; Add V suffix*

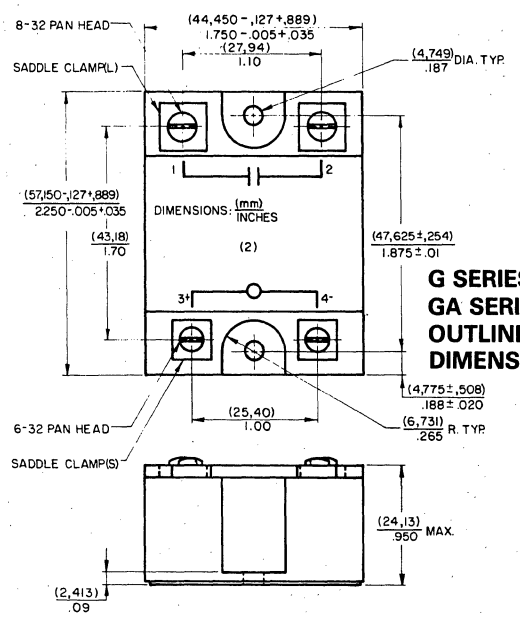
GA & GZ SERIES POWER RELAYS

- UL/CSA approved
- Zero voltage turn-on
- Industry standard packaging
- Optically coupled

	Output Voltage Rating (VAC)			Output Current Rating (AMPS)	Control Voltage
	120	240	280		
GA	GA5-2A05	GA5-4A05	GA5-6A05	5	90-280VAC
	GA5-2A10	GA5-4A10	GA5-6A10	10	90-280VAC
	GA5-2A25	GA5-4A25	GA5-6A25	25	90-280VAC
	GA5-2D05*	GA5-4D05*	GA5-6D05*	5	3-32VDC
	GA5-2D10*	GA5-4D10*	GA5-6D10*	10	3-32VDC
	GA5-2D25*	GA5-4D25*	GA5-6D25*	25	3-32VDC
	GA5-2E10	GA5-4E10	GA5-6E10	10	18-32VAC
	GA5-2E25	GA5-4E25	GA5-6E25	25	18-32VAC

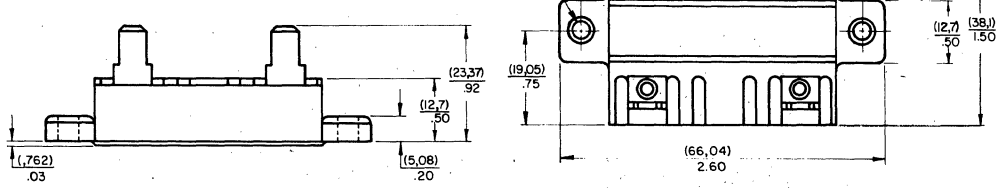
	Output Voltage Rating (VAC)			Output Current Rating (AMPS)	Control Voltage
	120	240	280		
GZ	GZ120D5	GZ240D5	GZ280D5	5	3-32VDC
	GZ120D10	GZ240D10	GZ280D10	10	3-32VDC

** VDE approved versions optional; Add V suffix*



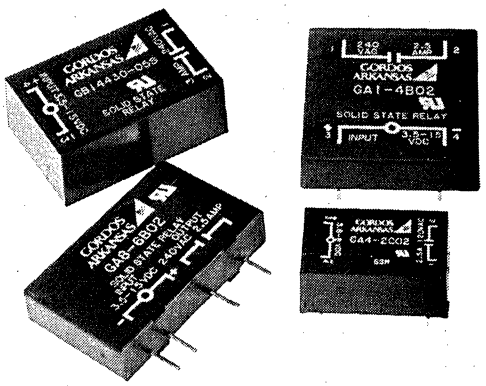
G SERIES AND GA SERIES OUTLINE DIMENSIONS

GZ SERIES OUTLINE DIMENSIONS



GORDOS ARKANSAS

PRINTED CIRCUIT BOARD MOUNTABLE SOLID STATE RELAYS

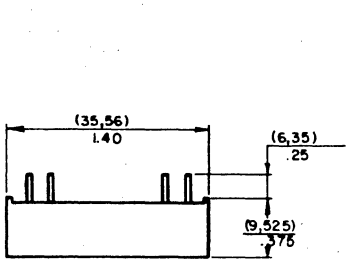


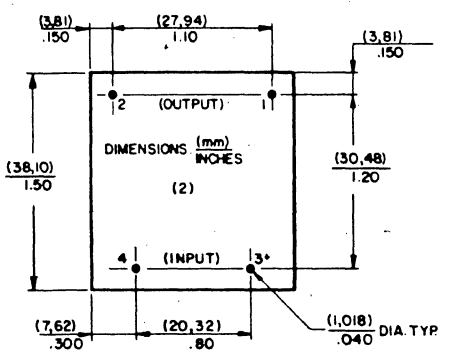
This series of solid state relays are ideally suited for mounting on printed circuit boards. The configurations offered address both the problems of pc board density, and component height considerations. All of the relays in this series are fabricated on a thick film hybrid for maximum density, uniformity and reliability.

GA-1 SERIES

- Lowest Overall Height
- UL Recognized/CSA Certified
- 2500 VAC Optical Isolation
- Zero Voltage Turn-on
- Industry Standard Packaging
- AC Switching

Maximum Output Voltage (VAC)			Output Current Rating (AMPS)	Control Voltage
140	250	280		
GA1-2B02	GA1-4B02	GA1-6B02	4	3.5-15VDC

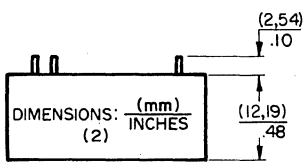


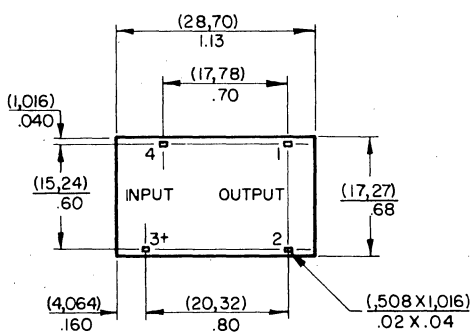


GA-4 SERIES

- Compact Design
- UL Recognized/CSA Certified
- 2500 VAC Optical Isolation
- Zero Voltage Turn-on
- Industry Standard Packaging
- AC Switching

Maximum Output Voltage (VAC)		Output Current Rating (AMPS)	Control Voltage
140	250		
GA4-2C02	GA4-4C02	3	3.8-8VDC

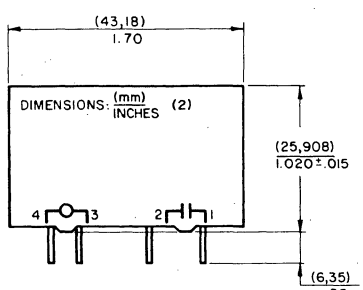


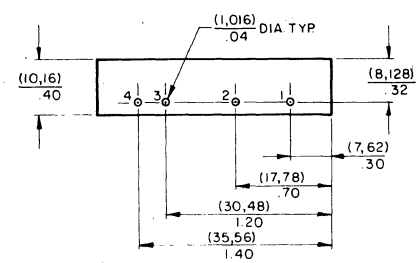


GA-8 SERIES

- Maximum PC Board Density
- UL Recognized/CSA Certified
- VDE Compliant Versions Available
- Zero Voltage Turn-on
- 4 KV Optical Isolation
- Industry Standard Packaging
- AC Switching

120	240	280	Output Current Rating (AMPS)	Control Voltage
GA8-2B02 GA8-2C04	GA8-4B02 GA8-4C04	GA8-6B02 GA8-6C04	4 5	3.5-15VDC 3.8-8VDC

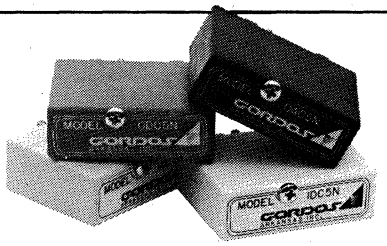




GORDOS ARKANSAS

I/O MODULES

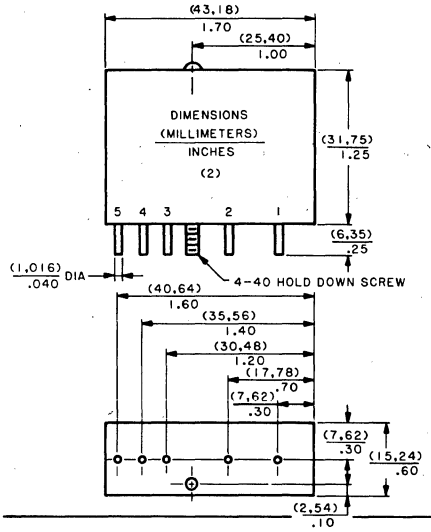
Gordos Arkansas offers the most comprehensive line of I/O modules of any manufacturer. These solid state modules provide optically isolated digital power control in both single point and Quad-Pack I/O configurations. All I/O products incorporate hybrid thick film construction for maximum product uniformity and performance.



SINGLE POINT I/O MODULES

Features Include:

- 4KV Optical Isolation
- UL Recognized/CSA Certified
- Industry Standard Packaging



OUTPUT MODULES

Model	DC Logic Voltage	Output Voltage	Current Rating (AMPS)	Options 1	2	3	4	5
OAC5	5	12-140 VAC	3.5	•	•	•		
OAC5A	5	24-280 VAC	3.5	•	•	•	•	
OAC15	15	12-140 VAC	3.5	•	•	•		
OAC15A	15	24-280 VAC	3.5	•	•	•	•	
OAC24	24	12-140 VAC	3.5	•	•	•		
OAC24A	24	24-280 VAC	3.5	•	•	•	•	
ODC5	5	3-60 VDC	3.0			•		•
ODC5A	5	5-200 VDC	1.0			•		
ODC15	15	3-60 VDC	3.0			•		•
ODC15A	15	5-200 VDC	1.0			•		
ODC24	24	3-60 VDC	3.0			•		•
ODC24A	24	5-200 VDC	1.0			•		

INPUT MODULES

Model	DC Logic Voltage	Line Input Voltage	Options 1	5
IAC5	5	90-140 VAC/VDC	•	
IAC5A	5	90-280 VAC/VDC	•	
IAC15	15	90-140 VAC/VDC	•	
IAC15A	15	90-280 VAC/VDC	•	
IAC24	24	90-140 VAC/VDC	•	
IAC24A	24	90-280 VAC/VDC	•	
IDC5	5	3.3-32 VDC	•	•
IDC15	15	3.3-32 VDC	•	•
IDC24	24	3.3-32 VDC	•	•

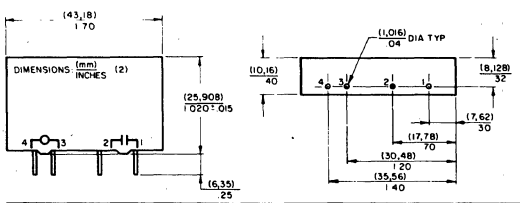
To Order Available Options:

1. Order "N" suffix to obtain an enhanced level of noise immunity per NEMA ICS2-230. The "N" version of the IDC series modules also provides a line input voltage of 10.0 to 60 VDC/VAC.
2. Order "RN" suffix to obtain a non-zero voltage turn-on AC (Random) output.
3. Order "B" suffix in place of voltage designations 5, 15 or 24 volts. This option provides for buffering to an unbuffered C-MOS interface.
4. Order "6" suffix after the A designator on OAC modules to provide for a 600 V peak offstate voltage rating.
5. Order "F" suffix to obtain a high speed DC switching device. The input voltage range is 3.3 to 30 VDC. In addition, the ODC modules can support 4 amps.

MINI I/O MODULES

Features Include:

- Outstanding Density
- 4KV Isolation
- UL Recognized/CSA Approved



OUTPUT MODULES

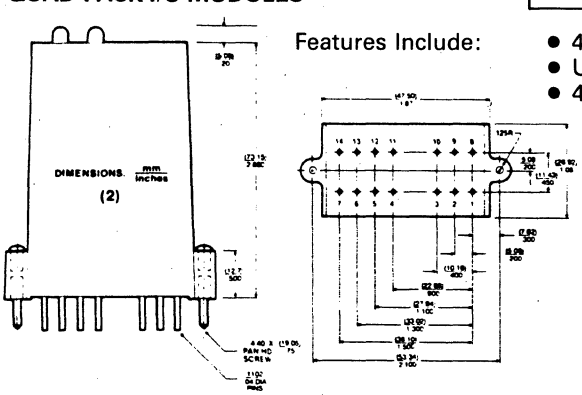
Model	DC Logic Voltage	Output Voltage	Current Rating (AMPS)
M-OAC5	5	12-140 VAC	3
M-OAC5A	5	24-280 VAC	3
M-ODC5	5	3-60 VDC	3
M-ODC5A	5	5-200 VDC	1

For other I/O configurations consult factory.

INPUT MODULES

Model	DC Logic Voltage	Line Input Voltage
M-IAC5	5	90-140 VAC/VDC
M-IAC5A	5	90-280 VAC/VDC
M-IDC5	5	3.3-32 VDC

QUAD-PACK I/O MODULES



Features Include:

- 4KV Optical Isolation
- UL Recognized/CSA Certified
- 4 I/O Modules/Package

OUTPUT MODULES

Model	DC Logic Voltage	Output Voltage	Current Rating (AMPS)
QAC5Q	5	12-140 VAC	3
QAC5AQ	5	24-280 VAC	3
QDC5Q	5	3-60 VDC	3

INPUT MODULES

Model	DC Logic Voltage	Line Input Voltage
IAC5Q	5	90-140 VAC/VDC
IAC5AQ	5	90-280 VAC/VDC
IDC5Q	5	10-32 VAC/VDC

For any other variations of this product please contact the factory.

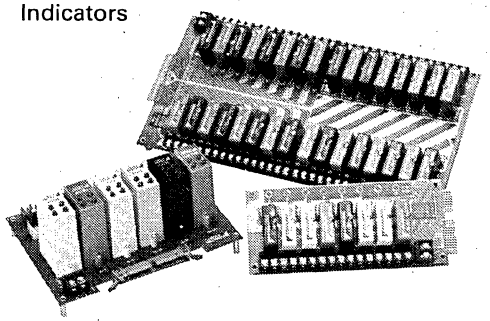
GORDOS ARKANSAS

I/O INTERFACES

MOUNTING RACKS

Features Include:

- Models Available for Mounting Quad-Packs and Single Point I/O's
- UL Recognized/CSA Certified
- All Module/Board Systems Include LED Indicators

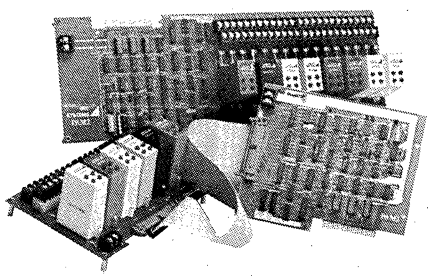


CONTROLLED VIA 50 CONDUCTOR EDGE CONNECTOR

Single Point	Quad Pack	Description
PB-8	—	8 Module Positions
PB-16	PB-16Q	16 Module Positions
PB-24	PB-24Q	24 Module Positions
PB-32D	PB-32Q	32 Module Positions

SINGLE POINT I/O CONTROLLED VIA BARRIER STRIP

PB-4R	4 Module Positions
PB-16S	16 Module Positions—Separate ± Logic I/O
PB-16T	16 Module Positions

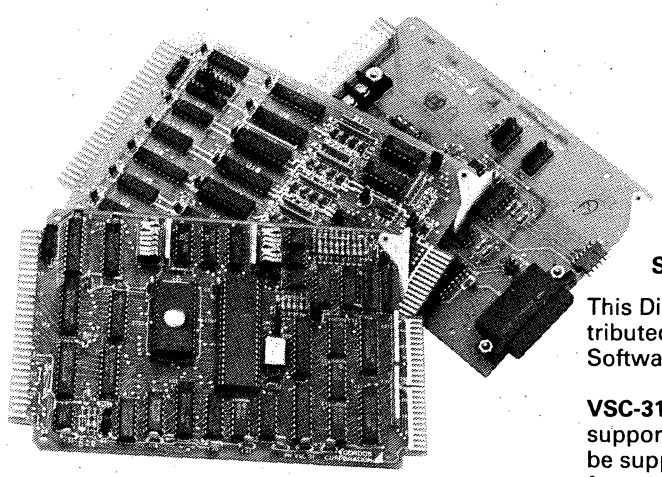


PARALLEL MULTIPLEXERS FOR POWER I/O CONTROL

This series of boards permits the control of up to 512 I/O modules with as few as 16 I/O lines. Each board can support 32 I/O modules. In order to implement the full complement of 512 I/O modules, only 16 PAM boards would be required.

The PAM 2 board provides for both the parallel control logic as well as the mounting space for 8 Quad Packs.

The PAM 3 board provides for the logic board to be separated from the PB-32D or PB-32Q I/O mounting racks. In addition, each PAM incorporates a watch dog timer function to be used in default conditions.



SERIAL MULTIPLEXERS FOR POWER I/O CONTROL

This Distributed Serial System allows the user to construct distributed control and monitoring systems on a RS422 Data Link. Software is available for easy interfacing to an IBM PC.

VSC-31—An STD based RS-422 serial controller card that directly supports the control of 16 I/O lines. Up to 63 VSC-31 systems can be supported on one serial link. Both ASCII and packed binary formats can be used.

G7507 I/O—An STD-based 24 line parallel I/O card which enables expansion of the VSC-31 system to more than 500 I/O lines.

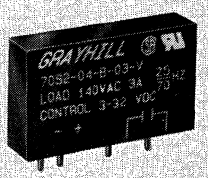
VSC-TR—An RS-232C to RS-422 translator card.

Grayhill INC.

Solid State Relays

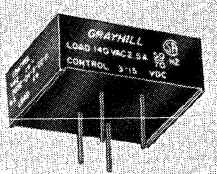
PC Mount and Plug In

V



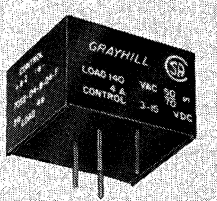
3A

H



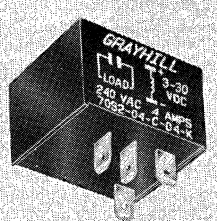
2.5A

F



4A

K



4A

Relays are shown at 50% actual size.

Miniature But Mighty

.680 Square Inch Area
Use Style V

1/2 The Size Of Hockey Pucks
Replace With S and N

- CMOS and TTL Compatible
- Excellent Transient Protection
- High Blocking Voltage
- High Surge Current Rating
- Minimal RFI And EMI
- Zero Voltage Turn-On
- UL And CSA Certified
- 100% Tested
- Loads Up To 25 Amps

Dimensions

Body length, width, and height in inches.

B = 2.1 x 1.1 x 1.0
D* = 1.8 x 1.5 x 1.0
F = 1.2 x 1.0 x 0.9
H = 1.2 x 1.0 x 0.5
K = 1.2 x 1.0 x 0.9
L* = 1.2 x 1.0 x 0.5
M* = 1.2 x 1.0 x 0.9
N* = 1.2 x 1.0 x 0.9
S* = 1.2 x 1.0 x 0.9
V = 1.7 x 0.4 x 1.0

*For styles L, M, N and S, heat sink extends the length to 2.2″; for style D, extended length is 2.8″.

Specifications

	24 Vac Load	120 Vac Load	240 Vac Load
Blocking Voltage:	200V	400V	600V
Zero Voltage & Offset:	6V	8V	18V

Transient Protection: (Relay does not turn on):
3000 Volts per microsecond for the 2.5, 3, 4, and 25 Amp relays.
4000 Volts per microsecond for the 6, 10, 12, and 15 Amp relays.

Surge Current Rating (At 1 full cycle duration):
60 Amps for the 2.5, 3, 4, and 6 Amp relays.
110 Amps for the 10 Amp relay.
150 Amps for the 12 and 15 Amp relays.
250 Amps for the 25 Amp relay.

Input Impedance: Average 2000 Ohms for control ranges of 3-30 Vdc and 3-32 Vdc. Average 6000 Ohms for control ranges of 6-30 Vdc and 6-32 Vdc.

Mounting: Panel mount styles are rated as if mounted on a 12 x 12 x 1/8 inch (6 x 6 x 1/8 for styles B and D) panel or as if they had an equivalent heat sink attached. Styles L, M, N, S mount on Hockey Puck relay centers.

UL Recognition and CSA Certification: UL file number E58632 and CSA file number 38763 apply to all relays shown here.

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

. . . Transient Protected

Ordering Information

Loads		Control	Description		Ordering Information	
Load Vac	Max. Amps	Range Vdc	Pkg. Style	Mounting and/or Termination	Part Number	Unit Price
24	2.5	3-30	H	PC	70S2-04-D-02-H	$15.25
24	2.5	6-30	H	PC	70S2-05-D-02-H	15.25
24	3	3-32	V	PC, In-line	70S2-04-D-03-V	12.14
24	3	6-32	V	PC, In-line	70S2-05-D-03-V	12.14
24	4	3-30	F	PC	70S2-04-D-04-F	15.00
24	4	6-30	F	PC	70S2-05-D-04-F	15.00
24	4	3-30	K	Plug-in	70S2-04-D-04-K	15.80
24	4	6-30	K	Plug-in	70S2-05-D-04-K	15.80
120	2.5	3-30	H	PC	70S2-04-B-02-H	15.25
120	2.5	6-30	H	PC	70S2-05-B-02-H	15.25
120	3	3-32	V	PC, In-line	70S2-04-B-03-V	12.91
120	3	6-32	V	PC, In-line	70S2-05-B-03-V	12.91
120	4	3-30	F	PC	70S2-04-B-04-F	15.00
120	4	6-30	F	PC	70S2-05-B-04-F	15.00
120	4	3-30	K	Plug-in	70S2-04-B-04-K	15.80
120	4	6-30	K	Plug-in	70S2-05-B-04-K	15.80
120	6	3-30	N	Bulkhead/Tabs	70S2-04-B-06-N	17.90
120	6	6-30	N	Bulkhead/Tabs	70S2-05-B-06-N	17.90
120	6	3-30	S	Bulkhead/Screws	70S2-04-B-06-S	18.71
120	6	6-30	S	Bulkhead/Screws	70S2-05-B-06-S	18.71
120	6	3-32	L	PC	70S2-04-B-06-L	15.35
120	6	6-32	L	PC	70S2-05-B-06-L	15.35
120	6	3-32	M	PC	70S2-04-B-06-M	15.25
120	6	6-32	M	PC	70S2-05-B-06-M	15.25
120	6	3-30	B	Bulkhead/Tabs	70S2-03-B-06-B	23.50
120	6	3-30	D	Bulkhead/Tabs	70S2-03-B-06-D	23.00
120	10	3-32	M	PC	70S2-04-B-10-M	16.95
120	10	6-32	M	PC	70S2-05-B-10-M	16.95
120	10	3-30	B	Bulkhead/Tabs	70S2-03-B-10-B	23.65
120	10	3-30	D	Bulkhead/Tabs	70S2-03-B-10-D	23.15
120	12	3-30	N	Bulkhead/Tabs	70S2-04-B-12-N	19.55
120	12	6-30	N	Bulkhead/Tabs	70S2-05-B-12-N	19.55
120	12	3-30	S	Bulkhead/Screws	70S2-04-B-12-S	20.60
120	12	6-30	S	Bulkhead/Screws	70S2-05-B-12-S	20.60
120	15	3-30	B	Bulkhead/Tabs	70S2-03-B-15-B	24.60
120	15	3-30	D	Bulkhead/Tabs	70S2-03-B-15-D	24.10
120	25	3-30	S	Bulkhead/Screws	70S2-03-B-25-S	27.35
240	2.5	3-30	H	PC	70S2-04-C-02-H	16.65
240	2.5	6-30	H	PC	70S2-05-C-02-H	16.65
240	3	3-32	V	PC, In-line	70S2-04-C-03-V	14.32
240	3	6-32	V	PC, In-line	70S2-05-C-03-V	14.32
240	4	3-30	F	PC	70S2-04-C-04-F	16.45
240	4	6-30	F	PC	70S2-05-C-04-F	16.45
240	4	3-30	K	Plug-in	70S2-04-C-04-K	17.25
240	4	6-30	K	Plug-in	70S2-05-C-04-K	17.25
240	6	3-30	N	Bulkhead/Tabs	70S2-04-C-06-N	19.40
240	6	6-30	N	Bulkhead/Tabs	70S2-05-C-06-N	19.40
240	6	3-30	S	Bulkhead/Screws	70S2-04-C-06-S	20.16
240	6	6-30	S	Bulkhead/Screws	70S2-05-C-06-S	20.16
240	6	3-32	L	PC	70S2-04-C-06-L	16.75
240	6	6-32	L	PC	70S2-05-C-06-L	16.75
240	6	3-32	M	PC	70S2-04-C-06-M	16.75
240	6	6-32	M	PC	70S2-05-C-06-M	16.75
240	6	3-30	B	Bulkhead/Tabs	70S2-03-C-06-B	24.45
240	6	3-30	D	Bulkhead/Tabs	70S2-03-C-06-D	23.95
240	10	3-32	M	PC	70S2-04-C-10-M	18.65
240	10	6-32	M	PC	70S2-05-C-10-M	18.65
240	10	3-30	B	Bulkhead/Tabs	70S2-03-C-10-B	24.60
240	10	3-30	D	Bulkhead/Tabs	70S2-03-C-10-D	24.10
240	12	3-30	N	Bulkhead/Tabs	70S2-04-C-12-N	21.35
240	12	6-30	N	Bulkhead/Tabs	70S2-05-C-12-N	21.35
240	12	3-30	S	Bulkhead/Screws	70S2-04-C-12-S	22.34
240	12	6-30	S	Bulkhead/Screws	70S2-05-C-12-S	22.34
240	15	3-30	B	Bulkhead/Tabs	70S2-03-C-15-B	25.90
240	15	3-30	D	Bulkhead/Tabs	70S2-03-C-15-D	25.40
240	25	3-30	S	Bulkhead/Screws	70S2-03-C-25-S	28.62

Other Relays

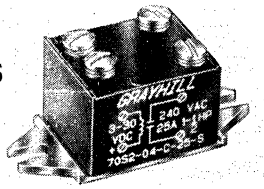
DC to AC Hybrid Relays and DC to DC Solid State Relays are also available. Contact GRAYHILL.

Discount Schedule

1-9 ....Unit Price
10-24 ....Less 20%
25-49 ....Less 28%
50-99 ....Less 34%
100-249....Less 40%
250 UP... Contact GRAYHILL

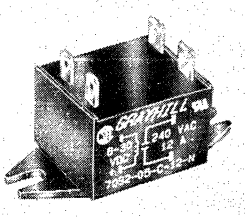
Panel Mount

S



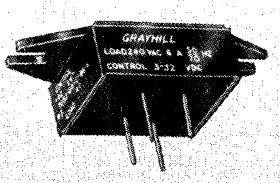
6A, 12A, 25A

N



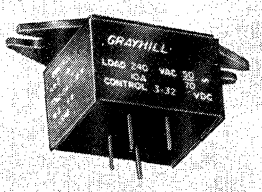
6A, 12A

L



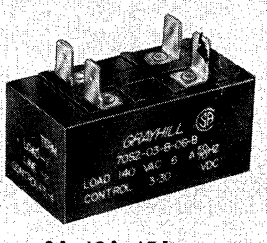
6A

M



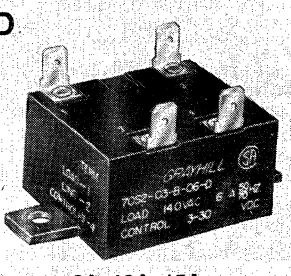
6A, 10A

B



6A, 10A, 15A

D



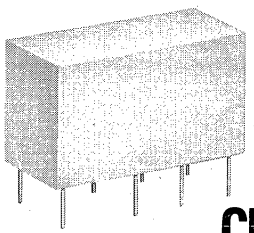
6A, 10A, 15A

Available Locally Through Your Grayhill Distributor

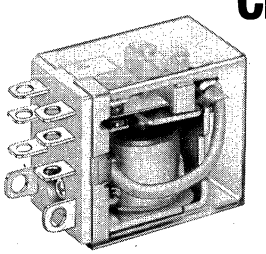
GUARDIAN ELECTRIC MANUFACTURING COMPANY
1550 W. CARROLL AVENUE / CHICAGO, ILLINOIS 60607 / TEL (312) 243-1100 / TWX 910-221-5073

RELAYS

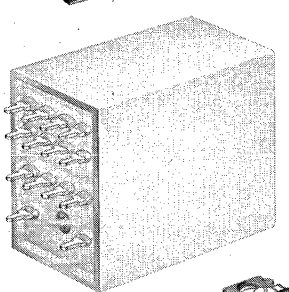
Printed Circuit
Enclosed
Sealed
Power/Powerloid®



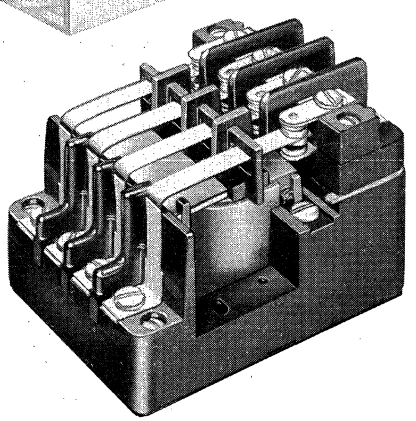
Choose from these unique RELAYability® features:

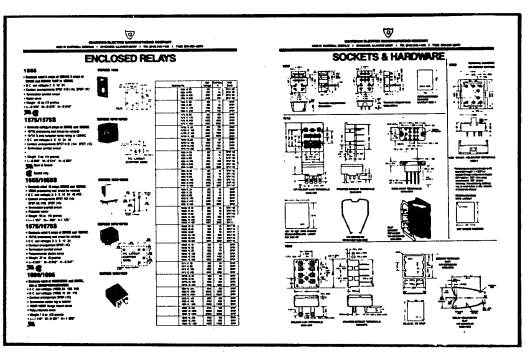


The most sizes: Large, small, miniature and subminiature.
The most ratings: From 1 amp for low level switching to a hefty 30 amp power relay...to our 200 amp Powerloid®.
The most terminations: Screw type, plug-in "radio" type, printed circuit, plug-in and solder lug.
The most accessories: Sockets and hardware to meet your specific application needs.



CALL...TWX...OR WRITE for complete catalog.
Or, call your local Guardian stocking distributor.

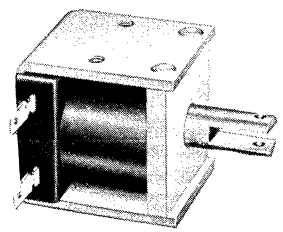


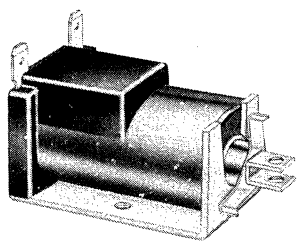


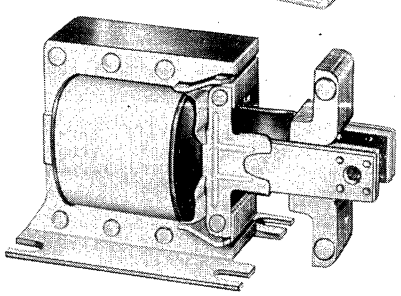
GUARDIAN ELECTRIC MANUFACTURING COMPANY
1550 W. CARROLL AVENUE / CHICAGO, ILLINOIS 60607 / TEL (312) 243-1100 / TWX 910-221-5073

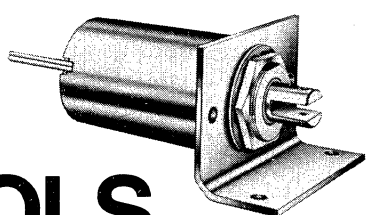
SOLENOIDS

Box Frame
U-Frame
Laminated
Tubular









Choose from:

Pull Forces from 50 pounds to a fraction of an ounce.

Strokes from inch-and-a-half to one thirty-secondth.

AC or DC.

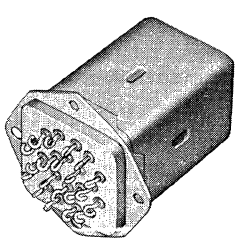
Intermittent or Continuous Duty.
Pull, push or with switch attached.

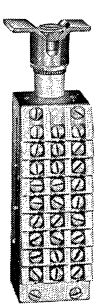
CALL...TWX...OR WRITE for complete catalog.
Or, call your local Guardian stocking distributor.

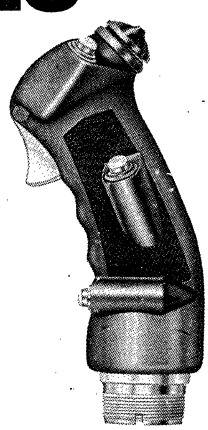
AIRCRAFT CONTROLS

Relays, multiple contact control switches and control grips. All specially engineered for the aircraft industry...both military and commercial.

CALL...TWX...OR WRITE for special catalogs.







GUARDIAN®

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

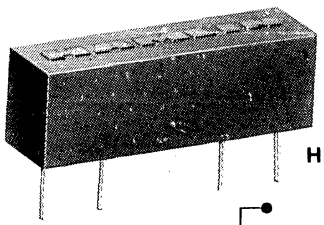
Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

HAMLIN INC

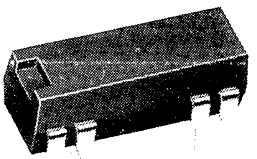
LAKE and GROVE STREETS · LAKE MILLS, WISCONSIN 53551
PHONE: SALES 414/648-2361 · TWX 910-260-3740

REED SWITCHES & SENSORS • REED, HG & MOS RELAYS • LIQUID CRYSTAL DISPLAYS

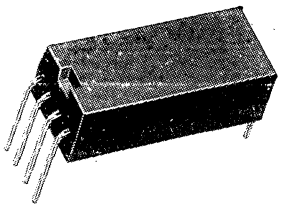
REED RELAYS



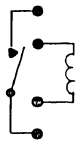
HE3300 SERIES — SIP



HE700 SERIES — DIP



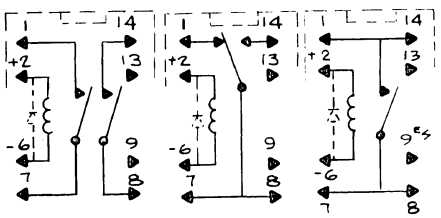
HE1100 SERIES



HE3321A

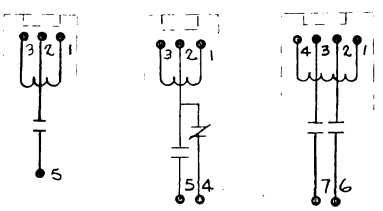
HE3351A

Relay Part Number	Coil Voltage (V)	Coil Resistance (Ω) (± 10%)	Must Operate Voltage V Max.	Must Release Voltage V Min.	Contact Form	Switch Rating Max. (W)	Contact Resistance (Ω)
HE3321A0400	5	500	3.75	0.5	1A	10	.200
HE3321A1200	12	500	9.0	1.0	1A	10	.200
HE3321A2400	24	2000	16.0	2.0	1A	10	.200
HIGH-VOLTAGE HOLD-OFF RELAY							
HE3351A0500	5	125	4.0	0.5	1A	20	.200
HE3351A1200	12	500	9.0	1.0	1A	20	.200
HE3351A2400	24	2000	18.0	2.0	1A	20	.200



HE722A HE721C HE721A

HE721A0500	5	500	3.75	0.5	1A	10	.200
HE721A1200	12	1000	8.0	1.0	a¹	10	.200
HE721C0500	5	200	3.75	0.5	1C	3	.200
HE721C1200	12	500	8.0	1.0	1C	3	.200
HE721C2400	24	2000	16.0	2.0	1C	3	.200
HE722A0500	5	200	3.75	0.5	2A	10	.200
HE722A1200	12	500	8.0	2.0	2A	10	.200
HE722A2400	24	2150	16.0	4.0	2A	10	.200



HE1121A HE1121C HE1122A

HE1121A0400	5	500	4	0.5	1A	10	.150
HE1121A1200	12	500	9	1	1A	10	.150
HE1121A2400	24	2000	18	2	1A	10	.150
HE1121C0500	5	125	4	0.5	1C	3	.200
HE1121C1200	12	500	9	1	1C	3	.200
HE1121C2400	24	2000	18	2	1C	3	.200
HE1122A0500	5	75	4	0.5	2A	10	.150
HE1122A1200	12	300	9	1	2A	10	.150
HE1122A2400	24	1200	18	2	2A	10	.150

LIQUID CRYSTAL DISPLAYS

∘ Ultra low power consumption ∘ Wide temperature range ∘ Excellent readability in direct sunlight

STANDARD STATIC DRIVE LCD'S

4 DIGIT PART NUMBER					
DUAL IN-LINE PINS	ELASTOMERIC CONNECTOR	NUMBER OF DIGITS	DIGIT HEIGHT (INCHES)	DISPLAY LENGTH (INCHES)	DISPLAY HEIGHT (INCHES)
3900	3950	4	.35	2.0	0.9
3901	3933	3.5/LO BAT	.5	2.0	1.2
3902	3962	3.5	.5	2.0	1.2
3903	3953	3.5	.7	2.75	1.5
3906	3966	4	.5	2.0	0.9
3907	3967	4	.7	2.75	1.5
3908	3968	4	1.0	3.695	1.8
3909	3959	4.5	.4	2.0	1.2
3912	3952	4.5	.8	3.695	1.8
3913	3963	5	.4	2.0	1.2
3915	3965	5	.7	3.2	1.5
3918	3978	6	.5	2.75	1.2
3919	3969	6	.7	3.695	1.5
3922	3972	8	.5	3.695	1.2
3935	3985	2	.5	1.2	1.2
3937	3987	3.5	.35	2.0	0.9
3938	3988	4.5	.35	2.0	0.9
3939	3989	4.5/LO BAT	.4	2.0	1.2
3970	3995	Dual 20-Bar Graph	—	2.75	1.5

STANDARD MULTIPLEX DRIVE LCD'S

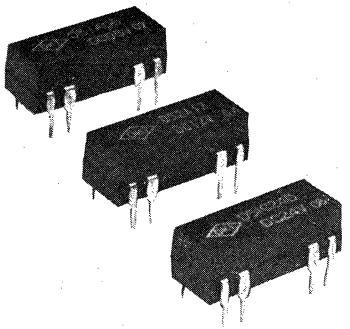
PART NUMBER						
DUAL IN-LINE PINS	ELASTOMERIC CONNECTOR	NUMBER OF DIGITS CHARACTERS	MATRIX FORMAT	DISPLAY LENGTH (INCHES)	DISPLAY HEIGHT (INCHES)	DIGIT/ CHARACTER HEIGHT (INCHES)
4285	N/A	1 x 16 (5 x 7 Dot Matrix)	7 x 80	4.7	0.9	0.3
N/A	4286	2 x 16 (5 x 7 Dot Matrix)	7 x 80 (each row)	4.8	1.3	0.3
N/A	4287	2 x 20 (5 x 7 Dot Matrix)	7 x 100 (each row)	5.75	1.3	0.3
4293	4293	36 element bargraph	3 x 12	2.0	1.2	0.3
4294	4294	48 element bargraph	3 x 16	2.75	1.2	0.3
4295	4295	48 element bargraph	4 x 12	2.75	1.2	0.3
4200	4200	6 digit	4 x 12	2.75	1.2	0.3
4201	N/A	4.5 digit/ LO BAT	3 x 12	2.0	1.05	0.3
4203	4203	6 digit	3 x 18	2.75	1.2	0.3
4204	4204	4 digit	3 x 12	2.0	1.2	0.3
4216	4216	8 digit	3 x 24	3.695	1.2	0.3

HASCO COMPONENTS INC. / REED RELAYS

OKI electric industry company, ltd.

D SERIES DIP REED RELAYS

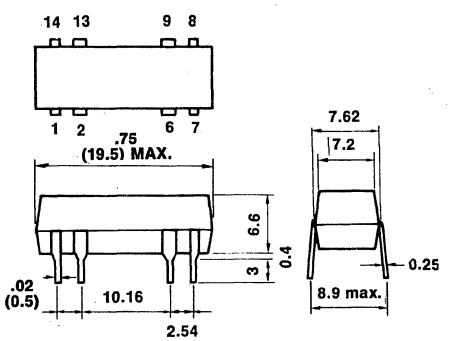
Hasco Components, Inc. is the exclusive agent for OKI's reed switches and reed relays.
For more information on reed relays, plus any of Hasco's miniature electromechanical relays, please consult the following pages. Samples cheerfully provided from stock.



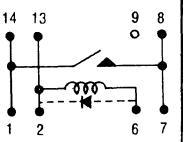
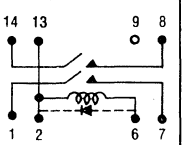
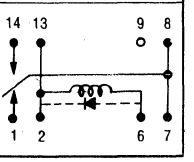
FEATURES

- De-activated rhodium contacts. for stable contact resistance.
- Standard TO-116 Terminal Grid fits all standard DIP sockets.
- Interface directly with RTL, DTL, TTL, HTL logic.
- Molded epoxy package for environmental immunity.
- Automatic insertion compatible.
- Relay testing services test report available.

STRUCTURE (Unit in mm)



CHARACTERISTICS

Contact Form	Part Number	Nominal Voltage (V)	Must Operate (V)	Must Release (V)	Coil Resistance (Ω)	Circuit Schematic (Top view)
1A	**D51A05(D)**	5	3.75	0.5	500	
	D51A12(D)	12	9.0	1.2	800	
	D51A24 (D)	24	18.0	2.4	2000	
2A	**D52A05 (D)**	5	3.75	0.5	140	
	D52A12 (D)	12	9.0	1.2	400	
	D52A24 (D)	24	18.0	2.4	1300	
1C	**D51C05 (D)**	5	3.75	0.5	200	
	D51C12 (D)	12	9.0	1.2	500	
	D51C24 (D)	24	18.0	2.4	1500	

(D); clamp diode optional

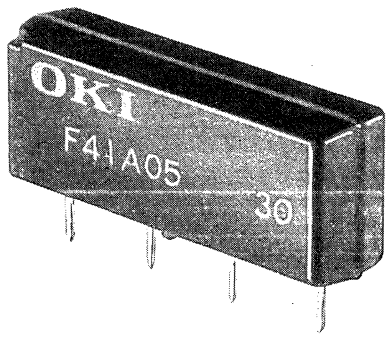
ENGINEERING DATA

	1A, 2A	1C
Operate time	0.5msec max.	0.5msec. max.
Release time	0.2msec max.	0.2msec max.
Bounce time	0.5msec max.	2.0msec max.
Contact resistance	150mΩ max. (initial)	150mΩ max. (initial)
Contact ratings	DC10VA max.	DC3VA max.
	DC100V max.	DC30V max.
	DC1.0A max. (carry only)	DC0.5A max. (carry only)
	DC0.5A max. (switched)	DC0.25A max. (switched)
Life expectancy	50 x 10^6 operations at signal level	30 x 10^6 operations at signal level
	3 x 10^6 full rated load	1 x 10^6 at full rated load
Breakdown voltage	DC250V across open contacts	DC200V across open contacts
	DC500V between coil and contact	DC500V between coil and contact
Insulation resistance	10^9Ω min.	10^9Ω min.
Vibration	20G (10 ~ 2000Hz)	20G (10 ~ 2000Hz)
Thermal shock	−55 ~ 105°C	−55 ~ 105°C
Moisture resistance	60°C-90% 240 hours	60°C-90% 240 hours
Terminal strength	225g	225g
Operating temperature	−40 ~ 85°C	−40 ~ 85°C
Storage temperature	−55 ~ 105°C	−55 ~ 105C°

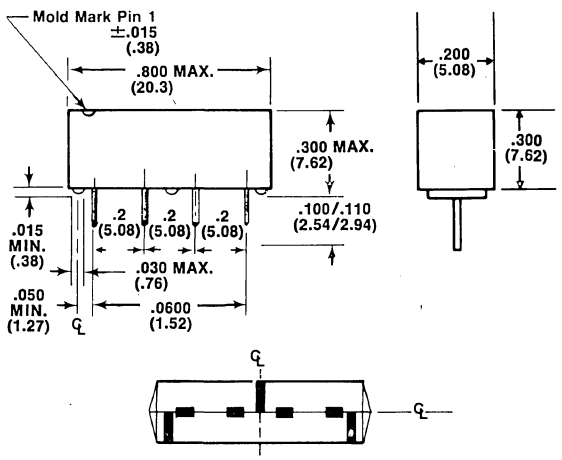
HASCO COMPONENTS INC. / REED RELAYS

"HI-REL" SIP REED RELAY F41A SERIES

OKI electric industry company, ltd.



SIP REED RELAY Unit: inch (mm)



FEATURES

- New small SIP configuration
- High quality — low price
- Resistance to cleaning solvents
- Automatic insertion compatible
- Relay testing services test report available

CONTACTS

Form: 1A
Current: 0.5 amps DC max.
Voltage: 100V DC max.
Power: 10 watts max.
Contact Resistance: 0.10Ω max.
Breakdown Voltage
(one minute between open contacts): 200V DC min.
Operations: 200 x 10^6 Low Level
Contact Resistance Stability Delta: 0.005Ω max.
Magnetostrictive Twist: 0.12Ω max.
Average Number of Bounces: 10 max.

INSULATION RESISTANCE

$10^{11}\Omega$ min. at 25°C, 85% R.H., 100V DC (contact to contact, coil to contacts for 5 seconds).

$10^{11}\Omega$ min. at 25°C, 50% R.H., 100V DC (contact to contact, coil to contacts for 5 seconds) 4 hrs. after aqueous cleaning cycle.

LIFE

Low Level: 2 x 10^8 operations, min. at 30 millivolts DC, 10 milliamps resistive load switched hot.

Low Intermediate Level: 5 x 10^7 operations at 10V DC, 4 milliamps resistive load switched hot.

End Points: 1 failure to operate or 1 failure to release, (Operate/Release time $>$ 2 msec) or contact resistance $>$ 0.5 ohm, 5 msec after energizing coil.

RESISTANCE TO CLEANING SOLVENTS

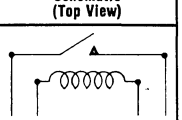
Withstand without detriment to performance and marking, immersion in Freon TMC for 2 cycles. Each cycle 2 minutes in vapor @ 97°F plus 2 minutes spray, with 2 minutes in air between cycles.

Withstand without detriment to performance and marking aqueous cleaning with Kester 5779 Bio-Kleen 5% solution for 2 minutes and hot-air drying (200°F) for 4 minutes.

SPEED

Operate Time (Incl. Bounce): 500 μsec max.
Release Time (Incl. Bounce) (Diode Suppressed): 500 μsec max.

CHARACTERISTICS

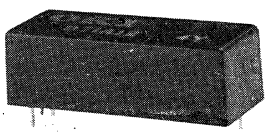
Part Number	Nominal Voltage (V)	Must Operate (V)	Must Release (V)	Coil Resistance (Ω)	Circuit Schematic (Top View)
F41A05	5	3.75	0.5	500	
F41A12	12	9.0	1.2	800	

HASCO COMPONENTS INC. / REED RELAYS

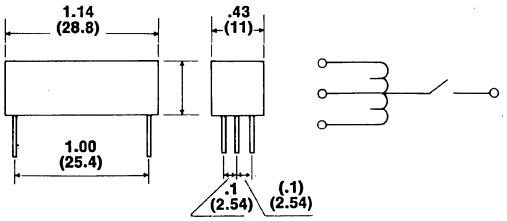
FORM 1A FLAT — OPEN TYPE REED RELAYS

FEATURES

- 9mm high flat package for close-packed mounting.
- Pin layout in international standards inch pitch.



STRUCTURE Unit: inch (mm) CIRCUIT SCHEMATIC



SPECIFICATIONS

Contact Form	Part Number	Nominal Voltage (V)	Must Operate (V) (at 20°C)	Continuous Voltage (Max. V)	Must Release (V)	Coil Resistance (Ω) ±10% (at 20°C)
1A	B71A05	5	3.5	10	0.8	500
1A	B71A12	12	9.0	20	1.2	1000
1A	B71A24	24	18.0	28	2.4	2500

CHARACTERISTICS

Operate Time: 0.5 ms max. (Rated voltage operation)
Release Time: 0.1 ms max. (Rated voltage operation)
Bounce Time: 0.5 ms max. (Rated voltage operation)
Contact Resistance: 150 mΩ max. (Initial value)
Breakdown Voltage: Between open contacts DC 250V min.
Between coil and contact DC 500V min.
Insulation Resistance: 10^9Ωmin. (DC 100V)
Contact Ratings: DC 10W AC 10 VA
DC 100V max. AC 100V max.
0.3A max. (switched), 1.0A max. (carry only)
Life Expectancy: 1 x 10^8 min. Mechanical operations
5 x 10^6 min. (24V, 50 mA resistance load)
1 x 10^6 min. (48V, 120 mA induction load)
Vibration: 20G (10 ~ 2000 Hz)
Shock Resistance: 50G (11 ms)
Operating Temperature: −20 ~ 60°C
Storage Temperature: −40 ~ 80°C

B 7 1 A 1 2 N P — A 1

- Coil location (1, 2, 3)
- Switch rating (A, B, ...)
- Epoxy sealed or not (P,)
- Cover or not (, N)
- Coil voltage (5, 12, 24)
- Contact configuration (A, C)
- Series name

CUSTOM PACKAGING, WITHOUT SPECIAL PRICING.

ORD 228VL — Standard
ORD 2210 — High Power
ORD 229 — High Voltage
ORD 2211 — High Inrush

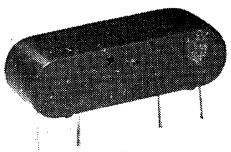
Please see reed switch chart for exact characteristics on other than standard part.

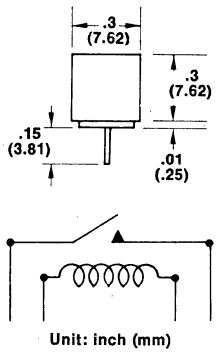
DRY CONTACT REED RELAYS 700 SIP/800 SERIES

FEATURES

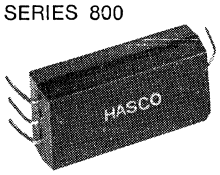
- Choice or normal, heavy duty or hi voltage
- Epoxy sealed

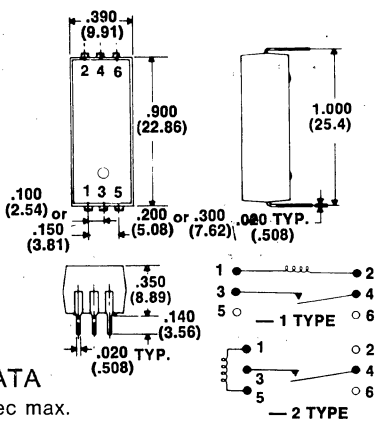
SERIES 700





SERIES 800





ENGINEERING DATA

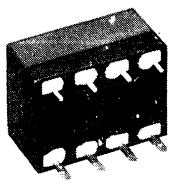
Operate Time: 0.5 mSec max.
Release Time: 0.2 mSec max.
Bounce Time: 0.5 mSec max.
Contact Resistance: 150 mΩ max. (initial)
Life Expectancy: 50 x 10^6 operations at signal level
3 x 10^6 at full rated load
Insulation Resistance: 10^9Ω min.
Vibration: 20G (10-2000 Hz)
Thermal Shock: −55~105°C
Moisture Resistance: 60°C - 90% 240 hours
Terminal Strength: 225g
Operating Temperature: −40~85°C
Storage Temperature: −55~105°C

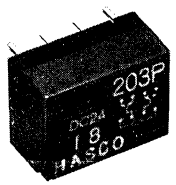
SPECIFICATIONS FOR SERIES 700 AND 800

Part Number	Nominal Voltage (V)	Must Operate (V)	Must Release (V)	Coil Resistance (Ohms)	Contact Rating	Breakdown Voltage
711-811-5	5-6	3.75	0.5	500	10VA DC max. 100V DC max. 1.0A max. carry 0.5 max. switching	250V DC across contacts 1000V DC contacts to coil
711-811-12	12	9.0	1.2	500		
711-811-24	24	18.0	2.4	2000		
HEAVY DUTY						
712-812-5	5-6	3.75	0.5	400	70VA DC max. 100V DC max. 2.5 max. carry 1.0A max. switching	300V DC across contacts 1000V DC contacts to coil
712-812-12	12	9.0	1.2	400		
712-812-24	24	18.0	2.4	1600		
HIGH VOLTAGE						
713-813-5	5-6	3.75	0.5	400	50VA DC max. 400 DC max. 2.5A max. carry 1.0A max. switching	750V DC across contacts 1000V DC contacts to coil
713-813-12	12	9.0	1.2	400		
713-813-24	24	18.0	2.4	1600		

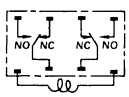
HASCO COMPONENTS INC. RELAYS

DPDT MINI 3 OR 5 AMP RELAY
SSD203P RELAY SERIES

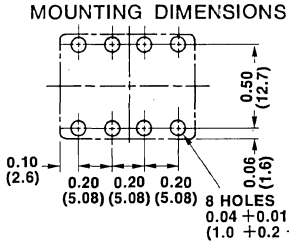


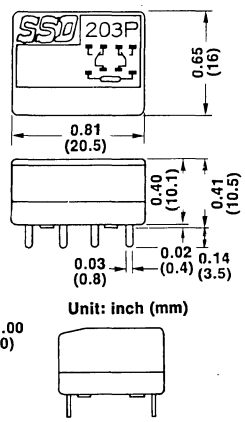


WIRING DIAGRAM



MOUNTING DIMENSIONS





MAXIMUM LOAD RATING:
125V AC 3A, 250V AC 2.5A, 30V DC 3A and 5A

This double pole, double throw miniature relay gives **3** Amp or **5** Amp switching in a **small package** only .81″ x .65″ x .41″ (20.5 x 16 x 10.5mm) at low cost. It's the perfect answer for applications in Industrial Controls, Computer Peripherals and a wide range of others.

FEATURES

- Miniature Size: .81″ x .65″ x .41″, 20.5 x 16 x 10.5mm
- Printed circuit terminals
- Double pole, double throw
- Low cost
- Can be flow soldered
- Fully sealed nitrogen filled option

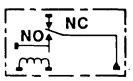
SPECIFICATIONS

Maximum Voltage: 120% of rated voltage at 20°C
Must Operate Voltage: 75% of rated voltage at 20°C
Operate Time: 5 ms
Coil Temperature Rise: 65°C max. at rated voltage
Insulation Resistance: 100M ohm min. at 500V DC
Dielectric Strength:
2000V AC 1 minute between coil and terminal
750V AC 1 minute between contacts
Electric Life: 100,000 operations
Mechanical Life: 10 million operations
Contact Material: Silver alloy
Contact Resistance: 100m ohm max. (4 to 6V DC, 1A)
Operating Temperature Range: −10°C to +65°C

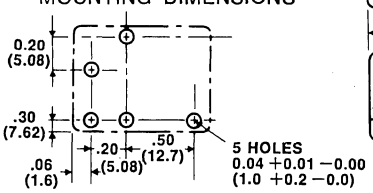
Rated Voltage (V)	5 DC	6 DC	12 DC	24 DC
Rated Current (mA)	120	100	50	25
Coil Resistance (Ω)	42	60	240	960

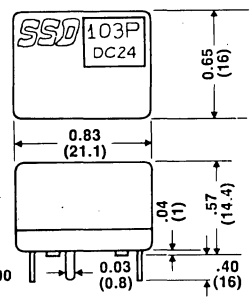
SPDT 3 OR 5 AMP RELAY
SSD103P RELAY SERIES

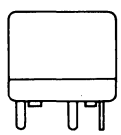
WIRING DIAGRAM



MOUNTING DIMENSIONS







MAXIMUM LOAD RATING:
125V AC 3A, 250V AC 2.5A, 30V DC 3A
SSD105P (125V AC 5A type) also available

This single pole, double throw miniature relay gives **3** or **5** Amp switching in a **small package** only .83″ x .63″ x .57″ (21 x 16 x 14.4mm) at low cost. It is ideal for use in Computer Peripherals, Industrial Controls and a wide range of other applications.

FEATURES

- Miniature Size: .83″ x .63″ x .57″, 21 x 16 x 14.4mm
- Printed circuit terminals
- Single pole, double throw
- Can be flow soldered
- Fully sealed nitrogen filled option

SPECIFICATIONS

Maximum Load Voltage: 150% of rated voltage at 20°C
Must Operate Voltage: 65% of rated voltage at 20°C
Operate Time: 5 ms
Coil Temperature Rise: 50°C max. at rated voltage
Insulation Resistance: 250 ohm min. at 500V DC
Dielectric Strength:
2000V AC 1 minute between coil and terminal
750V AC 1 minute between contacts
Surge Voltage Resistance: 7000V DC min. between coil and terminals at 20°C 65% RH, 40 sec., 3 times
Electric Life: 100,000 operations
Mechanical Life: 20 million operations
Contact Material: Silver alloy
Contact Resistance: 70m ohm max. (4 to 6V DC, 1A)
Operating Temperature Range: −30°C to +70°C

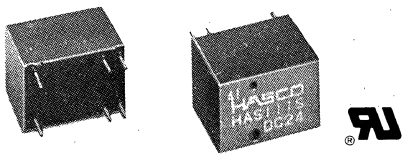
Rated Voltage (V)	6 DC	9 DC	12 DC	24 DC
Rated Current (mA)	75	50	37	18.5
Coil Resistance (Ω)	80	180	320	1280
Rated Current Tolerance: ±15%-20% at 20°C				

HASCO COMPONENTS INC.

RELAYS

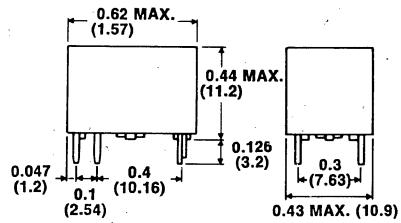
HAS 111, 112 & 124

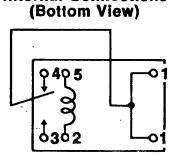
SPDT - 1 AMP DIP OR PC RELAY HAS 111

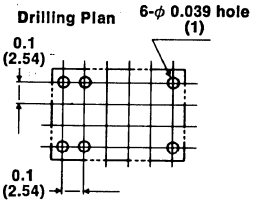


ORDERING INFORMATION

S = Sealed
2 = FCC Pt 68
S1 = Sealed with gas
S2 = Sealed & Pt 68
S3 = Sealed, Pt 68 & Gas







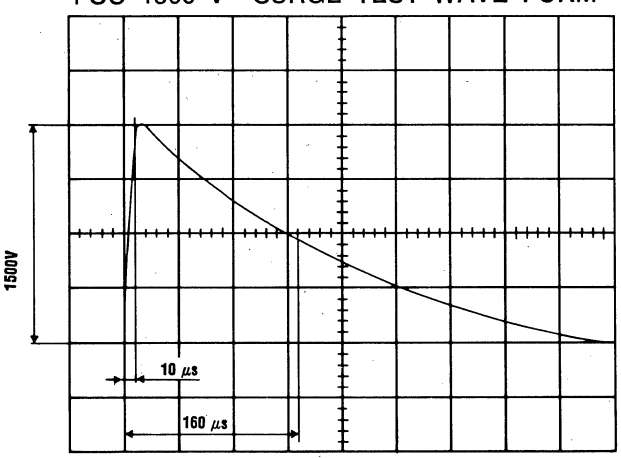
Specifications subject to change without notice.
Unit: inch (mm)

For sealed unit specify "S"

FEATURES

- Small size 1A switching capacity.
- Available semi or fully sealed.
- Voltages 1.5-48 volts available.
- Hi-quality, yet inexpensive.
- FCC Pt 68 available.

FCC 1500 V SURGE TEST WAVE FORM



Type	Contact Arrange-ment	Nom. Volt. (V)	Coil Resist. (Ω) ±10%)	Nom. Curr. (mA)	Pick-Up Volt. (V)	Drop-Out Volt. (V)	Max. Volt. (V)*	Nom. Pwr (W) Cons'p-tion
HAS-111-3V	SPDT 1 Form C	3	20	150	2.1	0.3	3.3	0.45
HAS-111-5V		5	56	89.3	3.5	0.5	5.5	
HAS-111-6V		6	80	75	4.2	0.6	6.6	
HAS-111-9V		9	180	50	6.3	0.9	9.9	
HAS-111-12V		12	320	37.5	8.4	1.2	13.2	
HAS-111-24V		24	1280	18.8	16.8	2.4	26.4	
HAS-111-48V		48	5120	9.4	33.6	4.8	52.8	

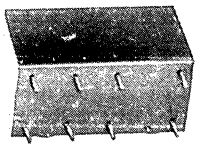
Data measured at 20°C,* measured at 40°C.

RATING PERFORMANCE

Specifications			Note
Coil	Nominal Voltage	1.5, 3, 5, 6, 9, 12, 24, 48 VDC	
	Nominal Power Consumption	0.45W	
	Pick-up Voltage	70% of nominal voltage	
	Drop-out Voltage	10% of nominal voltage	
Contact	Contact Arrangement	SPDT, 1 Form C	
	Contact Material	Silver-Palladium (Gold overlay)	
	Contact Resistance	Max. 100 mΩ	at initial value
	Max. Switching Power	DC 30W/AC 60 VA	at resistive load
	Max. Switching Voltage	60 VDC/120 VAC	
	Max. Switching Current	1A DC/AC	
Time	Operate Time	Approx. 2 mS	at nominal
	Release Time	Approx. 1 mS	voltage
	Bounce Time (Operating)	Max. 2 mS	no bounce in break contact
	Bounce Time (Releasing)	Max. 7 mS	no bounce in make contact
Insulation Resistance		Min. 100 MΩ	at 500 VDC
Dielectric Strength		500 VAC	1 minute
Vibration Resistance		1.5 mm DA 10 ~ 55 Hz	
Temperature Range		−25°C ~ +55°C	
Life	Mechanical Life	500 x 10^4 times	
	Electrical Life	50 x 10^4 times	at 24 VDC, 1A resistive load
		10 x 10^4 times	at 120 VAC, 0.5A, resistive load
Weight		Approx. 4 g	

HASCO COMPONENTS INC. RELAYS

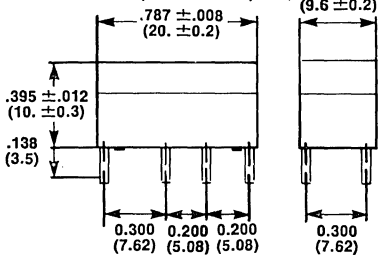
DPDT - 2 AMP DIP OR PC RELAY HAS 112



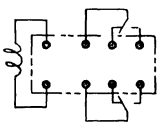
FEATURES

- Available fully sealed or "semi" sealed.
- Employing 16 pin, IC spacing.
- Low profile for tight spacing.
- Coil voltages: 5, 6, 9, 12, 24 & 48.
- Compatible and competitive!
- FCC Pt 68 available
- Sensitive available

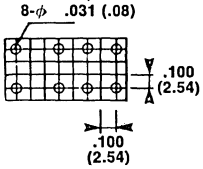
DIMENSIONS (Unit: inch (mm)



SCHEMATICS



MOUNTING HOLE LAYOUT



For sealed unit specify "S"
For Pt 68 specify (2)

COIL RATINGS

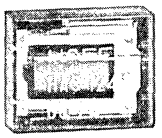
	STANDARD		SENSITIVE 212 TYPE	
Type	Rated Voltage	Coil Resistance	Rated Voltage	Coil Resistance
HAS 112	5V DC	45 ohms	5V DC	167 ohms
HAS 112	6V DC	60 ohms	6V DC	240 ohms
HAS 112	9V DC	140 ohms	9V DC	540 ohms
HAS 112	12V DC	280 ohms	12V DC	960 ohms
HAS 112	24V DC	1,070 ohms	24V DC	2,880 ohms
HAS 112	48V DC	4,000 ohms	48V DC	7,680 ohms

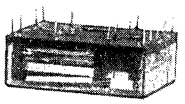
As for the resistance value, pull-in voltage and drop-out voltage, they show the value at ambient temperature, 20°C, and the tolerance is ±10%.

RATING PERFORMANCE

Specifications			Note
Coil	Nominal Voltage	5, 6, 9, 12, 24, 48 VDC	
	Nominal Power Consumption	0.56W	
	Pick-up Voltage	70% of nominal voltage	
	Drop-out Voltage	10% of nominal voltage	
Contact	Contact Arrangement	DPDT, 2 Form C	
	Contact Material	Gold-clad, Ag-Pd alloy	
	Contact Resistance	100 mΩ	at initial value
	Max. Switching Power	DC 30W/AC 60 VA	at resistive load
	Max. Switching Voltage	125 VDC/AC	
	Max. Switching Current	1.25 ADC/AC	
Time	Operate Time	Approx. 7 mS	at nominal voltage
	Release Time	Approx. 2 mS	
	Bounce Time (Operating)	0.5 to 2.0 mS	no bounce in break contact
	Bounce Time (Releasing)	1.5 to 3.5 mS	no bounce in make contact
Insulation Resistance		1000 MΩ	at 500 VAC, 25°C, 50% relative humidity
Dielectric Strength		500 VAC	1 minute is at 25°C, 50% relative humidity
Vibration Resistance		1.55 mm DA, 10 ~ 55 Hz	
Temperature Range		−25°C ~ +65°C	
Life	Mechanical Life	10 x 10^6 times	
	Electrical Life	5 x 10^5 times	at 24 VDC, 1A, resistive load
Weight		5 g	

4PDT - HAS 124 FLATPACK

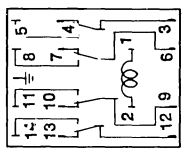




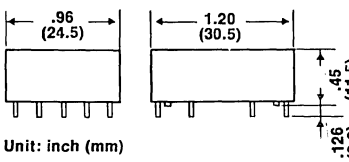
FEATURES

- Voltages - 5, 6, 12, 24 and 48.
- Bifurcated contacts.
- Fully sealed versions are in stock.
- Form D available.
- Latching available.
- Nitrogen filled.

INTERNAL CONNECTIONS

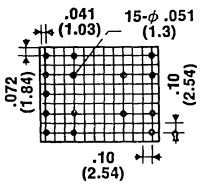


DIMENSIONS



Unit: inch (mm)

DRILLING PLAN



Relay Code	Contact Arrangement	Nom. Volt. (V)	Coil Resist. (Ω ±10%)	Nom. Curr. (mA)	Pick-Up Volt. (V)	Drop-Out Volt. (V)	Max. Volt. (V)*	Nom. Pwr (W) Cons'ption
HAS-124-5	4 PDT 4 Form C H: Sealed Add-2 for 1500V B.D.	5	52	96.2	3.5	0.5	7.0	0.48
HAS-124-6		6	85	70.6	4.2	0.6	8.4	
HAS-124-9		9	170	52.9	6.3	0.9	12.6	
HAS-124-12		12	330	36.4	8.4	1.2	16.8	
HAS-124-24		24	1200	20.0	16.8	2.4	33.6	
HAS-124-48		48	4200	11.4	33.6	4.8	67.2	

Data measured at 20°C, * measured at 40°C

RATING PERFORMANCE

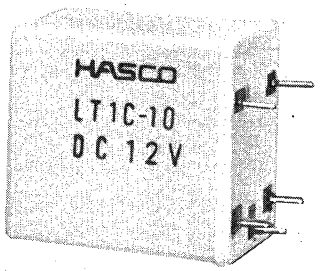
Specifications			Note
Coil	Nominal Voltage	5, 6, 9, 12, 24, 48 VDC	nominal voltage 48V
	Nominal Power Consumption	0.48W	
	Pick-up Voltage	70% of nominal voltage	
	Drop-out Voltage	10% of nominal voltage	
Contact	Contact Arrangement	4 PDT, 4 Form C	crossbar type, bifurcated contact
	Contact Material	Gold-Clad, Ag-Pd Alloy	
	Contact Resistance	100 mΩ	at initial value
	Max. Switching Power	DC 60W, AC 60 VA	at resistive load
	Max. Switching Voltage	110 VDC/AC	
	Max. Switching Current	2A DC/AC	
Time	Operate Time	Approx. 10 mS	at nominal voltage
	Release Time	Approx. 5 mS	
	Bounce Time (Operating)	0 to 3.5 mS on Operate	no bounce in break contact
	Bounce Time (Releasing)	1 to 5 mS on Release	no bounce in make contact
Insulation Resistance		1000 MΩ	at 500 VAC, 25°C, 50% relative humidity
Dielectric Strength		750 VAC	1 minute at 25°C, 50% relative humidity
Vibration Resistance		1.5 mm DA 10 ~ 55 Hz	
Temperature Range		−40°C ~ +70°C	
Life	Mechanical Life	100 x 10^6 times	
	Electrical Life	3 x 10^6 times	at 30 VDC, 1A, resistive load
Weight		15.5 g	

HASCO COMPONENTS INC.

RELAYS

LT MINIATURE POWER RELAYS SPDT 3, 5 & 10 AMP

508/TV-5
924
CSA



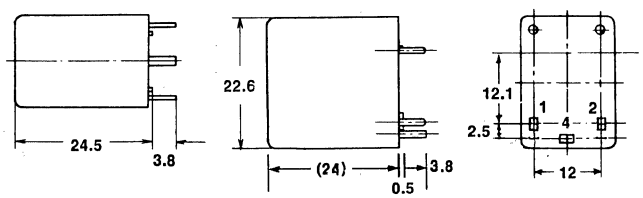
FEATURES

- Miniature, lightweight relay which requires less mounting space.
- UL 508/TV-5 available.
- High reliable relay with dielectric strength, 2000V which employs the specific construction.
- Economical and favorable price for simple construction.
- Fully sealed.

GENERAL CHARACTERISTICS

Ambient Temperature: −20 to +60°C (not to freeze).
Ambient Humidity: 45 to 85% (not to be dewy).
Operating Time: Less than 20 mS.
Release Time: Less than 20 mS.
Contact Resistance (at initial): Less than 100 milliohms at 6V DC, 1A.
Insulation Resistance: 500V DC, more than 100M Ohms.
Dielectric Strength: Between contacts: 500V AC (50/60 Hz) 1 minute — Between coil and contact; 2,000V AC (50/60 Hz) 1 minute.
Vibration: 6G (10 to 55 Hz).
Shock: 10G.
(The above mentioned values are at normal temperature and humidity.)

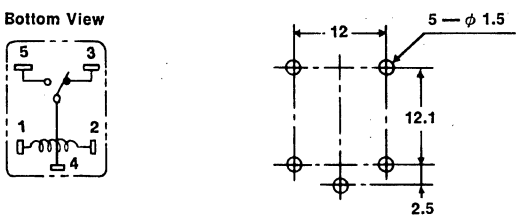
LT DIMENSIONS



CHARACTERISTICS

Power Consumption: Approx. 0.36W to approx. 0.5W.
Temperature Rise: Less than 40 deg. after applied max. continuous voltage.

CIRCUIT DIAGRAM AND MOUNTING



COIL RATINGS

Rated Voltage (V)	DC6	DC9	DC12	DC24
Rated Current (mA)	60	40	30	15
Coil Resistance (Ω)	100	225	400	1600

* Coil rated current tolerance is +15%, −20% at ambient temp. of 20°C.
* DC 5V coil rating also in stock.

MAXIMUM LOAD RATINGS

Type	Load	Voltage	AC 125V	DC 24V
3A	Resistive	($\cos\phi = 1$)	3A	3A
	Inductive	($\cos\phi = 0.4$ T = 7 ms)	1.2A	1.2A
5A	Resistive	($\cos\phi = 1$)	5A	5A
	Inductive	($\cos\phi = 0.4$ T = 7 ms)	2A	2A
10A	Resistive	($\cos\phi = 1$)	10A	10A
	Inductive	($\cos\phi = 0.4$ T = 7 ms)	4A	4A

ORDERING INFORMATION

LT — IC — 5 — XXV

IC:
C: SPDT
B: SPNC
A: SPNO

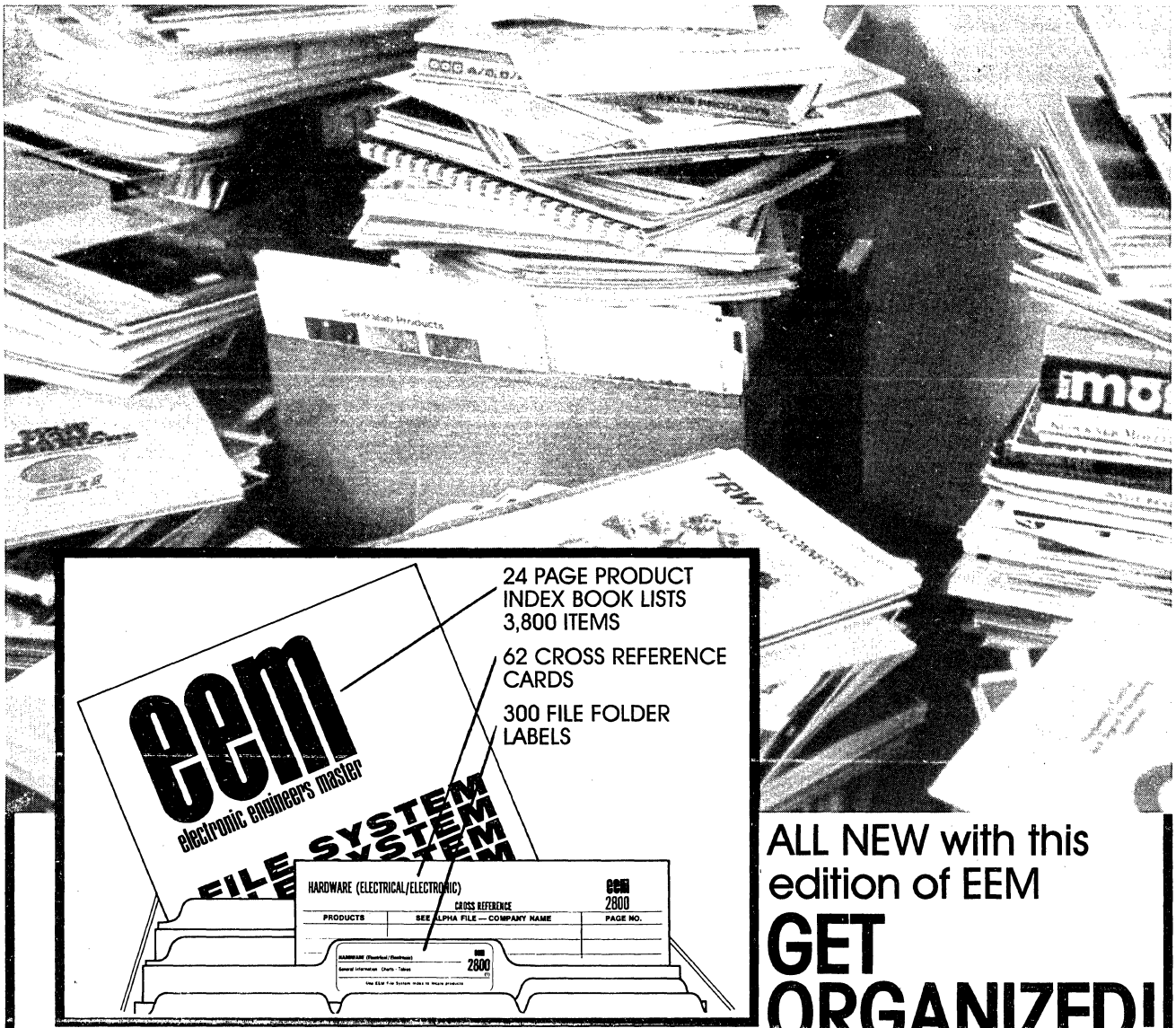
5:
3 = 3 amp
5 = 5 amp
10 = 10 amp

XXV:
5 = 5V
6 = 6V
9 = 9V
12 = 12V
24 = 24V
48 = 48V

SPECIFICATIONS

Maximum Continuous Voltage: 115% of rated voltage at 20°C.
Operating Voltage: Less than 80% of rated voltage at 20°C.
Opening Voltage: More than 10% of rated voltage at 20°C.
Coil Temperature Rise: LT 1C 3/LT 1C 5—Less than 50°C at rated voltage. LT 1C 10—Less than 60°C at rated voltage.
Initial Contact Resistance: Less than 100 mΩ (1A 6V DC).
Insulation Resistance: More than 100 MΩ (500V DC).
Dielectric Strength: Between coil and contact — AC 1500V for 1 minute. Between contacts — AC 750V for 1 minute
Electrical Life: More than 100,000 operations at rated voltage.
Mechanical Life: More than 5,000,000 operations.
Contact Material: LT 1C 3 — Gold plated over silver LT 1C 5 and LT 1C 10 — Silver alloy.
Operating Temperature: LT 1C 3/LT 1C 5 — 30°C ~ +20°C. LT 1C 10 — 30°C ~ +50°C.

* Available up to 4000V DC.



ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,

645 stewart ave., garden city, ny 11530

Hi-G Performance Miniature Relays

Hi-G Company is the leading supplier of rugged, hermetically-sealed, military-qualified relays, rated 10 amperes and under. Because all Hi-G Military Qualified relays are designed for extreme environmental conditions, they are also suited for critical commercial and computer applications.

Hi-G Relay Guide

MILITARY QUALIFIED RELAYS

Contact Rating (AMP)	Contact Arrangement	Enclosure	Sensitivity (mW)	Hi-G Series	Page Number
1	DPDT	TO-5	130	(J) MA	ii
1	SPDT	TO-5	100	(J) 1MA	iii
1	DPDT	TO-5	60	(J) MS	iv
1	SPDT	TO-5	40	(J) 1MS	v
1	DPDT	Square/.100 Grid	130	(J) MGA	vi
1	DPDT	Square/.100 Grid	60	(J) MGS	vii
2	DPDT	1/5 Xtal Can	135	(J) G	vii
2	DPDT	1/2 Xtal Can	250	(J) 2K-4730	vii
2	DPDT	1/2 Xtal Can	250	(J) 2K-4940	viii
2	DPDT	Xtal Can	250	2B-1506	viii
2	DPDT	Tall Xtal Can	40	2BC-1510	viii
10	DPDT	Xtal Can	500	2T-2911/2994	viii

SOLID STATE RELAYS

Contact Rating (AMP)	Contact Arrangement	Enclosure	Sensitivity (mW)	Hi-G Series	Page Number
50mA 40Vac or dc	SPST (N.O.)	TO-5	5.0Vdc	JTS-5	**
250mA 40Vdc	SPST (N.O.)	TO-5	5.0Vdc	JTS-6	**
100mA 250Vdc	SPST (N.O.)	TO-5	5.0Vdc	JTS-7	**

MILITARY, COMMERCIAL, AND COMPUTER GRADE RELAYS

Contact Rating (AMP)	Contact Arrangement	Enclosure	Sensitivity (mW)	Hi-G Series	Page Number
1	DPDT	TO-5	185	CA	x
1	DPDT	TO-5	90	CS	x
2	DPDT	1/2 Xtal Can	250	K	**
2	DPDT	Xtal Can	250	B, BR	**
2	4PDT	Xtal Can	400	4B	**
2	2PDT	1/2 Xtal Can	100	KA	**
2	SPDT/DPDT	Xtal Can	25/40	BK	**
2	SPDT/DPDT	Tall Xtal Can	25/40	BC	**
2	DPDT	Xtal Can	100	BA	**
4	DPDT	1/2 Xtal Can	300	HA	**
5	DPDT	Xtal Can	280	BN	**
5	DPDT	Tall Xtal Can	80	BCN	**
10	DPDT	Xtal Can	500	T	**
2	DPDT	1/2 Xtal Can	350	FS2	ix
2	DPDT	1/2 Xtal Can	150	FS3	ix
5	DPDT	1/2 Xtal Can	725	FS5	ix

RF RELAYS

Contact Rating (AMP)	Contact Arrangement	Enclosure	Sensitivity (mW)	Hi-G Series	Page Number
*	SPDT	Cube	150	RFC	**
*	DPDT	1/2 Xtal Can	250	RFK	x
*	DPDT	Xtal Can	250	RFB	**
*	DPDT	Tall Xtal Can	40	RFBC	**

*Contacts rated 75 Watts switching, 200 Watts carry.

**Descriptions of these relays are not listed here. For additional information, please contact Hi-G Company, 101 Locust St., Hartford, CT 06114 for complete miniature relay catalog. Telephone: (203) 522-8600.

HI-G RELAYS

Hi-G Military Relays

Hi-G offers the most complete selection of qualified relays, rated 10 amperes and under, of any manufacturer in the world. The following charts list the appropriate military specification, relay configuration, relay contact operating parameters, and the corresponding Hi-G part number. A (J) prefix to the Hi-G part number denotes Qualified Relay; L, M, and P suffixes denote applicable failure rate.

Series (J)MA:

TO-5 Case Relay, DPDT

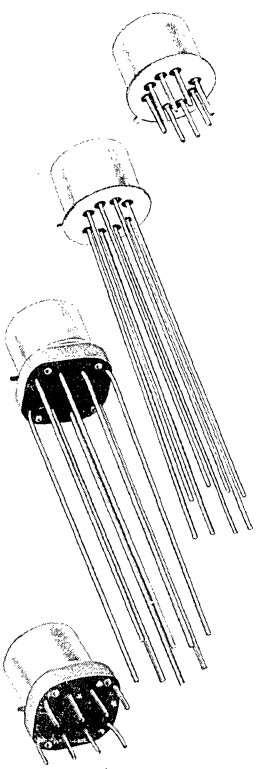
QUALIFIED:
MIL-R-39016/9
MIL-R-39016/15
MIL-R-39016/20
MIL-R-28776/1

These ultra-miniature DPDT relays in transistor-style case are available in 4 types: basic relay; with diode coil suppression (D); with two diodes for coil suppression and polarity reversal protection (DD); and with integral transistor driver and diode coil suppression (T).

Contacts: 2 Form C
Rating: 1 Amp
Sensitivity: 130 mW

RELAY TYPE	MILITARY DESIGNATION	HI-G PART NO.
	M39016/9	
	M39016/9-013L, M, P	JMAW-5XL, M, P
	-014L	-6XL
	-015L	-9XL
	-016L	-12XL
	-017L	-18XL
	-018L	-26XL
	-019L	JMAP-5XL
	-020L	-6XL
	-021L	-9XL
	-022L	-12XL
	-023L	-18XL
	-024L	-26XL
	-051L	JMAW-30XL
	-052L	JMAP-30XL
	-057L	JMAC-5XL
	-058L	-6XL
	-059L	-9XL
	-060L	-12XL
	-061L	-18XL
	-062L	-26XL
	-063L	-30XL
	-071L	JMAC-5XLS
	-072L	-6XLS
	-073L	-9XLS
	-074L	-12XLS
	-075L	-18XLS
	-076L	-26XLS
	-077L	-30XLS
	M39016/15	
	M39016/15-029L, M, P	JMAWD-6XL, M, P
	-030L	-9XL
	-031L	-12XL
	-032L	-18XL
	-033L	-26XL
	-034L	-5XL
	-035L	JMAPD-6XL
	-036L	-9XL
	-037L	-12XL
	-038L	-18XL
	-039L	-26XL
	-040L	-5XL
	-065L	JMAWDG-6XL
	-066L	-9XL
	-067L	-12XL
	-068L	-18XL
	-069L	-26XL
	-070L	-5XL
	-077L	JMACD-6XL
	-078L	-9XL
	-079L	-12XL
	-080L	-18XL
	-081L	-26XL
	-082L	-5XL
	-089L	JMACDG-6XL
	-090L	-9XL
	-091L	-12XL
	-092L	-18XL
	-093L	-26XL
	-094L	-5XL
	-101L	JMACD-6XLS
	-102L	-9XLS
	-103L	-12XLS
	-104L	-18XLS

Series (J)MA Cont'd.



RELAY TYPE	MILITARY DESIGNATION	HI-G PART NO.
	M39016/15 (cont'd.)	
	-105L	-26XLS
	-106L	-5XLS
	-113L	JMACDG-6XLS
	-114L	-9XLS
	-115L	-12XLS
	-116L	-18XLS
	-117L	-26XLS
	-118L	-5XLS
	M39016/20	
	M39016/20-007L, M, P	JMAWDD-5XL, M, P
	-008L	-6XL
	-009L	-9XL
	-010L	-12XL
	-011L	-18XL
	-012L	-26XL
	-037L	JMAPDD-5XL
	-038L	-6XL
	-039L	-9XL
	-040L	-12XL
	-041L	-18XL
	-042L	-26XL
	-049L	JMACDD-5XL
	-050L	-6XL
	-051L	-9XL
	-052L	-12XL
	-053L	-18XL
	-054L	-26XL
	-061L	JMACDD-5XLS
	-062L	-6XLS
	-063L	-9XLS
	-064L	-12XLS
	-065L	-18XLS
	-066L	-26XLS
	M28776/1	
	M28776/1-013L, M, P	JMAWT-5XL, M, P
	-014L	-6XL
	-015L	-9XL
	-016L	-12XL
	-017L	-18XL
	-018L	-26XL
	-019L	JMAPT-5XL
	-020L	-6XL
	-021L	-9XL
	-022L	-12XL
	-023L	-18XL
	-024L	-26XL
	-025L	JMACT-5XL
	-026L	-6XL
	-027L	-9XL
	-028L	-12XL
	-029L	-18XL
	-030L	-26XL
	-031L	JMACT-5XLS
	-032L	-6XLS
	-033L	-9XLS
	-034L	-12XLS
	-035L	-18XLS
	-036L	-26XLS

Series (J)1MA:

TO-5 Case Relay, SPDT

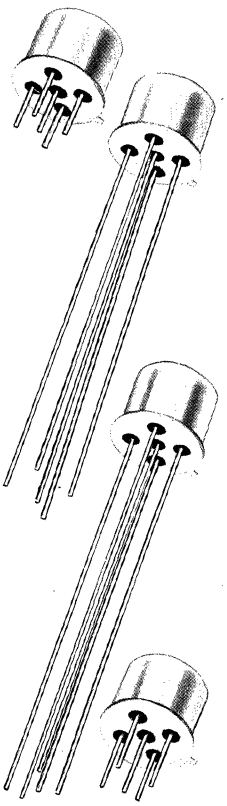
QUALIFIED:
MIL-R-39016/7
MIL-R-39016/23
MIL-R-39016/24
MIL-R-28776/5

These ultra-miniature SPDT relays in transistor-style case are available in 4 types: basic relay; with diode suppression (D); with two diodes for coil suppression and polarity reversal protection (DD); and with integral transistor driver and diode coil suppression (T).

Contacts: 1 Form C
Rating: 1 Amp
Sensitivity: 100 mW

RELAY TYPE	MILITARY DESIGNATION	HI-G PART NO.
	M39016/7	
	M39016/7-013L, M, P	J1MAW-5XL, M, P
	-014L	J1MAP-5XL
	-015L	J1MAW-6XL
	-016L	J1MAP-6XL
	-017L	J1MAW-9XL
	-018L	J1MAP-9XL
	-019L	J1MAW-12XL
	-020L	J1MAP-12XL
	-021L	J1MAW-18XL
	-022L	J1MAP-18XL
	-023L	J1MAW-26XL
	-024L	J1MAP-26XL
	-025L	J1MAC-5XL
	-026L	-6XL
	-027L	-9XL
	-028L	-12XL
	-029L	-18XL
	-030L	-26XL
	-031L	J1MAC-5XLS
	-032L	-6XLS
	-033L	-9XLS
	-034L	-12XLS
	-035L	-18XLS
	-036L	-26XLS
	M39016/23	
	M39016/23-013L, M, P	J1MAWD-5XL, M, P
	-014L	-6XL
	-015L	-9XL
	-016L	-12XL
	-017L	-18XL
	-018L	-26XL
	-019L	J1MAPD-5XL
	-020L	-6XL
	-021L	-9XL
	-022L	-12XL
	-023L	-18XL
	-024L	-26XL
	-025L	J1MACD-5XL
	-026L	-6XL
	-027L	-9XL
	-028L	-12XL
	-029L	-18XL
	-030L	-26XL
	-031L	J1MACD-5XLS
	-032L	-6XLS
	-033L	-9XLS
	-034L	-12XLS
	-035L	-18XLS
	-036L	-26XLS

Series (J)1MA Cont'd.



RELAY TYPE	MILITARY DESIGNATION	HI-G PART NO.
	M39016/24	
	M39016/24-013L, M, P	J1MAWDD-5XL, M, P
	-014L	-6XL
	-015L	-9XL
	-016L	-12XL
	-017L	-18XL
	-018L	-26XL
	-019L	J1MAPDD-5XL
	-020L	-6XL
	-021L	-9XL
	-022L	-12XL
	-023L	-18XL
	-024L	-26XL
	-025L	J1MACDD-5XL
	-026L	-6XL
	-027L	-9XL
	-028L	-12XL
	-029L	-18XL
	-030L	-26XL
	-031L	J1MACDD-5XLS
	-032L	-6XLS
	-033L	-9XLS
	-034L	-12XLS
	-035L	-18XLS
	-036L	-26XLS
	M28776/5	
	M28776/5-013L, M, P	J1MAWT-5XL, M, P
	-014L	-6XL
	-015L	-9XL
	-016L	-12XL
	-017L	-18XL
	-018L	-26XL
	-019L	J1MAPT-5XL
	-020L	-6XL
	-021L	-9XL
	-022L	-12XL
	-023L	-18XL
	-024L	-26XL
	-025L	J1MACT-5XL
	-026L	-6XL
	-027L	-9XL
	-028L	-12XL
	-029L	-18XL
	-030L	-26XL
	-031L	J1MACT-5XLS
	-032L	-6XLS
	-033L	-9XLS
	-034L	-12XLS
	-035L	-18XLS
	-036L	-26XLS

Hi-G Military Relays

RELAY TYPE

Series (J)MS:

Sensitive TO-5 Case Relay, DPDT

QUALIFIED:
MIL-R-39016/11
MIL-R-39016/16
MIL-R-39016/21
MIL-R-28776/3

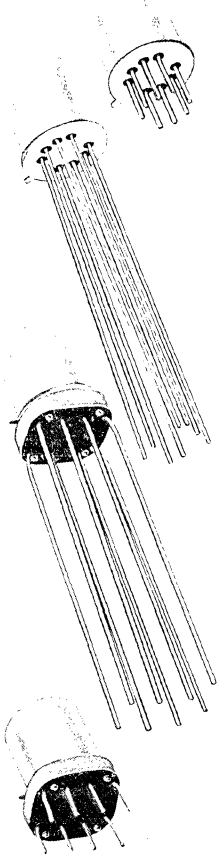
These sensitive ultra-miniature DPDT relays in transistor-style case are available in 4 types: basic relay; with diode suppression (D); with two diodes for coil suppression and polarity-reversal protection (DD); and with integral transistor driver and diode coil suppression (T).

Contacts: 2 Form C
Rating: 1 Amp
Sensitivity: 60 mW

MILITARY DESIGNATION	HI-G PART NO.
M39016/11	
M39016/11-017L, M, P	JMSW-5XL, M, P
-018L	JMSP-5XL
-019L	JMSW-6XL
-020L	JMSP-6XL
-021L	JMSW-12XL
-022L	JMSP-12XL
-023L	JMSW-26XL
-024L	JMSP-26XL
-025L	JMSW-36XL
-026L	JMSP-36XL
-027L	JMSW-48XL
-028L	JMSP-48XL
-029L	JMSW-9XL
-030L	JMSP-9XL
-031L	JMSW-18XL
-032L	JMSP-18XL
-033L	JMSC-5XL
-034L	-6XL
-035L	-12XL
-036L	-26XL
-037L	-36XL
-038L	-48XL
-039L	-9XL
-040L	-18XL
-041L	JMSC-5XLS
-042L	-6XLS
-043L	-12XLS
-044L	-26XLS
-045L	-36XLS
-046L	-48XLS
-047L	-9XLS
-048L	-18XLS
M39016/16	
M39016/16-017L, M, P	JMSWD-5XL, M, P
-018L	-6XL
-019L	-12XL
-020L	-26XL
-021L	-36XL
-022L	-48XL
-023L	-9XL
-024L	-18XL
-025L	JMSPD-5XL
-026L	-6XL
-027L	-12XL
-028L	-26XL
-029L	-36XL
-030L	-48XL
-031L	-9XL
-032L	-18XL
-033L	JMSCD-5XL
-034L	-6XL
-035L	-12XL
-036L	-26XL
-037L	-36XL
-038L	-48XL
-039L	-9XL
-040L	-18XL
-041L	JMSCD-5XLS
-042L	-6XLS
-043L	-12XLS
-044L	-26XLS
-045L	-36XLS
-046L	-48XLS
-047L	-9XLS
-048L	-18XLS

RELAY TYPE

Series (J)MS
Cont'd.



MILITARY DESIGNATION	HI-G PART NO.
M39016/21	
M39016/21-007L, M, P	JMSWDD-5XL, M, P
-008L	-6XL
-009L	-9XL
-010L	-12XL
-011L	-18XL
-012L	-26XL
-019L	JMSPDD-5XL
-020L	-6XL
-021L	-9XL
-022L	-12XL
-023L	-18XL
-024L	-26XL
-029L	JMSWDD-36XL
-030L	-48XL
-031L	JMSPDD-36XL
-032L	-48XL
-033L	JMSCDD-5XL
-034L	-6XL
-035L	-9XL
-036L	-12XL
-037L	-18XL
-038L	-26XL
-039L	-36XL
-040L	-48XL
-041L	JMSCDD-5XLS
-042L	-6XLS
-043L	-9XLS
-044L	-12XLS
-045L	-18XLS
-046L	-26XLS
-047L	-36XLS
-048L	-48XLS
M28776/3	
M28776/3-017L, M, P	JMSWT-5XL, M, P
-018L	-6XL
-019L	-9XL
-020L	-12XL
-021L	-18XL
-022L	-26XL
-023L	-36XL
-024L	-48XL
-025L	JMSPT-5XL
-026L	-6XL
-027L	-9XL
-028L	-12XL
-029L	-18XL
-030L	-26XL
-031L	-36XL
-032L	-48XL
-033L	JMSCT-5XL
-034L	-6XL
-035L	-9XL
-036L	-12XL
-037L	-18XL
-038L	-26XL
-039L	-36XL
-040L	-48XL
-041L	JMSCT-5XLS
-042L	-6XLS
-043L	-9XLS
-044L	-12XLS
-045L	-18XLS
-046L	-26XLS
-047L	-36XLS
-048L	-48XLS

Hi-G Military Relays

Series (J)1MS:
Sensitive TO-5 Case Relay, SPDT

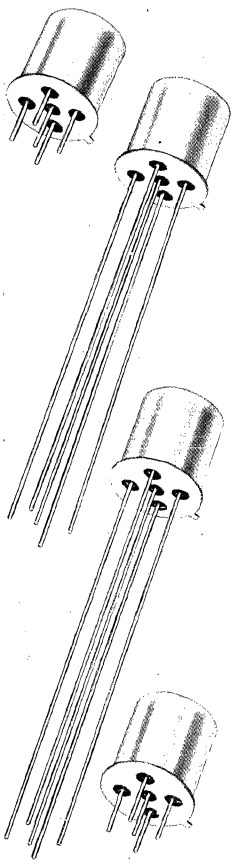
QUALIFIED:
MIL-R-39016/10
MIL-R-39016/25
MIL-R-39016/26
MIL-R-28776/4

These sensitive ultra-miniature SPDT relays in transistor-style case are available in 4 types: basic relay; with diode coil suppression (D); with two diodes for coil suppression and polarity reversal protection (DD); with integral transistor driver and coil suppression (T).

Contacts: 1 Form C
Rating: 1 Amp
Sensitivity: 40 mW

Hi-G Military Relays

RELAY TYPE	MILITARY DESIGNATION	HI-G PART NO.
	M39016/10	
Series (J)1MS:	M39016/10-017L, M, P	J1MSW-5XL, M, P
Sensitive TO-5 Case Relay, SPDT	-018L	J1MSP-5XL
	-019L	J1MSW-6XL
	-020L	J1MSP-6XL
	-021L	J1MSW-12XL
	-022L	J1MSP-12XL
	-023L	J1MSW-26XL
	-024L	J1MSP-26XL
	-025L	J1MSW-32XL
	-026L	J1MSP-32XL
	-027L	J1MSW-40XL
	-028L	J1MSP-40XL
	-029L	J1MSW-9XL
	-030L	J1MSP-9XL
	-031L	J1MSW-18XL
	-032L	J1MSP-18XL
	-033L	J1MSC-5XL
	-034L	-6XL
	-035L	-12XL
	-036L	-26XL
	-037L	-32XL
	-038L	-40XL
	-039L	-9XL
	-040L	-18XL
	-041L	J1MSC-5XLS
	-042L	-6XLS
	-043L	-12XLS
	-044L	-26XLS
	-045L	-32XLS
	-046L	-40XLS
	-047L	-9XLS
	-048L	-18XLS
	M39016/25	
	M39016/25-017L, M, P	J1MSWD-5XL, M, P
	-018L	-6XL
	-019L	-12XL
	-020L	-26XL
	-021L	-32XL
	-022L	-40XL
	-023L	-9XL
	-024L	-18XL
	-025L	J1MSPD-5XL
	-026L	-6XL
	-027L	-12XL
	-028L	-26XL
	-029L	-32XL
	-030L	-40XL
	-031L	-9XL
	-032L	-18XL
	-033L	J1MSCD-5XL
	-034L	-6XL
	-035L	-12XL
	-036L	-26XL
	-037L	-32XL
	-038L	-40XL
	-039L	-9XL
	-040L	-18XL
	-041L	J1MSCD-5XLS
	-042L	-6XLS
	-043L	-12XLS
	-044L	-26XLS
	-045L	-32XLS
	-046L	-40XLS
	-047L	-9XLS
	-048L	-18XLS

RELAY TYPE	MILITARY DESIGNATION	HI-G PART NO.
Series (J)1MS Cont'd.	**M39016/26**	
	M39016/26-017L, M, P	J1MSWDD-5XL, M, P
	-018L	-6XL
	-019L	-12XL
	-020L	-26XL
	-021L	-32XL
	-022L	-40XL
	-023L	-9XL
	-024L	-18XL
	-025L	J1MSPDD-5XL
	-026L	-6XL
	-027L	-12XL
	-028L	-26XL
	-029L	-32XL
	-030L	-40XL
	-031L	-9XL
	-032L	-18XL
	-033L	J1MSCDD-5XL
	-034L	-6XL
	-035L	-12XL
	-036L	-26XL
	-037L	-32XL
	-038L	-40XL
	-039L	-9XL
	-040L	-18XL
	-041L	J1MSCDD-5XLS
	-042L	-6XLS
	-043L	-12XLS
	-044L	-26XLS
	-045L	-32XLS
	-046L	-40XLS
	-047L	-9XLS
	-048L	-18XLS
	M28776/4	
	M28776/4-017L, M, P	J1MSWT-5XL, M, P
	-018L	-6XL
	-019L	-9XL
	-020L	-12XL
	-021L	-18XL
	-022L	-26XL
	-023L	-32XL
	-024L	-40XL
	-025L	J1MSPT-5XL
	-026L	-6XL
	-027L	-9XL
	-028L	-12XL
	-029L	-18XL
	-030L	-26XL
	-031L	-32XL
	-032L	-40XL
	-033L	J1MSCT-5XL
	-034L	-6XL
	-035L	-9XL
	-036L	-12XL
	-037L	-18XL
	-038L	-26XL
	-039L	-32XL
	-040L	-40XL
	-041L	J1MSCT-5XLS
	-042L	-6XLS
	-043L	-9XLS
	-044L	-12XLS
	-045L	-18XLS
	-046L	-26XLS
	-047L	-32XLS
	-048L	-40XLS

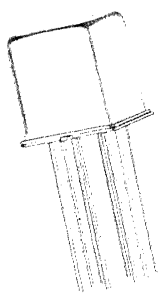
Series (J)MGA:

MINIGRID™ Relay, DPDT

QUALIFIED:
MIL-R-39016/17
MIL-R-39016/18
MIL-R-39016/19

These ultra-miniature DPDT relays are hermetically sealed with .100 inch grid space terminals. These relays are available in 3 types: basic relay; with diode suppression (D); and with two diodes for coil suppression and polarity reversal protection (DD).

Contacts: 2 Form C
Rating: 1 Amp
Sensitivity: 130 mW



RELAY TYPE	MILITARY DESIGNATION	HI-G PART NO.
	M39016/17	
	M39016/17-025L, M, P	JMGAP-5L, M, P
	-026L	-6L
	-027L	-9L
	-028L	-12L
	-029L	-18L
	-030L	-26L
	-031L	JMGAC-5L
	-032L	-6L
	-033L	-9L
	-034L	-12L
	-035L	-18L
	-036L	-26L
	-037L	JMGAC-5LW
	-038L	-6LW
	-039L	-9LW
	-040L	-12LW
	-041L	-18LW
	-042L	-26LW
	M39016/18	
	M39016/18-025L, M, P	JMGAPD-5L, M, P
	-026L	-6L
	-027L	-9L
	-028L	-12L
	-029L	-18L
	-030L	-26L
	-031L	JMGACD-5L
	-032L	-6L
	-033L	-9L
	-034L	-12L
	-035L	-18L
	-036L	-26L
	-037L	JMGACD-5LW
	-038L	-6LW
	-039L	-9LW
	-040L	-12LW
	-041L	-18LW
	-042L	-26LW
	M39016/19	
	M39016/19-025L, M, P	JMGAPDD-5L, M, P
	-026L	-6L
	-027L	-9L
	-028L	-12L
	-029L	-18L
	-030L	-26L
	-031L	JMGACDD-5L
	-032L	-6L
	-033L	-9L
	-034L	-12L
	-035L	-18L
	-036L	-26L
	-037L	JMGACDD-5LW
	-038L	-6LW
	-039L	-9LW
	-040L	-12LW
	-041L	-18LW
	-042L	-26LW

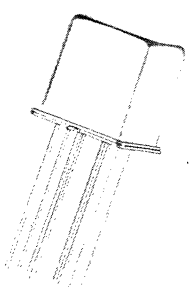
Series (J)MGS:

Sensitive MINIGRID™ Relay, DPDT

QUALIFIED:
MIL-R-39016/41
MIL-R-39016/42
MIL-R-39016/43

These sensitive ultra-miniature DPDT relays, in hermetically-sealed cans with .100 inch grid spaced terminals, are available in 3 types: basic relay; single-diode suppression (D); and with two diodes for coil suppression and polarity reversal protection (DD).

Contacts: 2 Form C
Rating: 1 Amp
Sensitivity: 60 mW



RELAY TYPE	MILITARY DESIGNATION	HI-G PART NO.
	M39016/41	
	M39016/41-033L, M, P	JMGSC-5L, M, P
	-034L	-6L
	-035L	-12L
	-036L	-26L
	-037L	-36L
	-038L	-48L
	-039L	-9L
	-040L	-18L
	-041L	JMGSP-5L
	-042L	-6L
	-043L	-12L
	-044L	-26L
	-045L	-36L
	-046L	-48L
	-047L	-9L
	-048L	-18L
	-049L	JMGSC-5LW
	-050L	-6LW
	-051L	-12LW
	-052L	-26LW
	-053L	-36LW
	-054L	-48LW
	-055L	-9LW
	-056L	-18LW
	M39016/42	
	M39016/42-033L, M, P	JMGSCD-5L, M, P
	-034L	-6L
	-035L	-12L
	-036L	-26L
	-037L	-36L
	-038L	-48L
	-039L	-9L
	-040L	-18L
	-041L	JMGSPD-5L
	-042L	-6L
	-043L	-12L
	-044L	-26L
	-045L	-36L
	-046L	-48L
	-047L	-9L
	-048L	-18L
	-049L	JMGSCD-5LW
	-050L	-6LW
	-051L	-12LW
	-052L	-26LW
	-053L	-36LW
	-054L	-48LW
	-055L	-9LW
	-056L	-18LW
	M39016/43	
	M39016/43-033L, M, P	JMGSCDD-5L, M, P
	-034L	-6L
	-035L	-9L
	-036L	-12L
	-037L	-18L
	-038L	-26L
	-039L	-36L
	-040L	-48L
	-041L	JMGSPDD-5L
	-042L	-6L
	-043L	-9L
	-044L	-12L
	-045L	-18L
	-046L	-26L
	-047L	-36L
	-048L	-48L
	-049L	JMGSCDD-5LW
	-050L	-6LW
	-051L	-9LW
	-052L	-12LW
	-053L	-18LW
	-054L	-26LW
	-055L	-36LW
	-056L	-48LW

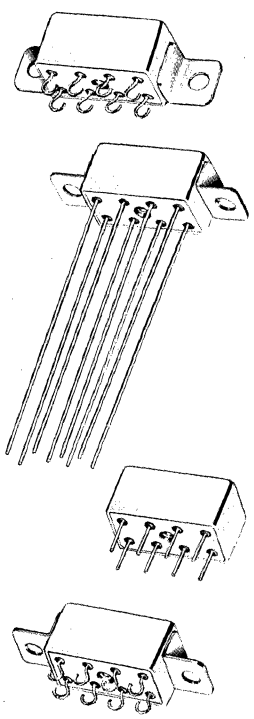
Hi-G Military Relays

Series G:
1/5 Crystal Can Relay

QUALIFIED:
MIL-R-39016/13

These 2-ampere, .150 grid, low-profile DPDT relays allow maximum packaging density under extreme environmental conditions. Relays are available in three terminal styles and in three enclosures.

Contacts: 2 Form C
Rating: 2 Amp
Sensitivity: 135 mW



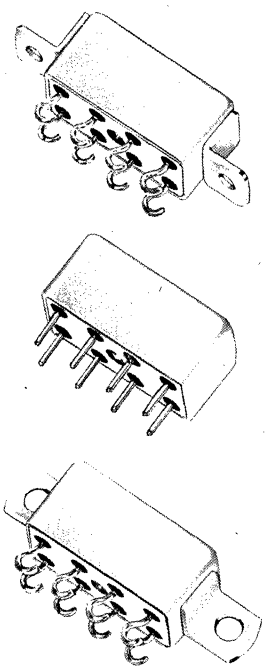
RELAY TYPE	MILITARY DESIGNATION	HI-G PART NO.
	M39016/13	
	M39016/13-055L, M, P	J2G-4650-55L, M, P
	-056L	-56L
	-057L	-57L
	-058L	-58L
	-059L	-59L
	-060L	-60L
	-061L	-61L
	-062L	-62L
	-063L	-63L
	-064L	-64L
	-065L	-65L
	-066L	-66L
	-067L	-67L
	-068L	-68L
	-069L	-69L
	-070L	-70L
	-071L	-71L
	-072L	-72L
	-073L	-73L
	-074L	-74L
	-075L	-75L
	-076L	-76L
	-077L	-77L
	-078L	-78L
	-079L	-79L
	-080L	-80L
	-081L	-81L
	-082L	-82L
	-083L	-83L
	-084L	-84L
	-085L	-85L
	-086L	-86L
	-087L	-87L
	-088L	-88L
	-089L	-89L
	-090L	-90L
	-091L	-91L
	-092L	-92L
	-093L	-93L
	-094L	-94L
	-095L	-95L
	-096L	-96L
	-097L	-97L
	-098L	-98L
	-099L	-99L
	-100L	-100L
	-101L	-101L
	-102L	-102L
	-103L	-103L
	-104L	-104L
	-105L	-105L
	-106L	-106L
	-107L	-107L
	-108L	-108L
	-109L	-109L
	-110L	-110L
	-111L	-111L
	-112L	-112L
	-113L	-113L
	-114L	-114L
	-115L	-115L
	-116L	-116L
	-117L	-117L

Series (J)2K-4730:
1/2 Crystal Can Relay

QUALIFIED:
MIL-R-39016/6

This 1/2 size crystal can DPDT relay is available with solder lug, wire leads and pins for printed circuit board mounting. Four mounting styles are available.

Contacts: 2 Form C
Rating: 2 Amp
Sensitivity: 250 mW



RELAY TYPE	MILITARY DESIGNATION	HI-G PART NO.
	M39016/6	
	M39016/6-104L, M, P	J2K-4730-104L, M, P
	-105L	-105L
	-106L	-106L
	-107L	-107L
	-108L	-108L
	-109L	-109L
	-110L	-110L
	-111L	-111L
	-112L	-112L
	-113L	-113L
	-114L	-114L
	-115L	-115L
	-116L	-116L
	-117L	-117L
	-118L	-118L
	-119L	-119L
	-120L	-120L
	-121L	-121L
	-122L	-122L
	-123L	-123L
	-124L	-124L
	-125L	-125L
	-126L	-126L
	-127L	-127L
	-128L	-128L
	-129L	-129L
	-130L	-130L
	-131L	-131L
	-132L	-132L
	-133L	-133L
	-134L	-134L
	-135L	-135L
	-136L	-136L
	-137L	-137L
	-138L	-138L
	-139L	-139L
	-140L	-140L
	-204L	-204L
	-205L	-205L
	-206L	-206L
	-207L	-207L
	-208L	-208L
	-209L	-209L
	-210L	-210L
	-211L	-211L
	-212L	-212L
	-213L	-213L
	-214L	-214L
	-215L	-215L
	-216L	-216L
	-217L	-217L
	-218L	-218L
	-219L	-219L
	-220L	-220L
	-221L	-221L
	-222L	-222L
	-223L	-223L
	-224L	-224L
	-225L	-225L
	-226L	-226L
	-227L	-227L
	-228L	-228L
	-229L	-229L
	-230L	-230L
	-231L	-231L
	-232L	-232L
	-233L	-233L
	-234L	-234L
	-235L	-235L
	-236L	-236L
	-237L	-237L
	-238L	-238L
	-239L	-239L
	-240L	-240L

Hi-G Military Relays

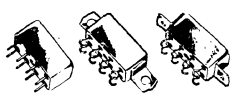
Series (J)2K-4940:

1/2 Crystal Can Relay
Coil Transient Suppressed

QUALIFIED:
MIL-R-39016/22

These DPDT transient suppressed relays are available with solder lugs, wire leads or pins for printed circuit board mounting. Three mounting styles are available.

Contacts: 2 Form C
Rating: 2 Amp
Sensitivity: 250 mW



MILITARY DESIGNATION	HI-G PART NO.
M39016/22'	
M39016/22-004L, M, P	J2K-4940-004L, M, P
-005L	-005L
-006L	-006L
-007L	-007L
-008L	-008L
-009L	-009L
-010L	-010L
-011L	-011L
-012L	-012L
-013L	-013L
-014L	-014L
-015L	-015L
-016L	-016L
-017L	-017L
-018L	-018L
-019L	-019L
-020L	-020L
-021L	-021L
-022L	-022L
-023L	-023L
-024L	-024L

Series 2B-1506:

Crystal Can Relay

QUALIFIED:
MIL-R-5757/10

These full size crystal can DPDT relays are available with solder lugs, wire leads or pins for printed circuit board mounting. Five mounting styles are available.

Contacts: 2 Form C
Rating: 2 Amp
Sensitivity: 250 mW

MILITARY DESIGNATION	HI-G PART NO.
M5757/10	
M5757/10-015	2B-1506-15
-016	-16
-022	-22
-035	-35
-036	-36
-037	-37
-038	-38
-039	-39
-040	-40
-043	-43
-044	-44
-052	-52
-053	-53
-054	-54
-056	-56

Series 2BC-1510:

Sensitive Crystal Can Relay

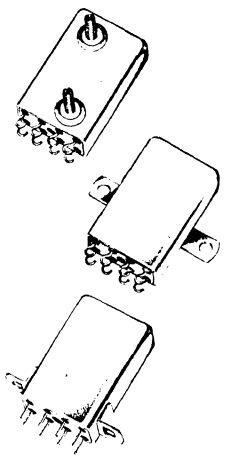
QUALIFIED:
MIL-R-5757/13

These sensitive full size crystal can DPDT relays are available with solder lugs, wire leads and pins for printed circuit board mounting. Four mounting styles are available.

Contacts: 2 Form C
Rating: 2 Amp
Sensitivity: 40 mW

MILITARY DESIGNATION	HI-G PART NO.
M5757/13	
M5757/13-011	2BC-1510-11
-012	-12
-013	-13
-014	-14
-015	-15
-016	-16
-017	-17
-018	-18
-019	-19
-020	-20
-031	-31
-032	-32
-033	-33
-034	-34
-035	-35
-036	-36
-037	-37
-038	-38
-039	-39
-040	-40
-041	-41
-042	-42
-043	-43
-044	-44
-045	-45

Series 2BC-1510
Cont'd.



MILITARY DESIGNATION	HI-G PART NO.
M5757/13 (cont'd.)	
-046	-46
-047	-47
-048	-48
-049	-49
-050	-50
-051	-51
-052	-52
-053	-53
-054	-54
-055	-55
-056	-56
-057	-57
-058	-58
-059	-59
-060	-60
-061	-61
-062	-62
-063	-63
-064	-64
-065	-65
-066	-66
-067	-67
-068	-68
-069	-69
-070	-70
-072	-72
-073	-73
-074	-74
-075	-75
-076	-76
-077	-77
-078	-78
-079	-79
-080	-80
-081	-81

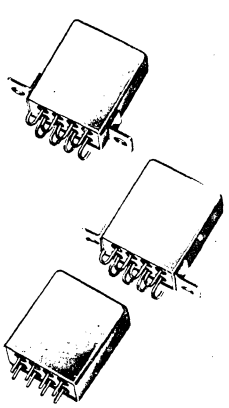
Series 2T-2911 and 2T-2994:

10 Amp Crystal Can Relay

QUALIFIED:
MIL-R-5757/23
MIL-R-5757/28

This 10-ampere full size crystal can DPDT relay is available with plug-in pins and solder lug terminals. Three mounting styles are available.

Contacts: 2 Form C
Rating: 10 Amp
Sensitivity: 500 mW



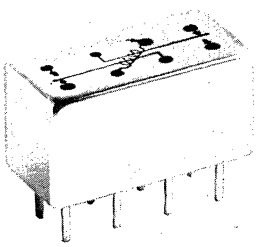
MILITARY DESIGNATION	HI-G PART NO.
M5757/23	
M5757/23-001	2T-2911-1
-002	-2
-003	-3
-004	-4
-005	-5
-006	-6
-007	-7
-008	-8
-009	-9
-010	-10
-011	-11
-012	-12
-013	-13
-014	-14
-015	-15
-016	-16
-017	-17
-018	-18
-019	-19
-020	-20
-026	-26
-027	-27
-028	-28
-029	-29
-030	-30
-031	-31
-032	-32
-033	-33
-034	-34
-036	-36
-037	-37
-038	-38
-039	-39
-040	-40
-041	-41
-042	-42
M5757/28	
M5757/28-001	2T-2994-1

Hi-G Commercial and Computer Relays

The advantages of the hermetically-sealed relay are also available for commercial and computer applications. These versatile, high-quality relays operate reliably under extreme environmental conditions, because they incorporate military design technology.

Series FS2:
Flagship™ 2-Ampere Relay

Versatile hermetically-sealed commercial DPDT relay, with 2 form C contacts, switches up to 60 W/100 VA, 2 amperes, maximum. Sensitivity is 350 mW.



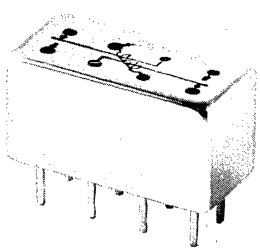
Operate Time: 4 ms max. at nominal coil voltage at 25°C.
Release Time: 4 ms max. at nominal coil voltage at 25°C.
Capacitance: Between contacts 2.5 pF.
Dielectric Strength: Between all other mutually insulated points 500 Vrms.
Insulation Resistance: 500 Megohms min.

COILS
Resistance: Standard available to 3500 ohms. Standard tolerance ±10%. Other resistances and tolerances available.
Operate Power: 350 milliwatts at 25°C.
Nominal Power Consumption: 660 milliwatts at 25°C.

VOLTAGE CODE	105	106	112	124	136	148
NOMINAL COIL VOLTAGE	5	6	12	24	36	48
MAX. CONTINUOUS VOLTAGE	6	7	14	29	43	57
PICK-UP VOLTAGE (MAX.)	3.7	4.4	8.7	17.5	26.0	35.0
DROP-OUT VOLTAGE (MIN.)	0.3	0.3	0.7	1.4	2.2	2.9
COIL RESISTANCE (OHMS)	39	55	220	870	1960	3480

Series FS3:
Flagship™ Sensitive 2-Amp Relay

This sensitive 150 mW hermetically-sealed DPDT relay has 2 form C contacts and switches up to 60 W/100 VA at 2 amperes, maximum.



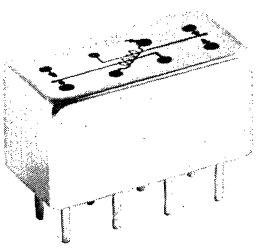
Operate Time: 6 ms max. at nominal coil voltage at 25°C.
Release Time: 4 ms max. at nominal coil voltage at 25°C.
Capacitance: Between contacts 2.5 pF.
Dielectric Strength: Between all other mutually insulated points 500 Vrms.
Insulation Resistance: 500 Megohms min.

COILS
Resistance: Standard available to 8300 ohms. Standard tolerance ±10%. Other resistances and tolerances available.
Operate Power: 350 milliwatts at 25°C.
Nominal Power Consumption: 280 milliwatts at 25°C.

VOLTAGE CODE	105	106	112	124	136	148
NOMINAL COIL VOLTAGE	5	6	12	24	36	48
MAX. CONTINUOUS VOLTAGE	6	7	14	29	43	57
PICK-UP VOLTAGE (MAX.)	3.7	4.4	8.7	17.5	26.0	35.0
DROP-OUT VOLTAGE (MIN.)	0.25	0.3	0.7	1.4	2.2	2.9
COIL RESISTANCE (OHMS)	90	130	520	2070	4550	8300

Series FS5:
Flagship™ 5-Ampere Relay

This 5-ampere DPDT relay has 2 form C contacts and switches up to 150 W/300 VA, 5 amperes, maximum. Sensitivity is 725 mW.



Operate Time: 5 ms max. at nominal coil voltage at 25°C.
Release Time: 3 ms max. at nominal coil voltage at 25°C.
Capacitance: Between contacts 2.5 pF.
Dielectric Strength: Between all other mutually insulated points 500 Vrms.
Insulation Resistance: 500 Megohms min.

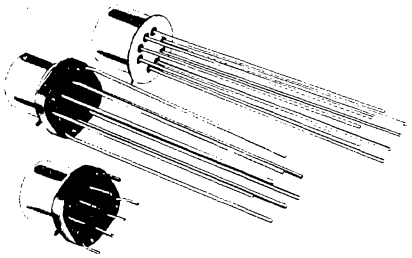
COILS
Resistance: Standard available to 1600 ohms. Standard tolerance ±10%. Other resistances and tolerances available.
Operate Power: 725 milliwatts at 25°C.
Nominal Power Consumption: 1.4 Watts at 25°C.

VOLTAGE CODE	105	106	112	124	136	148
NOMINAL COIL VOLTAGE	5	6	12	24	36	48
MAX. CONTINUOUS VOLTAGE	6	7	14	29	43	57
PICK-UP VOLTAGE (MAX.)	3.6	4.3	8.5	17.0	26.0	34.0
DROP-OUT VOLTAGE (MIN.)	0.25	0.3	0.7	1.4	2.2	2.8
COIL RESISTANCE (OHMS)	18	25	100	400	900	1600

RELAY TYPE	GENERAL CHARACTERISTICS	ELECTRICAL CHARACTERISTICS

Series CA:
Commercial TO-5 Case Relay

These sensitive 185 mW 1-ampere TO-5 case DPDT relays, with 2 form C contacts, are available in 3 types: basic relay; with coil-suppression diode (D); and with integral transistor driver and coil-suppression diode (T).



Coil Data: Standard coil resistance available to 1,560 ohms. Design tolerance ±10%.

Contact Resistance: 200 milliohms max., initial.

Operate Time: 4.0 milliseconds max.

Release Time: 3.0 milliseconds max. basic. 6.0 milliseconds max. suppressed. 6.0 milliseconds max. transistor.

Dielectric Strength: 350 Vrms, 60 Hz, all points at sea level except between transistor terminals.

Insulation Resistance: 1,000 megohms min., all points at 500 Vdc.

Contact Capacitance: 0.7 pF typical, between contacts.

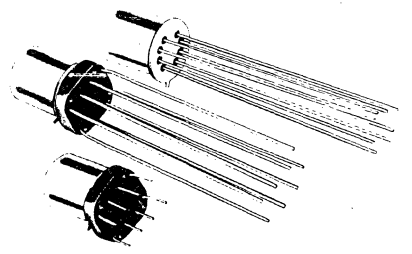
Series: CAW, CAWD, CAWT

Coil Voltage Code	Nominal Coil Voltage (Vdc)	Coil Resistance (ohms) ±10% @25°C	Pick-Up† (Vdc) Max. @25°C	Base Current to†† Turn-on (mAdc) (CAWT only)
-5	5	50	3.6	3.0
-6	6	100	4.2	2.04
-9	9	200	6.5	1.36
-12	12	390	8.4	1.03
-18	18	880	13.0	0.68
-26	26	1560	17.0	0.50

†CAWT — Not Applicable
††Limit Base/Emitter Current to 50 mA max.

Series CS:
Commercial Sensitive TO-5 Case Relay

These ultrasensitive 90 mW 1-ampere DPDT transistor-case relays, with 2 form C contacts, are available in 3 types: basic relay; with coil-suppression diode (D); and with integral transistor driver and coil-suppression diode (T).



Coil Data: Standard coil resistance available to 11,000 ohms. Design tolerance ±10%.

Contact Resistance: 200 milliohms max., initial.

Operate Time: 6.0 milliseconds max.

Release Time: 3.0 milliseconds max. basic. 7.5 milliseconds max. suppressed. 7.5 milliseconds max. transistor.

Dielectric Strength: 250 Vrms, 60 Hz, all points at sea level except between transistor terminals.

Insulation Resistance: 1,000 megohms min., all points at 500 Vdc.

Contact Capacitance: 0.7 pF typical, between contacts.

Series: CSW, CSWD, CSWT

Coil Voltage Code	Nominal Coil Voltage (Vdc)	Coil Resistance (ohms) ±10% @25°C	Pick-Up† (Vdc) Max. @25°C	Base Current to†† Turn-on (mAdc) (CSWT only)
-5	5.0	100	3.6	1.5
-6	6.0	200	4.2	1.00
-9	9.0	400	6.5	0.75
-12	12.0	850	8.4	0.47
-18	18.0	1600	13.0	0.36
-26	26.5	3300	17.0	0.24
-36	36.0	6500	24.0	†††
-48	48.0	11000	32.0	†††

†CSWT — Not Applicable
††Limit Base/Emitter Current to 50 mA max.
†††Consult Factory

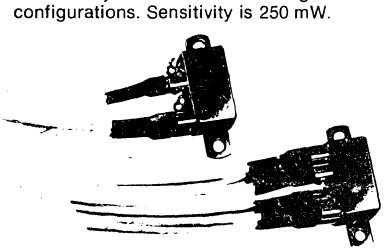
Hi-G Radio Frequency Relays

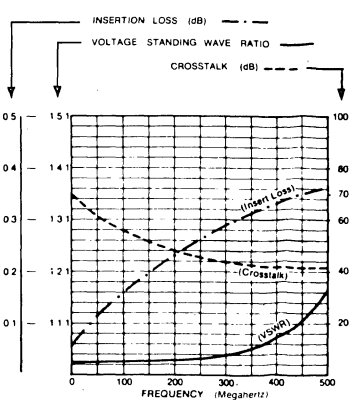
Coaxially terminated and hermetically sealed, these 0-500 MHz relays incorporate a relay design to provide reliable switching functions in the most demanding RF applications. Thousands of testing hours and millions of field operations assure the highest degree of reliability. Two-pole devices are available with either one or both sets of poles cabled. When only one set of poles is cabled, the other set is available for use with pin or hook termination.

RELAY TYPE	OPERATING CHARACTERISTICS	ELECTRICAL CHARACTERISTICS

Series RFK:
75 Watt 1/2 Crystal Can RF Relay

Coaxially-terminated, hermetically-sealed 0 to 500 MHz relays can carry 200 RF watts with low-level to 2 amperes auxiliary switching capability. These relays are available with two terminal styles and three mounting configurations. Sensitivity is 250 mW.





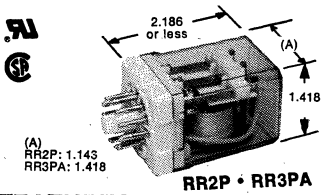
NOTE: Values shown are in a 50 ohm impedance coaxial system.

Voltage Code	106	112	126
Nominal Coil Voltage	6	12	26.5
Max. Continuous Coil Voltage	7.2	14.4	32.0
Max. Pick-up Voltage @ +25°C	3.3	6.5	13.5
Min. Drop-out Voltage @ +25°C	0.3	0.7	1.5
Effective DC Coil Resistance @ +25°C ohms	40	150	675

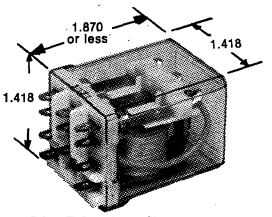
GENERAL PURPOSE RELAY/SOCKETS

RR SERIES

POWER TYPE LARGE CAPACITY-10A 1, 2, AND 3 POLES



RR2P • RR3PA



RR1BA • RR2BA • RR3B

FEATURES

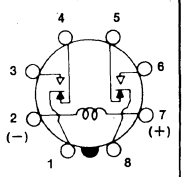
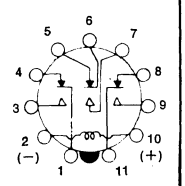
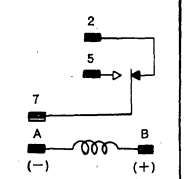
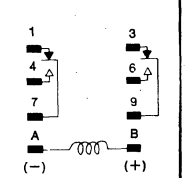
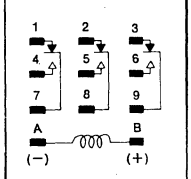
- Contact mechanism secured directly to molded resin base, eliminates intermediate plate.
- Simple construction.
- UL recognized and CSA certified.
- Available with check button for test operation and indicator lights.
- Complete line of sockets and socket accessories available for flexible application.

SPECIFICATIONS

Contact Material: Silver (AG)
Contact Resistance: 30mΩ maximum (initial value)
Operate Time: 25ms maximum
Release Time: 25ms maximum
Power Consumption: AC: Approx. 3VA (50Hz), 2.5VA (60Hz); DC: Approx. 1.5W
Insulation Resistance: 100MΩ minimum (measured w/500 DC megger)
Dielectric Strength:
Pin Type (RR2P, RR3PA)
Bet. live and non-live parts: 1,500V AC, 1 minute
Bet. contact circuits and operating coil: 1,500V AC, 1 minute
Bet. contact circuits: 1,500V AC, 1 minute
(1,000V AC bet. NO-NC contacts)
Blade Type (RR1BA, RR2BA, RR3B)
Bet. live and non-live parts: 2,000V AC, 1 minute
Bet. contact circuit and operating coil: 2,000V AC, 1 minute
Bet. contact circuits: 2,000V AC, 1 minute
Bet. contacts of same polarity: 1,000V AC, 1 minute
Frequency Response: 1,800 operations/hour
Temperature Rise: Coil: 153°F (85°C) max. Contact: 117°F (65°C) max.
Vibration Resistance: 0 to 6g (55Hz maximum)
Shock Resistance: 10g minimum
Life Expectancy:
Electrical: Over 500,000 operations (120V, 50/60Hz, 10A)
Mechanical: Over 10,000,000 operations
Operating Temperature: −22°F to +158°F (−30°C to +70°C)

TYPES OF RR SERIES

Terminal Style	Contact Config.	Basic Type	with Indicator Light	with Check Button
P,PA (Pin)	DPDT 3PDT	RR2P-U RR3PA-U	RR2P-UL RR3PA-UL	RR2P-UC RR3P-UC
B,BA (Blade)	SPDT DPDT 3PDT	RR1BA-U RR2BA-U RR3B-U	RR1BA-UL RR2BA-UL RR3B-UL	RR1BA-UC RR2BA-UC RR3B-UC

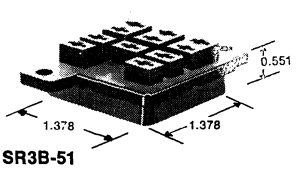
Type	Coil Input	Coil Resist Ohms	Coil Nom. Power Approx.	Contact Arrangement	Contact Amps (Max.)	Circuit Diagram
RR2P	6VAC	4.6	2.5VA	DPDT	10A	
	12VAC	20				
	24VAC	80				
	120VAC	2200				
	240VAC	8930				
	6VDC	25	1.5W			
	12VDC	100				
	24VDC	400				
	48VDC	1600				
	110VDC	8450				
RR3PA	6VAC	4.6	2.5VA	3PDT	10A	
	12VAC	20				
	24VAC	80				
	120VAC	2200				
	240VAC	8930				
	6VDC	25	1.5W			
	12VDC	100				
	24VDC	400				
	48VDC	1600				
	110VDC	8450				
RR1BA	6VAC	4.6	2.5VA	SPDT	10A	
	12VAC	20				
	24VAC	80				
	120VAC	2200				
	240VAC	8930				
	6VDC	25	1.5W			
	12VDC	100				
	24VDC	400				
	48VDC	1600				
	110VDC	8450				
RR2BA	6VAC	4.6	2.5VA	3PDT	10A	
	12VAC	20				
	24VAC	80				
	120VAC	2200				
	240VAC	8930				
	6VDC	25	1.5W			
	12VDC	100				
	24VDC	400				
	48VDC	1600				
	110VDC	8450				
RR3B	6VAC	4.6	2.5VA	DPDT	10A	
	12VAC	20				
	24VAC	80				
	120VAC	2200				
	240VAC	8930				
	6VDC	25	1.5W			
	12VDC	100				
	24VDC	400				
	48VDC	1600				
	110VDC	8450				

Note: ◦ Options : Light Emitting Diode (LED)
Check Button and Neon $2.45; Neon; Check Button
◦ LED suited for 110VAC and less. Neon suited for greater than 110VAC

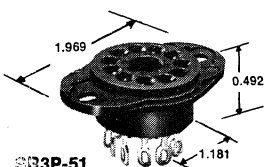
SOCKETS FOR RR SERIES

Relay	Socket No.
RR2P	SR2P-05 (DIN Rail Mount)
	SR2P-06 (DIN Rail Mount)
	SR2P-51 (Panel Mount)
RR3PA	SR3P-05 (DIN Rail Mount)
	SR3P-06 (DIN Rail Mount)
	SR3P-51 (Panel Mount)
RR1BA, RR2BA, RR3B	SR3B-02 (Surface Mount)
	SR3B-05 (DIN Rail Mount)
	SR3B-51 (Panel Mount)

Accessories	
BND-1000	(DIN Rail)
BNL-5	(End Clip)

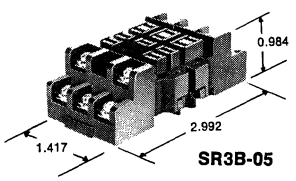


SR3B-51

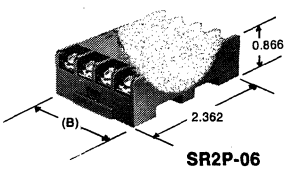


SR3P-51

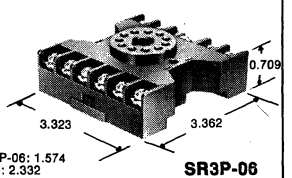
All dimensions in inches.



SR3B-05



SR2P-06



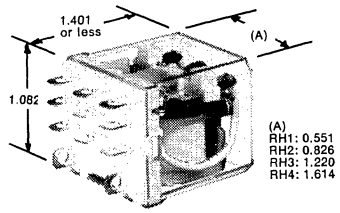
(B) SR2P-06: 1.574
SR3P-06: 2.332

SR3P-06

1213 ELKO DRIVE, SUNNYVALE, CA 94089-2211 • 408/747-0550 • TELEX: 340601 • TWX: 910 339 9383

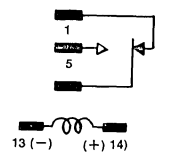
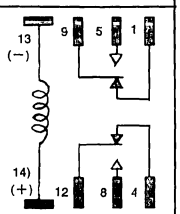
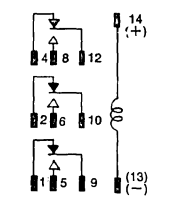
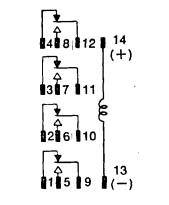
MIDGET POWER/GENERAL PURPOSE RELAYS

RH SERIES
MIDGET POWER TYPE LARGE CAPACITY-10A 1, 2, 3, AND 4 POLES



FEATURES
- Miniature size package allows compact system designing.
- 10 amp contact capacity.
- Dielectric strength — up to 2,000 volts.
- UL recognized and CSA certified.
- Indicator light or check button available on 2, 3 and 4-pole models.
- Complete accessories include IDEC's broad line of sockets, hold-down springs and mounting rails.

SPECIFICATIONS
Contact Material: Silver cadmium oxide (Ag-CdO)
Contact Resistance: 50 mΩ max. (initial value)
Operate Time: SPDT(RH1), DPDT(RH2) — 20 msec max., 3PDT(RH3), 4PDT(RH4) — 25 msec max.
Release Time: SPDT(RH1), DPDT(RH2) — 20 msec max., 3PDT(RH3), 4PDT(RH4) — 25 msec max.
Power Consumption (Approx.):
SPDT(RH1) — AC: 1.1 VA (50 Hz), 1 VA (60 Hz), DC: 0.8W
DPDT(RH2) — AC: 1.4 VA (50 Hz, 1.2 VA 60 Hz), DC: 0.9W
3PDT(RH3) — AC: 2 VA (50 Hz), 1.7 VA (60 Hz), DC: 1.5W
4PDT(RH4) — AC: 2.5 VA (50 Hz, 2 VA (60 Hz), DC: 1.5W
Insulation Resistance: 100 MΩ min. (measured at 500V DC megger)
Dielectric Strength:
SPDT(RH1)
Between live and non-live parts: 2000V AC, 1 minute
Between contact circuit and operating coil: 2000V AC, 1 minute
Between contacts of the same pole: 1000V AC, 1 minute
DPDT(RH2), 3PDT(RH3), 4PDT(RH4)
Between live and non-live parts: 2000V AC, 1 minute
Between contact circuit and operating coil: 2000V AC, 1 minute
Between contact circuit and operating coil: 2000V AC, 1 minute
Between contact circuits: 1500V AC, 1 minute
Between contacts of the same pole: 1000V AC, 1 minute
Frequency Response: 1800 operations/hour
Temperature Rise: Coil: 85 deg. max., Contact: 65 deg. max.
Vibration Resistance: 0 to 6g (55 Hz max.)
Shock Resistance: SPDT(RH1), DPDT(RH2) — 20g, 3PDT (RH3) 4PDT(RH4) — 10g
Operating Temperature: −22° to +158°F (−30°C to +70°C)
Weight (Approx:): RH1: 24g, RH2: 37g, RH3: 50g, RH4: 74g
Life Expectancy:
Electrical: 500,000 operations or more (120V AC, 10A)*
Mechanical: 50,000,000 operations or more
Note*: 200,000 operations or more (120V AC, 10A) in SPDT(RH1), 3PDT(RH3), 4PDT(RH4) Types.

Type	Coil: Input	Coil: Resist Ohms	Coil: Nom. Power Approx.	Contact: Arrangement	Contact: Amps (Max.)	Circuit Diagram
RH1	6VAC	18.8	1VA	SPDT	10A	
	12VAC	76.8				
	24VAC	300				
	120VAC	7680				
	6VDC	47	0.8W			
	12VDC	188				
	24VDC	750				
	48VDC	2660				
	110VDC	13800				
RH2	6VAC	9.6	1.2VA	DPDT	10A	
	12VAC	40.5				
	24VAC	156.7				
	120VAC	4280				
	240VAC	15720				
	6VDC	40	0.9W			
	12VDC	160				
	24VDC	650				
	48VDC	2600				
	110VDC	12100				
RH3	6VAC	6.0	1.7VA	3PDT	10A	
	12VAC	25.3				
	24VAC	103				
	120VAC	2770				
	240VAC	12110				
	6VDC	25	1.5W			
	12VDC	100				
	24VDC	400				
	48VDC	1600				
	110VDC	8600				
RH4	6VAC	5.4	2VA	4PDT	10A	
	12VAC	21.2				
	24VAC	84.5				
	120VAC	2220				
	240VAC	9120				
	6VDC	24	1.5W			
	12VDC	96				
	24VDC	388				
	48VDC	1550				
	110VDC	7340				

Note: • Options : Light Emitting Diode (LED); Check Button and Neon; Check Button
• LED suited for 110VAC and less. Neon suited for greater than 110VAC

TYPES OF RH SERIES

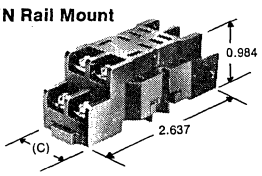
Terminal Style	Contact Config.	Basic Type	with Indicator Light	with Check Button	Top Bracket Mntg. Type
B (Blade)	SPDT	RH1B-U	—	—	RH1B-UT
	DPDT	RH2B-U	RH2B-UL	RH2B-UC	RH2B-UT
	3PDT	RH3B-U	RH3B-UL	RH3B-UC	—
	4PDT	RH4B-U	RH4B-UL	RH4B-UC	RH4B-UT
V2 (PCB)*	SPDT	RH1V2-U	—	—	—
	DPDT	RH2V2-U	RH2V2-UL	RH2V2-UC	—
	3PDT	RH3V2-U	RH3V2-UL	RH3V2-UC	—
	4PDT	RH4V2-U	RH4V2-UL	RH4V2-UC	—

Note*: 2mm (0.078) wide

SOCKETS FOR RH SERIES

Relay	Socket No.
RH1B	SH1B-05 (DIN Rail Mount) SH1B-51 (Panel Mount) SH1B-62 (PC Mount)
RH2B	SH2B-02 (Surface Mount) SH2B-05 (DIN Rail Mount) SH2B-51 (Panel Mount) SH2B-62 (PC Mount)
RH3B	SH3B-05 (DIN Rail Mount) SH3B-51 (Panel Mount) SH3B-62 (PC Mount)
RH4B	SH4B-05 (DIN Rail Mount) SH4B-51 (Panel Mount) SH4B-62 (PC Mount)
Accessories	
BND-1000	(DIN Rail)
BNL-5	(End Clip)

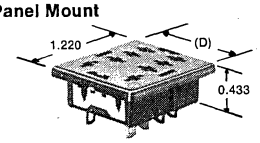
DIN Rail Mount



SH2B-05

(C)
SH1B-05: 0.787
SH2B-05: 1.181
SH3B-05: 1.575
SH4B-05: 1.968

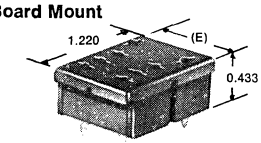
Panel Mount



SH2B-51

(D)
SH1B-51: 0.709
SH2B-51: 1.063
SH3B-51: 1.417
SH4B-51: 1.171

PC Board Mount



SH2B-62

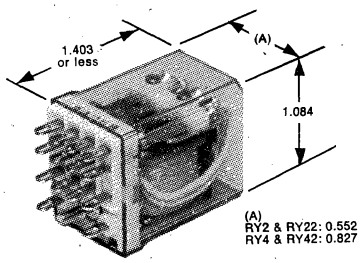
(E)
SH1B-62: 0.708
SH2B-61: 0.835
SH3B-61: 1.447
SH4B-62: 1.772

All dimensions in inches

1213 ELKO DRIVE, SUNNYVALE, CA 94089-2211 • 408/747-0550 • TELEX: 340601 • TWX: 910 339 9383

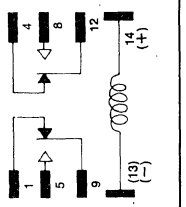
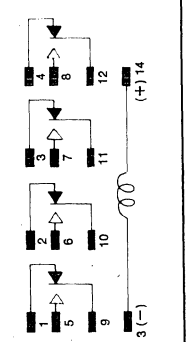
MINIATURE GENERAL PURPOSE RELAYS/SOCKETS

RY SERIES
3A RATING—2 AND 4 POLES
TWIN CONTACT ALSO AVAILABLE



FEATURES
- Available with check button for test operation and indicator lights (on 4PDT only).
- For dry circuit applications, bifurcated crossbar contacts available on both 2 and 4-pole models (contact material Ag-Pd alloy).
- Simple construction using the least possible number of components.
- UL recognized and CSA certified models.
- Complete line of sockets and socket accessories for flexible application.

SPECIFICATIONS
Contact Material: RY2, RY4: Fine Silver (Gold Plated)
RY22, RY42: Ag-Pd alloy
Contact Resistance: RY22, RY42: 100 mΩ maximum
(Initial Value)
Operate Time: 20 ms maximum
Release Time: 20 ms maximum
Power Consumption:
RY2, RY22/AC: Approx. 1.1VA (50 Hz), 1 VA (60 Hz),
DC: Approx. 0.8W
RY4, RY42/AC: Approx: 7.4 VA (50 Hz), 1.2 VA (60 Hz),
DC: Approx. 0.9W
Insulation Resistance: 100 MΩ minimum (measured with 500V DC megger)
Dielectric Strength:
Between live and dead parts: 1500V AC, 1 minute
Between contact circuit and operating coil: 1000V AC 1 minute
Between contact circuits: 1000V AC, 1 minute
Between NO-NC contact: 700V
Frequency Response: 1800 operations/hour
Temperature Rise: Coil: 153°F (85°C) maximum; 117°F (65°C) maximum
Vibration Resistance: 0 to 6g (55 Hz maximum)
Shock Resistance: RY2, RY22: 10g minimum
RY4, RY42: 20g minimum
Life Expectancy:
RY2, RY4: Electrical: Over 200,000 operations (120V AC, 3A)
Mechanical: Over 50,000,000 operations
RY22, RY42: Electrical: Over 200,000 operations (120V AC, 1A)
Mechanical: Over 50,000,000 operations
Operating Temperature: −22° to +158°F (−30° to +70°C)

Type	Coil: Input	Coil: Resist Ohms	Coil: Nom. Power Apprx.	Contact: Arrangement	Contact: Amps (Max.)	Circuit Diagram
RY2	6VAC	18.8	1VA	DPDT	3A	
	12VAC	76.8				
	24VAC	300				
	120VAC	7680				
	6VDC	47	0.8W			
	12VDC	188				
	24VDC	750				
	48VDC	2660				
*RY22	6VAC	18.8	1VA	DPDT	3A	
	12VAC	76.8				
	24VAC	300				
	120VAC	7680				
	6VDC	47	0.8W			
	12VDC	188				
	24VDC	750				
	48VDC	2660				
RY4	6VAC	9.6	1.2VA	4PDT	3A	
	12VAC	40.5				
	24VAC	156.7				
	120VAC	4280				
	240VAC	15720				
	6VDC	40	0.9W			
	12VDC	160				
	24VDC	650				
	48VDC	2600				
	110VDC	12100				
*RY42	6VAC	9.6	1.2VA	4PDT	3A	
	12VAC	40.5				
	24VAC	156.7				
	120VAC	4280				
	240VAC	15720				
	6VDC	40	0.9W			
	12VDC	160				
	24VDC	650				
	48VDC	2600				
	110VDC	12100				

Note: ◦ Options: Light Emitting Diode (LED); Check Button and Neon; Check Button
• LED suited for 110VAC and less. Neon suited for greater than 110VAC
* UL Pending; Not CSA Certified

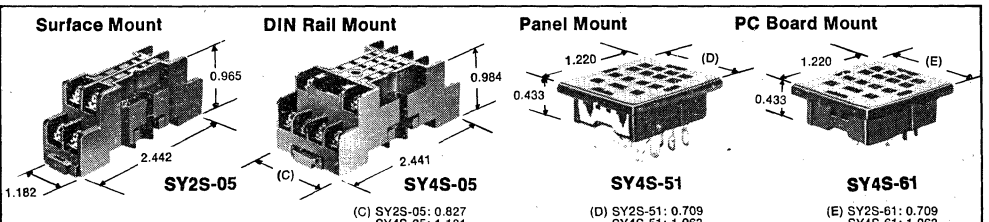
TYPES OF RY SERIES

Terminal Style	Contact Config.	Basic Type	with Indicator Light	with Check Button	Top Bracket Mntg. Type
S (Solder)	DPDT	RY2S-UL	—	—	RY2S-UT
	DPDT*	RY22S	—	—	RY22S-T
	4PDT	RY4S-UL	RY4S-UL	RY4S-UC	RY4S-UT
	4PDT*	RY42S	RY42S-L	RY42S-C	RY42-T
V (PCB)**	DPDT	RY2V-UL	—	—	—
	DPDT	RY22V	—	—	—
	4PDT	RY4V-UL	RY4V-UL	RY4V-UC	—
	4PDT*	RY42V	RY42V-L	RY42V-C	—
V1 (PCB)***	4PDT	RY4V1-CSA	RY4V1-L	RY4V1-C	—
W (Wrapping)	4PDT	RY4W-CSA	—	—	RY4W-T

Note: *Twin contact **0.8mm (0.031) wide ***1.5mm (0.059) wide

SOCKETS FOR RY SERIES

Relay	Socket No.
RY2S RY22S	SY2S-05 (DIN Rail Mount) SY2S-51(Panel Mount) SY2S-62 (PC Mount)
RY4S RY42S	SY4S-02 (Surface Mount) SY4S-05 (DIN Rail Mount) SY4S-51 (Panel Mount) SY4S-62 (PC Mount)
Accessories	
BND-1000	(DIN Rail)
BNL-5	(End Clip)



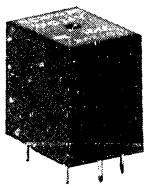
(C) SY2S-05: 0.827
SY4S-05: 1.181
(D) SY2S-51: 0.709
SY4S-51: 1.063
(E) SY2S-61: 0.709
SY4S-61: 1.063

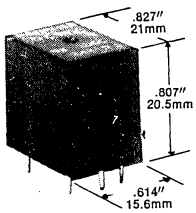
1213 ELKO DRIVE, SUNNYVALE, CA 94089-2211 • 408/747-0550 • TELEX: 340601 • TWX: 910 339 9383

P.C. TYPE RELAYS

RCN SERIES

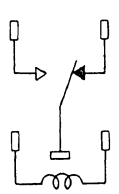
P.C. MOUNT RELAY MINIATURE SIZE
SINGLE POLE—3, 5 AND 10 AMP
CONTACT RATING



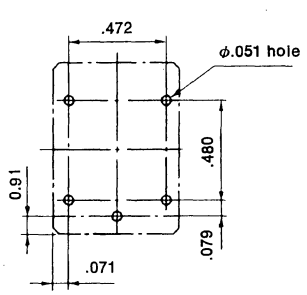


SPECIFICATIONS (3 and 5 Amp Types)

Contact Resistance: 100 mΩ max. (initial value)
Operate Time: 15 msec max. (at the rated voltage)
Release Time: 10 msec max. (at the rated voltage)
Insulation Resistance: 100 MΩ min. (measured with a 500V DC megger)
Dielectric Strength:
Between contact and coil: 1,500V AC, 1 minute
Between contacts: 750V AC, 1 minute
Operation Frequency: 1,800 operations/hour
Vibration Resistance:
Damage limits: 10 to 55 Hz, total amplitude 1.5 mm
Operating extremes: 10 to 55 Hz, total amplitude 1.5 mm
Shock Resistance:
Damage limits: 100 m/sec² (approx. 10G)
Operating extremes: 1,000 m/sec² (approx. 100G)
Operating Temperature: −22°F to +158°F (−30°C to +70°C) (no freezing)
Life (operations):
Mechanical: 10,000,000 (at 18,000 operations/hour)
Electrical: 100,000 (at 1,800 operations/hour)
Soldering Temperature: 500°F, 10 sec maximum
Weight: Approx. 14g
Note: For detailed specifications of 10 amp type, contact IDEC.

Type	Coil Input	Coil Resist Ohms	Coil Nom. Power	Contact Arrangement	Contact Max. (A)	Circuit Diagram
(Sealed) RCN1V- 3A Stand-ard	5VAC 6VAC 12VAC 24VAC 48VAC			SPDT	3	
	5VDC 6VDC 12VDC 24VDC 48VDC			SPDT	3	
5A	5VDC 6VDC 12VDC 24VDC 48VDC	70 100 400 1600 6400	0.36W	SPDT	5	
10A	5VDC 6VDC 12VDC 24VDC 48VDC	70 100 400 1600 6400	0.36W	SPDT	10	

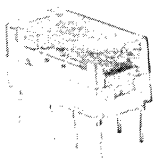
PC BOARD LAYOUT

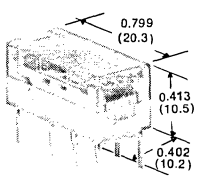


All dimensions in inches

RD SERIES

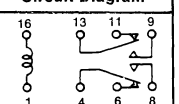
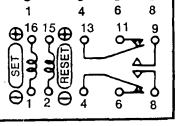
DUAL IN-LINE PACKAGE
.1mA TO 1.25A CONTACT CAPACITY



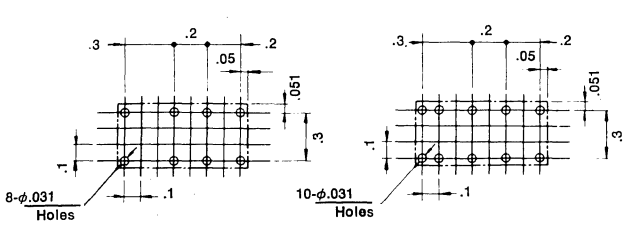


SPECIFICATIONS

Coil Voltages: 3, 5, 6, 12, 24V DC
Contact Configuration: DPDT (Form C Package)
Contact Material: Silver-Palladium (Gold-Clad)
Terminal Material: Copper-Nickle Alloy
Contact Resistance: 100 mΩ max. (initial value)
Operate Time: 6 msec max. @ Rated Voltage
(Set time of latching type: 5 msec max.)
Release Time: 4 msec max. @ Rated Voltage
(Reset time of latching type: 5 msec max.)
Bounce Time: 5 msec max. @ Rated Voltage
Insulation Resistance: 100 MΩ min. (initial value)
Dielectric Strength:
Between contact circuit and operational coil: 1,000V AC, 1 minute
Between contact circuits of different poles: 1,000V AC, 1 minute
Between contact circuits of the same pole: 500V AC, 1 minute
Between 2 coils of 2-coil latching type: 300V AC, 1 minute
Operating Frequency: 3,600 operations/hr
Vibration Resistance: 0 to 90 m/sec² (Approx. 9G) 10 to 55 Hz
Shock Resistance:
Damage limits: 1,000 m/sec² (Approx. 100G)
Operating extremes: 100 m/sec² (Approx. 10G)
Electrical Life* (Resistive Load): 125V AC, 0.24A, 24V DC, 1A 500,000 oper/min.
Mechanical Life: 10,000,000 oper/min.
Operating Temperature: −22° to +158°F (−30° to +70°C)
Note: *Refer to electrical life curve.

Type	Coil Input	Coil Resist Ohms	Coil Nom. Power	Contact Arrangement	Contact Max. (A)	Circuit Diagram
RD22V-1	3VDC 5VDC 6VDC 12VDC 24VDC	22.5 62.5 90 360 1440	400mW	DPDT	2.5A	
RD22LV-1	3VDC 5VDC 6VDC 12VDC 24VDC	14 38.5 55.5 222 890	650mW	DPDT	2.5A	

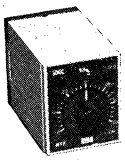
PC BOARD LAYOUT



RD22V-1 RD22LV-1

TIMERS

RTE SERIES
ELECTRONIC TIMERS
CMOS INTEGRATED SOLID STATE CIRCUIT


RTE
Standard Model

RTEL
Deluxe Model

FEATURES
- CMOS integrated solid state circuit
- 8 time range settings in one timer
- Available in RTE Standard and RTEL Deluxe models
- Time ranges from 1 second to 10 hours
- 4 operating modes: Delay On Make, Delay On Break, Interval and Single Shot
- High repeat accuracy of ±0.25%
- 10 amp rated DPDT delay out-put contacts
- Power saving 3.5VA consumption
- ON and timing OUT LED indicators
- Standard 8 or 11-pin and 11-blade plug-in terminal bases
- UL Recognized in general use, UL Listed in combination with IDEC's 8-pin (SR2P-06) and 11-blade (SR3B-05) Snap-Mount DIN rail sockets
- UL Listed and CSA Certified

SPECIFICATIONS
Contact Configuration: 2 Form C, DPDT (Delay out-put contacts)
Input Voltages: 24, 120V AC; 24V DC
(Other voltages available on special order)
Contact Load Rating: 10A Resist. @ 240V AC, 30V DC
7A Induct. @ 240V AC, 30V DC
1/3HP @ 120V AC, 1 HP @ 240V AC
Temperature Range: Operating: −4°F to +149°F (−20°C to +65°C)
Storage: −22°F to +185°F (−30°C to +85°C)
Power Consumption: AC: 3.5VA DC: 2.5W
Transient Protection: AC Voltage: Standardized value 4kV
DC Voltage: 40 times the rated voltage (Up to 4kV for 12V DC)
Dielectric Strength: 1500V AC, 1 minute @ 60 Hz
Between Power and out-put terminal
Repeat Accuracy: ±0.25%, ±10ms
Voltage Accuracy: ±0.5%, ±10ms
Temperature Error: ±2%, ±10ms
Reset Time: 100ms or less
Mechanical Life: 5 x 10^7 operations (for N & I Mode Settings)
1 x 10^7 operations (for F & S Mode Settings)
Electrical Life: 250,000 operations minimum
Time Range Settings:
Range Group Code 1: 1, 3, 6, 10, 30, 60 seconds 5, 10 minutes
Range Group Code 2: 60 seconds 3, 6, 10, 30, 60 minutes 5, 10 hours

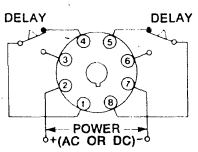
TYPE LIST

Mode of Operation (Code)	RTE Type No.		RTEL Type No.	
	Pin Type	Blade Type	Pin Type	Blade Type
Delay On Make (N)	RTE-PN	RTE-BN	RTEL-PN	RTEL-BN
Interval (I)	RTE-PI	RTE-BI	RTEL-PI	RTEL-BI
Delay On Break (F)	*RTE-PF	RTE-BF	*RTEL-PF	—
Single Shot (S)	*RTE-PS	RTE-BS	*RTEL-PS	RTEL-BS

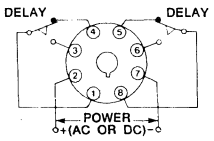
* Available in 11-pin terminal base only; UL listing pending.

INTERNAL CONNECTIONS

DELAY ON MAKE

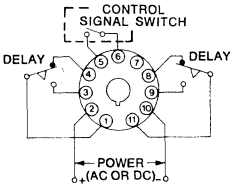


INTERVAL



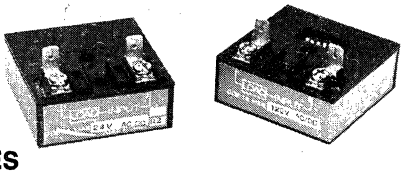
DELAY ON BREAK
SINGLE SHOT

(Delay on break and single-shot available only in 11-pin terminal base.)



Do not apply voltage to terminals 5 and 6.

RTS SERIES
2X2 SOLID STATE TIMERS
INTEGRATED CIRCUITRY



FEATURES
- Solid state digital integrated circuitry
- Available in multi-range time delay and factory fixed time delay models
- Time delay ranges from 1 second to 630 seconds
- Operational modes available in Delay on Make and Interval
- Rated input voltages in 24 and 120 volts AC/DC
- UL Recognized and CSA Certified

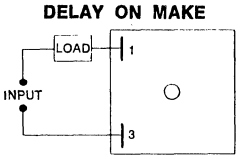
SPECIFICATIONS
Output Configuration: Solid State, Normally Open
Maximum Current Load: 1 Amp Steady State
10 Amps Inrush
Time Delay Adjustment: Binary DIP Switch 6-Pole (M-Type)
Factory Fixed (F-Type)
Time Delay Range: 1 to 63 Seconds (1 Second Increments)
10 to 630 Seconds (10 Second Increments)
Repeat Accuracy: ±0.5% Typical
Delay Accuracy: ±10%
Reset Time: 100 milliseconds maximum
Rated Input Voltage: 24, 120 Volts AC/DC (Other voltages available)
Line Frequency: 50/60 Hertz
Operational Voltage: 80 to 120% of Rated Voltage
Dielectric Strength: 1500V RMS minimum, 1 minute
Protection: Transient Protected 1.2 x 50 μs 4 Kilovolts
Insulation Resistance: 100 Megohms minimum
Operation Temperature: −20°C to +60°C
Relative Humidity: 20% to 90% relative (Non-Condensing)
Termination: .250″ Male Fast-On Terminals and 6-32 (M3.5) Terminal screw w/captive wire clamp
Mounting: Surface with #8 or #10 screw

TYPE LIST

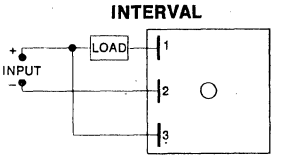
Mode of Operation	Type No.	
	Multi-Range (M)	Fixed (F)
Delay On Make (N)	RTS-MN	RTS-FN
Interval (I)	RTS-MI	RTS-FI

CONNECTIONS

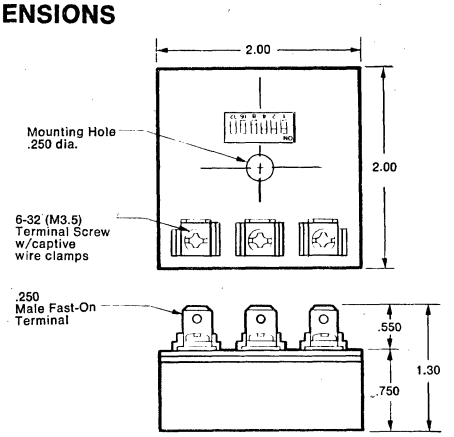
DELAY ON MAKE



INTERVAL

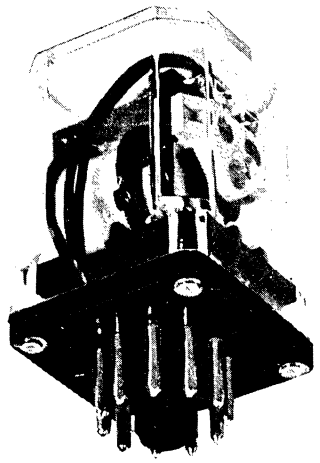


DIMENSIONS



IEI-ISKRA
• Ceramic Caps, Discs, Feed Thru • Ferrites • Meters • Motors, fractional H.P. • Semiconductors • Switches • Speakers • Trimmer Pots

GENERAL PURPOSE RELAYS
ECONOMY PLUG-IN TYPE — SERIES PR



General purpose relay enclosed in a clear polycarbonate dust cover. The PR Relay is a ruggedly constructed, UL recognized relay; available in contact arrangements up through 3 form C (3PDT) and with a mechanical life of 10 million operations, minimum. Approximate weight: 3 oz. (85 g). Other features include:

- Manual test access standard
- Anti-shock base construction
- Indicator lamp available
- Extremely low priced

Technical Specifications

GENERAL:

OPERATE TIME
15 ms. max. @ nominal voltage
RELEASE TIME
10 ms max.
LIFE EXPECTANCY

Mechanical: 10 million operations

DIELECTRIC STRENGTH
1500 VRMS 60 Hz Hipot test between all elements

INSULATION RESISTANCE
100 M Ω minimum

TEMPERATURE RANGE
PR relays will operate continuously in ambient temperatures of −45° to 75° C for D.C. coils and −45° to 55° C for A.C. coils.

CONTACTS:

CONTACT RATING/MATERIAL

Contact material	Ag-CdO (other materials on request)
Contact rating (Resistive)	10 A @ 240 VAC max.
Contact rating (Inductive)	¼ H.P. @ 240 VAC - 1 phase.

CONTACT ARRANGEMENTS
All types of the Series PR are available in standard contact arrangements up to 3PDT.

AGENCY APPROVALS:

U.L. for Types 41, 58, 59

COIL DATA:

COIL VOLTAGE/RESISTANCE

	D.C. COILS		A.C. COILS
VOLTS	D.C. RESIST-ANCE	VOLTS	D.C. RESIST-ANCE
6	29	6	4.2
12	105	12	17
24	420	24	70
110	8400	120	1300
220	8400 *	240	6700

COIL RESISTANCE
Standard coils are available with a tolerance of plus or minus 10% measured in an ambient of 20°C.

* Coils for DC versions may be supplied only for voltages not exceeding 110V. In the event of 220V. 10kOhm/2 W series resistors are supplied along with the relays, to be connected in series with the energizing winding.

PULL-IN VOLTAGE
80% of nominal

POWER CONSUMPTION

Rated voltage	DC relays	AC relays
6— 48V	1.3 W approx.	2 VA (50 Hz) approx.
60—110V	1.5 W approx.	
220 V	2.5 W approx. with series resistor	1.8 VA (60 Hz) approx.

ORDERING INFORMATION:

☐ PR − ☐ ☐ − ☐

- PR — TYPE: 58: Octal Plug-In; 59: 11-Pin Plug-In
- CONTACTS: A: SPDT; B: DPDT; C: 3PDT
- 1 — 0: D.C.; 6: 60Hz, A.C.
- COIL VOLTAGE: 006... 6V; 012... 12V; 024... 24V; 048... 48V; 060... 60V; 110...110V; 220...220V

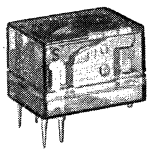
ISKRA ELECTRONICS INC.
222 SHERWOOD AVE., FARMINGDALE, NY 11735 • (516) 753-0400

ITT Components
A Division of ITT Corporation

Sub Miniature Printed Circuit Board Relays

MZ RELAY

1 Amp SPDT
L — 0.606″,
W — 0.449,
H — 0.433″



CONTACT DATA

Arrangement — 1 Form C
Material — Gold overlay silver-palladium alloy
Resistance — 100 milliohms maximum (initial value)
Ratings — 50μ amps to 1 amp at 30V DC or 120V AC, resistive
Life Expectancy — Mechanical: 20 million operations
Electrical: 500,000 operations minimum at 1 amp 24V DC resistive load
200,000 operations minimum at 0.5 amps 120V AC resistive load

COIL DATA

Voltages — 1.5 to 24 volts DC
Power (at 20°C) —
Standard type: Operate—0.22 watt, Nominal—0.45 watt, Maximum—1 watt
High sensitive type: Operate—0.1 watt, Nominal—0.2 watt, Maximum—1 watt
Operate (at 20°C) — 70% of nominal voltage
Duty — Continuous

GENERAL DATA

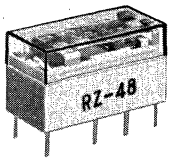
Insulation Resistance — 100 megohms minimum at 500V DC
Dielectric Strength — 500V AC (50/60 Hz), between all insulated elements
Temperature Range (at nominal voltage) — Standard type: −40°C to +55°C
High sensitive type: −30°C to +75°C
Time Values — Operate <3 ms standard, <6 ms sensitive; release <1 ms
Mounting — For direct printed circuit mounting on grid spacing of 2.54 mm (0.1 in.) up to board thickness of 2.5 mm (0.98 in.)
Approximate Weight — 3.5 gr. (0.12 oz.)
Enclosure — Polycarbonate

Standard Coil and Contact Combination (20°C)

Nominal Voltage	Operate Voltage	Maximum Continuous Voltage	Coil Resistance ±10%, Ohms	Ordering Code	List Price
Standard Types					
1.5	1.05	2.0	5	MZ-1.5HG	$2.05
3	2.1	4.1	20	MZ-3HG	$2.05
5	3.5	6.8	56	MZ-5HG	$2.05
6	4.2	8.1	80	MZ-6HG	$2.05
9	6.3	12.2	180	MZ-9HG	$2.05
12	8.4	16.2	320	MZ-12HG	$2.05
24	16.8	32.4	1280	MZ-24HG	$2.05
High Sensitive Type					
1.5	1.05	3.0	12	MZ-1.5HS	$2.20
3	2.1	6.0	45	MZ-3HS	$2.20
5	3.5	10.0	120	MZ-5HS	$2.20
6	4.2	12.0	180	MZ-6HS	$2.20
9	6.3	18.0	400	MZ-9HS	$2.20
12	8.4	24.0	700	MZ-12HS	$2.20
24	16.8	48.0	2800	MZ-24HS	$2.20
Latching Types					
3	2.1	NA	5.7	MZL-3	$3.00
5	3.5	NA	15	MZL-5	$3.00
6	4.2	NA	21	MZL-6	$3.00
9	6.3	NA	50	MZL-9	$3.00
12	8.4	NA	87	MZL-12	$3.00
24	16.8	NA	350	MZL-24	$3.00

RZ/RZL RELAYS

1 Amp DPDT
L — 0.795″,
W — 0.386″,
H — 0.457″



CONTACT DATA

Arrangement — DPDT (B-M) — RZ, RZ( )W Type
Material — Gold overlaid silver-palladium alloy
Max. Switching Power —
30W/50VA — Single Contact
17W/30VA — Bifurcated contact at resistive load
Max. Switching Current —
1.25A AC or DC — Single Contact
0.7A AC or DC — Bifurcated contact at resistive load
Max. Switching Voltage —
150V DC/125V AC — Single Contact
100V DC/90V AC — Bifurcated contact at resistive load
Contact Resistance (Pin-pin) — 100mΩ Max.
Capacitance — 1.5PF max. between open contact
0.5PF max. between adjacent change-over contact
Life Expectancy —
Mechanical: 20 million operations — Single Contact
15 million operations — Bifurcated contact
Electrical: 0.5 million operations at 1.25A 24V DC or 0.4A 125V AC at resistive load — Single contact
0.5 million operations at 0.7A 24V DC or 0.25A 125V AC at resistive load — Bifurcated contact

COIL DATA

Nominal Voltage — 3 to 48 V DC — RZ, RZ( )W Type,
3 to 24V DC — RZ1, RZ1( )W Type
Power (at 20°C) — Nominal: 515 ~ 560 mW — RZ, RZ( )W Type,
Operate: 200 ~ 324 mW — RZ, RZ( )W Type
Max: 1050 mV
Temperature Range (at nominal voltage) — −40°C ~ +65°C — RZ RZ( )W Type
−40°C ~ +75°C — RZ1 RZ1( ) Type

GENERAL DATA

Dielectric Strength — 500V AC (50/60 Hz) between open contacts, 1000V AC contact-coil
Insulation Resistance — 1000 MΩ min. at 500V DC
Timing — Operate <4 ms, release <2
Bounce Time — Approx. 1 ms on operate
Approx. 4 ms on release
Vibration Resistance — 10 to 60 Hz amplitude 1.5 mm (10G)
Shock Resistance — Destruction shock: 100G (11 ms ±1 ms)
Unerror shock: 10G (11 ms ± 1 ms)
Surge Strength — 1500V AC between all conductors

Standard Coil and Contact Combinations (20°C

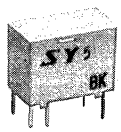
Nominal Voltage	Operate Voltage	Maximum Continuous Voltage	Coil Resistance ±10%, Ohms	Ordering Code	List Price
Standard types					
5	3.2	7.0	45	RZ-5	$3.20
6	3.8	8.4	66	RZ-6	$3.20
9	5.1	12.6	140	RZ-9	$3.20
12	7.6	16.8	280	RZ-12	$3.20
24	15.2	33.6	1070	RZ-24	$3.20
48	36.0	67.2	4000	RZ-48	$3.70
Latching types					
5	3.2	NA	8.4	RZL-5	$4.35
6	3.8	NA	12	RZL-6	$4.35
9	5.7	NA	27	RZL-9	$4.35
12	7.6	NA	52	RZL-12	$4.35
24	15.2	NA	192	RZL-24	$4.35
48	36.0	NA	820	RZL-48	$4.85

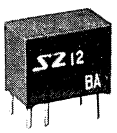
ITT Components
A Division of ITT Corporation

Sub Miniature Printed Circuit Board Relays

SY/SZ RELAYS

1 Amp SPDT
L — 0.492″,
W — 0.291″,
H — 0.374″





CONTACT DATA

Arrangement — 1 Form C

Material — Gold overlay silver-palladium

Resistance — Max. 100 mΩ (initial value)

Ratings — 0.5A, 120V AC or 1A, 24V DC (resistive)

Life Expectancy — Mechanical: Min. 5 million operations
Electrical: SZ Min. 200,000 operations at rated load
SY Min. 150,000 operations at rated load

COIL DATA

Voltages — 1.5 to 24V DC

Power (at 20°C) —
SZ Operate — 0.15 watt (0.16 watt for 18V coil, 0.18 watt for 24V coil)
Nominal — 0.3 watt (0.32 watt for 18V coil, 0.36 watt for 24V coil)
SY Operate — 0.075 watt
Nominal — 0.15 watt

Operate (at 20°C) — 70% of nominal voltage

Duty — Continuous

GENERAL DATA

Insulation Resistance — 100 MΩ minimum at 500V DC

Dielectric Strength — 500V AC (50, 60 Hz), between all conductors

Temperature Range — −40°C to +70°C (18V coil: −30°C to +65°C, 25V coil; −30°C to +60°C) (at nominal voltage)

Time Values (approx.) — Operate 1.5 mS, Release 1 mS (at nominal voltage)

Vibration Resistance — 20G (10 ~ 300 Hz) amplitude 3 mm

Shock Resistance — 50G

Mounting — For direct printed circuit mounting on grid spacing of 2.54 mm (0.1 in.)

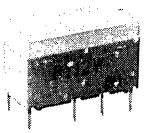
Approximate Weight — 1.7 gr (0.06 oz.)

Enclosure — Polybutylene terephthalate (PBT)

Nominal Coil Voltage	Coil Resistance	Operate Voltage	Type No.	List Price
3	30	2.1	SZ-3	$2.30
5	83	3.5	SZ-5	$2.30
6	100	3.9	SZ-6	$2.30
9	270	6.3	SZ-9	$2.30
12	480	8.4	SZ-12	$2.30
18	1000	12.6	SZ-18	$2.30
24	1600	16.8	SZ-24	$2.30
5	167	3.5	SY-5	$2.45
6	240	4.2	SY-6	$2.45
9	540	6.3	SY-9	$2.45
12	960	8.4	SY-12	$2.45

RY RELAY

1 Amp DPDT
L — 0.795″,
W — 0.386″,
H — 0.472″



CONTACT DATA

Arrangement — 2 Form C, 2 Form D

Material — Gold overlay silver-palladium

Resistance — Max. 100 mΩ (initial)

Ratings — 0.5A 120V AC or 1A 24V DC (resistive)

Life Expectancy — Mechanical: Min. 20 million operations
Electrical: Min. 500,000 operations at 1A 24V DC
Min. 200,000 operations at 0.5A 120V AC

COIL DATA

Voltages — 4.5 to 48V DC

Power (at 20°C) —
Operate — 0.075 watt (0.098 watt for 18V, 24V coil, 0.138 watt for 48V coil)
Nominal — 0.15 watt (0.2 watt for 18V, 24V coil, 0.3 watt for 48V coil)

Operate (at 20°C) — 68 ~ 71% of nominal voltage

Duty — Continuous

GENERAL DATA

Insulation Resistance — 1000 MΩ min. at 500V DC

Dielectric Strength — 500V AC between open contact
1000V AC between all other conductors

Temperature Range — −40°C ~ +80° at nominal voltage

Surge Strength — 1500V between all conductors

Time Values (max.) — Operate 6 ms, Release 3 ms at nominal voltage

Vibration Resistance — 10G (10 ~ 55 Hz)

Shock Resistance — 10G 11 ±1 ms) — Unerror, 100G (6 ±1 ms) — Destruction

Enclosure — Polybutylene terephthalate (PBT)

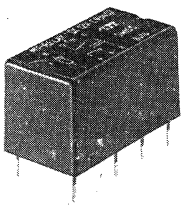
Standard Coil and Contact Combinations (20°C)

Nominal Voltage	Operate Voltage	Maximum Continuous Voltage	Coil Resistance ±10%, Ohms	Ordering Code	List Price
B-M (2 form C)					
5	3.6	12.5	167	RY-5W	$3.70
6	4.3	15.0	240	RY-6W	$3.70
9	6.4	22.5	540	RY-9W	$3.70
12	8.5	30.0	960	RY-12W	$3.70
24	16.8	51.6	2880	RY-24W	$3.70
48	32.6	84.0	7680	RY-48W	$4.35
M-B (2 form D)					
5	3.3	7.1	55	RY-5D	$4.00
6	4.0	8.5	80	RY-60	$4.00
9	5.9	12.8	180	RY-9D	$4.00
12	7.9	17.0	320	RY-12D	$4.00
24	15.8	34.1	1280	RY-24D	$4.00
48	31.8	65.8	4800	RY-48D	$4.70

ITT Components
A Division of ITT Corporation

Sub Miniature Printed Circuit Board Relays

MT RELAY



CONTACT DATA

Contact Type — twin type break-before-make

Contact Power (Resistive Load) — Max. 30W / 50VA

Contact Voltage (Resistive Load) — Max. 150V[a]

Contact-circuit Resistance for Contacts in New Conditions — Max. 70mΩ

Electrical Endurance —
Number of Operations with 30 W Resistive Load — Min. 5×10^5
Number of Operations Under Dry Circuit Conditions — Min. 10^7
Number of Operations with Cable Load of 10m — Min. 5×10^6

COIL DATA

Operate Power — 75mW

Nominal Power — 150mW

Maximum Power — 1W

GENERAL DATA

Dielectric Strength (at 23°C, 50% RH)
Between Contacts and Coil — Min. 1500VRMS
Between Open Contacts and Adjacent Pile-ups — Min. 1000VRMS

Insulation Resistance (at 23°C, 50% RH) — Min. 10^3 MΩ (U=500V DC)

Operate Time, Make Contacts at U_n — Max. 5ms

Release Time, Break Contacts — Max. 3ms

Bounce Time, Make Contacts on Operation — Max. 5ms

Bounce Time, Break Contacts on Release — Max. 5ms

Temperature Range — −55°C to +85°C

Thermal Resistance — 125 K/W

Thermal Time Constant — 6 min.

Capacitance —
Between Open Contacts — Max. 2pF
Between Adjacent Contacts Pile-ups — Max. 2pF
Between Contact Springs and Coil — Max. 4 pF

Mechanical Endurance (No Load Operation) — Min. 10^8

Resistance to Vibration, Sinusoidal Vibration, 10 to 500Hz (Function Not Disturbed) — Min. 10G

Shock Resistance, Half-sine Shock, Duration 11ms (Function Not Disturbed) — Min. 10G

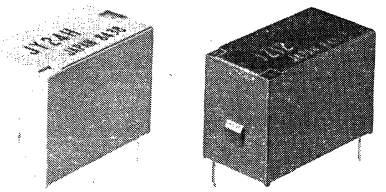
Component Climatic Category — 55/070/56

Resistance to Soldering Heat — Max. 10 s (260°C)
Max. 3.5 s (350°C)

Standard Coil and Contact Combinations

Nominal Voltage	Operate Voltage	Maximum Continuous Voltage	Coil Resistance	Ordering Code	List Price
5	3.6	11.3	168	MTZ-5	$4.45
9	6.4	20.3	544	MTZ-9	$4.45
12	8.6	27.1	968	MTZ-12	$4.45
24	17.1	54.1	3872	MTZ-24	$4.45
48	34.1	108.3	15,486	MTZ-48	$5.00

JY/JZ RELAYS



CONTACT DATA

Arrangement — 1 Form A (SPST-N.O.)

Material & Rating —
JY-( )H, JY-( ) — Gold plated silver cadmium oxide alloy
JY-( )H — 5A, 30V DC or 250V AC resistive
JY-( ) — 3A, 30V DC or 250V AC resistive
JZ-( )H, JZ-( ) — Silver cadmium oxide alloy
JZ-( )H — 5A, 30V DC or 250V AC resistive
JZ-( ) — 3A, 30V DC or 250V AC resistive

Life Expectancy — Mechanical — 20 million operations
Electrical — 100,000 operations at rated load

COIL DATA

Voltage — JY- 4.5 to 24V DC
JZ- 4.5 to 48V DC

Power (at 20°C) — JY- Nominal 0.2W
JZ- Nominal 0.36W
JY- Operate 0.098W
JZ- Operate 0.165W

Max. Operate (at 20°C) — 70% of nominal voltage

Duty — Continuous

GENERAL DATA

Insulation Resistance — Min. 1000MΩ at 500V DC

Dielectric Strength — JY- 750V AC (50/60 Hz) between open contacts
JZ- 1000V AC (50/60 Hz) between open contacts
2000V AC (50/60 Hz) between coil and contacts

Surge Strength — 6000V (1 x 40μs)

Temperature Range (at Nominal Voltage) —
JY- −40°C to +80°C — Non-carrying condition of contacts
JZ- −40°C to +70°C — Non-carrying condition of contacts

Time Value — Operate Max. 10ms
Release Max. 10ms

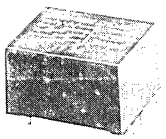
Weight — 5gr (Approx.)

Standard Coil and Contact Combinations

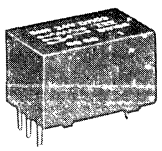
Nominal Voltage	Operate Voltage	Maximum Continuous Voltage	Coil Resistance	Ordering Code	List Price
5	3.5	11.5	125	JY-5-K	$3.40
6	4.2	13.8	180	JY-6-K	$3.40
9	6.3	20.7	405	JY-9-K	$3.40
12	8.4	27.6	720	JY-12-K	$3.40
18	12.6	41.4	1620	JY-18-K	$3.40
24	16.8	55.2	2880	JY-24-K	$3.40
5	3.4	8.5	69	JZ-5-K	$3.30
6	4.0	10.2	100	JZ-6-K	$3.30
9	6.1	15.3	225	JZ-9-K	$3.30
12	8.1	20.4	400	JZ-12-K	$3.30
18	12.2	30.6	900	JZ-18-K	$3.30
24	16.3	40.8	1600	JZ-24-K	$3.30
48	32.6	81.6	6400	JZ-48-K	$3.80

ITT Components
A Division of ITT Corporation

Miniature Printed Circuit Board Relays



SM RELAYS



0.5 Amps DPDT, SPDT

L — 0.618″, 0.618″
W — 0.504″, 0.394″
H — 0.390″, 0.390″

CONTACT DATA

Arrangement — 2 Form C, 1 Form C, bifurcated crossbar
Material — Gold-silver nickel, bifurcated crossbar
Load — Maximum switched power: 30VA, resistive
Maximum switched current: 0.5A, resistive
Maximum switched voltage: 100V, resistive
Life — Mechanical: 200 million operations minimum
Electrical: 0.5 x 10^6 operations minimum at rated load
Timing — Operate: < 3.5ms
Release: < 2ms
Bounce: < 0.7ms on operate, < 5ms on release

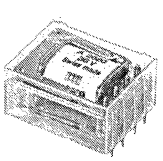
COIL DATA (@ 20°C)

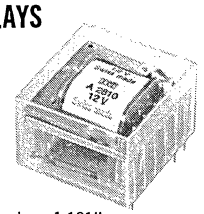
Operate power — 100mW — DPDT, 85mW — SPDT
Nominal power — 200mW — DPDT, 170mW — SPDT
Maximum power — 1.0W — DPDT or SPDT

Standard Coil and Contact Combinations (20°C)

	Nominal Voltage	Pull-In Voltage	Maximum Continuous Voltage	Coil Resistance ±10%, Ohms	Ordering Code	List Price
SPDT	5	3.6	12.1	148	SM1-D1101	$ 6.80
	12	8.6	29.0	852	SM1-D1102	$ 6.80
	24	17.1	57.6	3350	SM1-D1103	$ 6.80
	48	34.1	117	13,830	SM1-D1104	$ 7.30
DPDT	5	3.6	12.6	135	SM2-D1005	$ 8.95
	12	8.6	29.3	724	SM2-D1012	$ 8.95
	24	17.1	57.1	2760	SM2-D1024	$ 8.95
	48	34.1	114.6	11,100	SM2-D1048	$10.15

PZ & PZM RELAYS





L — 1.142″,
W — 0.677″,
H — 0.591″

L — 1.142″,
W — 0.977″,
H — 0.630″

L — 1.181″,
W — 1.386″,
H — 0.866″ PZ-6,

1 Amp DPDT, 4PDT, 6PDT, DPST

CONTACT DATA

Arrangement — 2 Form C, 4 Form C, 6 Form C, 2 Form A
Material — Silver-palladium, bifurcated crossbar
Gold overlay silver palladium, bifurcated crossbar
Load — Maximum switched power: 30VA, resistive
Maximum switched current: 1A, resistive
Maximum switched voltage: 100V, resistive
Life — Mechanical: PZ types: 2 x 10^8 operations minimum
PZM types: 5 x 10^6 operations minimum
Electrical: AgPd types: 3 x 10^6 operations at rated load, minimum
AuAg types: 5 x 10^5 operations at rated load, minimum
Timing — Operate: PZ-2: < 10ms, PZ-4: < 9ms, PZ-6: < 13ms,
PZ-2A: < 12ms
Release: PZ-2, 4: < 3ms, PZ-6: < 4 ms, PZ-2A: < 2.5ms,
PZM-2: < 8ms
PZM-4: < 18ms, PZM-6 (1 winding): < 19ms, PZM-6
(2 windings): < 3.5ms
Bounce: 4ms on operate
PZ(M)-2: < 1.5ms, PZ(M)-4: < 6 ms, PZ-6 < 4ms,
PZM-6: < 6ms

COIL DATA (@ 20°C)

Operate power — PZ-2: 0.5W, PZ-4: 0.5W, PZ-6: 0.4W, PZ-2A: 0.3W
PZM-2: 1.1W, PZM-4: 1W, PZM-6 (1 winding): 1W
Nominal Power — PZ-2: 0.6-0.8W, PZ4: 0.6-0.9W, PZ-6: 0.5-0.7W, PZ-2A: 0.35-0.45W
PZM-2: 1.3W, PZM-4: 1.2W, PZM-6 (1 winding): 1.2W
Maximum power — PZ-2:1W, PZ-4: 2W, PZ-6: 2.8W, PZ-2A: 1W
PZM-2: 1.1W, PZM-4: 1W, PZM-6 (1 winding): 1W

Coil Data — Standard Relays

DC Nominal Voltage	Coil Resistance ±10%, Ohms	Ordering Code Ag/Pd Contacts*	Ordering Code AgPd/Au Contacts†	List Price Ag/Pd	List Price AgPd/Au
PZ-2					
6	60	A 2400	A 2406	$5.85	$7.75
12	210	A 2410	A 2416	$5.85	$7.75
18	500	A 2412	A 2419	$5.85	$7.75
24	850	A 2420	A 2426	$5.85	$7.75
36	1600	A 2430	A 2436	$5.85	$7.75
48	3000	A 2440	A 2446	$5.85	$7.75
PZ-2A					
6	90	B 70100	B 70106	$5.85	$7.75
12	360	B 70110	B 70116	$5.85	$7.75
18	780	B 70112	B 70119	$5.85	$7.75
24	1350	B 70120	B 70126	$5.85	$7.75
36	3000	B 70130	B 70136	$5.85	$7.75
48	5500	B 70140	B 70146	$5.85	$7.75
PZ-4					
6	40	A 2640	A 2646	$7.00	$10.70
12	210	A 2600	A 2606	$7.00	$10.70
18	450	A 2611	A 2619	$7.00	$10.70
24	850	A 2610	A 2616	$7.00	$10.70
36	1600	A 2620	A 2626	$7.00	$10.70
48	3000	A 2630	A 2636	$7.00	$10.70
60	4800	A 2650	A 2656	$7.00	$10.70
PZ-6					
6	66	A 2800	A 2806	$10.25	$15.20
12	230	A 2810	A 2816	$10.25	$15.20
18	520	A 2812	A 2819	$10.25	$15.20
24	900	A 2820	A 2826	$10.25	$15.20
36	1900	A 2830	A 2836	$10.25	$15.20
48	3600	A 2840	A 2846	$10.25	$15.20
60	6100	A 2850	A 2856	$10.25	$15.20

* Silver Palladium alloy, 70% Silver, 30% Palladium
† Gold/Silver alloy, 80% Gold, 20% Silver

Coil Data — Latching Relays††

DC Nominal Voltage	Coil Resistance ±10%, Ohms	Ordering Code Ag/Pd Contacts*	Ordering Code AgPd/Au Contacts†	List Price Ag/Pd	List Price AgPd/Au
PZM-2					
6	26	B 2400	B 2406	$8.50	$10.05
12	120	B 2410	B 2416	$8.50	$10.05
18	240	B 2420	B 2426	$8.50	$10.05
24	480	B 2430	B 2436	$8.50	$10.05
36	930	B 2440	B 2446	$8.50	$10.05
48	1980	B 2450	B 2456	$8.50	$10.05
PZM-4					
6	26	B 2500	B 2506	$9.80	$13.05
12	120	B 2510	B 2516	$9.80	$13.05
18	240	B 2520	B 2526	$9.80	$13.05
24	460	B 2530	B 2536	$9.80	$13.05
36	1260	B 2540	B 2546	$9.80	$13.05
48	1840	B 2550	B 2556	$9.80	$13.05
60	2900	B 2560	B 2566	$9.80	$13.05
PZM-6, 1 WINDING					
6	27	B 2700	B 2706	$11.55	$16.10
12	120	B 2710	B 2716	$11.55	$16.10
18	260	B 2720	B 2726	$11.55	$16.10
24	560	B 2730	B 2736	$11.55	$16.10
36	1090	B 2740	B 2746	$11.55	$16.10
48	2080	B 2750	B 2756	$11.55	$16.10
60	3300	B 2760	B 2766	$11.55	$16.10
PZM-6, 2 WINDINGS					
6/6	60/19	B 2600	B 2606	$13.50	$18.05
12/12	240/110	B 2610	B 2616	$13.50	$18.05
24/24	900/360	B 2630	B 2636	$13.50	$18.05
48/48	1460/1400	B 2650	B 2656	$13.50	$18.05

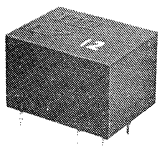
†† Remanant latch — designed for pulse operation. For additional technical information contact factory.

ITT Components
A Division of ITT Corporation

Miniature General Purpose Relays

LZ RELAY

5 Amp SPDT
L — 0.843″
W — 0.646″
H — 0.583″



CONTACT DATA

Arrangement — 1 Form C

Material — 5A type: Gold overlay silver-nickel alloy (single)
3A type: Gold overlay silver (single)
1A type: Gold overlay silver-palladium alloy (bifurcated)

Load — 5A type: 5A @ 30V DC or 120V AC. 4A @ 240V AC resistive. 1/8 HP
3A type: 3A @ 30V DC or 120V AC, 2.5A @ 240V AC resistive, 1/10 HP
1A type: 1A @ 30V DC or 120V AC, resistive

Life — Mechanical: 20 million operations minimum
Electrical: 0.1 x 10^6 operations minimum at rated load

Timing — Operate: ≤ 5ms (standard type), ≤ 6ms (high sensitive type)
Release: ≤ 2ms

COIL DATA (@ 20°C)

Operate power — 210mW (standard type), 150mW (high sensitive type)

Nominal power — 450mW (standard type), 330mW (high sensitive type)

Maximum power — 1.4W

GENERAL DATA

Insulation Resistance — 250 MΩ at 500V DC

Dielectric Strength — 750V AC between open contacts
2000V AC between all other points

Temperature Range — standard type −40°C to +70°C
sensitive type −40°C to +80°C

Vibration Resistance — 15G (10-55 Hz)

Shock Resistance — 15G (11ms ±1ms)

Approximate Weight — 8 gr (0.28 oz.)

Enclosure — Polycarbonate

Surge Strength — 3000V

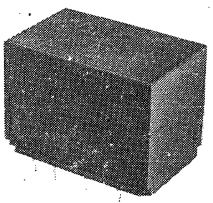
Standard Coil and Contact Combinations (20°C)

Nominal Voltage	Pull-In Voltage	Maximum Continuous Voltage	Coil Resistance ±10%, Ohms	Ordering Code 5A*	Ordering Code 3A	List Price
Standard types						
5	3.25	8.3	56	LZ-5H	LZ-5	$2.30
6	3.90	9.9	80	LZ-6H	LZ-6	$2.30
9	5.85	14.9	180	LZ-9H	LZ-9	$2.30
12	7.80	19.8	320	LZ-12H	LZ-12	$2.30
24	15.6	39.6	1280	LZ-24H	LZ-24	$2.30
48	28.8	79.2	3800	LZ-48H	LZ-48	$2.60
High sensitive types						
5	3.25	9.8	80	—	LZ-5S	$2.40
6	3.90	11.7	110	—	LZ-6S	$2.40
9	5.85	17.6	250	—	LZ-9S	$2.40
12	7.80	23.4	440	—	LZ-12S	$2.40
24	15.6	45.6	1780	—	LZ-24S	$2.40
Latch types						
5	3.4	NA	12	LZL-5H	LZL-5	$3.40
6	4.1	NA	17.5	LZL-6H	LZL-6	$3.40
9	6.2	NA	40	LZL-9H	LZL-9	$3.40
12	8.1	NA	70	LZL-12H	LZL-12	$3.40
24	16.2	NA	275	LZL-24H	LZL-24	$3.40
48	32.3	NA	1000	LZL-48H	LZL-48	$3.40
60	40.4	NA	1500	LZL-60H	LZL-60	$3.40

* Add $0.10 to List Price

GZ RELAY

5 Amp DPDT
L — 1.098″
W — 0.728″
H — 0.866″



CONTACT DATA

Arrangement — 2 Form C

Material — Heavy duty type: Gold overlay silver-nickel alloy (single)
Standard type: Gold overlay silver-nickel alloy (single)
Low level type: Gold overlay silver-palladium (bifurcated)

Life — Mechanical: 10 million operations minimum
Electrical: 0.1 x 10^6 operations minimum at rated load

Timing — Operate: ≤ 10ms
Release: ≤ 5ms

COIL DATA (@ 20°C)

Operate power — 270mW

Nominal power — 650mW

Maximum power — 1W

GENERAL DATA

Insulation Resistance — 100 MΩ at 500V DC

Dielectric Strength — 750V AC between open contacts
2000V AC between all other points

Temperature Range — −40°C to +70°C

Vibration Resistance — 10G (10-55 Hz)

Shock Resistance — 10G (6ms)

Approximate Weight — 18 gr. (0.63 oz.)

Enclosure — Polycarbonate

Surge Strength — 4000V

Standard Coil and Contact Combinations (20°C)

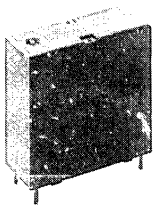
Nominal Voltage	Pull-In Voltage	Maximum Continuous Voltage	Coil Resistance ±10%, Ohms	Ordering Code	List Price
Heavy duty type 5 Amp					
6	3.8	9.0	55	GZ-6H	$4.95
12	7.6	18.0	220	GZ-12H	$4.95
24	15.2	36.0	880	GZ-24H	$4.95
48	27.8	63.4	2700	GZ-48H	$4.95
Standard types 3 Amp					
6	3.8	9.0	55	GZ-6	$4.80
12	7.6	18.0	220	GZ-12	$4.80
24	15.2	36.0	880	GZ-24	$4.80
48	27.8	63.4	2700	GZ-48	$4.80
Low level types 1 Amp					
6	3.8	9.0	55	GZ-6W	$5.40
12	7.6	18.0	220	GZ-12W	$5.40
24	15.2	36.0	880	GZ-24W	$5.40
48	27.8	63.4	2700	GZ-48W	$5.40

ITT Components
A Division of ITT Corporation

Sub Miniature General Purpose Relays

VG RELAY

L — 0.925″,
W — 0.386″,
H — 0.984″



CONTACT DATA

Arrangement — 1 Form C (SPDT)

Material & Rating —
VG-( )H, — Silver alloy 5A 24V DC or 120V AC resistive
VG-( ), VG-( )S — Silver alloy 3A 30V DC or 120V AC resistive
VG-( )L, VG-( )LS — Gold overlaid silver alloy 1A 30V DC or 120V AC resistive

Life Expectancy — Mechanical: 10 million operations
Electrical: 100,000 operations at rated load
30,000 operations at TV Rating

COIL DATA

Voltage — 5 to 48V DC (High sensitive type — to 24V DC)

Power (at 20°C) — Standard type: operate 0.18 ~ 0.2W
nominal 0.36 ~ 0.4W
High sensitive type: operate 0.1 ~ 0.13W
nominal 0.2 ~ 0.26W

Max. Operate (at 20°C) — 70% of nominal voltage

Duty — Continuous

GENERAL DATA

Insulation Resistance — Min. 1000 MΩ at 500V DC

Dielectric Strength — 750V AC (50/60 Hz) between open contacts
4000V AC (50/60 Hz) between coil and contacts

Surge Strength — 7000V (1 × 40 μs)

Temperature Range (at Nominal voltage) —
Standard type −40°C to +75°C } Non-carrying condition
High sensitive type −40°C to +85°C } of contacts

Time Value (at Nominal voltage) — Operate Max. 8 ms
Release Max. 5 ms

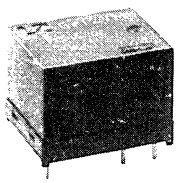
Mounting — For direct printed circuit mounting on grid spacing of 2.54 mm (0.1 in.) up to board thickness of 2 mm (0.08 in.)

Weight — 12 gr (Approx.)

Coil Data			Ordering Code Gold Overlaid Silver Alloy					
Nom. Coil Voltage	Coil Resist. in Ohm ±10% at 20°C	Must operate Voltage at 20°C	5A 1 Form C	List Price	3A 1 Form C	List Price	1A 1 Form C	List Price
Standard Type								
5	69	3.5	VG- 5H	$2.60	VG- 5	$2.50	VG- 5L	$2.50
6	100	4.2	VG- 6H	$2.60	VG- 6	$2.50	VG- 6L	$2.50
9	225	6.3	VG- 9H	$2.60	VG- 9	$2.50	VG- 9L	$2.50
12	400	8.4	VG-12H	$2.60	VG-12	$2.50	VG-12L	$2.50
18	870	12.6	VG-18H	$2.80	VG-18	$2.60	VG-18L	$2.60
24	1450	16.8	VG-24H	$2.80	VG124	$2.60	VG-24L	$2.60
48	6000	33.6	VG-48H	$3.20	VG-48	$3.10	VG-48L	$3.10
High Sensitive Type								
5	120	3.5			VG- 5S	$2.60	VG- 5LS	$2.60
6	150	4.2			VG- 6S	$2.60	VG- 6LS	$2.60
9	325	6.3			VG- 9S	$2.60	VG- 9LS	$2.60
12	575	8.4			VG-12S	$2.60	VG-12LS	$2.60
18	1400	12.6			VG-18S	$2.80	VG-18LS	$2.80
24	2230	16.8			VG-24S	$2.80	VG-24LS	$2.80

LZG RELAY

L — 0.862″,
W — 0.685″,
H — 0.634″



CONTACT DATA

Arrangement — [LZG-( )VM — SPST (N-O) only]

Material & Rating — Silver tin oxide alloy
[LZG-( )VM]: 10A at 24V DC or 120V AC resistive

Resistance — (Initial value) Silver tin oxide alloy — Max. 100 mΩ (at 6V, 1A)

Life Expectancy — Mechanical: 20 million operations
Electrical: 100,000 operations

COIL DATA

Voltage — 1.5 to 24V DC

Power (at 20°C) — Standard type: operate 0.19W
nominal 0.45W
maximum 1.4W

Operate (at 20°C) — 65% of nominal voltage

Duty — Continuous

GENERAL

Insulation Resistance — Min. 250 MΩ at 500 VDC

Dielectric Strength — 750V AC (50/60 Hz) between open contacts
2500V AC (50/60 Hz) between all other conductors

Surge Strength — 7000V (1 × 40 μs)

Temperature Range (at Nominal voltage) —
Standard type: −40°C to +70°C — Non-carrying condition of contacts

Time Value (at Nominal voltage) — Operate Max. 7 ms
Release Max. 4 ms

Mounting — For direct printed circuit mounting on grid spacing of 2.54 mm (0.1 in.) up to board thickness of 2.5 mm (0.098 in.)

Weight — 9.2 gr (Approx.)

Coil Data			Ordering Code 10A	List Price
Nominal Coil Voltage	Coil Resistance in Ohms ±10% at 20°C	Must Operate Voltage at 20°C		
Standard Type				
1.5	5	0.97	LZG 1.5VM	$2.50
3	20	1.95	LZG 3VM	$2.50
5	56	3.25	LZG 5VM	$2.50
6	80	3.90	LZG 6VM	$2.50
9	180	5.85	LZG 9VM	$2.50
12	320	7.80	LZG 12VM	$2.50
18	720	11.70	LZG 18VM	$2.50
24	1280	15.60	LZG 24VM	$2.50

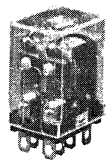
ITT Components
A Division of ITT Corporation

Miniature General Purpose Relays

ITT-2R

10 Amps DPDT
L — 1.098″
W — 0.843″
H — 1.362″

ITT-2H RELAY



CONTACT DATA

Arrangement — 2 Form C
Materials — Gold flashed silver, button
Load — 10A type: 10A @ 30V DC/120V AC, resistive, ¼ HP
5A type: 5A @ 30V DC/120V AC, resistive, ⅛ HP
Life — Mechanical: 50 million operations minimum
Electrical: 10A type: 0.1 x 10^6 operations minimum at rated load
5A type: 0.5 x 10^6 operations minimum at rated load
Timing — Operate: < 20ms
Release: < 20ms (AC relays), < 10ms (DC relays)

COIL DATA (@ 20°C)

Operate power — 500-575mW (DC relays), 2.0-2.3VA (AC relays)
Nominal power — 900mW (DC relays), 1.2VA (AC relays)
Maximum power — 2.2W (DC relays), 2.7VA (AC relays)

GENERAL DATA

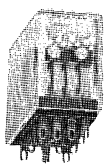
Insulation Resistance — 1000 MΩ at 500V DC
Dielectric Strength — 1000VRMS between open contacts
1500VRMS between all other points
Temperature Range — DC types −40°C to +65°C
AC types −40°C to +60°C
Vibration Resistance — 6G (10-55 Hz)
Shock Resistance — 20G (11ms ±1ms)
Approximate Weight — 45 gr (1.6 oz)
Enclosure — **Case** — polycarbonate
Base — phenolic
Surge Strength — 3000V

Standard Coil and Contact Combinations (20°C)

Nominal Voltage	Pull-In Voltage	Maximum Continuous Voltage	Coil Resistance ±10% DC, Ohms ±15% AC	Ordering Code: Printed Circuit	Ordering Code: Standard	List Price
5A types, DC Coils						
6	4.5	9.3	40	ITT-2BAR	ITT-2AR	$4.85
12	9	18.6	160	ITT-2BBR	ITT-2BR	$4.85
24	18	37.2	650	ITT-2BCR	ITT-2CR	$4.85
5A types, AC Coils						
24	19.2	30.6	180	ITT-2ZBCR	ITT-2ZCR	$5.05
115	92	146.6	4270	ITT-2ZBFR	ITT-2ZFR	$5.50
10A types, DC Coils						
6	4.8	9.3	40	ITT-2BAH	ITT-2FAH	$6.50
12	9.6	18.6	160	ITT-2BBH	ITT-2FBH	$6.50
24	19.2	37.2	650	ITT-2BCH	ITT-2FCH	$6.50
10A types, AC Coils						
24	20.4	30.6	180	ITT-2ZBCH	ITT-2ZFCH	$6.80
115	97.8	146.6	4270	ITT-2ZBFH	ITT-2ZFFH	$7.15

ITT-4 RELAYS

5 Amp 4PDT
L — 1.098″
W — 0.843″
H — 1.362″



CONTACT DATA

Arrangement — 4 Form C
Material — 5A type: Gold-flashed silver-cadmium-oxide, button
3A type: Gold-flashed silver, button
1A type: Gold-silver alloy, cross-bar
Load — 5A type: 5A @ 30V DC/120V AC, resistive, ⅛ HP
3A type: 3A @ 30V DC/120V AC, resistive, 1/10 HP
1A type: 1A @ 30V DC/120V AC, resistive
Life — Mechanical: 5A and 3A types: 50 million operations minimum
1A type: 20 million (DC relays), 10 million (AC relays) operations minimum
Electrical: 0.2 x 10^6 operations minimum at rated load
Timing — Operate: < 20ms
Release: < 20ms (AC relays), < 10ms (DC relays)

COIL DATA (@ 20°C)

Operate power — 500mW (DC relays), 2.0VA (AC relays)
Nominal power — 900mW (DC relays), 1.2VA (AC relays)
Maximum power — 2.2W (DC relays), 2.7W (AC relays)

GENERAL DATA

Insulation Resistance — 1000 MΩ at 500V DC
Dielectric Strength — 750VRMS between open contacts
Temperature Range — DC types −40°C to +65°C
AC types −40°C to +60°C
Vibration Resistance — 6G (10-55 Hz)
Shock Resistance — 20G (11ms ±1ms)
Approximate Weight — 45 gr (1.6 oz)
Enclosure — **Case** — polycarbonate
Base — phenolic
Surge Strength — 3000V

Standard Coil and Contact Combinations (20°C)

Nominal Voltage	Pull-In Voltage	Maximum Continuous Voltage	Coil Resistance ±10% DC, Ohms ±15% AC	Ordering Code: Printed Circuit	Ordering Code: Standard	Price List
3A types, DC Coils						
6	4.5	9.3	40	ITT-4BAR	ITT-4AR	$5.30
12	9	18.6	160	ITT-4BBR	ITT-4BR	$5.30
24	18	37.2	650	ITT-4BCR	ITT-4CR	$5.30
3A types, AC Coils						
24	19.2	30.6	180	ITT-4ZBCR	ITT-4ZCR	$5.60
115	92	146.6	4270	ITT-4ZBFR	ITT-4ZFR	$5.85
5A types, DC Coils						
6	4.5	9.3	40	ITT-4BAH	ITT-4AH	$5.65
12	9	18.6	160	ITT-4BBH	ITT-4BH	$5.65
24	18	37.2	650	ITT-4BCH	ITT-4CH	$5.65
5A types, AC Coils						
24	19.2	30.6	180	ITT-4ZBH	ITT-4ZCH	$5.95
115	92	146.6	4270	ITT-4ZBFH	ITT-4ZFH	$6.25

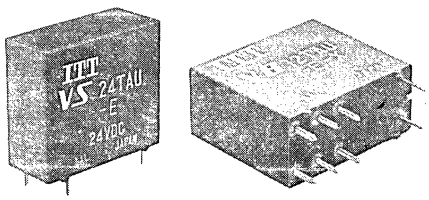
ITT Components

A Division of ITT Corporation

Miniature Power Relays

VB/VS RELAY

L — 1.150″
W — 0.508″
H — 0.996″



CONTACT DATA

Arrangement — 1 Form A, B or C 10 Amp (VS)
2 Form A, B or C 5 Amp (VB)

Material — Silver Nickel (Standard)

Rating — 5 or 10 Amp at 24V DC or 240V AC
⅙ or ⅓ HP 120V AC motor load

Inrush Current — 51 or 78A at 120 V AC

Max. Carrying Current — SPDT 14A, DPDT 7A

Life Expectancy — Mechanical 5 million operations
Electrical: 100,000 operations at 5 or 10A 24V DC or 240V AC
200,000 operations at 5 or 10A 120V AC resistive
3.5 or 7A 24V DC or 240V AC
30,000 operations at ⅙ or ⅓ 120V AC motor load

COIL DATA

Nominal Voltage — 3 to 60V DC

Power (at 20°C) — Nominal: 0.72W Standard Type
0.53W High Sensitive Type
Operate: 0.35W Standard Type
0.26W High Sensitive Type
Maximum: 1.4W

GENERAL

Dielectric Strength — Min. 1000V AC between open contact
Min. 5000V AC between all other conductors

Insulation Resistance — Min. 1000MΩ at 500V DC between conductors

Surge Strength — 10,000V

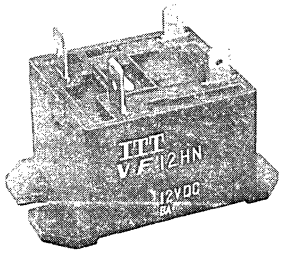
Temperature Range — (TV types) −40°C to +50°C
Standard types) −40°C to +65°C
(Sensitive types) −40°C to +75°C

Standard Coil and Contact Combinations

Type	Nominal Voltage DC (V)	Coil Resistance −10% at 20°C (V)	Must Operate Voltage at 20°C (V)	Ordering Code	List Price
Standard Types					
SPDT	5	36	3.5	VS- 5TBU-E	$3.25
	6	50	4.2	VS- 6TBU-E	$3.25
	12	200	8.4	VS-12TBU-E	$3.25
	24	820	16.8	VS-24TBU-E	$3.25
DPDT	5	36	3.5	VB- 5TBU-E	$3.80
	6	50	4.2	VB- 6TBU-E	$3.80
	12	200	8.4	VB-12TBU-E	$3.80
	24	820	16.8	VB-24TBU-E	$3.80
High Sensitive Type					
SPDT	5	47	3.5	VS- 5STBU-E	$3.35
	6	68	4.2	VS- 6STBU-E	$3.35
	12	270	8.4	VS-12STBU-E	$3.35
	24	1100	16.8	VS-24STBU-E	$3.35
DPDT	5	47	3.5	VB- 5STBU-E	$3.90
	6	68	4.2	VB- 6STBU-E	$3.90
	12	270	8.4	VB-12STBU-E	$3.90
	24	1100	16.8	VB-24STBU-E	$3.90

VF RELAY

L — 1.968″
W — 1.268″
H — 0.949″



CONTACT DATA

Arrangement — 1 Form A

Material — Silver Alloy

Rating:

Classification	Rating		Maximum Inrush Current
	Resistive	Motor Load	
H	30A 250V AC	2HP 25A 250V AC	70A 200V AC
M	25A 250V AC	1.5HP 20A 250V AC	60A 200V AC
L	20A 250V AC	1HP 15A 250V AC	55A 100V AC

Maximum Carry Current — 30A

Life Expectancy — Mechanical: 5 million operations
Electrical: 200,000 operations at motor load
100,000 operations at resistive load

COIL DATA

Nominal Voltage — 3 to 60V DC

Power (at 20°C) — Nominal: 1.2W
Operate: 0.59W
Maximum: 3.0W

GENERAL DATA

Dielectric Strength — 1200V AC between open contacts
4000V AC between all other conductors

Insulation Resistance — 1000MΩ (min.) at 500V DC

Surge Voltage — 10,000V

Timing (approx.) — Operate: 15ms at nominal
Release: 3ms at nominal

Weight — 55 gr

Vibration — 10 - 55Hz

Shock — 20G

Standard Coil and Contact Combinations

Coil Data at 20°C			Ordering Code		
Nominal Coil Voltage	Coil Resistance in Ohms ±10%	Must Operate Voltage	Quick Connect Terminals	PCB Coil Terminals	List Price
6	30	4.2	VF- 6HU	VFB- 6HU	$5.70
12	120	8.4	VF-12HU	VFB-12HU	$5.70
24	480	16.8	VF-24HU	VFB-24HU	$5.70
48	1920	33.6	VF-48HU	VFB-48HU	$5.70
6	30	4.2	VF- 6MU	VFB- 6MU	$5.20
12	120	8.4	VF-12MU	VFB-12MU	$5.20
24	480	16.8	VF-24MU	VFB-24MU	$5.20
48	1920	33.6	VF-48MU	VFB-48MU	$5.20
6	30	4.2	VF- 6LU	VFB- 6LU	$4.85
12	120	8.4	VF-12LU	VFB-12LU	$4.85
24	480	16.8	VF-24LU	VFB-24LU	$4.85
48	1920	33.6	VF-48LU	VFB-48LU	$4.85

ITT COMPONENTS • 1201 E. McFadden Avenue • Santa Ana, California 92705 • Phone: (714) 836-0351 • TWX: 910-595-1744 • Telex: 69-1389

ITT Components
A Unit of ITT Corporation

Solid-State Relays

ITT Components offers a full line of Solid-State Relays to cover a wide range of switching and isolation applications where long life, environmental ruggedness, low RFI, no contact bouncing and logic circuitry compatibility are prime requisites.

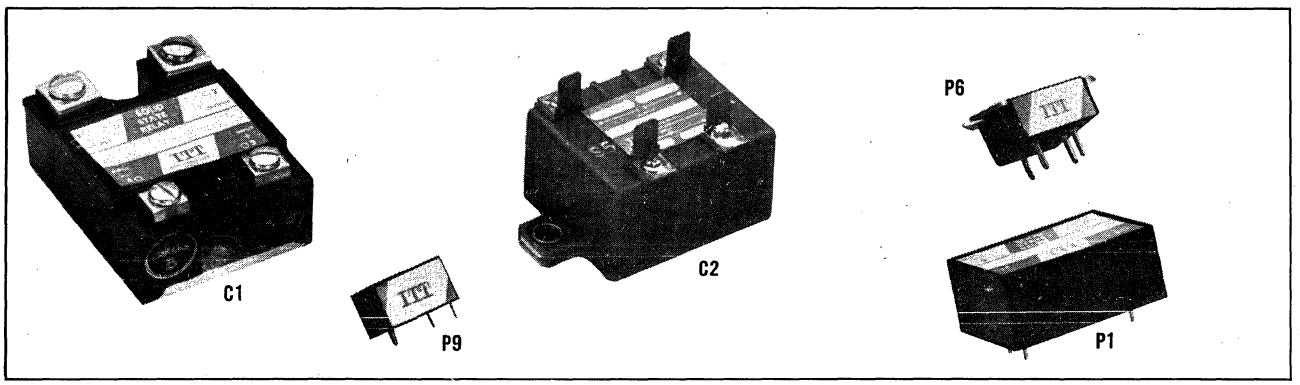
These SSRs feature:

- Photo-transistor or reed relay coupling.
- Various chassis mounting or printed circuit board mounting housings.
- AC switching.
- Zero-crossing or random switching.

AC output models can switch:

Voltages of 120, 240, 330, 480V AC.
Currents of 0.5, 2, 3, 7, 10, 25 or 30A AC.

A full line of input-output modules (DC and AC input as well as DC and AC output) to fit microprocessor based controls is also available.
Do not hesitate to call us for any additional information you might need.



INPUT				OUTPUT		
PACKAGE	VOLTAGE	TYPE	COUPLING	VOLTAGE	TYPE OF SWITCHING	CURRENT
C1	5	D	RC	120	R	10

PACKAGE
- CHASSIS MOUNT: C1, C2
- PRINTED CIRCUIT MOUNT: P1, P6, P9

VOLTAGE
- D → DC: 3(3-32), 5, 12, 24
- A → AC: 120, 240

TYPE
- D → DC
- A → AC

COUPLING
- PC- PHOTO TRANSISTOR COUPLED
- RC- REED RELAY COUPLED

VOLTAGE
- V AC: 12, 120, 240, 330, 480

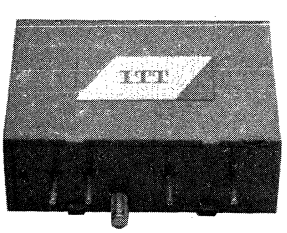
TYPE OF SWITCHING
- X- ZERO CROSSING SWITCHING
- R- RANDOM CROSSING SWITCHING

CURRENT
- A-AC: 0.5, 1, 2, 3, 7, 10, 25, 30

Example: C1-3D-PC-240X10

A Chassis mount, "hockey-puck" housing, the input circuit is driven with 3-32V DC, and it switches a 240V, 10A output triac. The relay features photo-transistor coupling, and zero cross-over switching.

I-O MODULES



Input	Housing	Logic Supply Voltage	Input Voltage
I	P7	5D/15D/24D	10D/120A/240A

NOT ANY COMBINATION OF THE ABOVE PARAMETERS IS POSSIBLE. PLEASE CONSULT US FOR ANY OTHER COMBINATION OF VOLTAGE, CURRENT, PACKAGE, ETC.

Output	Housing	Signal Pick-Up Voltage	Output Voltage	Output Current
O	P7	5D/15D/24D	60D/120A/240A	3

NOT ANY COMBINATION OF THE ABOVE PARAMETERS IS POSSIBLE. PLEASE CONSULT US FOR ANY OTHER COMBINATION OF VOLTAGE, CURRENT, PACKAGE, ETC.

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M

MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O

OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P

PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

WPS word processing software

Y

YIG yttrium iron garnet

Z

ZIF zero insertion force

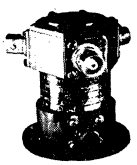
Vacuum Coaxial Relays

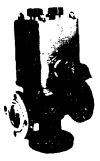
Applications for these units include high speed switching from omnidirectional to directional antennas, transmit-receive switching, and switching between transmitters for standby control.

Other applications include crossbar matrices and switching trees, CCTV, CATV, and microwave telemetry and data acquisition links, as well as general coaxial instrumentation.

Jennings vacuum coaxial relays have a recorded history of dependable, maintenance free operation. Because of this, they were chosen for ground and airborne applications for the tracking network of the Apollo program and the Atlantic Missile Range Communications.

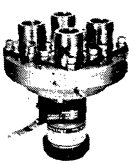
RC5


RC41


RC6

RC53

RC10


RC54

RC21

Model Number	Power Rating (CW in KW)	Frequency Range† (MHz)	VSWR†	Crosstalk† (db Isolation)	Actuating Voltage	Insertion Loss† (Max)	Coil Resistance (Ohms ± 10%)	Contact Configuration	Connector Size	Position Indicators Auxiliary Contacts	Operate Time†† (Max)	Weight Lbs. (Nom.)
GENERAL TRANSMITTER/RECEIVER SWITCH												
RC41E6000K440	3 @ 30 MHz	0-500	1.1:1 Max to 300 MHz	30 @ 300 MHz	26.5 VDC	0.1 dB	265	SPDT	C	None	25 ms	0.9
RC43E6050N440	5 @ 30 MHz	0-500	1.1:1 Max to 300 MHz	30 @ 300 MHz	26.5 VDC	0.1 dB	265	SPDT	LC	None	25 ms	3.3
CROSS OVER TYPE/4-PORT: 2 INPUT, 2 OUTPUT												
RC53A6300K24B	2.25 @ 30 MHz (connector limited)	0-600	1.1:1 Max to 300 MHz	75 @ 30 MHz	26.5 VDC	0.1 dB	19**	Transfer	N	DPDT	30 ms	2.8
RC54A6325H24B	7.5 @ 30 MHz	0-400	1.1:1 Max to 300 MHz	53 @ 500 MHz	26.5 VDC	0.1 dB	19**	Transfer	LC	DPDT	30 ms	6.4
1⅝" LINE SIZE												
RC5A5101A24B	25 @ 30 MHz	0-100	1.05:1 Max to 60 MHz	70 @ 30 MHz	26.5 VDC	0.02 dB	Opening 19.9 Closing 18.7	SPST	1⅝"	DPDT	30 ms	1.8
RC6A5126F14B	25 @ 30 MHz	0-400	1.1:1 Max to 150 MHz	65 @ 30 MHz	26.5 VDC Latching	0.01 dB	15.4	SPDT	1⅝"	DPDT	50 ms	8.0
3⅛" LINE SIZE												
RC10C5227A24B	90 @ 30 MHz	0-100	1.05:1 Max to 60 MHz	65 @ 30 MHz	26.5 VDC	0.02 dB	Opening 20.3 Closing 18.7	SPST	3⅛"	DPDT	30 ms	3.8
RC21A5500F14B	90 @ 30 MHz 2 MW Peak Spec. Order	0-500	1.1:1 Max to 400 MHz	60 @ 30 MHz	26.5 VDC Latching	0.01 dB	4.8	SPDT	3⅛"	DPDT	40 ms	14.0
SWITCH ASSEMBLY												
RC265552G24F	90* @ 30 MHz 2 MW Peak Spec. Order	0-600	1.1:1 Max to 400 MHz	60 @ 30 MHz	26.5 VDC Latching	0.01 dB	19	SPDT	3⅛"	DPDT	50 ms	14.0
ATTENUATOR												
RC275576G24F	90* @ 30 MHz 2 MW Peak Spec. Order	0-600	1.1:1 Max to 400 MHz	60 @ 30 MHz	26.5 VDC Latching	0.01 dB	19	SPST	3⅛"	DPDT	50 ms	13.0

* Power rating applies when connecting line pressurized 45 PSIA Dry Air or 31 PSIA Dry Nitrogen.
** ±15%
† All measurements with a characteristic impedance of 50 ohms.
†† Faster operate times can be obtained on most units by coil pulse circuits. Information available from factory.
NOTE: This power ratings is for the frequency at which the relay is most commonly used. The power rating for any point in the frequency range of the unit other than that shown may be obtained by consulting factory.

JENNINGS

970 McLaughlin Avenue • Department EM • San Jose, CA 95122 • (408) 292-4025

Vacuum and Gas Filled Relays

Relay Testing

Jennings operates test facilities to provide all environmental, high voltage, and radio frequency (RF) test parameters. All relays are individually tested prior to shipment for pull-in voltage, timing characteristics, contact resistance, and dielectric strength.

Vibration, shock, humidity, salt spray, temperature effects, current load and reliability tests are regularly performed on a sampling basis.

Mechanical life reliability tests are performed on a sample basis with equipment that only passes relays which cycle with proper sequences of contact operation. Some relay types have been checked to more than 10^8 operations.

RF3A

RF40

RJ2B

RB1D

RB1E

RF10B

RE6B

RB7A

RGD1,5

Peak Test Voltage (kV)	Model Number	Peak Working Voltage (kV) DC/60 Hz	Continuous Current Amps (RMS) DC/60 Hz	Maximum Capacitance Between Open Contacts or Contacts to Ground	Contact Configuration	Contact Resistance (ohms)	Operate Time (ms, Max)	Release Time (ms, Max)	Coil Resistance*	Expected Mech Life × 10^6	Connector Type**	Weight Ozs. (Nom.)
SPST/VACUUM												
4	RF40[1], RF40A[1]	3.6	12	1.6	Latch	.020	10	N/A	47[1]	1	Sol.	1
4	RF41, RF42	3.6	12	1.6	N/C, N/O	.020	10	10	290	1	Sol.	1
8	RF5A	7.5	12	1.6	N/C	.050	12	12	920	2	Sol.	1
9	RF43[1]	7.0	12	1.6	Latch	.020	10	N/A	47[1]	1	Sol.	1
10	RF4A, RF4B[1]	8.0	30	2.5	N/C, Latch	.015	18/10[1]	18/NA[1]	156/6.7[1]	1	Sol.	2
10	RF4T	7.0	20	10.0	N/C	.020	10	10	156	1	Sol.	2
12	RF50, RF51	10.0	6	1.6	N/C, N/O	.C20	15	15	290	1	Sol.	1
15	RD5A, RD5B,	12.0	15	1.0	N/O	.010	18	8	265	1	N300/400	3
15	RD6A, RD6B	12.0	15	1.0	N/C	.010	18	8	265	1	N300/400	3
30	RS8, RS10	28.0	75	1.5	N/O, N/C	.003	30	10	120	1	T	7
33	RJ8A	28.0	110	1.3	N/O	.003	18	8	120	2	T	10
SPDT/VACUUM												
4	RF1D, RF1E	2.0	8	2.0	SPDT	.050	10	10	920	2	Sol.	1
4	RF1J[1]	3.6	12	2.5	Latch	.050	10	N/A	18[1]	1	Sol.	1
4	RF61, RF60[1], RF60A[1]	3.6	12	2.0	SPDT, Latch	.020	10	N/A/10[1]	47/290[1]	1	Sol.	1
5	RJ1A	3.5	18	2.5	SPDT	.010	8	8	335	2	Sol.	1
5	RJ1H	2.5	3	N/A	SPDT	.030	6	6	335	1	Sol.	1
9	RF62, RF63[1], RF63A[1]	7.0	12	1.6	SPDT, Latch	.020	10	10/NA[1]	290/47[1]	1	Sol.	1
10	RF3A, RF3C[1]	8.0	30	4.0	SPDT, Latch	.015	18/10[1]	18/NA[1]	156/12[1]	1	Sol.	2
15	RJ2B, RJ2C	12.0	50	1.0	SPDT	.012	18	9	270	1	Sol.	3
15	RB1H, RB1J	12.0	15	1.0	SPDT	.012	18	9	265	1	S, N300/400	3
18	RB1D, RB1E	12.0	15	1.0	SPDT	.012	18	8	265	1	S, N300/400	3
20	RF10B	15.0	75	1.8	SPDT	.012	30	10	225	.1	Sol.	16
30	RE6B	25.0	25	2.5	SPDT	.012	25	10	120	.5	S, N300/400	7
DPDT/VACUUM												
9	RB7A, RB7B	7.0	14	2.0	DPDT	.020	15	5	270	1	S, N300/400	2
15/12*[2]	RB3	12/6*[2]	30	2.5	DPDT	.010	20	8	120	.5	S, N300/400	6
22	RB2A	20.0	20	2.5	DPDT	.010	20	10	225	.5	S, N300/400	8
4PDT/VACUUM												
17	RB4	15.0	20	2.5	4PDT	.010	45	10	131	.1	S, N300/400	16
DPDT/GAS FILLED												
14	RGD6	7.5	30	N/A	DPDT	0.1	20	N/A	18***	.01††	Flex.	11
14	RGD9	7.5	10†	N/A	DPDT	1.0	20	N/A	7.6***	.01††	Flex.	12
14	RGD7	7.5	30	N/A	DPDT	0.1	20	N/A	70	.01††	Sol.	11
20	RGD1	18.0	30	N/A	DPDT	0.1	25	N/A	52	.01††	Sol.	16
20	RGD5	18.0	30	N/A	DPDT	0.1	25	N/A	52	.01††	Sol.	10

* 26.5 VDC operate at 25°C.
** S—Standard Nickel Tabs; N300—Copper; N400—Heavy Duty Copper Bolt-on Connectors; Flex.—Flying Leads; Sol.—Solder-on Terminals; T—Thread Mount.
*** 12 VDC Coil
† Gold Plated Contacts †† Rated Load Life 1 Latching Model 2 Lower Contacts

JENNINGS

970 McLaughlin Avenue • Department EM • San Jose, CA 95122 • (408) 292-4025

High Voltage Relays

Applications

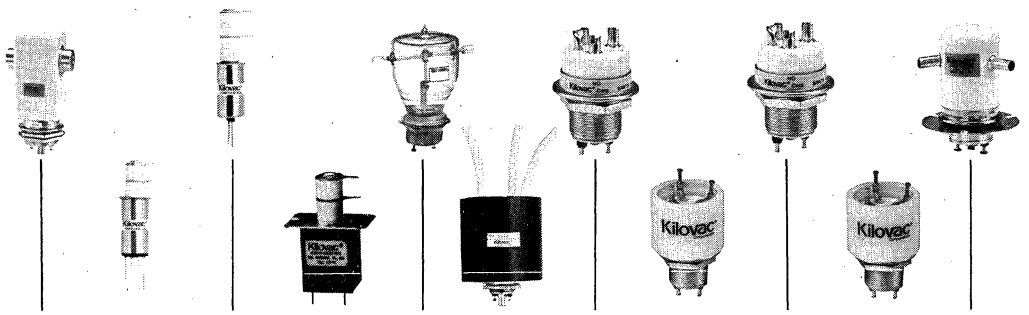
The capability to rapidly switch high voltages in a small package makes Kilovac® relays especially well suited for applications in ECM, communications, sonar and radar pulse forming networks, heart defibrillators and other capacitive discharge circuits, electrostatic coating equipment, laser and x-ray power supplies, digital antenna couplers (tuners), automatic dielectric-strength test equipment, and other high voltage equipment, or low voltage applications where extreme reliability is required.

Vacuum as a Dielectric

Since most high voltage arcs are initiated by ionization of the insulating medium, absence of any such medium (i.e., a hard vacuum) produces the greatest possible isolation between contact electrodes. In a vacuum of 10^{-8}mm of mercury, dielectric strengths can be achieved on the order of 2000 V/mil. A vacuum dielectric has the additional advantage of providing an inert (i.e., nonoxidizing) atmosphere in which high voltage contacts operate.

Low Contact Resistance

In conventional relays, contact resistance is variable from cycle to cycle. In Kilovac vacuum relays, it remains low and stable over the life of a relay (.015 ohms typical). Stability and low resistance are attributable to uniform cleanliness of parts, lack of oxidation or contamination, and use of only pure metals in the contact areas. Contact maintenance is never required.



Kilovac Part No.	KC-20	K41P	K43B	K42A332[4]	H-23 H-24	K61C	HC-1	HC-2	HC-3[1]	HC-4[1]	KC-2
Contact Arrangement	SPST-NO	SPST-LATCH	SPST-NC	SPST-NO	SPST[2]	SPDT	SPDT	SPDT	SPDT	SPDT	SPDT
Rated Operating Voltage (kVdc or 60 Hz peak)	25	5	10	5	30	35	3.5	8	3.5	8	15
Test Voltage (kVdc)	30	6	11	6	35	40	5	10	5	10	18
Continuous Current contacts closed, max (amps dc or 60 Hz peak)	110	15	12	15	30	10	25	25	18	15	50
Contact Resistance, max (ohms)	.005	.020	.020	.020	.015	0.5	.010	.010	.020	.020	.012
Operate Time, max (ms)	30	6	10	10	30	15	6	6	6	6	18
Coil Resistance (ohms ±10% @ 20°C)	120	80	290	680	120	180	335	335	335	335	250
Coil Voltage (Vdc, nominal)	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5
Nominal Dimensions (inches)	1.31 Sq x 4.00H	1.8 x .5D	2.2D x .5D	.75D x 1.72 H	2D x 3.62H	1.9D x 2.6H	.75D x 1.50H	1.13D x 1.88H	.75D x 1.50H	1.13D x 1.88H	1.00D x 2.50H
Nominal Weight (oz)	10	1	1	1	7	8	1	1.25	1	1.25	3
Mounting Style	Thr'ded Base	Strap Base	Strap Base	Flange Base	Thr'ded Base	Thr'ded Base	Thr'ded Base	Thr'ded Base	Thr'ded Base	Thr'ded Base	Flange[3] Base

(1) Suitable for power switching applications. Consult factory for details. Also available part no. KC-28 for pulsed power.
(2) H-23, SPST-NC, H-24, SPST-NO.
(3) For threaded base, use part no. KC-11.
(4) K42B332: SPST-NC.

Send for Kilovac catalog

Kilovac Corporation
P.O. Box 4422EM, Santa Barbara, CA 93140 USA
(805) 684-4560 • TWX 910-336-1141

Kilovac® Corporation

High Voltage Relays

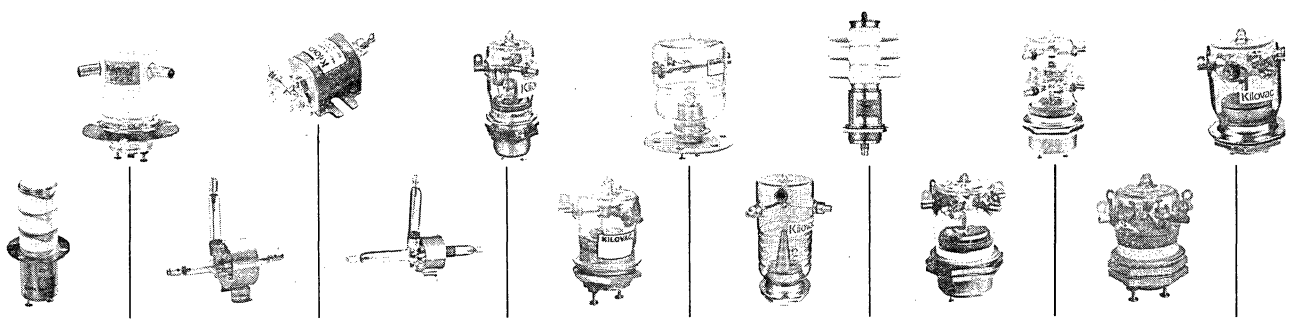
Small Size and Weight
The small contact gap and short contact travel possible with a vacuum dielectric result in minimal package size and weight.

Safety
Because contacts are sealed within the high voltage envelope, switching may be safely accomplished in explosive atmospheres.

Fast Switching Time
10 ms typical, due to small contact gap and short armature travel.

Electronegative Gas as a Dielectric
Kilovac gas-filled relays are pressurized with an electronegative gas mixture. This insulating medium offers several advantages, including high voltage isolation capability in a compact package. The primary advantage is its ability to suppress arcing in heart defibrillator and other capacitive discharge circuits.

Kilovac Medical Relays
Since 1964 Kilovac has produced and delivered thousands of high voltage relays especially designed for heart defibrillators. Kilovac produces several models of patient relays, safety discharge relays, and ECG relays, as well as a multifunction relay capable of performing all of these switching functions in a defibrillator.



KC-3	KC-8	HVS-1	H-4	H-35	H-8	H-12	H-17	H-25	K52C	H-14	H-16	H-18	H-19
SPDT	SPDT	SPDT	SPDT	SPDT	SPDT	SPDT	SPDT	SPDT	SPDT	DPDT	DPDT	DPDT	DPDT
8	15	17	5	35	15	8	25	50	100[6]	12	12	8	20
11	18	22	7.5	40	20	12	30	60	110[6]	15	15	10	25
25	30	7	10	10	15	15	30	30	1	30	30	10	30
.015	.025	.015	.02	.015	.015	.015	.015	.015	2	.015	.030	.020	.015
18	18	25	10	30	15	18	25	60	30	20	20	15	30
220	180	128	250	50	265	250	120	120	28	120	120	250	225
26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5
.75D x 2.75H	1D x 2.50H	4.75L x 5H	1.88L x .75H	8.25L x 5.75H	1D x 3H	1D x 2.0H	2.38D x 3.57H	3D x 7.5H	3.56D x 6.25H	1.29D x 2.77H	1.03D x 3.26H	1.03D x 1.97H	1.80D x 3.25H
2.5	3	15	1	15	3	2	5	30	24	8	5	4	7
Flange Base	Flange Base	Foot Bracket	Foot Bracket	Foot Bracket	Thr'ded Base	Thr'ded Base	Flange Base	Thr'ded Base	Thr'ded Base	Thr'ded Base	Thr'ded Base	Thr'ded Base	Thr'ded Base

[5] For threaded base, use part no. KC-12.
[6] In oil.

Send for Kilovac catalog

Kilovac Corporation
P.O. Box 4422EM, Santa Barbara, CA 93140 USA
(805) 684-4560 • TWX 910-336-1141

Kilovac® Corporation

LEACH® CONTROL PRODUCTS DIVISION TIME DELAY RELAYS & SENSORS

LEACH CPD products are synonymous with quality, reliability, product development and delivery of products at the leading edge of technology. With 65 years of experience, we're devoted to furthering State-of-the-Art time delay relay concepts and customer satisfaction.

HERMETICALLY-SEALED TIME DELAY RELAYS

Time delay (TD) relays provide SPDT to 4PDT contacts, with contact rating from 0.25 amp to 10 amps at 28V DC or 115/200V AC, 400 Hz, 1 or 3 θ, for high density packaging applications. Control time can be provided within the 50 ms to 200 minute range, for TD on operate and TD on release positive or negative control, and with a selection of mounting styles and terminal types. Time delay relays qualified to MIL-R-83726 are also available.

SENSORS

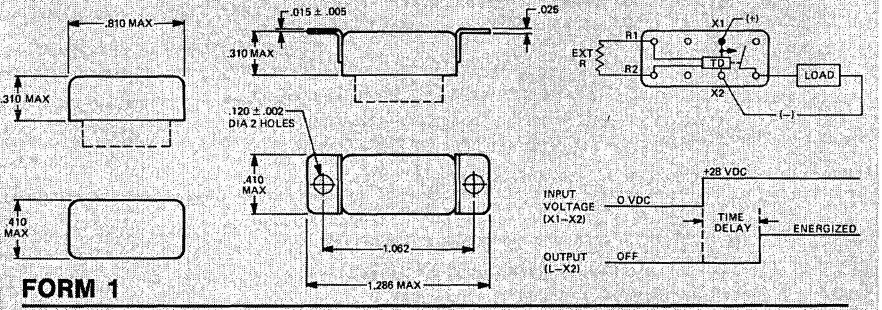
Sensor combinations provide voltage, frequency and phase sequence detection with built-in time delays for system monitoring. Power Monitors incorporate any combination of these sensing functions within a single unit.

FOR SPECIAL APPLICATIONS

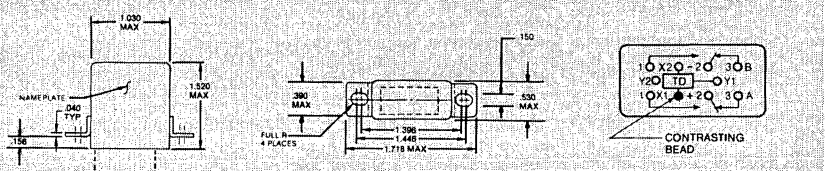
Build to print designs — are available for extended timing ranges and greater accuracies.

DIMENSIONS: INCH

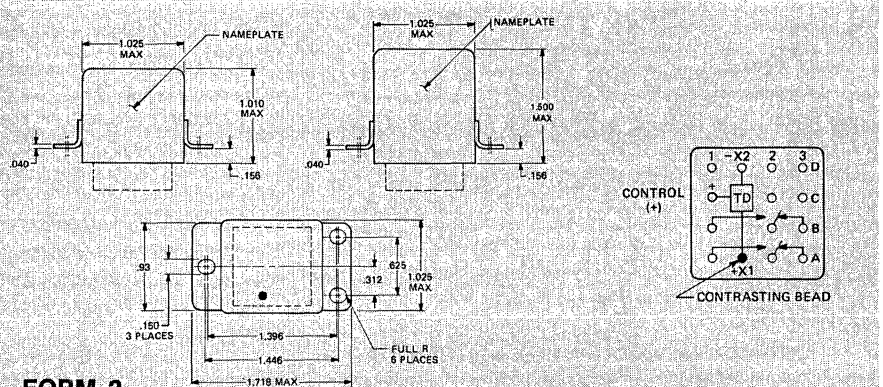
CIRCUIT



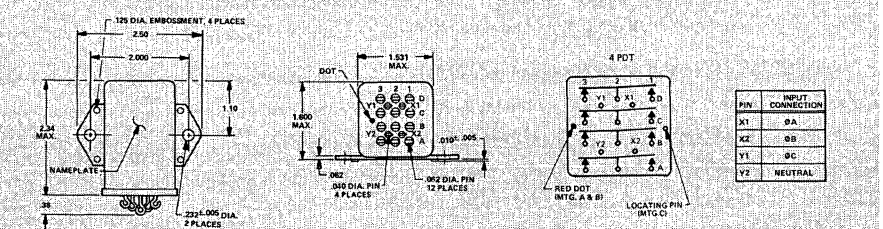
FORM 1



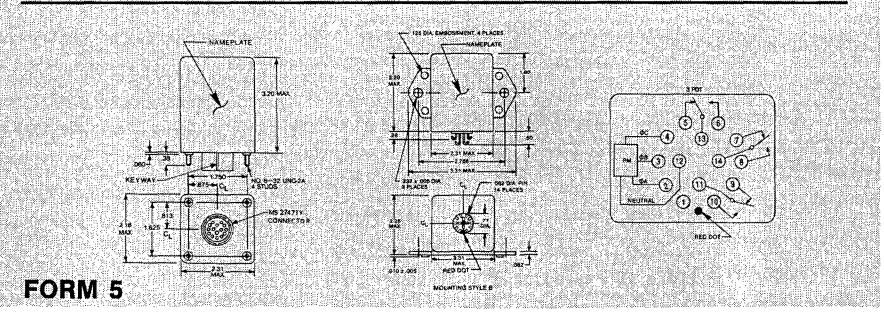
FORM 2



FORM 3



FORM 4



FORM 5

LEACH® CONTROL PRODUCTS DIVISION TIME DELAY RELAYS & SENSORS

ENGINEERING DATA

ITEM	GENERAL SPECIFICATIONS
ELECTRICAL	
Operating Voltage (X1-X2)	a) 18V to 32V DC b) 90V to 124V AC, 400 Hz c) 90V to 150V AC
Operating Current (X1-X2)	a) 75 MA RMS per Phase @ 25°C b) 150 MA MAX. @ 25°C c) 175 MA MAX. @ 25°C
Contact Form & Rating a) Contact Form b) Contact Rating-Resistive	Per MIL-R-6106 a) SPNO b) 2PDT c) 3PDT d) 4PDT a) 0.25 AMP b, c, d) 2 & 10 AMP
Timing Range	0.1 to 300 Seconds, ±10%
Recycle Time	a) 10 Milliseconds, Max. b) 50 Milliseconds, Max.
Transients a) Positive b) Spike c) Self-Generated	Per MIL-STD-704 80V Max. ±600V, 10 Microseconds Max. ±50V Max.
Phase Sequence Sensing	ABC
Input Frequency Range	44 to 480 Hz, ±2%
Dielectric Strength	1000V RMS, 60 Hz, 350V @ 80,000 ft.

ITEM	GENERAL SPECIFICATIONS
ENVIRONMENTAL	
Temperature Range	−55°C to +125°C
Vibration	MIL-STD-202 Method 204 Cond. D
Shock	MIL-STD-202 Method 213
Acceleration	MIL-STD-202 Method 212A Cond. A
Life Rated Resistive Load	a) 100,000 Operations, Min b) 1,000,000 Operations, Min
MECHANICAL	
Weight	Refer to Selection Table
Mounting & Terminals	See Dimension. Other mounting styles available on request.
Enclosure	Hermetically Sealed
Finish	Electro Tin, Type 1 per MIL-T-10727

SELECTION TABLE

DESCRIPTION	SERIES MODEL NUMBER	MECHANICAL		ELECTRICAL				
		FORM #	WEIGHT	CONTACT FORM	CONTACT RATING	OPERATING VOLTAGE	OPERATING CURRENT	RECYCLE TIME
Time Delay On Operate:								
Relay Output	Series 6000	2	1.9 oz Max	2PDT	10 AMP	20-30V DC	150 MA	50 MS
	Series 7000	3	3.0 oz Max	4PDT	10 AMP	20-30V DC	150 MA	50 MS
	Series 8000*	3	2.5 oz Max	2PDT	10 AMP	20-30V DC	150 MA	50 MS
Solid State Output	TD-1435*	1	0.5 oz Max	SPST	250 MA	28V DC	5 MA Max	10 MS
	TD-1436*	1	0.5 oz Max	SPST	250 MA	28V DC	5 MA Max	10 MS
Time Delay On Release:								
Relay Output	Series 6000	2	1.9 oz Max	2PDT	10 AMP	20-30V DC	150 MA	50 MS
	Series 7000	3	3.0 oz Max	4PDT	10 AMP	20-30V DC	150 MA	50 MS
* Qualified to MIL-R-83726	Series 8000*	3	2.5 oz Max	2PDT	10 AMP	20-30V DC	150 MA	50 MS
Sensors:						INPUT VOLTAGE	PICK-UP & DROPOUT TIME	
DC Voltage, Relay Output	V110	4	10 oz Max	2 & 4PDT	2 & 10 AMP	19.5-30V DC	50 MS Max	
AC Undervoltage, Relay Output	V210	4	10 oz Max	2 & 4PDT	2 & 10 AMP	90-124V AC	50 MS Max	
AC Overvoltage, Relay Output	V310	4	10 oz Max	2 & 4PDT	2 & 10 AMP	90-124V AC	50 MS Max	
AC Frequency, Relay Output	F410	4	10 oz Max	2 & 4PDT	2 & 10 AMP	90-124V AC	50 MS Max	
AC Phase Sequence, Relay Output	P510	4	10 oz Max	2 & 4PDT	2 & 10 AMP	90-124V AC	50 MS Max	
AC Power Monitor Sensor	V610	5	27 oz Max	2 & 3PDT	2 & 10 AMP	90-150V AC	.05-10 Sec ±10%	

LEACH®

QUICK REFERENCE GUIDE SUBMINIATURE RELAYS

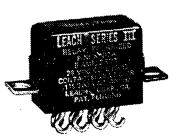
Leach subminiature relays have set the industry standards for technology and reliability for decades. With their proven high performance in the most demanding applications, they are ideal for your critical subsea, shipboard, ground-based and aerospace applications.

Our Balanced Force™ subminiature relays are rugged, high-environment relays for applications where size, weight and reliability are important. For systems where size and weight are critical, our Series III subminiature relays are the smallest, lightest aircraft relays made with their contact ratings, and are 40% the size and weight of our J and K Series relays, yet offer the same high performance. Both relay types are available in a variety of termination, mounting and operating configurations.

Sales Dept. Direct Line: (213) 232-8228

Subminiature Relays Dry Circuit to 10 Amps

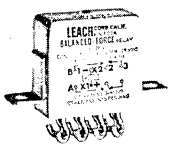
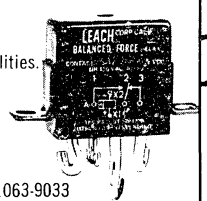
LEACH® RELAY DIVISION
5915 AVALON BLVD., LOS ANGELES, CA 90003
(213) 232-8221 TWX (901) 321-2303

		Contact Rating (Amps) 28 VDC Resistive	Inductive	Motor	Lamp	115/200 VAC 400 Hz, 3φ (Case Grounded)	Nominal Coil Voltage(s)	Coil Resistance(s)—(Ohms)	Operate Time, Maximum (MS)	Release Time, Maximum (MS)	Bounce Time, Maximum (MS)	Shock, Minimum, G	Sinusoidal Vibration, Minimum, G	Weight, Maximum, Oz. (Grams)
Low Level to 5A, 2PDT Non-Latch & Latch Series X, XL, XA Series III design, 5 mounting & 3 terminal types. 0.810" x 0.410" x 0.640" Designed to MIL-R-6106. Sockets available: SO-1064-001 (Non-Latch) SO-1064-003 (Latch)		5	3	2	1	Same as DC except inductive is 5A and motor is 3A	6.0 12.0 28.0 48.0 VDC	30 125 500 1600	4	4	0.5	200	30	.56 (16)
							DC LATCH 28 VDC	730						
							AC Coil (400 Hz) 115/28 (50-400 Hz) 115/28	AC Coil I, Max .030/.120 .040/.120						
Low Level to 5A, 4PDT Non-Latch & Latch Series Y, YL, YA Series III design, 5 mounting & 3 terminal types. 0.810" x 0.810" x 0.640". Designed to MIL-R-6106. Sockets available: SO-1066-001 (Non-Latch) SO-1066-003 (Latch)		5	3	2	1	Same as DC except inductive is 5A and motor is 3A	6.0 12.0 28.0 48.0 VDC	25 100 400 1275	6	6	0.5	200	30	.92 (26)
							DC LATCH 28 VDC	600						
							AC Coil (400 Hz) 115/28 (50-400 Hz) 115/28	AC Coil I, Max .040/.120 .030/.120						
Low Level to 10A, 1PDT Non-Latch & Latch Series XC, XCL Series III design, 5 mounting & 3 terminal types. 0.810" x 0.410" x 0.640". Designed to MIL-R-6106. Sockets available.		10	6	4	2	Same as DC except inductive is 8A	6.0 12.0 28.0 48.0 VDC	25 125 500 1600	6	6	1.0	200	30	.56 (16)
							DC LATCH 28 VDC	730						
							AC Coil (400 Hz) 115/28 (50-400 Hz) 115/28	AC Coil I, Max .040/.120 .030/120						
Low Level to 10A, 3PDT Non-Latch & Latch Series YC, YCL, YCA Series III design, 5 mounting & 3 terminal types. 0.810" x 0.810" x 0.640". Designed to MIL-R-6106. Sockets available: SO-1065-001 (Non-Latch) SO-1065-003 (Latch)		10	6	4	2	Same as DC except inductive is 8A	6.0 12.0 28.0 48.0 VDC	25 100 400 1275	6	6	1.0	200	30	.99 (28)
							DC LATCH 28 VDC	600						
							AC Coil (400 Hz) 115/28 (50-400 Hz) 115/28	AC Coil I, Max 040/.120 .030/.120						

Subminiature Relays Dry Circuit to 25 Amps (Cont'd)

LEACH®
RELAY DIVISION

5915 AVALON BLVD., LOS ANGELES, CA 90003
(213) 232-8221 TWX (901) 321-2303

	Contact Rating (Amps) 28 VDC Resistive	Inductive	Motor	Lamp	115/200 VAC 400 Hz, 3ϕ (Case Grounded)	Nominal Coil Voltage(s)	Coil Resistance(s)—(Ohms)	Operate Time, Maximum (MS)	Release Time, Maximum (MS)	Bounce Time, Maximum (MS)	Shock, Minimum, G	Sinusoidal Vibration, Minimum, G	Weight, Maximum, Oz. (Grams)
Low Level to 12A, 2PDT Non-Latch & Latch Series J, JA & JL Balanced Force* design. 4 mounting & 3 terminal types. DC - 1.015″x 0.515″x 1.000″ AC - 1.015″x 0.515″x 1.125″ Non-Latch applicable to MS27401 Latch applicable to MS27744. Sockets available: DC, Non-Latch SO-1049-8309(#16 Crimp) SO-1049-8526(#20 Crimp); AC-115VAC SO-1049-8772(#16 Crimp); 28VAC SO-1049-8774(#16 Crimp); DC, Latch SO-1055-8690(#16 Crimp)		DC Coil 12	8	4	2	Same as DC Rating	DC Non-Latch 6 12 28	DC Non-Latch 20 80 320	DC Non-Latch 10	DC Non-Latch 10	1	200	30	1.4 (40)
		AC Coil 10					DC Latch 6 12 28	DC Latch 38 150 600	DC Latch 10	DC Latch N/A				
							AC Coil (400 Hz) 115/28 (50-400 Hz) 115/28	AC Coil I, Max .040/.240 .024/.100	AC Coil 15	AC Coil 50				
Low Level to 12A, 4PDT Non-Latch & Latch Series K, KA & KL Balanced Force* design. 4 mounting & 3 terminal types. 1.015″x 1.015″x 1.000″ Non-Latch applicable to MS27400 Latch applicable to MS27745 Sockets available: DC, Non Latch SO-1048-8308(#16 Crimp) SO-1048-8518(#20 Crimp); AC-115VAC SO-1048-8776(#16 Crimp); 28VAC SO-1048-8779(#16 Crimp); DC, Latch SO-1056-8691(#16 Crimp)		DC Coil 12	8	4	2	Same as DC Rating	DC-Non-Latch 6 12 28	DC Non-Latch 18 70 290	DC Non-Latch 15	DC Non-Latch 15		200	30	DC Coil 2.5 (71)
		AC Coil 10					DC Latch 6 12 28	DC Latch 28 112 450	DC Latch 15	DC Latch N/A				
							AC Coil (400 Hz) 115/28 (50-400 Hz) 115/28	AC Coil I, Max .040/.225 .028/.120	AC Coil 20	AC Coil 50				AC Coil 2.7 (77)
Low Level to 25A, 1PDT Non-Latch & Latch Series JC. JCA & JCL[1] JS & JSA[2] Balanced Force* design. 50 ADC & 80A, 400 Hz overload capabilities. JS Series 20A overload capabilities. Special Models available. 3 mounting & 2 terminal types. DC-1.015″x 0.515″x 1.000″ AC-1.015″x 0.515″x 1.125″ Applicable MS, MIL-R-6106. Sockets available: DC, Non Latch SO-1063-9033; AC SO-1063-9034; DC, Latch SO-1063-9036		[1] JC, JCA & JCL					DC Non-Latch 6 12 28	DC Non-Latch 20 80 320	DC Non-Latch 10	DC Non-Latch 10	1	200	30	1.6 (45)
		25	12	10	5	Same as DC Rating								
		[2] JS & JSA Series Only 115V, 60 Hz Case Grounded					DC Latch 6 12 28	DC Latch 38 150 600	DC Latch 10	DC Latch N/A				
		10	10	8	4	N/A	AC Coil (400 Hz) 115/28 (50-400 Hz) 115/28	AC Coil I, Max .040/.240 .024/.100	AC Coil 15	AC Coil 50				
Low Level to 25A, 3PDT Non-Latch & Latch Series KC, KCA & KCL Balanced Force* design. 50ADC & 80A, 400 Hz overload capabilities. Special Models available. 3 mounting & 2 terminal types. 1.015″x 1.015″x 1.000″ DC, Non-Latch applicable to MS27743. Latch applicable to MS27742. Sockets available: DC, Non-Latch SO-1057-8912; AC SO-1062-8917; DC, Latch SO-1058-8913		25	12	10	5	Same as DC except inductive 15A	DC Non-Latch 6 12 28	DC Non-Latch 18 70 290	DC Non-Latch 15	DC Non-Latch 15	1	200	30	3.0 (85)
							DC Latch 6 12 28	DC Latch 28 112 450	DC Latch 15	DC Latch N/A				
							AC Coil (400 Hz) 115/28 (50-400 Hz) 115/28	AC Coil I, Max .040/.225 .028/.120	AC Coil 20	AC Coil 50				
Low Level to 25A 3PST/NO, 2A 1PDT Aux. Non-Latch & Latch Series KD, KDA & KDL Balanced Force* design. Same design as the Series KC with added auxiliary pole. Special Models available. 3 mounting & 2 terminal types. DC, Non-Latch applicable to MIL-R-6106/13. Latch applicable to MIL-R-6106/12. Sockets available: DC, Non-Latch SO-1059-8914; AC SO-1061-8916; DC, Latch SO-1060-8915		25	12	10	5	Same as DC except inductive 15A	DC Non-Latch 6 12 28	DC Non-Latch 18 70 290	DC Non-Latch 15	DC Non-Latch 15	1 Aux 4	200	30	3.0 (85)
		Aux 2	Aux 1		Aux .05		DC Latch 6 12 28	DC Latch 28 112 450	DC Latch 15	DC Latch N/A				
							AC Coil (400 Hz) 115/28 (50-400 Hz) 115/28	AC Coil 1, Max .040/.225 .028/.120	AC Coil 20	AC Coil 50				

* Patented and T.M. Leach Corp.

POWER AND CONTROL RELAYS

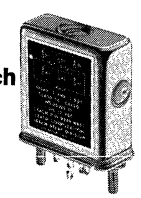
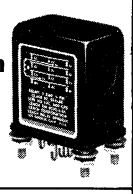
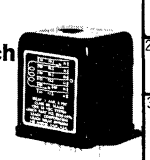
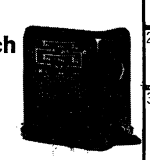
Leach power and control relays have been used for decades in commercial and military aircraft, trucks and buses, ships and tanks—any application that calls for proven durability, high performance and long life.

To ensure that you get the right relay for your application, our power and control relays are available in a broad range of configurations. You can choose from various terminal and mounting styles, dust and moisture resistant and hermetically-sealed enclosures, and a variety of operating ratings and characteristics.

Power and Control Relays

LEACH®
RELAY DIVISION

5915 AVALON BLVD., LOS ANGELES, CA 90003
(213) 232-8221 TWX (910) 321-2303

		Contact Rating (Amps)														
		1 28 VDC				2 115 VAC, 400 Hz, 1φ				3 115 VAC, 50/60 Hz, 1φ						
		Resistive	Inductive	Motor	Lamp	Resistive 115/200VAC, 3φ 400Hz (Case Grounded)	Contact Configuration	Resistance, Ohms ±10% @ 25°C for 28 VDC	Nominal Coil Voltage(s)	Operate Time, Maximum (MS)	Release Time, Maximum (MS)	Bounce Time, Maximum (MS)	Sinusoidal Vibration, Minimum, G	Shock, Minimum, G	Weight, Maximum, Lbs.	
5 Amp, 2PDT **Series 9229** **Series 9235; Magnetic Latch** Contact rating @ 28 VDC or 115 VAC 400 Hz. 1.750″x 1.531″x .687″. Applicable to MS25395, MS25321, MS25465, MS25455.		1 5	3	1.5	.8	N/A	—	9229 248Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .020	AC Coils .050 DC Coils .020	.002	10G 55 to 2000 Hz	25	.18	
		2 5	3	1.5	.8											
		3 4	2	1	.6			9235 310Ω		DC Coils .020	9235 N.A.				.20	
5 Amp, 4PDT **Series 9220** **Series 9228; Magnetic Latch** Contact rating @ 28 VDC or 115 VAC 400 Hz. 1.750″x 1.531″x 1.032″. Applicable to MS25267, MS25325, MS25467, MS25459.		1 5	3	1.5	.8	N/A	—	9220 248Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .020	AC Coils .050 DC Coils .020	.002	10G 55 to 2000 Hz	25	.30	
		2 5	3	1.5	.8											
		3 4	2	1	.6			9228 200Ω		DC Coils .020	9228 N.A.				.30	
5 Amp, 6PDT **Series 9226** **Series 9223; Magnetic Latch** Contact rating @ 28 VDC or 115 VAC, 400 Hz. 1.812″x 1.531″x 1.531″. Applicable to MS25269, MS25329, MS25469, MS25463		1 5	3	1.5	.8	N/A	—	9226 180Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .020	AC Coils .050 DC Coils .020	.002	10G 55 to 2000 Hz	25	.40	
		2 5	3	1.5	.8											
		3 4	2	1	.6			9223 200Ω		DC Coils .020	9223 N.A.				.67	
10 Amp, 2PDT **Series 9227** **Series 9237; Magnetic Latch** Contact rating @ 28 VDC or 3 phase 115/200 VAC, 400 Hz. 1.781″x 1.531″x 1.032″. Applicable to MS25273, MS25323, MS25466, MS25457.		1 10	6	4	2	10	—	9227 175Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .020	AC Coils .050 DC Coils .020	.002	10G 55 to 2000 Hz	25	.30	
		2 10	6	4	2											
		3 6	4	3	1.5			9237 200Ω		DC Coils .020	9237 N.A.				.30	

Power and Control Relays

LEACH® RELAY DIVISION

5915 AVALON BLVD., LOS ANGELES, CA 90003
(213) 232-8221 TWX (910) 321-2303

	Contact Rating (Amps)				Resistive 115/200VAC, 3φ 400 Hz (Case Grounded)	Contact Configuration	Resistance, Ohms ±10% @ 25°C for 28 VDC	Nominal Coil Voltage(s)	Operate Time, Maximum (MS)	Release Time, Maximum (MS)	Bounce Time, Maximum (MS)	Sinusoidal Vibration, Maximum (MS)	Shock, Minimum, G	Weight, Maximum, Lbs.		
	1 28 VDC															
	2 115 VAC, 400 Hz, 1φ															
	3 115 VAC, 50/60 Hz, 1φ															
	Resistive	Inductive	Motor	Lamp									Shock, Minimum, G			
10 Amp, 4PDT **Series 9224** **Series 9225; Magnetic Latch** Contact rating @ 28 VDC or 3 phase 115/200 VAC, 400 Hz. 1.812″x 1.531″x 1.531″. Applicable to MS25271, MS25327, MS25461, MS25468.	1 10	6	4	2	10	—	9224 110Ω 9225 200Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .020 DC Coils .020	AC Coils .050 DC Coils .020 9225 N.A.	.002	10G 55 to 2000 Hz	25	.43 .40
	2 10	6	4	2												
	3 6	4	3	1.5												
10 Amp, 2PDT **Series 9330** Contact rating @ 28 VDC or 115 VAC, 400 Hz. 1.781″x 1.531″x 1.032″. Applicable to MS24149.	1 10	10	6	2	10	—	160Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .020 DC Coils .020	AC Coils .050 DC Coils .020	.002	10G 15 to 1500 Hz	25	.30 .30
	2 10	10	6	2												
	3 6	4	3	1.5												
15 Amp, 4PDT **Series 9274** Contact rating @ 28 VDC or 3 phase 115/200 VAC, 400 Hz. 1.80″x 2.06″x 2.06″. Applicable to MS24568.	1 10	10	6	3	15	—	92Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .025 DC Coils .025	AC Coils .050 DC Coils .020	N.O. .003 N.C. .005	10G 1000 to 2000 Hz	50	.73
	2 15	10	6	3												
	3 10	6	4	2												
25 Amp **Series 9324—3PST/NO** 25 A, 115 VAC, 60 Hz. 1.47″x 2.50″x 2.40″. Applicable to MS27418.	1 25	15	20	10	25	3PST/NO	160	28 VDC, 115 VAC, 400 Hz; 60 Hz	AC Coils .025 DC Coils .020	AC Coils .050 DC Coils .010	.002	10G 55 to 1500 Hz	25	.60
	2 25	25	20	10												
	3 25	25	12	10												
25 Amp **Series 9325—3PDT/NO** Mechanical interlock version of 9324. 3.71″x 3.00″x 3.20″. Applicable to MS27706.	1 25	15	20	10	25	3PDT/NO	160	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .025 DC Coils .020	AC Coils .050 DC Coils .010	.005	10G 55 to 1500 Hz	25	1.4
	2 25	25	20	10												
	3 25	25	12	10												
25 Amp **Series 9123—3PST/NO** 50g shock, 15g vibration. Auxiliary 5 amp contacts available. 3.30″x 3.73″x 2.50″. Repairable models available. Applicable to MS27997.	1 25	25	25	N/A	25	3PST/NO	50	28 VDC 115 VAC, 400/60 Hz	.025	AC Coils .050 DC Coils .010	.002	15G 55 to 1500 Hz	50	1.25
	2 25	25	25	N/A												
	3 N/A	N/A	N/A	N/A												
25 Amp **Series 9339—3PST/NO** 25 A, 115 VAC, 60 Hz. 1.47″ x 2.50″ x 2.40″. Auxiliary Contact — 2 Amp.	1 25	15	20	10	25	3PST/NO 1PDT Aux.	160	28 VDC, 115 VAC, 400 Hz; 60 Hz	AC Coils .025 DC Coils .020	AC Coils .050 DC Coils .010	.002 .004 Aux.	10G 55 to 1500 Hz	25	.60
	2 25	25	20	10												
	3 25	25	12	10												

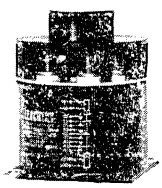
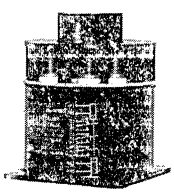
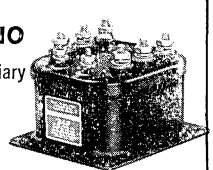
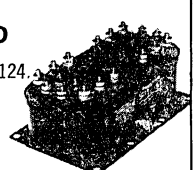
Power and Control Relays

LEACH® RELAY DIVISION
5915 AVALON BLVD., LOS ANGELES, CA 90003
(213) 232-8221 TWX (910) 321-2303

	Contact Rating (Amps)				Resistive 220/440 VAC 60 Hz 3φ (Case Grounded)	Contact Configuration	Resistance, Ohms @ 25°C for 28 VDC ±10%	Nominal Coil Voltage(s)	Operate Time, Maximum (MS)	Release Time, Maximum (MS)	Bounce Time, Maximum (MS)	Sinusoidal Vibration, Minimum, G	Shock, Minimum, G	Weight, Maximum, Oz./Lbs.		
	1 28 VDC															
	2 115/200 VAC 400 Hz 3φ															
	3 115/200 VAC 50/60 Hz 3φ															
	Resistive	Inductive	Motor	Lamp												
100 Amp Series "ZC" Center-Off Repairable models available. Design to MIL-R-6106. Basic unit: 3.65″ Dia. x 4.28″.	1 50	30	30	N/A	N/A	3PDT 3PST	6 VDC, .8 A 12 VDC, .4 A 28 VDC, .23 A 115 VAC, .09 A	6, 12, 28 VDC 115 VAC 400 Hz 115 VAC 60 Hz	.060	.040	.004	10G 70 to 1000 Hz	15	2.0 lb.
	2 100	100	60	N/A	N/A									
	3 N/A	N/A	N/A	N/A	N/A									
120 Amp Series "ZL" Magnetic Latch Repairable models available. Design to MIL-R-6106. Basic unit: 3.65″ Dia. x 4.28″.	1 50	30	30	N/A	N/A	3PDT	28 VDC, .215 A	6, 12, 28 VDC 115 VAC 400 Hz 115 VAC 60 Hz	.060	N/A	.004	10G 70 to 1000 Hz	15	2.0 lb.
	2 120	120	80	N/A										
	3 N/A	N/A	N/A	N/A	N/A									
100 Amp Series 9213 Sealed rotary, 1, 2, 3 and 4 pole. Auxiliary contacts from 5 amps. Design to MIL-R-6106 .	1 100	100	100	N/A	50	3PST/NO 4PST/NO	44.5	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	AC Coils .040 DC Coils .030	AC Coils .060 DC Coils .020	.010	10G 55 to 1500 Hz	25	2.7 lb.
	2 100	100	100	N/A										
	3 50	50	50	N/A										
25 to 100 Amp Series 9207 Unsealed rotary, 1, 2, 3 and 4 pole. Auxiliary contacts from 5 amps. Design to MIL-R-6106.	1 100	100	100	N/A	50	3PST/NO 4PST/NO	44.5	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	.030	AC Coils .050 DC Coils .020	.010	10G 55 to 500 Hz	50	1.6 lb.
	2 100	100	100	N/A										
	3 50	50	50	N/A										
25 to 400 Amp Solenoid Type Power Contactors 1PST, 2PST Types shown: 3PST/NO, 25 amps. Design to MIL-R-6106.	1 7064: 25 50	25 50	25 50	N/A 25	N/A N/A	3PST/NO 1PDT	Varying	28 VDC	.040	.015	N/A	2G 250 to 500 Hz	25	2.6 lb.
	1 7264: 200	100	200	N/A	N/A	1PST/NO								
	1 7401: 400	100	400	N/A	N/A	1PST/NO								
						1PST/NO								
300 Amp Series A Sealed Contactor SPST-NO. Auxiliary contacts — 5 amps. MIL-R-6106/33 (pending).	1 300	100	250	N/A	N/A	1PST/NO	60	28 VDC	.035	0.15	.004	10G 70 to 500 Hz 5G 500 to 1500 Hz	25	28 oz.
	2 N/A	N/A	N/A	N/A		1PST/NO 1PNO/1PNC Aux.								
	3 N/A	N/A	N/A	N/A		1PST/NO 2PDT/Aux.								
						1PST/NO 2PNO 1PNC Aux.								

Power and Control Relays

LEACH® RELAY DIVISION
5915 AVALON BLVD., LOS ANGELES, CA 90003
(213) 232-8221 TWX (910) 321-2303

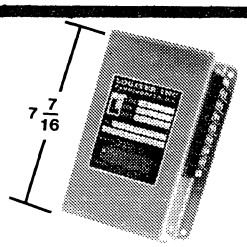
	Contact Rating (Amps) 28 VDC				Contact Configuration	Resistance, Ohms ±10% @ 25°C for 28 VDC	Nominal Coil Voltage(s)	Operate Time, Maximum (MS)	Release Time, Maximum (MS)	Bounce Time, Maximum (MS)	Sinusoidal Vibration, Minimum, G	Shock, Minimum, G	Weight, Maximum, Oz./Lbs.
	Resistive	Inductive	Motor	Lamp	Resistive 115/200VAC, 3φ 400 Hz (Case Grounded)								
60 Amp Series "H," "HT" Auxiliary contacts 5 amps. Repairable models available. Basic unit: 2.50" Dia. x 3.13". Applicable to MS27751. "HT" Power Transfer model	50	20	20	10	60	3PDT 3PDT SPST/NO Aux. 3PST/NO SPST/NO SPST/NC Aux.	6 VDC, 12Ω 12 VDC, 50Ω 28 VDC, 200Ω 115 VAC, .09A	6, 12, 28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	.050	.025	.003	10G 70 to 1000 Hz	50	13.5 Oz.
60 Amp Series "HC" Center-Off Repairable models available. Basic unit: 2.50" Dia. x 3.13". Applicable to MS27750. 	25	15	15	10	60	3PDT	6 VDC, 12Ω 12 VDC, 50Ω 28 VDC, 200Ω	6, 12, 28 VDC	.035	.025	.003	10G 70 to 1000 Hz	50	14.0 Oz.
60 Amp Series "HL," "HLT" Magnetic Latch Repairable models available. Basic unit: 2.50" Dia. x 3.13". Applicable to MS27749. "HLT" Power Transfer model 	50	20	20	10	60	3PDT	6 VDC, 12Ω 12 VDC, 50Ω 28 VDC, 200Ω	6, 12, 28 VDC	.035	—	.003	10G 70 to 1000 Hz	50	14.0 Oz.
50 Amp Series 9124—3PST/NO 50g shock, 15g vibration. Auxiliary 5 amp contacts available. Applicable to MS27222. 3.30" x 3.73" x 2.50". Repairable models available. 	50	50	50	N/A	50	3PST/NO	50	28 VDC, 115 VAC, 400/60 Hz	.025	AC Coils .050 DC Coils .010	.002	15G 55 to 1500 Hz	50	125 lb.
50 Amp Series 9125—6PST/NO Mechanical interlock version of 9124. Design to MIL-R-6106. Aux. 5 amp contacts available. 6.21"x 3.80"x 2.70". 	50	50	50	N/A	50	6PST/NO	50	28 VDC, 115 VAC, 400/60 Hz	.030	AC Coils .050 DC Coils .010	.002	10G 70 to 1500 Hz	50	2.90 lb.
120 Amp Series "Z" Auxiliary contacts-5 amp. available in many models of contact. Configuration-consult factory. Available in repairable models. Design to MIL-R-6106. Basic unit: 3.65" Dia. x 4.28".	50	30	30	N/A	120	3PDT 3PST/NO 3PST/NO SPST/NO SPST/NC Aux. 3PDT W/SPST/NO or SPST/NC Aux.	6 VDC, 1.2 A 12 VDC, .6 A 28 VDC, .31 A 115 VAC, .12 A	6, 12, 28 VDC 115 VAC 400 Hz 115 VAC 60 Hz	.060	.040	.004	10G 70 to 1000 Hz	15	2.0 lb.

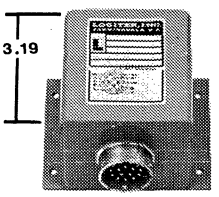
LOGITEK INC.

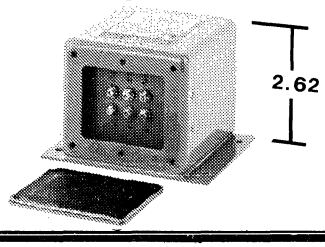
101 Christopher St., Ronkonkoma, NY 11779 (516) 467-4200 TWX 510 224-6253

ELECTRONIC MONITORS & CONTROLS

POWER MONITORS • AC & DC VOLTAGE MONITORS • FREQUENCY MONITORS • PHASE MONITORS







APPLICATIONS

Logitek power monitoring equipment is used to continuously monitor the characteristics of AC and DC electric power systems for conformance to their design acceptable limits. This type of continuous surveillance is of particular importance in such systems where undetected power line malfunctions could cause major system failure, utilization equipment malfunction, or erroneous operation. Without continuous monitoring, utilization equipment operators are often unaware that their equipment is malfunctioning or of its slow degradation until functional failure.

EQUIPMENT TYPES

Individual units are available to monitor AC or DC voltage, line frequency, phase to phase voltage unbalance and phase angle unbalance, each for both high and low limits, or to monitor for phase loss and/or reversal. "Power Monitors" are also available incorporating any combination of these monitoring functions within a single unit. Units generally fall into two categories: those in which the limits of high and low voltage, frequency and pick-up and drop-out time delay are factory pre-set, and those in which the limits are factory set, but field adjustable. Models are also available with two limit sets, one set for abnormal condition limits and a second set of limits for emergency conditions.

OPERATING CHARACTERISTICS

The equipment is connected to the power line to be monitored where it continuously measures the desired characteristics. Should any one of these characteristics exceed the pre-set acceptable limits, the drop-out time delay will begin. If the condition persists for a time longer than the drop-out time delay, the output control circuit will de-energize. Once the control circuit de-energizes, the power line must return to normal for a time exceeding the pick-up time delay before the control circuit will re-energize. In the case of phase loss or reversal, however, the control circuit will de-energize immediately bypassing the time delay circuits. Control circuits normally consist of relay contacts, but various logic levels can also be provided. Standard units are generally supplied with a single control circuit responsive to any type anomaly, however, equipment providing many variations can be specified for particular applications. Examples of variations include control circuits which provide a logic level output, a separate output for each characteristic being monitored, both real time and delayed time signal outputs and manual reset or override capabilty.

SPECIFICATIONS

ELECTRICAL

Input Voltage	28 VDC, 120/208, 120/240, 277/480 VAC
Input Frequency	50/60/400 HZ
Sense Voltage	As Required
Sense Frequency	As Required
Accuracy	±1%, ±5%
Phase Sequence	A + B + C
Phase to Phase Voltage Unbalance/Phase Angle Shift	5-10%
Time Delay (Pick-Up and Drop Out)	250 Milliseconds to 10 Seconds, factory set or field adjustable
Relay Contacts	DPDT, 3PDT
Contact Rating	2 Amp, 10 Amp

PHYSICAL

Finish	Gloss Blue #15177, FED-STD-595, Meet or exceed MIL-E-5556 or 5557
Connector	Glass to Metal Seal Solder Hooks, MS3113H-20-16PN Connector, Barrier Strip

ENVIRONMENTAL

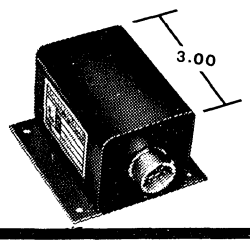
Temperature	−55°C to +125°C, −40°C to +85°C, −10°C to +70°C
Vibration	Per MIL-E-5272, Procedure II, 10 - 80 HZ @ .06″ D.A. 80 - 2000 HZ 20g's
Shock	Per MIL-E-5272, Procedure V, 50g's 11 ± 1 Millisecond, any axis
Acceleration	Per MIL-E-5272, Procedure I, 20g's Steady state, any axis
Humidity	Per MIL-E-5272, Procedure I
Altitude	Per MIL-E-5272, Procedure IV, Condition F, 100,000 Feet
General	Per MIL-E-5400R, Class 4 except Paragraph 3.1.29

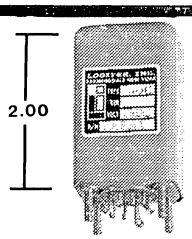
LOGITEK INC.

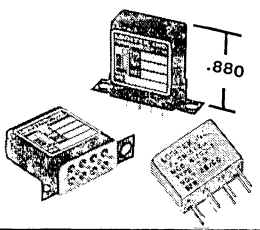
101 Christopher St., Ronkonkoma, NY 11779 (516) 467-4200 TWX 510 224-6253

ELECTRONIC MONITORS & CONTROLS

TIME DELAY RELAYS • SOLID STATE FLASHERS • REPEAT CYCLE & INTERVAL TIMERS







APPLICATIONS

The design of complex electrical distribution systems often requires that certain operations be delayed or sustained for a precise interval of time from occurrence of a control or initializing signal. Combinations of various timing devices can be used for sequential startup or shutdown programs, load transfer or shedding, or delayed transfer to avoid race conditions. In addition, pulsers, interval timers, and flashers are used in applications such as operating instrument panel warning lights or other annunciator devices, landing gear, door open indicators and navigation lights.

EQUIPMENT TYPES

Several timing functions are available to facilitate the different timing and sequencing requirements ordinarily required. These include "delay on make," providing a time delay from application of the control signal to output circuit energization; "delay on break," providing immediate energization which sustains for a timed interval; "delayed interval," providing a delay on make followed by a timed "energized" interval and then return to the de-energized state. "Controlled" timers generally fall into two categories: timers which produce an immediate transfer of the control circuit upon application of a control signal and then a time delayed release after removal of the control signal and "true delay on break" timers which generate a timed interval and relay transfer after removal of all operating power.

OPERATING CHARACTERISTICS

Logitek timing devices are generally CMOS integrated circuits appropriately protected from line transients and other line perturbations and either a solid state or electromechanical relay output circuit. Since there are no large capacitive timing or storage elements in these devices, recycle times (the time after control removal which will cause a new timing cycle within specified accuracy) are very short. In addition, the use of CMOS IC digital counting circuits allows the use of very stable timing elements resulting in excellent stability through wide temperature ranges.

SPECIFICATIONS

ELECTRICAL

Input Voltage	28, 115, 120, 220 VAC/DC
Timing Range	50 Milliseconds to 1000 seconds
Accuracy	±10%, ±5%, ±2%
Contacts	
Relay	DPDT, 3-PDT; 2 AMP, 10 AMP
Solid State	.5 AMP, 2 AMP, 2.5 AMP, 4 AMP, 5 AMP
Radio Interference	MIL-1-6181D, MIL-1-26600

PHYSICAL

Finish	Gloss Blue #15177, FED-STD-595, meet or exceed MIL-E-5556 or 5557, Flat Black per MIL-E-5556
Connector	Glass to Metal Seal Solder Hooks, MIL-STD Connector, Octal Plug

ENVIRONMENTAL

Temperature	−55°C to +125°C, −55°C to +85°C, −55°C to +71°C, −30°C to +30°C
Vibration	Per MIL-E-5272, Procedure II, 10 - 80 HZ @ .06" D.A. 80 - 2000 HZ 20g's
Shock	Per MIL-E-5272, Procedure V, 50g's 11 ±1 Millisecond, any axis
Acceleration	Per MIL-E-5272, Procedure I, 20g's Steady state, any axis
Humidity	Per MIL-E-5272, Procedure I
Altitude	Per MIL-E-5272, Procedure IV, Condition F, 100,000 Feet
General	Per MIL-E-5400R, Class 4 except— Paragraph 3.1.29

• QUALITY ASSURANCE

Logitek equipment is manufactured in accordance with

- MIL-Q-9858A
- MIL-I-45208

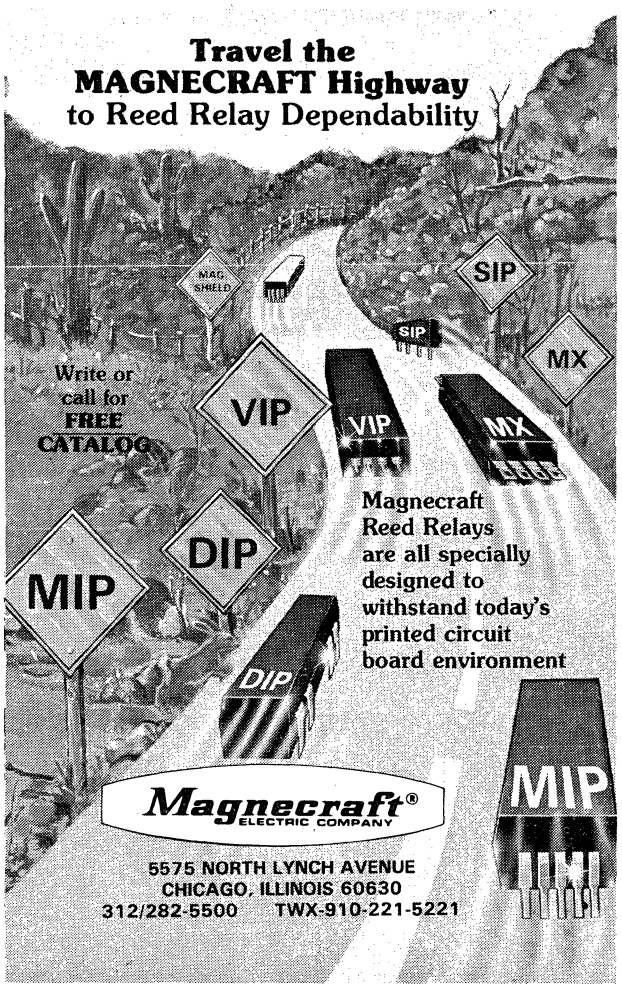
All production equipment undergoes a 100 hour burn-in schedule to insure in-service reliability.

• APPLICATIONS

- Aircraft, Electrical Systems
- Mobile Radar Systems
- Equipment Test Stations
- Tanks
- Mobile Missile Launchers
- Offshore Drilling Rigs
- Computer Systems
- Shipboard Electrical Systems
- Hospital Auxiliary Power Systems

• SPECIAL PRODUCTS

Logitek's engineering department is available to discuss your application of our product or to design special equipment to satisfy your system requirements.

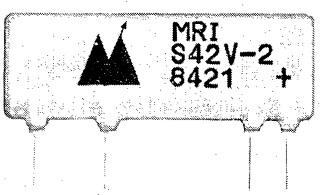


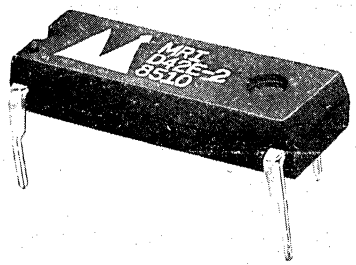
MAGNECRAFT ELECTRIC CO. PRODUCTS INCLUDE: Low Profile Relays, Miniature Industrial Relays, Miniature Printed Circuit Relays, General Purpose and Power Relays, General Purpose Industrial Relays, Molded In-Line Packaged Reed Relays, Mercury Wetted Relays, Dual In-Line Packaged Reed Relays, Solid State Relays, Mercury Displacement Relays, Current Sensing Relays, Time Delay Relays, Coaxial & R.F. Switching Relays, Sensitive Relays, Telephone Type Relays, Latching Relays, Sealed Relays, Actuators and Buzzers.

MICROELECTRONIC RELAYS, INC.

Subminiature (DIP & SIP) Solid State Relays

Standard TO-116 DIP and 4-pin SIP packages, featuring thick film hybrid microcircuitry. Eighteen models available, both AC and DC output types from signal level to 1 amp outputs. Photocoupled AC types provide 3500 VRMS input/output isolation to meet UL, CSA and VDE standards. Transformer coupled AC and DC types provide up to 2500 VRMS isolation and ultra-fast switching speeds, up to 1μsec.



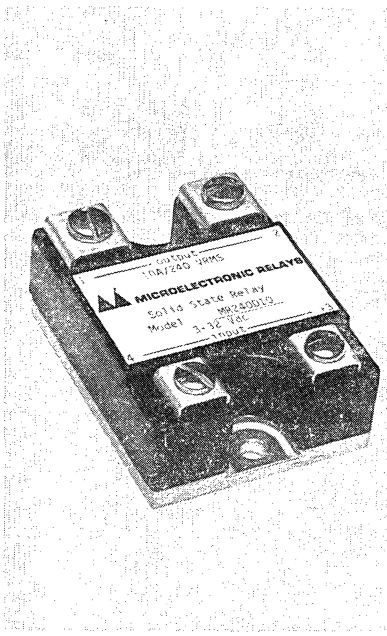


PART NUMBER	INPUT SPECIFICATIONS		OUTPUT/LOAD RATINGS (max.)		
	VOLTAGE (VDC)	CURRENT (mA at 5V)	CURRENT	VOLTAGE	AC/DC
D40-1	3.8-10	20	80mA	50V pk	AC or DC
D41-1	4 -10	12	0.5A	140VRMS	AC
D41-2*	4 -10	12	0.5A	280VRMS	AC
D42E-2*	3.5-15	8	1A	280VRMS	AC
D42E-21*	3 -15	8**	1A	280VRMS	AC
D42E-4*	3 -32	10	1A	280VRMS	AC
S42V-2*	3.5-15	8	1A	280VRMS	AC
S42V-21*	3 -15	8**	1A	280VRMS	AC
S42V-4*	3 -32	10	1A	280VRMS	AC
D43-1	3.8-10	12	500mA	60V	DC
D43-2	3.8-10	12	200mA	250V	DC

* Add "H" suffix to P/N for 600V pk output voltage rating
** Guaranteed turn-on at 2.5mA dc

Solid State AC Power Relays

Internal circuitry features MRI S42V Series patented thick film hybrid driver/isolator to reduce component count to only 6 compared to 20-25 in conventional SSRs. This design approach reduces cost while increasing inherent reliability. A current regulator IC chip is included to limit input drive current to 15mA max. over the 3-32Vdc input voltage range. Optical coupling provides 3750VRMS input/output isolation, and along with prescribed creepage and clearance spacings, meets VDE safety standards. "Zero voltage" turn-on and low insertion factor result in an exceptionally low EMI relay. Output ratings are 10, 25 and 40 Amps at 140 and 280VRMS, with optional peak transient ratings of 600V.



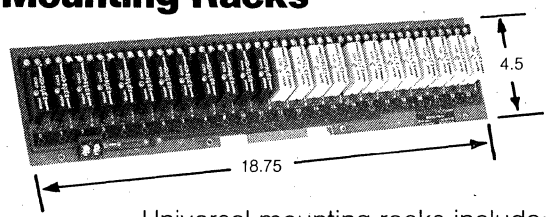
MODEL NUMBER	OUTPUT VOLTAGE RATING		OUTPUT CURRENT RATING
	VRMS	PRV	AMPS (RMS)
MR120D10	140	200	10
MR240D10	280	400	10
MR240D10-6	280	600	10
MR120D25	140	200	25
MR240D25	280	400	25
MR240D25-6	280	600	25
MR120D40	140	200	40
MR240D40	280	400	40
MR240D40-6	280	600	40

Opto 22. Solid state of the art.

Power I/O Systems

The most versatile I/O system available – also the most complete; Choices of 4, 8, 16, 24 or 32 module mounting racks; three logic voltages; 120 VAC, 240 VAC, 60 VDC, or 200 VDC load voltages; allow maximum flexibility in system design. The first true plug-in system per NEMA ICS2-230.02 simplifies maintenance, installation and modification. Provides power interface & optical isolation between the μP (or other logic) & industrial power.

Mounting Racks



Universal mounting racks include:

- ☐ LED status indicator
- ☐ Plug connection for logic signals
- ☐ UL Recognized, CSA Certified

Instant Delivery From Stock

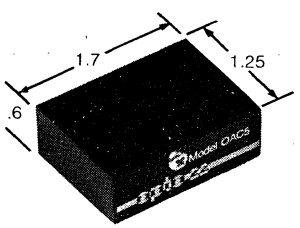
CONTROL VIA BARRIER STRIP

PB4	**4 MODULE POSITIONS**
PB4R	**4 MODULE POSITIONS (ISOLATED CONTROL)**
PB16T	**16 MODULE POSITIONS**

CONTROL VIA EDGE CONNECTOR

PB8	**8 MODULE POSITIONS**
PB16A	**16 MODULE POSITIONS**
PB16C	**16 MODULE POSITIONS-EXTRA BARRIER STRIP**
PB24	**24 MODULE POSITIONS**
PB24Q	**24 MODULE POSITIONS**
PB32DEC	**32 MODULE POSITIONS-CONNECTS TO DEC LSI 11**

I/O Modules



- ☐ 4000 V Optical Isolation
- ☐ Built-in Snubbers on AC output
- ☐ Zero Cross Switching on AC output
- ☐ UL Recognized, CSA Certified
- ☐ High Transient Immunity

Instant Delivery From Stock

OUTPUT MODULES

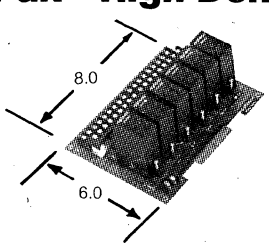
MODEL	DC Logic Voltage	Power Voltage	Power Current Rating Amps	1 Cycle Surge Rating Amps Peak
OAC5	5	12-140 VAC	3	80
OAC5A	5	24-280 VAC	3	80
ODC5	5	2-60 VDC	3	5
ODC5A	5	2-200 VDC	1	5
OAC5A5*	5	24-280 VAC	3	80
OAC15	15	12-140 VAC	3	80
ODC15	15	2-60 VDC	3	5
OAC24	24	12-140 VAC	3	80
ODC24	24	2-60 VDC	3	5
ODC24A	24	2-200 VDC	1	5

*Normally closed

INPUT MODULES

MODEL	DC Logic Voltage	Power Voltage
IAC5	5	90-140 VAC/DC
IAC5A	5	180-280 VAC/DC
IDC5	5	10-32 VDC/AC
IDC5B	5	4-16 VDC HIGH SPEED
IAC15	15	90-140 VAC/DC
IDC15	15	10-32 VDC/AC
IAC24	24	90-140 VAC/DC
IDC24	24	10-32 VDC/AC

Quad Pak™ High Density Power I/O Modules



Instant Delivery From Stock

MODEL	Power Voltage	Power Current Rating Amps	1 Cycle Surge Rating Amps Peak	MODEL	Power Voltage
OAC5Q	12-280 VAC	3	80	IAC5Q	90-140 VAC
ODC5Q	2-60 VDC	3	5	IAC5AQ	180-280 VAC
Note: All Quad Pak® input & output modules operate with 5 VDC logic.				IDC5Q	10-32 VDC
				IDC5BQ	4-16 VDC

The OPTO 22 Direct Connection to Commonly Used Host Computers and Buses

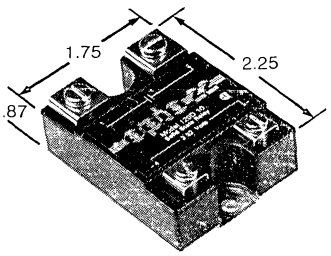
OPTO 22 offers cables and/or adapter boards to facilitate connection to a wide variety of host computers and buses.

CIMBUS
EXORBUS,
IEEE 488
MULTIBUS
STD BUS
S-100 BUS
Q BUS
UNIBUS
VME BUS
APPLE II
DEC FALCON
IBM PC/SERIES 1
RCA MICROBOARD
ROCKWELL AIM/SBC
TI 990 SERIES

Optically Isolated SSRs

- ☐ TTL Compatible Control
- ☐ 4000 V Optical Isolation
- ☐ UL Recognized, CSA Certified
- ☐ Zero Cross Switching for low noise
- ☐ Intergal snubber – tested twice at Rated & Surge Current for both resistive load & 0.5 power factor inductive load.

Power Series – AC Load†



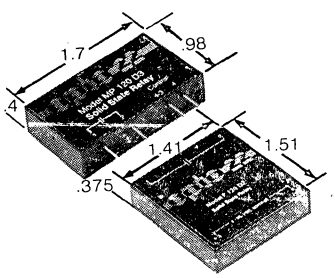
Chassis mount, heavy duty power relays untilizing two SCRs & the most advanced heat transfer design.

Instant Delivery From Stock

Output Current Rating Amps	Output Voltage Rating* 120 VAC	240 VAC	1 Cycle Surge (Amps) Peak	Control Voltage
3	120D3	240D3	55	3-32 VDC
10	120D10	240D10	110	3-32 VDC
25*	120D25	240D25	250	3-32 VDC
45*	120D45	240D45	650	3-32 VDC
10	120A10	240A10	110	85-280 VAC
25*	120A25	240A25	250	85-280 VAC
45*	120A45	240A45	650	85-280 VAC

*Also available with 380 VAC rating

PC Board Series – AC Load†

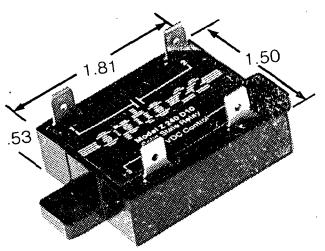


Two optimized configurations – the thin P series for edge stacked cards and the MP series where a small footprint is required.

Instant Delivery From Stock

Output Current Rating Amps	Output Voltage Rating 120 VAC	240 VAC	1 Cycle Surge (Amps) Peak	Control Voltage
2	MP120D2	MP240D2	20	3-24 VDC
4	MP120D4	MP240D4	85	3-24 VDC
2	P120D2	P240D2	20	3-32 VDC
4	P120D4	P240D4	85	3-32 VDC

Liberator Z Series



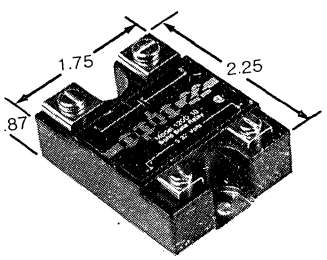
Designed for high volume the best buy in solid state relays.

Proof that quality does not have to cost more.

Instant Delivery From Stock

Output Current Rating Amps	Output Voltage Rating 120 VAC	240 VAC	1 Cycle Surge (Amps) Peak	Control Voltage
10	Z120D10	Z240D10	110	3-32 VDC

480 Volt Transient Proof High Voltage Power Series



Advanced design provides transient immunity to 2000 volts!

Instant Delivery From Stock

Current Rating Amps	Output Voltage Rating 480 VAC	1 Cycle Surge (Amps) Peak	Control Voltage
10	480D10-12	110	3-32 VDC
15	480D15-12	150	3-32 VDC
10	480A10-12	110	85-280 VAC

†DC Load Relays

opto 22

15461 Springdale Street, Huntington Beach, CA 92649 / (714) 891-5861 / Telex 692386

EEM PRODUCT SELECTION GUIDES

Use the EEM Product Selection Guides. There are 34 Guides in this edition of EEM. See page 2 (A•2, B•2, C•2, D•2) of each volume to locate the Product Selection Guides that pertain to your needs.

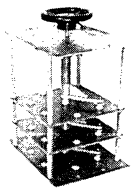
HIGH VOLTAGE DEVICES

RELAYS
SWITCHES
MEASUREMENT
CONTROL UNITS

AC
DC
RF
PULSE

208V to 900 KV
ENERGY STORAGE
ELECTRONIC AND POWER
SAFETY AND ACCESSORIES

HV ROTARY SWITCHES

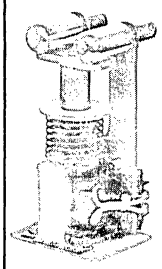


Ratings from 5 to 150KV, 1 to 200 amps. Either manual or electrical operators, depending upon requirements. Position detents and interlocks to prevent opening under load.

HIGH CURRENT SWITCHES

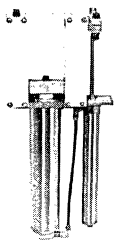
Models are available up to 20,000 amps continuous, and over 500,000 amps pulse, with voltage ratings of 6 volts to 300 KV peak test. Many are air cylinder or motor operated for high contact force.

HV RELAYS



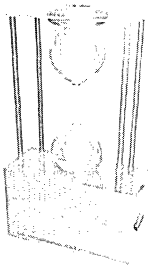
HV relays of the air insulated type both for low and high current. This series has ratings from 1 to 200 amps continuous, 100 to 100,000 amps momentary and capacitor discharge. Peak test voltages from 5 to 300KV. Single or Multipole. NO, NC, and DT. Auxiliary contacts optional on all types. Extended life and tungsten contacts also available for high current closing. Usable in oil.

HV-RF SWITCHES



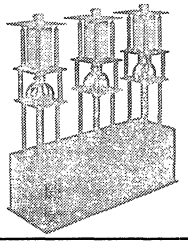
For RF applications, low loss G-7 Silicone glass insulation and non-magnetic materials are used. Switches available up to 50 MHz. 1 to 50 KV, 1 to 800 amps. Air or hydraulic, and spring actuated.

HV GROUNDING RELAYS



Extra high voltage low corona grounding relays of the air insulated type. Ratings up to 600 KV peak at 100 amps continuous. Solenoid, motor or air cylinder operated and spring or gravity return.

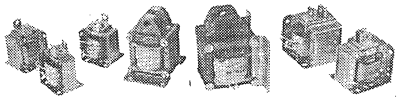
HIGH SPEED (One Cycle) VACUUM CONTACTORS CIRCUIT BREAKERS



Vacuum switches, single phase, three phase, upright or low profile, for high reliability sealed arc interrupting or crobar shorting. 208V to 200 KV RMS operate. 50 to 4,000 amps continuous, 2,000 to 35,000 amps AC, 10 to 20,000 amps DC interrupt, 5,000 to 100,000 amps momentary and capacitor discharge.

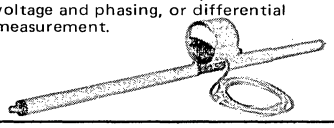
QUIET AC PRECISION SOLENOIDS

To 36 lbs. continuous hold and to 126 lbs. intermittent. Class H coils with 180°C insulation. 1" stroke, or, with special stainless steel guides, extendable to several inches. Corrosion resistant. Coil voltages offered are: 115V, 208V, 240V, and 480V, 60Hz; 50Hz optional. Other voltages and frequencies including DC are available.

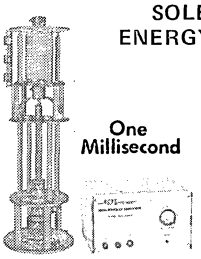


Hi-Z T.M. HV VOLTMETERS SAFE POWER LINE USE AC - DC

Fully safe portable, all solid state, 2% to 5% accuracy. Taut band shielded high voltage measurement with minimum circuit loading. 0.0001 V to 50 KV AC and DC. Ideal for use with Elbow capacitance tap voltage test points. For cable test point or direct line voltage and phasing, or differential measurement.

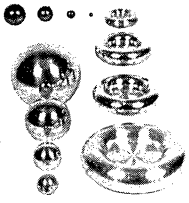


SOLENOID DRIVERS ENERGY STORAGE UNITS



For high speed or loss of power automatic circuit breaker trip and for high speed activation of contactor or circuit breaker solenoids. Energy storage up to 400 joules or more at 150 to 700 volts or more, 100 to 4,000 microfarad or more. Instantaneous SCR control available.

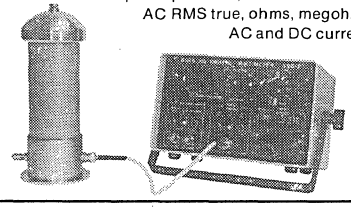
TOROIDS, SPHERES, CORONA SHIELDS



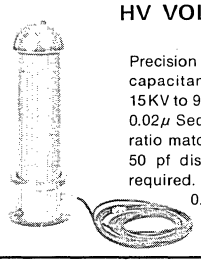
Geometrically designed to avoid excessive voltage gradients at connecting points and other areas needing shielding or balancing of electrostatic fields to increase withstand voltage and minimize corona. Diameters are to international standard metric sizes.

HV DIGITAL MULTIMETERS

Easy to read, 4½-digit display; 0.05% basic accuracy. 0.0001 volt to 900 KV. Battery/AC with charger. Recorder and scope outputs. DC, AC RMS average, AC RMS true, ohms, megohms, AC and DC current.

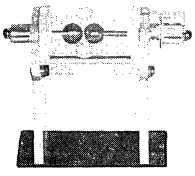


WIDE BAND HV VOLTAGE DIVIDERS



Precision compensated resistance-capacitance voltage dividers for 15KV to 900KV, DC to 10MHz or to 0.02μ Sec rise time pulse. 1,000/1 ratio matched to 1 megohm, 20 to 50 pf display or recorder, or as required. Accuracy and stability 0.1% to 3%.

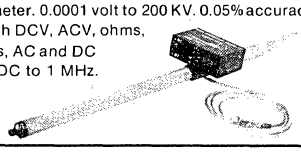
HV ADJUSTABLE SPARK GAPS



Non-melting carbon spheres, 1 cm to 10 cm and heavy wall aluminum spheres, 10 cm and above. Dust tight transparent covers used 1 KV to 88 KV. Open style to 670 KV. Direct reading micrometer type calibrating device.

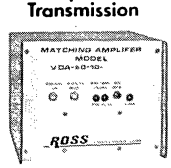
HV DIGITAL PROBES

HV DC, AC, & Wideband DC-1 MHz Safety Probes for any digital display or VTVM. Also available complete with large 4½-digit display 0.1% to 5% AC/DC accuracy, safety handle digital voltmeter. Battery/AC with charger. Removable Digital Display or Multimeter. 0.0001 volt to 200 KV. 0.05% accuracy basic, with DCV, ACV, ohms, megohms, AC and DC current. DC to 1 MHz.



WIDE BAND MATCHING AMPLIFIER

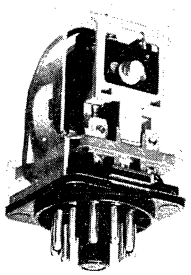
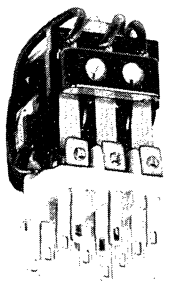
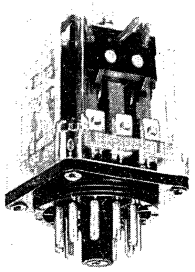
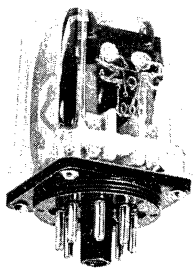
NEW! Fiber Optics Transmission



AC or rechargable battery/AC operated. DC to 1 MHz. 1 megohm or higher input to 50 ohm load. Cable driver has a maximum output to 10V PK (20V PK to PK) and maximum input of 10V to 1,000V PK direct from signal source. With Ross wide band HV dividers useful from 0.1V to over 900KV.

ROSS ENGINEERING CORPORATION
540 WESTCHESTER DRIVE CAMPBELL, CALIF. 95008 **WRITE FOR CATALOG**
(408) 377-4621 24 HR. (408) 559-4326

SCHRACK P.W.B. RELAYS-

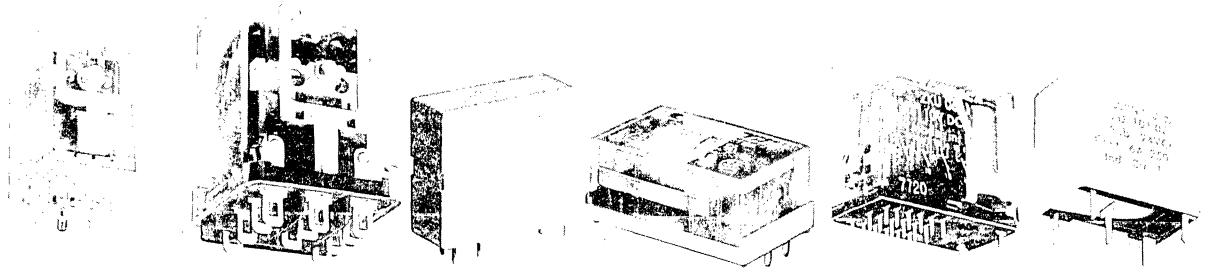





Relay	General Purpose	General Purpose	General Purpose Magnetic Latching	General Purpose Sensitive
Type	**CAD**	**CA**	**CRD**	**CMD/CSD**
Standard Design Design	Enclosed with clear dust cover and visual on/off indicator	Open type	Enclosed with clear dust cover or open frame	Enclosed with clear dust cover or open frame
Terminals	8 or 11 pin plug-in base to mate with standard tube sockets	Pierced terminals soldering, .110 Faston or PCB Also mates with socket RD78700.	8 or 11 pin plug-in base; soldering, .110 Faston or PCB	8 or 11 pin plug-in base; soldering, .110 Faston or PCB
Contacts Number and Form	1, 2 or 3 form "C"	1, 2 or 3 form "C"	1, 2 or 3 form "C"	1, 2 or 3 form "C"
Rated Contact Voltage	250 VAC	250 VAC	250 VAC	250 VAC
Rated Continuous Current	5A or 10A	5A or 10A	5A or 10A	2A
Rated breaking capacity	1250 VA	1250 VA	1250 VA	500 VA
Standard contact material	Hard silver or AgCdO	Hard silver or AgCdO	Hard silver or AgCdO	Fine silver, Gold flashed
Special contact material	Fine silver, Gold flashed	Fine silver, Gold flashed	Fine silver, Gold flashed	AuNi/3, PdAg
Coil Rated Coil Voltage	6-230 VAC 6-110 VDC	6-230 VAC 6-110 VDC	24-220 VAC 12-110 VDC	5-220 VAC 5-110 VDC
Coil Resistance ± 10%	5.3-8200Ω 32-38,000Ω	5.3-8200Ω 32-38,000Ω	54-4500Ω	54-6900Ω 450-10,000Ω
Voltage Range at 25° C	80-110% 75-110%	80-110% 75-110%	80-110% 70-110%	80-110% 70-110%
Power Consumption at rat. volt.	2 VA 1.2 W	2 VA 1.2 W	—	200 mVA 40-300 mW
Maximum Ambient Temperature	60° C	60° C	60° C	60° C
Other Data Operate Time (appr.)	10 ms	10 ms	30 ms	10-30 ms
Release Time (appr.)	8 ms	8 ms	25 ms	8-25 ms
Test Voltage	2500 V rms	2500 V rms	2500 V rms	2500 V rms
Mechanical Life	20 × 10^6	20 × 10^6	20 × 10^6	20 × 10^6

For a free catalog describing Schrack Relays, stocked at 75 distributors throughout the U.S., call or write us at Dept. EEM-85.

SCHRACK NORTH AMERICA, INC.
3 Westchester Plaza • Elmsford, NY 10523
(914) 592-1305 • Telex: 646149

RELIABLE AND IN STOCK!



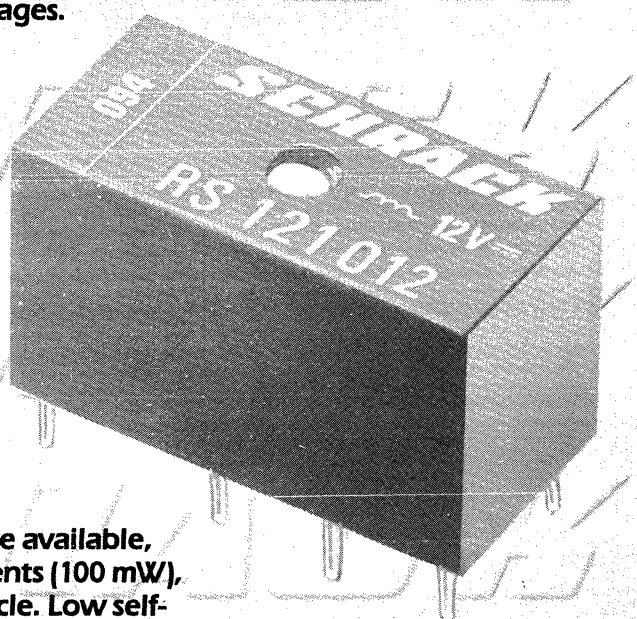
Midget	Power	Miniature Power	Miniature For PCB Mounting	Miniature General Purpose	Miniature
RA	RM	RP	RU 110	ZKU/ZLU	RU 101
Enclosed with clear dust cover and visual on/off indicator	Enclosed with clear dust cover and visual on/off indicator	Enclosed	Enclosed with clear dust cover	Enclosed with dust cover	Enclosed with nylon dust cover
Plug-in, solder lugs, printed circuit	Solder, .187 or .250; also PCB. .187 mates with socket	Solder pins for PCB mounting	Solder pins for PCB mounting	Plug-in, solder lugs, printed circuit	Soldered into p.c. board
4 form "C"	1, 2 or 3 form "C"	1 or 2 form "C"	1 form "C"	2, 4 or 6 form "C"	1 form "C"
110 VDC 220 VAC	480 VAC	250 VAC	250 VAC	28 VDC 115 VAC	250 VAC
3A 5A	16 A	8A	6A	3A or 7.5A	10A
350 VA 1100 VA	6000 VA	2000 VA	1320 VA	50 VA 550 VA	1000 VA
Fine silver AgCdO Gold flashed	AgCdO	AgCdO	AgCdO	Fine silver, Gold flashed	AgNi or AgCdO
AgCdO, AuNi/3, PdAg	On Request	Silver, Gold flashed	On Request	PdAg	Fine silver, Gold diffused
6-220 VAC 6-110 VDC	6-380 VAC 6-220 VDC	6-60 VDC	5-110 VDC	6-110 VDC	6-220 VAC 3-110 VDC
8.8-3750Ω 40-11,000Ω	4-16,500Ω 32-10,000Ω	80-7200Ω	30-15,500Ω	25-15,000Ω	19-18,000Ω
80-110% 75-110%	80-110% 75-110%	75-110%	75-120%	75-130%	75-130%
1.65 VA 0.9 W	2 VA 1.2 W	500 mW	800 mW	80-1200 mW	480 mW
70° C	70° C	70° C	45° C	75° C	85° C
9-11 ms	15 ms	7 ms	8 ms	15 ms	15 ms
3-6 ms	10 ms	5 ms	3 ms	6 ms	10 ms
2500 V rms	2500 V rms	2000 V rms	2000 V rms	500-1000 V rms	1000-1500 V rms
100×10^6	20×10^6	20×10^6	$>10^7$	10×10^6	10×10^6

For a free catalog describing Schrack Relays, stocked at 75 distributors throughout the U.S., call or write us at Dept. EEM-85.

SCHRACK NORTH AMERICA, INC.
3 Westchester Plaza • Elmsford, NY 10523
(914) 592-1305 • Telex: 646149

Now you can get subminiature immersion-proof relays from SCHRACK—from *stock*!

New Schrack RS Subminiature Relays, in dual-in-line design, are now available from stock! They're perfect for a broad range of applications in control circuits, signalling, and telecommunication systems. But besides doing their job well, cycle after cycle, they offer many production and application advantages.



All are available immersion-proof (washable) to IEC 68 standards, in standard models at no extra cost. You get complete protection during soldering and cleaning procedures. And, you *know* they'll work in adverse climatic conditions.

They're available with either single (switched current 1.25A) or twin (bifurcated) contacts (.5A). Breaking capacity is from 10 µW minimum (twin contact) up to 30W (single contact).

Both monostable and bistable versions are available, with extremely low coil power requirements (100 mW), and may be energized on a 100% duty cycle. Low self-heating and heat transfer to adjacent components make Schrack RS Relays particularly well-suited for use on PC boards with high packing density. High contact pressure and very short bounce time ensure contact reliability.

For a free catalog describing Schrack RS Relays, stocked at 75 distributors throughout the U.S., call or write us at Dept. EEM-10.

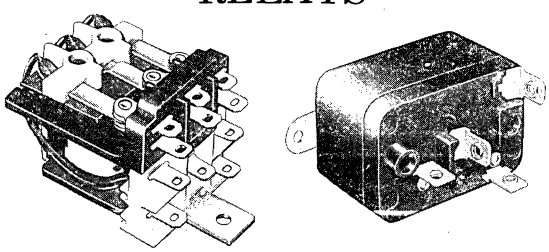
SCHRACK NORTH AMERICA, INC.
3 Westchester Plaza • Elmsford, NY 10523
(914) 592-1305 • Telex: 646149

Distributor inquiries invited.

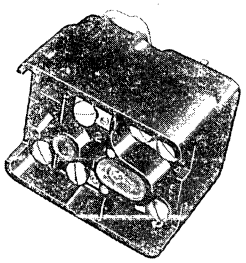
STANCOR® RELAYS

Immediately Available Off • the • Shelf

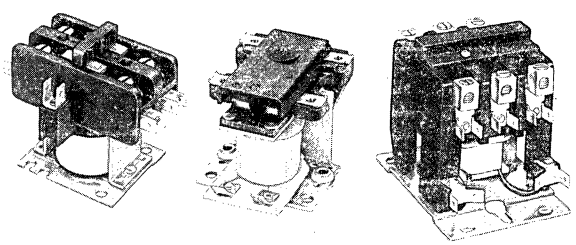
AC - DC GENERAL PURPOSE RELAYS



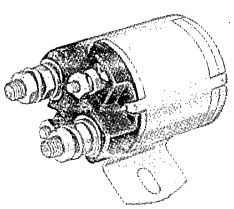
AC POWER RELAYS



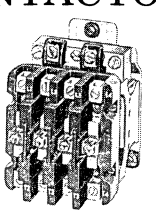
AC POWER CONTACTORS



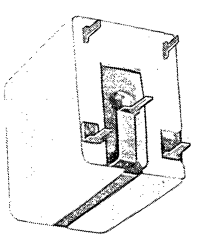
DC POWER CONTACTORS



AC INDUSTRIAL CONTACTORS



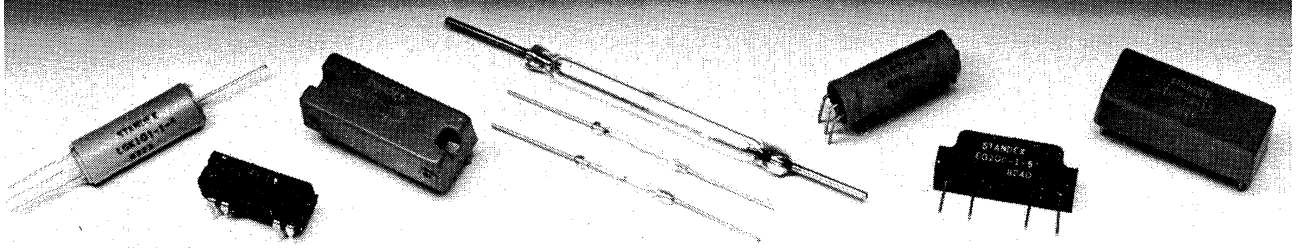
MINIATURE DC SENSITIVE RELAYS



For Information
Call 1-219/722-2244 or Contact:
Stancor, 131 Godfrey Street, Logansport, Indiana 46947

UNITED TECHNOLOGIES
HAMILTON STANDARD
CONTROLS

FASTEST GROWING MANUFACTURER OF REED SWITCHES AND RELAYS.



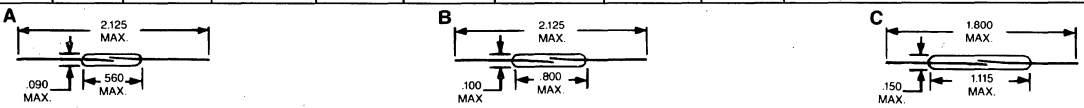
STANDEX REED RELAYS

Series	Features	PART NUMBER	Coil V.D.C.	Coil Res. (OHMS) @ 20°C	Max. Pickup V.D.C. @ 20°C	Min. Dropout V.D.C. @ 20°C	Max. Coil Voltage
D	• DIP • Compatible with Auto Insertion equipment • Available with GHG560, GR560 standard	DK1-5 DK1-6 DK1-12 DK1-24	5 6 12 24	500 200 500 2000	4.0 4.0 9.6 19.0	.5 .5 1.0 2.0	8 8 16 32
EG	• SIP • Fully injection molded • Versions available to meet VDE requirements	EG200-1-5 EG200-1-6 EG200-1-12 EG200-1-24	5 6 12 24	500 125 500 2000	3.5 4.0 8.0 16.0	.5 .5 1.0 2.0	8 8 16 32
JG	• UL Recognized under the Component Program of Underwriters Laboratories, Inc. Yellow Card No. E68451 • CSA No. LR42087-1 • Available with .100 or .150 - 1.0 pin spacings.	JG100-1-5 JG100-2-12 JG100-4-12	8 16 16	500 440 250	3.5 8.0 8.0	.5 1.0 1.0	8 16 16
LG	• Low cost • Fully encapsulated construction • Available with GK126 switch; GR100 standard	LG101-1-5 LG101-1-6 LG101-1-12 LG101-1-24	5 6 12 24	500 125 500 2000	3.5 4.0 8.0 16.0	.5 .5 1.0 2.0	8 8 16 32
LC	• True Form C • Fully encapsulated • Contact rated at 3VA	LC101-1-5 LC101-1-6 LC101-1-12 LC101-1-24	5 6 12 24	500 125 500 2000	3.5 4.0 9.0 18.0	.5 .5 1.0 2.0	8 8 16 32

Above represents a small sampling of the several hundred models available in 11 different relay product groups. Call or write for complete catalog.

STANDEX REED SWITCHES

Switch Type	Glass Size	Power Rating VA, DC Max.	Switching Voltage VDC, Max.	Breakdown Voltage VDC, Min.	Switching Current Amp DC, Max.	Carry Current Amp DC, Max.	Contact Resistance MADO Max. at 10 MA; IVDC	Insulation Resistance Ohms Min.	Pull-in Range in AT	Remarks
GR560	A	10	100	250	0.5	1.0	100	10^{12}	7.5-50	General Purpose Switch
GR100	B	10	200	350	1.0	2.0	100	10^{12}	10-100	General Purpose Switch
GK560	A	10	100	250	0.5	1.0	150	10^{12}	25-100	For telecom applications and inductive loads
GK126	B	25*	200	350	1.0	2.0	150	10^{12}	20-800	For telecom applications and inductive loads. Handles pulse dialing applications
GHG560	A	10	100	250	0.5	1.0	75	10^{12}	7.5-50	For ATE and other low level or dry switching applications. Very stable contact resistance
GHG126	B	15	200	350	1.0	2.0	75	10^{12}	20-80	Stable Contact Resistance, performs well with high and low level loads
PRR100	B	10	200	1000	1.0	2.0	150	10^{12}	20-80	High Breakdown, TRIAC Switching
TS560	A	5	50	200	0.5	0.75	250	10^{9}	10-100	General purpose switch consumer products, proximity detectors
TS100	B	7.5	100	300	0.5	0.75	250	10^{9}	10-100	General purpose switch consumer products, proximity detectors
GRR100	B	10	250	350	1.0	2.0	100	10^{12}	20-60	Heavy Rhodium, medium differential switch

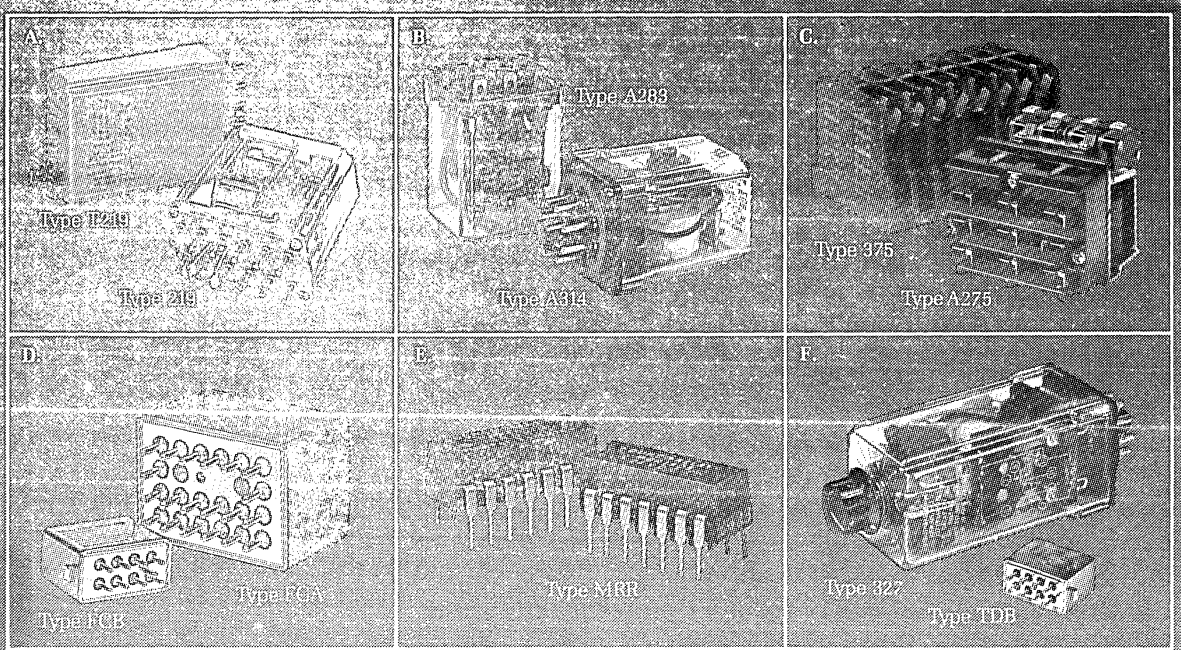


Standex Electronics
4538 Camberwell Road, Cincinnati, Ohio 45209 • (513) 871-3777

a Standex company
Morley Road, Tonbridge, Kent, England • (732) 358398

Right relay, right price, right on time.

No sooner said than Struthers-Dunn.



And that's not just a slick slogan—it's an iron-clad promise. You'll get exactly the relay you need at a tough-to-beat price. And you'll get it when or even before you need it. Time after time. You can count on it.

Because nobody can match Struthers-Dunn for relay experience and capability. And nobody will give you a broader choice of relays to match your every cost/performance objective. From low cost commercial/industrial relays to hi-rel military/aerospace relays. And everything in between. Here's the proof:

A. Hi-Rel Industrial Relays. A complete line from 1 to 100 amp for general purpose timing, latching, sequencing and over and under-voltage switching. Open and closed types. Contact arrangements to 6 poles. Plus compact 300-V and 600-V relays, including modular and field convertible relays.

B. Compact, General Purpose Plug-In Relays. Quality, cost-efficient plug-in relays with rectangular or octal base; 1, 2 or 3 poles; 10 amp; AC or DC coils; in open or enclosed styles.

C. Reversing Contactors. Compact, multi-purpose contactors and starters for OEM applications. Sizes through 4. Open or enclosed types, with or without overloads.

D. Aerospace/Military Relays. Hermetically sealed relays in both miniature and power types to meet most applicable Mil specs. Low level to 25 amp; 1 to 6 PDT; AC or DC operation.

E. Reed Relays. Miniature and standard size dry reed relays for fast, light load service; plus mercury-wetted contact relays for long-life, no-bounce switching in PC and plug-in mounting models. Built to industrial or Mil specs.

F. Timers. A full range of time-delay relays for industrial or military applications. Range includes on and off delay, square or octal base, fixed or adjustable timing, monitor or repeat cycle, AC or DC input and miniature types. Plus motor, inertial and thermal timers.

Solid State, Hybrid and Special Relays. A wide variety of solid state and hybrid relays, plus custom-designed or modified relays to meet your most specialized application needs.

Available Locally from Your Nearby S-D Distributor. All of the most popular S-D relays are available immediately from the well-stocked shelves of our more than 100 distributor branches. When it comes to relays, no sooner said than Struthers-Dunn. For a copy of our comprehensive catalog and the name and number of your S-D representative or distributor, just give us a call or write Struthers-Dunn, Inc., Lambs Road, Pitman, NJ 08071. (609) 589-7500.

S-D

SIX DECADES STRUTHERS DUNN 1923 1983

Allied Control Relays

General Purpose Relays

CRADLE® SERIES T154/163

DC Relays — Current and Voltage Adjusted

AC Relays — Voltage Adjusted

FEATURES

- **T154 Single-Point Contacts**
- **T163 Bifurcated Contacts**
- **Proven Cradle® reliability**
- **100 million mechanical operations**
- **Contact selection to match application**
- **Contact configuration:**
  DC Voltage: up to 8 Form C
  AC Voltage: up to 4 Form C
- **Input voltages:**
  DC Voltage: from 3 VDC to 115 VDC
  AC Voltage: from 6 VAC to 220 VAC
  50/60 Hz
- **Sensitivity as low as 20 MW/pole** (DC Voltage only)
- **Low-priced relays**
- **Versatile mounting configurations**
- **High density packaging**
- **UL File E20604 / CSA File 34171**

TYPICAL OPERATING CONDITIONS @ 25°C

ELECTRICAL

Minimum drop-out (DC voltage):
10% of maximum pick-up value (5% for single and double-pole relays)

Dielectric Strength:
1000 VRMS, coil to contacts and between gaps on standard T154 series 500 VRMS, between contact gaps on sensitive, ultrasensitive relays and on all relays with bifurcated contacts

Insulation resistance:
10,000 megohms minimum

Capacitance, DC Voltage:
Closed contacts to frame 3.0 pf
Open contacts to frame 3.0 pf
Between open contacts 3.0 pf
(energized or de-energized)

Capacitance, AC Voltage:
Contact to contact 3.0 pf
Coil to contact 3.0 pf
Coil to frame 30 pf

Operate time, DC Voltage:
15 MS max. at nominal voltage

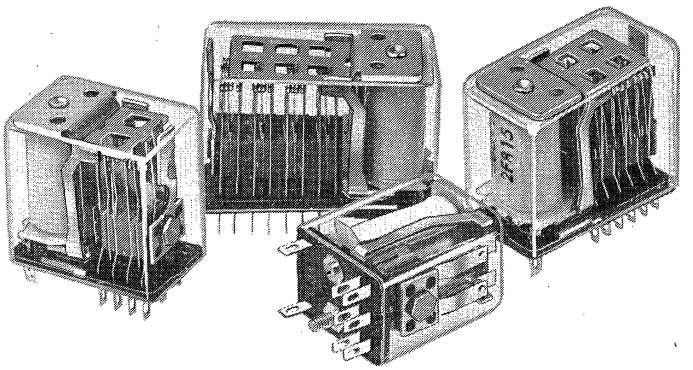
Operate time, AC Voltage: 25 MS

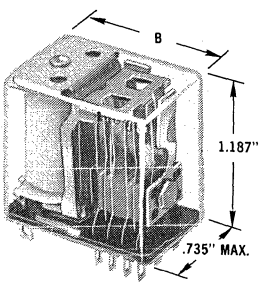
Release time, DC Voltage:
8 MS max. at nominal voltage

Release time, AC Voltage: 25 MS

ENVIRONMENTAL

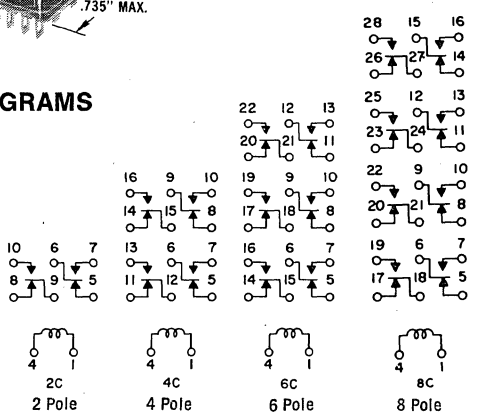
Ambient temperature: −55°C to 71°C





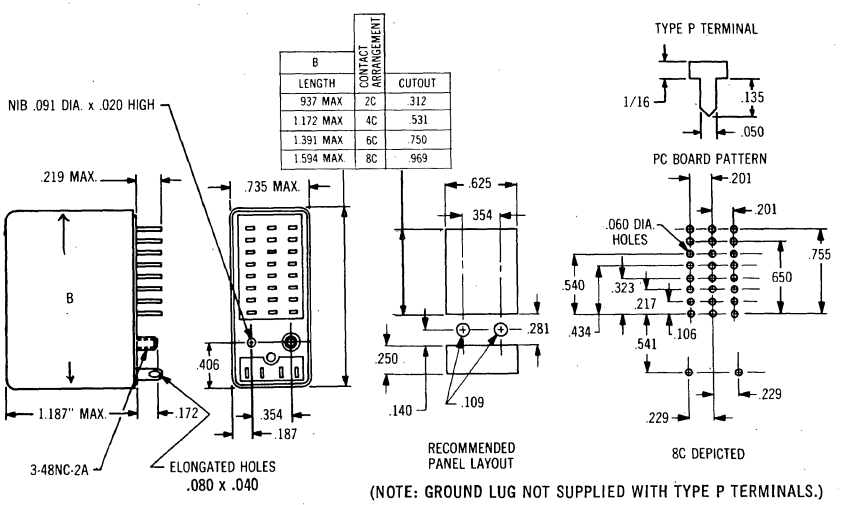
DIMENSION B	
2C	.937
4C	1.172
6C	1.391
8C	1.594

WIRING DIAGRAMS



Circuit Diagrams — Unenergized

DETAILED DIMENSIONS



(NOTE: GROUND LUG NOT SUPPLIED WITH TYPE P TERMINALS.)

Telemecanique

Telemecanique Inc.
901 Baltimore Boulevard
Westminster, MD 21157
Tel. (301) 876-2214

Allied Control Relays

General Purpose Relays

CRADLE® SERIES T154/163

DC RELAYS

Catalog No. 1 2	Coil Res.	Input	Pick-up	Pick-up Power	Contact 3 Arrangement	Contact 4 Rating
STANDARD DC VOLTAGE ADJUSTMENT						
T154-2C-6VDC	52Ω	6V	4.5V	500mW	2C	2 Amp
T154-2C-12VDC	185Ω	12V	9.0V	500mW	2C	2 Amp
T154-2C-24VDC	700Ω	24V	18.0V	500mW	2C	2 Amp
T154-2C-48VDC	2,500Ω	48V	36.0V	500mW	2C	2 Amp
T154-2C-115VDC	15,000Ω	115V	86.0V	500mW	2C	2 Amp
T154-4C-6VDC	52Ω	6V	4.5V	500mW	4C	2 Amp
T154-4C-12VDC	185Ω	12V	9.0V	500mW	4C	2 Amp
T154-4C-24VDC	700Ω	24V	18.0V	500mW	4C	2 Amp
T154-4C-48VDC	2,500Ω	48V	36.0V	500mW	4C	2 Amp
T154-4C-115VDC	15,000Ω	115V	86.0V	500mW	4C	2 Amp
T154-6C-6VDC	25Ω	6V	4.5V	800mW	6C	2 Amp
T154-6C-12VDC	90Ω	12V	9.0V	800mW	6C	2 Amp
T154-6C-24VDC	430Ω	24V	18.0V	800mW	6C	2 Amp
T154-6C-48VDC	1,550Ω	48V	36.0V	800mW	6C	2 Amp
T154-6C-115VDC	9,000Ω	115V	86.0V	800mW	6C	2 Amp
T154-8C-6VDC	20Ω	6V	4.5V	1.000W	8C	2 Amp
T154-8C-12VDC	75Ω	12V	9.0V	1.000W	8C	2 Amp
T154-8C-24VDC	430Ω	24V	18.0V	1.000W	8C	2 Amp
T154-8C-48VDC	1,275Ω	48V	36.0V	1.000W	8C	2 Amp
T154-8C-115VDC	9,000Ω	115V	86.0V	800mW	8C	2 Amp
SENSITIVE DC VOLTAGE ADJUSTMENT						
TS154-2C-6VDC	185Ω	6V	4.5V	100mW	2C	2 Amp
TS154-2C-12VDC	800Ω	12V	9.0V	100mW	2C	2 Amp
TS154-2C-24VDC	3,200Ω	24V	18.0V	100mW	2C	2 Amp
TS154-2C-48VDC	13,000Ω	48V	36.0V	100mW	2C	2 Amp
TS154-4C-6VDC	110Ω	6V	4.5V	175mW	4C	2 Amp
TS154-4C-12VDC	430Ω	12V	9.0V	175mW	4C	2 Amp
TS154-4C-24VDC	1,800Ω	24V	18.0V	175mW	4C	2 Amp
TS154-4C-48VDC	7,500Ω	48V	36.0V	175mW	4C	2 Amp
TS154-6C-6VDC	75Ω	6V	4.5V	250mW	6C	2 Amp
TS154-6C-12VDC	350Ω	12V	9.0V	250mW	6C	2 Amp
TS154-6C-24VDC	1,275Ω	24V	18.0V	250mW	6C	2 Amp
TS154-6C-48VDC	5,200Ω	48V	36.0V	250mW	6C	2 Amp
TS154-8C-6VDC	52Ω	6V	4.5V	400mW	8C	2 Amp
TS154-8C-12VDC	190Ω	12V	9.0V	400mW	8C	2 Amp
TS154-8C-24VDC	800Ω	24V	18.0V	400mW	8C	2 Amp
TS154-8C-48VDC	3,200Ω	48V	36.0V	400mW	8C	2 Amp

Catalog No. 1 2	Coil Res.	Input	Pick-up	Pick-up Power	Contact 3 Arrangement	Contact 4 Rating
ULTRA-SENSITIVE VOLTAGE ADJUSTMENT						
TSS154-2C-6VDC	500Ω	6V	4.5V	40mW	2C	1 Amp
TSS154-2C-12VDC	2,000Ω	12V	9.0V	40mW	2C	1 Amp
TSS154-2C-24VDC	7,500Ω	24V	18.0V	40mW	2C	1 Amp
TSS154-4C-6VDC	250Ω	6V	4.5V	80mW	4C	1 Amp
TSS154-4C-12VDC	1,000Ω	12V	9.0V	80mW	4C	1 Amp
TSS154-4C-24VDC	3,700Ω	24V	18.0V	80mW	4C	1 Amp
SENSITIVE DC CURRENT ADJUSTMENT						
TS154-2C-8.5Madc	1,000Ω	8.5Madc	8.5Madc	85mW	2C	2 Amp
TS154-2C-5.8Madc	2,500Ω	5.8Madc	5.8Madc	85mW	2C	2 Amp
TS154-2C-4.1Madc	5,000Ω	4.1Madc	4.1Madc	85mW	2C	2 Amp
TS154-2C-3.1Madc	10,000Ω	3.1Madc	3.1Madc	85mW	2C	2 Amp
TS154-2C-2.6Madc	15,000Ω	2.6Madc	2.6Madc	85mW	2C	2 Amp
TS154-4C-13.0Madc	1,000Ω	13.0Madc	13.0Madc	175mW	4C	2 Amp
TS154-4C-8.4Madc	2,500Ω	8.4Madc	8.4Madc	175mW	4C	2 Amp
TS154-4C-6.2Madc	5,000Ω	6.2Madc	6.2Madc	175mW	4C	2 Amp
TS154-4C-4.5Madc	10,000Ω	4.5Madc	4.5Madc	175mW	4C	2 Amp
TS154-4C-3.5Madc	15,000Ω	3.5Madc	3.5Madc	175mW	4C	2 Amp
TS154-6C-16.0Madc	1,000Ω	16.0Madc	16.0Madc	250mW	6C	2 Amp
TS154-6C-10.0Madc	2,500Ω	10.0Madc	10.0Madc	250mW	6C	2 Amp
TS154-6C-7.2Madc	5,000Ω	7.2Madc	7.2Madc	250mW	6C	2 Amp
TS154-6C-5.0Madc	10,000Ω	5.0Madc	5.0Madc	250mW	6C	2 Amp
TS154-6C-4.2Madc	15,000Ω	4.2Madc	4.2Madc	250mW	6C	2 Amp
TS154-8C-20.0Madc	1,000Ω	20.0Madc	20.0Madc	400mW	8C	2 Amp
TS154-8C-13.0Madc	2,500Ω	13.0Madc	13.0Madc	400mW	8C	2 Amp
TS154-8C-9.0Madc	5,000Ω	9.0Madc	9.0Madc	400mW	8C	2 Amp
TS154-8C-6.4Madc	10,000Ω	6.4Madc	6.4Madc	400mW	8C	2 Amp
TS154-8C-5.3Madc	15,000Ω	5.3Madc	5.3Madc	400mW	8C	2 Amp
ULTRA-SENSITIVE CURRENT ADJUSTMENT						
TSS154-2C-6.5Madc	1,000Ω	6.5Madc	6.5Madc	40mW	2C	1 Amp
TSS154-2C-4.1Madc	2,500Ω	4.1Madc	4.1Madc	40mW	2C	1 Amp
TSS154-2C-2.9Madc	5,000Ω	2.9Madc	2.9Madc	40mW	2C	1 Amp
TSS154-2C-2.0Madc	10,000Ω	2.0Madc	2.0Madc	40mW	2C	1 Amp
TSS154-2C-1.7Madc	15,000Ω	1.7Madc	1.7Madc	40mW	2C	1 Amp
TSS154-4C-9.0Madc	1,000Ω	9.0Madc	9.0Madc	80mW	4C	1 Amp
TSS154-4C-5.8Madc	2,500Ω	5.8Madc	5.8Madc	80mW	4C	1 Amp
TSS154-4C-4.1Madc	5,000Ω	4.1Madc	4.1Madc	80mW	4C	1 Amp
TSS154-4C-3.0Madc	10,000Ω	3.0Madc	3.0Madc	80mW	4C	1 Amp
TSS154-4C-2.4Madc	15,000Ω	2.4Madc	2.4Madc	80mW	4C	1 Amp

AC RELAYS

Catalog No. 1 2	Coil Res.	Input	Pick-up	Contact 3 Arrangement	Contact 4 Rating
T154-2C-6VAC	14Ω	6V	5.0V	2PDT	2 Amp
T154-2C-12VAC	65Ω	12V	9.0V	2PDT	2 Amp
T154-2C-24VAC	280Ω	24V	18.0V	2PDT	2 Amp
T154-2C-48VAC	1,250Ω	48V	36.0V	2PDT	2 Amp
T154-2C-115VAC	6,000Ω	115V	86.0V	2PDT	2 Amp
T154-2C-220VAC	15,000Ω	220V	170.0V	2PDT	2 Amp

Catalog No. 1 2	Coil Res.	Input	Pick-up	Contact 3 Arrangement	Contact 4 Rating
T154-4C-6VAC	14Ω	6V	5.0V	4PDT	2 Amp
T154-4C-12VAC	65Ω	12V	9.0V	4PDT	2 Amp
T154-4C-24VAC	280Ω	24V	18.0V	4PDT	2 Amp
T154-4C-48VAC	1,250Ω	48V	36.0V	4PDT	2 Amp
T154-4C-115VAC	6,000Ω	115V	86.0V	4PDT	2 Amp
T154-4C-220VAC	15,000Ω	220V	170.0V	4PDT	2 Amp

NOTES:

1. Single-point contacts shown as standard; for bifurcated contacts, substitute "163" for "154".
2. Solder lug terminals shown as standard; for printed circuit mounts, add "P" after "T", "TS" or "TSS".
   Note: Solder Lug terminals not supplied on printed circuit mount relays.
3. Form C contact arrangement shown as standard; for Form A, B or D, substitute appropriate letter.
4. 5-amp and 10-amp contacts are also available for Standard DC and AC single-point-contact relays; if desired, add "F" after "T" for 5-amp; and add "Y" after "T" for 10-amp.

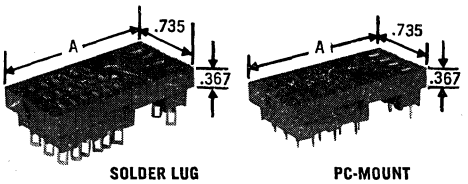
Telemecanique

Telemecanique Inc.
901 Baltimore Boulevard
Westminster, MD 21157
Tel. (301) 876-2214

Allied Control Relays

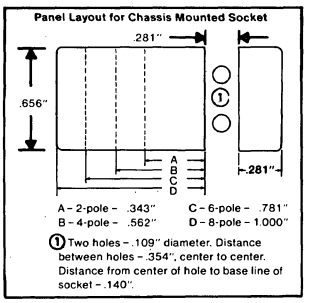
General Purpose Relays (cont'd)

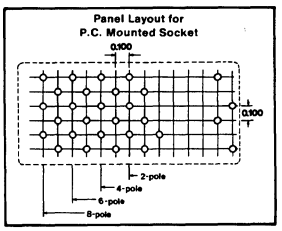
CRADLE® SOCKETS AND HARDWARE



SOLDER LUG PC-MOUNT

Dimensions			
Poles	A	Poles	A
2-Pole	1.000"	6-Pole	1.430"
4-Pole	1.205"	8-Pole	1.645"





T-Series Cradle® Relay Sockets

Redesigned, improved, and directly interchangeable with other Cradle® type sockets.

FEATURES

- Body molded of glass filled flame retardant Polyester (PBT).

  Can be wave soldered and cleaned with commercial solvents without degradation.

  Meets U.L. 94VO and is fungus resistant.

- Wider contact mating surface.

  Provides for higher reliability of relay terminal mating.

- One piece contact/terminal construction of beryllium copper.

  More conductive, greater strength higher spring rate.

- Selectively plated gold over nickel on contact area – 60/40 Brite-Tin on terminal area.

- Low insertion and high withdrawal forces of relay to socket.

  Assures maximum retention.

- Captive ground spring.

  Once inserted, not easily dislodged.

- Provision for either end or side retainer/bale.

- U.L. E-20604.

- C.S.A. LR34171.

Ordering Information and Available Options

T-Series relay sockets accommodate Allied Cradle® relay models: T154/T163, T351/T362, and TD10 timers, as well as equivalent competitive models. Order sockets with the mounting configuration required by your application and the number of poles required by the relay, using the guidelines below.

CRADLE® SOCKET ORDERING INFORMATION

T- ① ② ③ ④

① Number of Poles
2=2-pole socket
4=4-pole socket
6=6-pole socket
8=8-pole socket

② Type of Terminal
1=Solder lug/chassis mounted
3=Standard PC in-line mounting
5=PC mounting, .100" × .100" grid throughout
7=PC mounting, .100" × .100" grid in contact terminal area
.100" × .150" grid in coil terminal area

③ Contact Finish*
1=10 to 12 microinch gold over nickel contact area

④ Socket Assemblies*
10=Socket only
11=Socket with ground spring installed
12=Socket with ground spring installed and retainer
13=Socket with retainer

Examples:
T-21110: 2-pole, solder/lug chassis mount, standard gold contact plating, socket only.
T-43112: 4-pole, PC in-line mounting, standard gold contact plating, with ground spring and standard retainer.

* Consult factory for additional variations.

Accessories

Part Name	Part No.	Diagram	Retainer-Part No.	Diagram
Ground Spring for Solder Lug/Chassis	T-00101		T-00102 2-pole T-00104 4-pole T-00106 6-pole	to be inserted into recesses on narrow sides of sockets
Ground Spring for all P.C. mounted sockets	T-00105		T-00108 8-pole Flat Retainer	

All dimensions in inches unless otherwise noted. General tolerance ±.015.

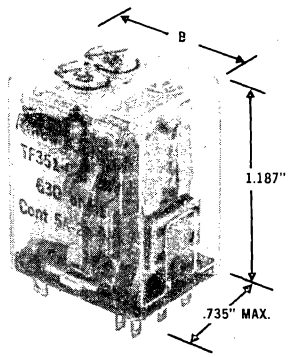
Telemecanique
Telemecanique Inc.
901 Baltimore Boulevard
Westminster, MD 21157
Tel. (301) 876-2214

Allied Control Relays

General Purpose Relays (cont'd)

CRADLE® SERIES T351/T362

MAGNETIC LATCH RELAYS



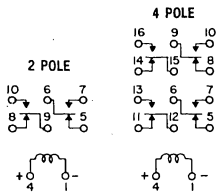
B	.937" for 2C
B	1.172" for 4C

Catalog No. 1 2	Coil Res.	Input	Transfer Voltage	Contact 3 Arrangement	Contact 4 Rating
SINGLE COIL					
T351-2C-12VDC	166Ω	12V	7.0V	2C	2 Amp
T351-2C-24VDC	630Ω	24V	14.5V	2C	2 Amp
T351-4C-12VDC	166Ω	12V	7.0V	4C	2 Amp
T351-4C-24VDC	630Ω	24V	14.5V	4C	2 Amp
DUAL COIL					
T351-2C-2/12VDC	134/134Ω	2/12V	9.2V	2C	2 Amp
T351-2C-2/24VDC	485/485Ω	2/24V	18.0V	2C	2 Amp
T351-4C-2/12VDC	134/134Ω	2/12V	9.2V	4C	2 Amp
T351-4C-2/24VDC	485/485Ω	2/24V	18.0V	4C	2 Amp

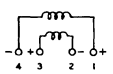
NOTES:

1. Single-point contacts shown as standard; for bifurcated contacts, substitute "362" for "351."
2. Solder lug terminals shown as standard; for printed circuit mounts, add "P" after "T."
3. Form C contact arrangement shown as standard; for Form A, B or D, substitute appropriate letters.
4. 5-amp contacts are also available for single-point-contact relays; if desired, add "F" after "T" for 5-amp, and add "Y" after "T" for 10-amp.

WIRING DIAGRAM (RESET POSITION SHOWN)



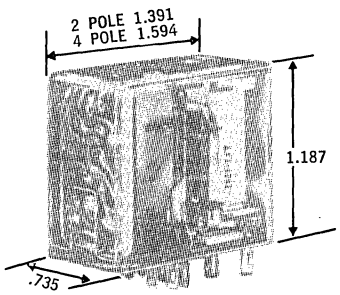
SINGLE WINDING CIRCUIT DIAGRAMS TO OPERATE REVERSE POLARITY



DUAL WINDING CIRCUIT DIAGRAMS
1-4 OPERATE 2-3 RESET

- Consult factory for other voltage coils.

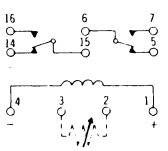
TIMERS, DPDT 5 AMP — Series TD10



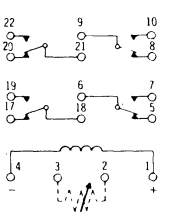
The TD10 utilizes the service proved T154 Cradle® relay with a solid state timing circuit to provide timing from 0.1 to 100 seconds with +2% repeat accuracy.

Available as "time delay to make" or "interval" timing models with optional operating and mounting features.

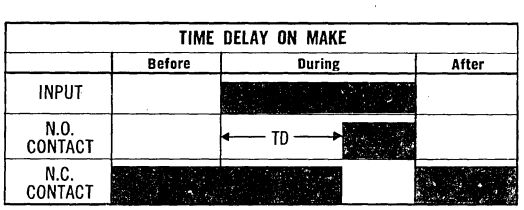
Catalog Number	Time Range (in seconds)	Input Volt
INTERVAL		
TD10NA-2C-12DNB	0.1 to 10	12VDC
TD10NA-2C-24DNB	0.1 to 10	24VDC
TD10NA-2C-115ANB	0.1 to 10	115VAC 50/60 Hz
TD10NA-2C-12DND	1 to 100	12VDC
TD10NA-2C-24DND	1 to 100	24VDC
TD10NA-2C-115AND	1 to 100	115VAC 50/60 Hz
DELAY TO MAKE		
TD10DA-2C-12DNB	0.1 to 10	12VDC
TD10DA-2C-24DNB	0.1 to 10	24VDC
TD10DA-2C-115ANB	0.1 to 10	115VAC 50/60 Hz
TD10DA-2C-12DND	1 to 100	12VDC
TD10DA-2C-24DND	1 to 100	24VDC
TD10DA-2C-115AND	1 to 100	115VAC 50/60 Hz

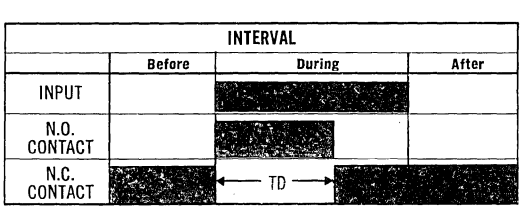


2 POLE



4 POLE



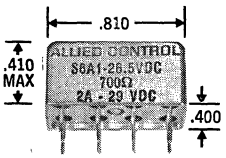


Telemecanique

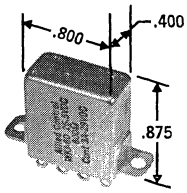
Telemecanique Inc.
901 Baltimore Boulevard
Westminster, MD 21157
Tel. (301) 876-2214

Allied Control Relays

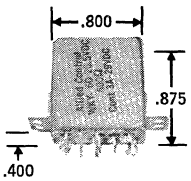
Military Relays



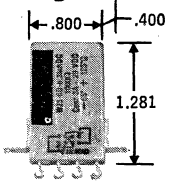
SERIES S6A1



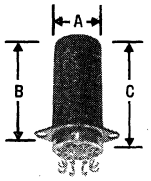
SERIES WKJ-6D



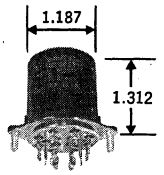
SERIES WKY-6D



SERIES WJS-6D



SERIES MH/MHB/MHJ



SERIES MHY-12D

FEATURES

- **Series S:** ½ Size Crystal Can, 2 amps
- **Series WKJ/WKY:** Crystal Can, 3 amps
- **Series WJS:** Sensitive, Long Crystal Can, 3 amps
- **Series MH/MHB/MHJ:** Miniature Round Can, 5 amps
- **Series MHY:** Miniature Round Can, 10 amps

Specification per MIL-R-5757 and MIL-R-39016 as applicable.

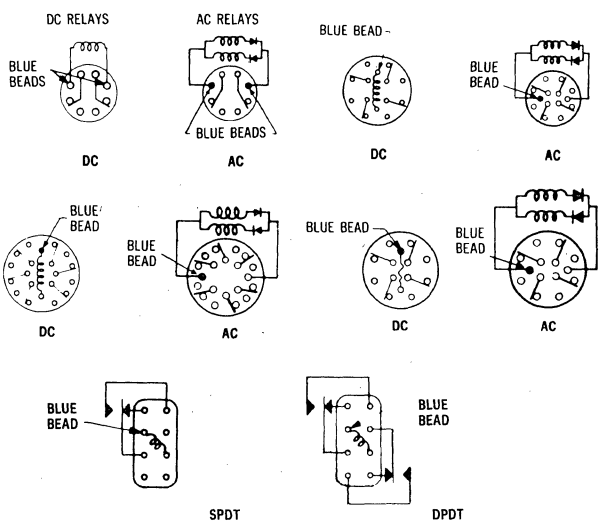
	(Dim. in Inches) A	B	C
DPDT	.635	1.312	1.796
4PDT*	1.046	1.312	1.750
6PDT*	1.187	1.312	1.750

* Mounting bracket includes studs

CRYSTAL CAN RELAYS

Bifurcated contacts make these relays ideal for dry circuit loads up to rated amperage.

Catalog No.	Contact Arrangement	Coil Res.	Input	Contact Rating
SERIES S — DC RELAYS				
S6-A1-12VDC	DPDT	140Ω	12.0V	2 Amp
S6-A1-26.5VDC	DPDT	700Ω	26.5V	2 Amp
SERIES WKJ/WKY — DC RELAYS				
WKJ-6D-12VDC	DPDT	150Ω	12.0V	3 Amp
WKJ-6D-26.5VDC	DPDT	600Ω	26.5V	3 Amp
WKJ-6D-115VDC	DPDT	10,000Ω	115.0V	3 Amp
WKY-6D-12VDC	DPDT	150Ω	12.0V	3 Amp
WKY-6D-26.5VDC	DPDT	600Ω	26.5V	3 Amp
WKY-6D-115VDC	DPDT	10,000Ω	115.0V	3 Amp
SERIES WJS — DC RELAYS				
WJS-3D-5.0Madc	SPDT	1,000Ω	7.5Madc	3 Amp
WJS-3D-3.2Madc	SPDT	2,500Ω	4.8Madc	3 Amp
WJS-3D-1.6Madc	SPDT	10,000Ω	2.4Madc	3 Amp
WJS-6D-6.3Madc	DPDT	1,000Ω	9.4Madc	3 Amp
WJS-6D-4.0Madc	DPDT	2,500Ω	6.0Madc	3 Amp
WJS-6D-2.0Madc	DPDT	10,000Ω	3.0Madc	3 Amp



MINIATURE ROUND CAN RELAYS

Series MH/MHB/MHJ — DC Relays — up to 5 amps

Catalog No.	Contact Arrangement	Coil Res.	Input	Temp. Range	Contact Rating
SERIES MH — DC RELAYS					
MH-6D-12VDC	DPDT	82Ω	12.0V		5 Amp
MH-6D-26.5VDC	DPDT	400Ω	26.5V		5 Amp
MH-6D-115VDC	DPDT	6,500Ω	115.0V		5 Amp
MH-12D-12VDC	4PDT	60Ω	12.0V	−55°C	5 Amp
MH-12D-26.5VDC	4PDT	300Ω	26.5V	to	5 Amp
MH-12D-115VDC	4PDT	5,000Ω	115.0V	+85°C	5 Amp
MH-18D-12VDC	6PDT	48Ω	12.0V		5 Amp
MH-18D-26.5VDC	6PDT	240Ω	26.5V		5 Amp
MH-18D-115VDC	6PDT	3,500Ω	115.0V		5 Amp
SERIES MHB — DC RELAYS					
MHB-6D-12VDC	DPDT	65Ω	12.0V		5 Amp
MHB-6D-26.5VDC	DPDT	325Ω	26.5V		5 Amp
MHB-6D-115VDC	DPDT	6,000Ω	115.0V		5 Amp
MHB-12D-12VDC	4PDT	50Ω	12.0V	−65°C	5 Amp
MHB-12D-26.5VDC	4PDT	250Ω	26.5V	to	5 Amp
MHB-12D-115VDC	4PDT	5,000Ω	115.0V	+125°C	5 Amp
MHB-18D-12VDC	6PDT	40Ω	12.0V		5 Amp
MHB-18D-26.5VDC	6PDT	200Ω	26.5V		5 Amp
MHB-18D-115VDC	6PDT	3,500Ω	115.0V		5 Amp
SERIES MHJ — DC RELAYS					
MHJ-12D-12VDC	4PDT	50Ω	12.0V		5 Amp
MHJ-12D-26.5VDC	4PDT	250Ω	26.5V		5 Amp
MHJ-12D-115VDC	4PDT	5,000Ω	115.0V	−65°C	5 Amp
MHJ-18D-12VDC	6PDT	40Ω	12.0V	to	5 Amp
MHJ-18D-26.5VDC	6PDT	200Ω	26.5V	+125°C	5 Amp
MHJ-18D-115VDC	6PDT	3,500Ω	115.0V		5 Amp

(MHJ capabilities 20G to 2000 Hz)

SERIES MHB-MHJ — AC RELAYS					
MHB-6A-115VAC	DPDT	4215/ 4215	115.0V		5 Amp
MHJ-12A-115VAC	4PDT	2765/ 2765	115.0V	−65°C to +125°C	5 Amp
MHJ-18A-115VAC	6PDT	2635/ 2635	115.0V		5 Amp

(MHJ capabilities 20G to 2000 Hz)

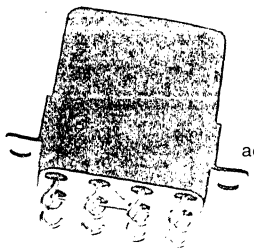
SERIES MHY — AC AND DC RELAYS					
MHY-12A-115VAC	4PDT	2635/ 2635	115.0V	−55°C to +85°C	10 Amp
MHY-12D-12VDC	4PDT	40Ω	12.0V	−65°C	10 Amp
MHY-12D-26.5VDC	4PDT	200Ω	26.5V	to	10 Amp
MHY-12D-115VDC	4PDT	3,500Ω	115.0V	+125°C	10 Amp

Telemecanique

Telemecanique Inc.
901 Baltimore Boulevard
Westminster, MD 21157
Tel. (301) 876-2214

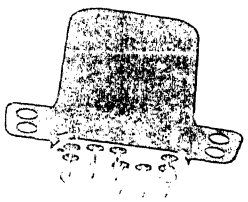
Allied Control Relays

Military Relays



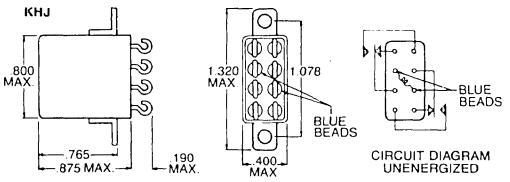
actual size

KHJ-6D-26.5 VDC

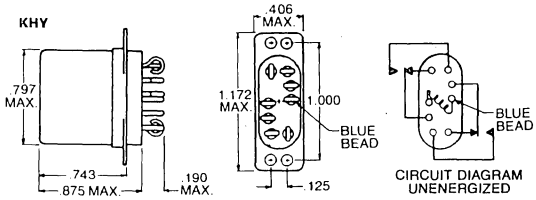


KHY-6D-26.5 VDC

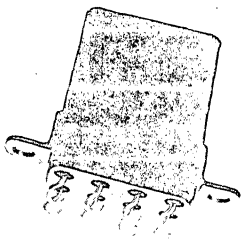
Relay Type		DC Nominal Coil Data			Maximum Pull-in Voltage	
		Volts	Amperes	Ohms*	@ +25°C	@ +125°C
KHJ-6D-6V DC	KHY-6D-6V DC	6	.154 .176	39 34	3.2 3.2	4.4 4.4
KHJ-6D-12V DC	KHY-6D-12V DC	12	.082 .078	147 155	6.2 6.5	8.6 9.0
KHJ-6D-26.5V DC	KHY-6D-26.5V DC	26.5	.043 .043	612 615	13 13	18.0 18.0
KHJ-6D-48V DC	KHY-6D-48V DC	48	.020 .025	2370 1920	26 26	36.0 36.0
KHJ-6D-115V DC	KHY-6D-115V DC	115	.012 .014	10000 8120	58 54	80.0 75.0



MOUNTING .120 DIA. HOLES (2)
Dimensional Tolerances ±.010



MOUNTING .096 DIA. HOLES (4)
(RECOMMEND USING 2 DIAGONAL HOLES)
Dimensional Tolerances ±.010



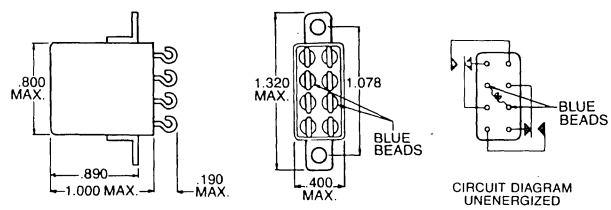
JH-6D-26.5 VDC actual size

Relay Type	Maximum Pull-in M.A.D.C.	Coil Resistance Ohms*	Nominal Operate Current
JH-6D-6.0 MADC	6.0	7240	7.2
JH-6D-5.0 MADC	5.0	10820	6.0
JH-6D-4.5 MADC	4.5	16480	5.4
JH-12D-11.0 MADC	11.0	4,800	13.2
JH-12D- 9.0 MADC	9.0	7,500	10.8
JH-12D- 7.5 MADC	7.5	11,000	9.0

*DC coil resistance—standard tolerance ±10%, other values of resistance can be supplied

Note Relays specified for low level operation will be run for 10,000 cycles on our standard low level miss test equipment prior to shipment

JH-6D



MOUNTING .120 DIA. HOLES (2)

ALLIED CONTROL RELAYS MILITARY CROSS REFERENCE

Government Designation	Allied Control P/N
M39016/6-104L	ERS6B3-26.5-L1
M39016/6-105L	ERS6B1-26.5-L1
M39016/6-106L	ERS6B2-26.5-L1
M39016/6-107L	ERS6C3-26.5-L1
M39016/6-108L	ERS6C2-26.5-L1
M39016/6-109L	ERS6A1-26.5-L1
M39016/6-110L	ERS6A2-26.5-L1
M39016/6-111L	ERS6B3-12.0-L1
M39016/6-112L	ERS6B1-12.0-L1
M39016/6-113L	ERS6B2-12.0-L1
M39016/6-114L	ERS6C3-12.0-L1
M39016/6-115L	ERS6C2-12.0-L1
M39016/6-116L	ERS6A1-12.0-L1
M39016/6-117L	ERS6A2-12.0-L1
M39016/6-118L	ERS6B3-6.0-L1
M39016/6-119L	ERS6B1-6.0-L1
M39016/6-120L	ERS6B2-6.0-L1
M39016/6-121L	ERS6C3-6.0-L1
M39016/6-122L	ERS6C2-6.0-L1
M39016/6-123L	ERS6A1-6.0-L1
M39016/6-124L	ERS6A2-6.0-L1
M39016/6-125L	ERS6C1-26.5-L1
M39016/6-126L	ERS6C1-12.0-L1
M39016/6-127L	ERS6C1-6.0-L1
M39016/6-128L	ERS6H3-26.5-L1
M39016/6-129L	ERS6A3-26.5-L1
M39016/6-130L	ERS6A3-12.0-L1
M39016/6-131L	ERS6A3-6.0-L1
M39016/6-204L	ERS6B3-26.5-L2
M39016/6-205L	ERS6B1-26.5-L2
M39016/6-206L	ERS6B2-26.5-L2
M39016/6-207L	ERS6C3-26.5-L2
M39016/6-208L	ERS6C2-26.5-L2
M39016/6-209L	ERS6A1-26.5-L2
M39016/6-210L	ERS6A2-26.5-L2

Government Designation	Allied Control P/N
M39016/6-211L	ERS6B3-12.0-L2
M39016/6-212L	ERS6B1-12.0-L2
M39016/6-213L	ERS6B2-12.0-L2
M39016/6-214L	ERS6C3-12.0-L2
M39016/6-215L	ERS6C2-12.0-L2
M39016/6-216L	ERS6A1-12.0-L2
M39016/6-217L	ERS6A2-12.0-L2
M39016/6-218L	ERS6B3-6.0-L2
M39016/6-219L	ERS6B1-6.0-L2
M39016/6-220L	ERS6B2-6.0-L2
M39016/6-221L	ERS6C3-6.0-L2
M39016/6-222L	ERS6C2-6.0-L2
M39016/6-223L	ERS6A1-6.0-L2
M39016/6-224L	ERS6A2-6.0-L2
M39016/6-225L	ERS6C1-26.5-L2
M39016/6-226L	ERS6C1-12.0-L2
M39016/6-227L	ERS6C1-6.0-L2
M39016/6-228L	ERS6H3-26.5-L2
M39016/6-229L	ERS6A3-26.5-L2
M39016/6-230L	ERS6A3-12.0-L2
M39016/6-231L	ERS6A3-6.0-L2
M39016/6-104M	ERS6B3-26.5-M1
M39016/6-105M	ERS6B1-26.5-M1
M39016/6-106M	ERS6B2-26.5-M1
M39016/6-107M	ERS6C3-26.5-M1
M39016/6-108M	ERS6C2-26.5-M1
M39016/6-109M	ERS6A1-26.5-M1
M39016/6-110M	ERS6A2-26.5-M1
M39016/6-111M	ERS6B3-12.0-M1
M39016/6-112M	ERS6B1-12.0-M1
M39016/6-113M	ERS6B2-12.0-M1
M39016/6-114M	ERS6C3-12.0-M1
M39016/6-115M	ERS6C2-12.0-M1
M39016/6-116M	ERS6A1-12.0-M1
M39016/6-117M	ERS6A2-12.0-M1
M39016/6-118M	ERS6B3-6.0-M1

Government Designation	Allied Control P/N
M39016/6-119M	ERS6B1-6.0-M1
M39016/6-120M	ERS6B2-6.0-M1
M39016/6-121M	ERS6C3-6.0-M1
M39016/6-122M	ERS6C2-6.0-M1
M39016/6-123M	ERS6A1-6.0-M1
M39016/6-124M	ERS6A2-6.0-M1
M39016/6-125M	ERS6C1-26.5-M1
M39016/6-126M	ERS6C1-12.0-M1
M39016/6-127M	ERS6C1-6.0-M1
M39016/6-128M	ERS6H3-26.5-M1
M39016/6-129M	ERS6A3-26.5-M1
M39016/6-130M	ERS6A3-12.0-M1
M39016/6-131M	ERS6A3-6.0-M1
M39016/6-204M	ERS6B3-26.5-M2
M39016/6-205M	ERS6B1-26.5-M2
M39016/6-206M	ERS6B2-26.5-M2
M39016/6-207M	ERS6C3-26.5-M2
M39016/6-208M	ERS6C2-26.5-M2
M39016/6-209M	ERS6A1-26.5-M2
M39016/6-210M	ERS6A2-26.5-M2
M39016/6-211M	ERS6B3-12.0-M2
M39016/6-212M	ERS6B1-12.0-M2
M39016/6-213M	ERS6B2-12.0-M2
M39016/6-214M	ERS6C3-12.0-M2
M39016/6-215M	ERS6C2-12.0-M2
M39016/6-216M	ERS6A1-12.0-M2
M39016/6-217M	ERS6A2-12.0-M2
M39016/6-218M	ERS6B3-6.0-M2
M39016/6-219M	ERS6B1-6.0-M2
M39016/6-220M	ERS6B2-6.0-M2
M39016/6-221M	ERS6C3-6.0-M2
M39016/6-222M	ERS6C2-6.0-M2
M39016/6-223M	ERS6A1-6.0-M2
M39016/6-224M	ERS6A2-6.0-M2
M39016/6-225M	ERS6C1-26.5-M2

Government Designation	Allied Control P/N
M39016/6-226M	ERS6C1-12.0-M2
M39016/6-227M	ERS6C1-6.0-M2
M39016/6-228M	ERS6H3-26.5-M2
M39016/6-229M	ERS6A3-26.5-M2
M39016/6-230M	ERS6A3-12.0-M2
M39016/6-231M	ERS6A3-6.0-M2
M5757/13-011	WJSW-6D-45.0MADC
M5757/13-012	WJSW-6D-20.0MADC
M5757/13-013	WJSW-6D-9.0MADC
M5757/13-014	WJSW-6D-6.5MADC
M5757/13-015	WJSW-6D-5.2MADC
M5757/13-016	WJSW-6D-4.5MADC
M5757/13-017	WJSW-6D-4.0MADC
M5757/13-018	WJSW-6D-2.8MADC
M5757/13-019	WJSW-6D-2.3MADC
M5757/13-020	WJSW-6D-2.0MADC
M5757/13-031	WJSC-6D-45.0MADC
M5757/13-032	WJSC-6D-20.0MADC
M5757/13-033	WJSC-6D-9.0MADC
M5757/13-034	WJSC-6D-6.5MADC
M5757/13-035	WJSC-6D-5.2MADC
M5757/13-036	WJSC-6D-4.5MADC
M5757/13-037	WJSC-6D-4.0MADC
M5757/13-038	WJSC-6D-2.8MADC
M5757/13-039	WJSC-6D-2.3MADC
M5757/13-040	WJSC-6D-2.0MADC
M5757/13-041	WJSR-6D-45.0MADC
M5757/13-042	WJSR-6D-20.0MADC
M5757/13-043	WJSR-6D-9.0MADC
M5757/13-044	WJSR-6D-6.5MADC
M5757/13-045	WJSR-6D-5.2MADC
M5757/13-046	WJSR-6D-4.5MADC
M5757/13-047	WJSR-6D-4.0MADC
M5757/13-048	WJSR-6D-2.8MADC
M5757/13-049	WJSR-6D-2.3MADC

Government Designation	Allied Control P/N
M5757/13-050	WJSR-6D-2.0MADC
M5757/13-051	WJSOR-6D-45.0MADC
M5757/13-052	WJSOR-6D-20.0MADC
M5757/13-053	WJSOR-6D-9.0MADC
M5757/13-054	WJSOR-6D-6.5MADC
M5757/13-055	WJSOR-6D-5.2MADC
M5757/13-056	WJSOR-6D-4.5MADC
M5757/13-057	WJSOR-6D-4.0MADC
M5757/13-058	WJSOR-6D-2.8MADC
M5757/13-059	WJSOR-6D-2.3MADC
M5757/13-060	WJSOR-6D-2.0MADC
M5757/13-061	WJSPC-6D-45.0MADC
M5757/13-062	WJSPC-6D-20.0MADC
M5757/13-063	WJSPC-6D-9.0MADC
M5757/13-064	WJSPC-6D-6.5MADC
M5757/13-065	WJSPC-6D-5.2MADC
M5757/13-066	WJSPC-6D-4.5MADC
M5757/13-067	WJSPC-6D-4.0MADC
M5757/13-068	WJSPC-6D-2.8MADC
M5757/13-069	WJSPC-6D-2.3MADC
M5757/13-070	WJSPC-6D-2.0MADC
M5757/13-072	WJSB-6D-45.0MADC
M5757/13-073	WJSB-6D-20.0MADC
M5757/13-074	WJSB-6D-9.0MADC
M5757/13-075	WJSB-6D-6.5MADC
M5757/13-076	WJSB-6D-5.2MADC
M5757/13-077	WJSB-6D-4.5MADC
M5757/13-078	WJSB-6D-4.0MADC
M5757/13-079	WJSB-6D-2.8MADC
M5757/13-080	WJSB-6D-2.3MADC
M5757/13-081	WJSB-6D-2.0MADC

Telemecanique

Telemecanique Inc.
901 Baltimore Boulevard
Westminster, MD 21157
Tel. (301) 876-2214

Allied Control Relays

Low Profile Relays

SERIES SR SIP RELAYS

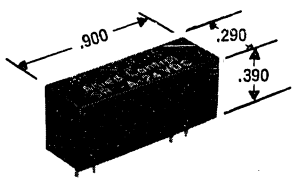
FEATURES:

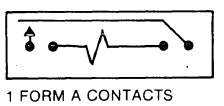
- Superior switching – 2 ampere Bifurcated contacts, handles (6) times the inductive load of a standard size Form "A" contact Reed Relay.
- Small space – ¼ in² PCB space with .390" max. height.
- Easy mounting, symmetrical, eliminates installation errors. Mounts in PCB or on strip or in DIP sockets.
- Fast response – 2 ms typical at rated pull in voltage, 1 ms release.
- 420-SEO Valox Housing meets UL 94V-0 flammability requirement.
- Housing resists fluorocarbon, aqueous detergent and chlorinated commercial solvents.

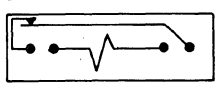
Catalog No.	Coil Res.	Input	Pull-in	Drop-out	Pick-up Power	Contact Rating
SPST-NO[1]						
SR-1A-3VDC	38Ω	3V	2.3V	0.13V	125mW	2 Amp
SR-1A-5VDC	95Ω	5V	3.7V	0.19V	125mW	2 Amp
SR-1A-6VDC	150Ω	6V	4.5V	0.23V	125mW	2 Amp
SR-1A-9VDC	380Ω	9V	6.8V	0.34V	125mW	2 Amp
SR-1A-12VDC	600Ω	12V	9.0V	0.45V	125mW	2 Amp
SR-1A-18VDC	1,500Ω	18V	13.5V	0.70V	125mW	2 Amp
SR-1A-24VDC	2,400Ω	24V	18.0V	0.90V	125mW	2 Amp
SR-1A-48VDC	6,000Ω	48V	36.0V	1.80V	125mW	2 Amp

NOTE:
1. For SPST-NC, substitute "1B" for "1A." For example SR-1B-3VDC.

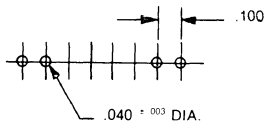
NEW! SERIES SR– SINGLE-IN-LINE




1 FORM A CONTACTS


1 FORM B CONTACTS

PC LAYOUT GRID



ORDER DATA
EXAMPLE: SR-1A-12 VDC

MILITARY TYPE RELAY-MODEL ST

DC 2 Pole Double Throw (2 Amperes)

FEATURES:

- Reliability By Design.
- Complete Welded Construction.
- Bifurcated Contacts.
- High Contact Force.
- Balanced Armature.
- Low Profile, High Density Package.
- Mounting Versatility.
- 2 Form C Contact Configuration.

Contact Rating†: (at nominal coil voltage)
Contact Bounce — 5 MS Maximum
Non-inductive —
2 ampere at 28 volts d-c, 0.3 ampere at 115 volts a-c 60 to 400 cps.
Inductive: 0.75 ampere at 28 volts d-c.

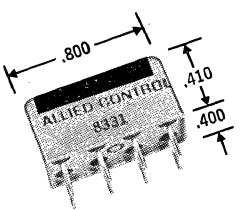
Initial Contact Resistance:
0.100 ohms maximum

Contact Arrangement:
Double pole double throw

Ambient Temperature:
−55°C to +85°C

Dielectric Strength:
1000 volts rms at sea level
500 volts rms between open contacts and between coil terminals and case,
350 volts rms at 80,000 feet

PART NUMBER
ST 6A1-26.5VDC



Coil Data Operating Conditions at 25°C

Nominal Voltage VDC	Pick-Up VDC Max.	Drop-Out VDC Min.	Coil Resistance Ohms ±20%
26.5	16	0.5	770

Vibration:
5 to 28 cps at .5 inch double amplitude
28 to 2000 cps at a constant 20g

Shock:
50g operational

Operate Time: (at +25 C)
4 milliseconds maximum at nominal coil voltage

Release Time: (at +25 C)
4 milliseconds maximum at nominal coil voltage

Enclosure:
Hermetically sealed by welding

Terminals:
Plug-in, printed circuit, and hook type

Weight:
0.3 ounce maximum

† AC ratings are for single phase case grounded

Telemecanique

Telemecanique Inc.
901 Baltimore Boulevard
Westminster, MD 21157
Tel. (301) 876-2214

Allied Control Relays

Low Profile Relays

SERIES MPC MINIATURE RELAYS

Series MPC – Miniature PC, Standard
Series MPCS – Miniature PC, Sensitive
Series MPCL – Miniature PC, Latching

FEATURES:

LOW PROFILE – miniature dc operated relay offers space savings comparable to reed relay

LONG LIFE – patented hingeless armature construction insures long mechanical life

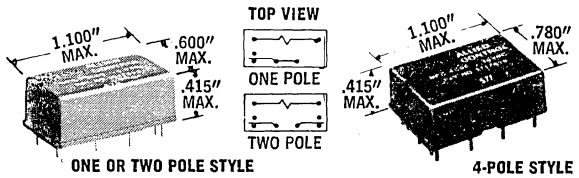
POWER SWITCHING – using standard gold plated silver contact material, MPC Relay has power handling capability of 50 watts per pole

HIGH RELIABILITY – interlocking housing to base minimizes contaminants affecting performance

MULTI-POLE CONTACTS – one form C to four form C available in two basic case sizes

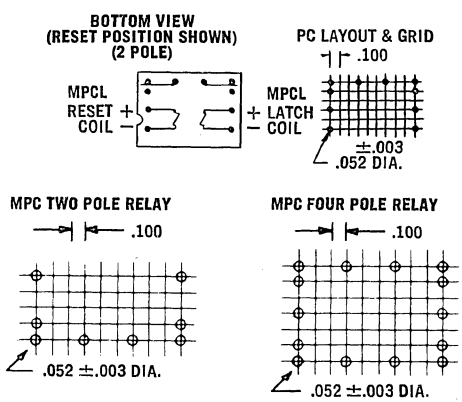
SENSITIVE VERSION – operates from TTL – Driver circuits, available in one form C and two form C within same package size

SERIES MPC – STANDARD VERSION



Catalog No.	Coil Res.	Input	Pull-in	Drop-out	Pick-up Power	Contact Rating
SPDT						
MPC-1C-5VDC	35Ω	5V	3.7V	0.37V	400 mW	2 Amp
MPC-1C-6VDC	50Ω	6V	4.5V	0.45V	400 mW	2 Amp
MPC-1C-12VDC	200Ω	12V	9.0V	0.9V	400 mW	2 Amp
MPC-1C-20VDC	550Ω	20V	15.0V	1.5V	400 mW	2 Amp
MPC-1C-24VDC	800Ω	24V	18.0V	1.8V	400 mW	2 Amp
MPC-1C-48VDC	3,200Ω	48V	36.0V	3.6V	400 mW	2 Amp
DPDT						
MPC-2C-5VDC	35Ω	5V	3.7V	0.37V	400 mW	2 Amp
MPC-2C-6VDC	50Ω	6V	4.5V	0.45V	400 mW	2 Amp
MPC-2C-12VDC	200Ω	12V	9.0V	0.9V	400 mW	2 Amp
MPC-2C-20VDC	550Ω	20V	15.0V	1.5V	400 mW	2 Amp
MPC-2C-24VDC	800Ω	24V	18.0V	1.8V	400 mW	2 Amp
MPC-2C-48VDC	3,200Ω	48V	36.0V	3.6V	400 mW	2 Amp
4PDT						
MPC-4C-5VDC	26Ω	5V	3.7V	0.37V	550 mW	2 Amp
MPC-4C-6VDC	38Ω	6V	4.5V	0.45V	550 mW	2 Amp
MPC-4C-12VDC	150Ω	12V	9.0V	0.9V	550 mW	2 Amp
MPC-4C-20VDC	400Ω	20V	15.0V	1.5V	550 mW	2 Amp
MPC-4C-24VDC	600Ω	24V	18.0V	1.8V	550 mW	2 Amp
MPC-4C-48VDC	2,400Ω	48V	36.0V	3.6V	550 mW	2 Amp

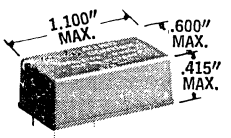
NOTE:
1. For a 3PDT substitute "3C" for "4C."



Note: Consult factory for dual source footprint layout.

SERIES MPCS – SENSITIVE VERSION

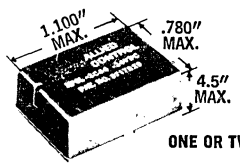
Operates from TTL – Driver Circuits



Catalog No.	Coil Res.	Input	Pull-in	Drop-out	Pick-up Power	Contact Rating
SPDT						
MPCS-1C-5VDC	80Ω	5V	46 mA	5 mA	160 mW	2 Amp
MPCS-1C-6VDC	125Ω	6V	4.5V	0.45V	160 mW	2 Amp
MPCS-1C-12VDC	500Ω	12V	9.0V	0.9V	160 mW	2 Amp
MPCS-1C-24VDC	2,000Ω	24V	18.0V	1.8V	160 mW	2 Amp
MPCS-1C-48VDC	8,000Ω	48V	36.0V	3.6V	160 mW	2 Amp
DPDT						
MPCS-2C-5VDC	80Ω	5V	46 mA	5 mA	160 mW	2 Amp
MPCS-2C-6VDC	125Ω	6V	4.5V	0.45V	160 mW	2 Amp
MPCS-2C-12VDC	500Ω	12V	9.0V	0.9V	160 mW	2 Amp
MPCS-2C-24VDC	2,000Ω	24V	18.0V	1.8V	160 mW	2 Amp
MPCS-2C-48VDC	8,000Ω	48V	36.0V	3.6V	160 mW	2 Amp

For sealed version precede catalog number with an "S." For example SMPC-2C-12VDC.

SERIES MPCL – LATCHING VERSION



Two completely isolated coils; minimum pulse width: 10 ms.

Catalog No.	Coil Res.	Input	Latch or Reset Voltage	Power	Contact Rating
SPST					
MPCL-1A-5VDC	15.8Ω	5V	3.7V	800mW	2 Amp
MPCL-1A-6VDC	25.0Ω	6V	4.5V	800mW	2 Amp
MPCL-1A-12VDC	100.0Ω	12V	9.0V	800mW	2 Amp
MPCL-1A-24VDC	400.0Ω	24V	18.0V	800mW	2 Amp
MPCL-1A-48VDC	1,600.0Ω	48V	36.0V	800mW	2 Amp
DPDT					
MPCL-2A-5VDC	15.8Ω	5V	3.7V	800mW	2 Amp
MPCL-2A-6VDC	25.0Ω	6V	4.5V	800mW	2 Amp
MPCL-2A-12VDC	100.0Ω	12V	9.0V	800mW	2 Amp
MPCL-2A-24VDC	400.0Ω	24V	18.0V	800mW	2 Amp
MPCL-2A-48VDC	1,600.0Ω	48V	36.0V	800mW	2 Amp

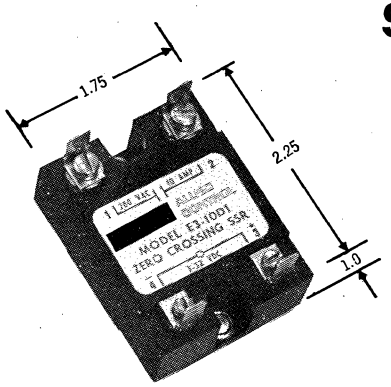
For sealed version precede catalog number with an "S." For example SMPCL-2A-12VDC.

Telemecanique

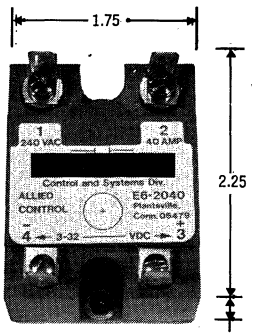
Telemecanique Inc.
901 Baltimore Boulevard
Westminster, MD 21157
Tel. (301) 876-2214

Allied Control Relays

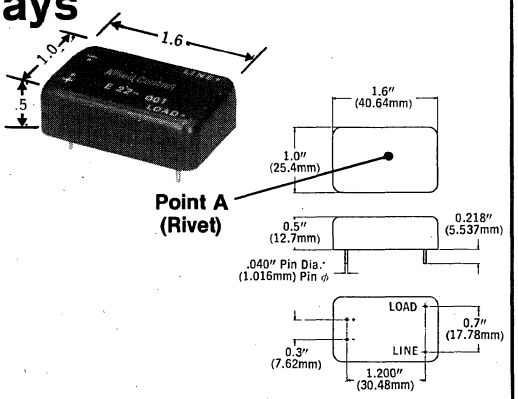
Solid State Relays



SERIES E3 — Optically isolated, zero crossing.



SERIES E6 — Optically isolated, zero crossing, "integral cycling."



SERIES E22 — Optically isolated, miniature full-wave power switching pc mounting.

FEATURES:

- Bounceless switching
- Long life
- Integrated circuit compatibility
- High noise immunity
- Photo isolated

Note: Consult factory for technical data on heat sink and special applications:

Catalog Number	Max. Load Current	Input	Output (AC)	Contact Type	Surge One Cycle	Max. Contact Voltage Drop	Off State Leakage Current	Pick-up Voltage	Drop-out Voltage	Input Impedance
SERIES E3										
E3-10D1A	10A	3-32VDC	280	A	100A	1.6V	8MA	3VDC	1VDC	2200Ω
E3-10D1B	10A	3-32VDC	280	B	100A	1.6V	8MA	3VDC	1VDC	2200Ω
E3-10A0A	10A	20-28VAC	280	A	100A	1.6V	8MA	18VAC	10VAC	10KΩ
E3-10A0B	10A	20-28VAC	280	B	100A	1.6V	8MA	18VAC	10VAC	10KΩ
E3-10A4A	10A	100-135VAC	280	A	100A	1.6V	8MA	90VAC	10VAC	40KΩ
E3-10A4B	10A	100-135VAC	280	B	100A	1.6V	8MA	90VAC	10VAC	40KΩ
E3-25D1A	25A	3-32VDC	280	A	250A	2V	8MA	3VDC	1VDC	2200Ω
E3-25D1B	25A	3-32VDC	280	B	250A	2V	8MA	3VDC	1VDC	2200Ω
E3-25A0A	25A	20-28VAC	280	A	250A	2V	8MA	18VAC	10VAC	10KΩ
E3-25A0B	25A	20-28VAC	280	B	250A	2V	8MA	18VAC	10VAC	10KΩ
E3-25A4A	25A	100-135VAC	280	A	250A	2V	8MA	90VAC	10VAC	40KΩ
E3-25A4B	25A	100-135VAC	280	B	250A	2V	8MA	90VAC	10VAC	40KΩ
E3-40D1A	40A	3-32VDC	280	A	400A	2V	8MA	3VDC	1VDC	2200Ω
E3-40D1B	40A	3-32VDC	280	B	400A	2V	8MA	3VDC	1VDC	2200Ω
E3-40A0A	40A	20-28VAC	280	A	400A	2V	8MA	18VAC	10VAC	10KΩ
E3-40A0B	40A	20-28VAC	280	B	400A	2V	8MA	18VAC	10VAC	10KΩ
E3-40A4A	40A	100-135VAC	280	A	400A	2V	8MA	90VAC	10VAC	40KΩ
E3-40A4B	40A	100-135VAC	280	B	400A	2V	8MA	90VAC	10VAC	40KΩ
SERIES E6										
E6-1010	10A	3-32VDC	120	A	100A	1.6V	6MA	3VDC	1VDC	1KΩ
E6-2010	10A	3-32VDC	240	A	100A	1.6V	7.5MA	3VDC	1VDC	1KΩ
E6-4010	10A	3-32VDC	480	A	100A	1.6V	8MA	3VDC	1VDC	1KΩ
E6-1025	25A	3-32VDC	120	A	250A	2V	6MA	3VDC	1VDC	1KΩ
E6-2025	25A	3-32VDC	240	A	250A	2V	7.5MA	3VDC	1VDC	1KΩ
E6-4025	25A	3-32VDC	480	A	250A	2V	8MA	3VDC	1VDC	1KΩ
E6-1040	40A	3-32VDC	120	A	400A	2V	6MA	3VDC	1VDC	1KΩ
E6-2040	40A	3-32VDC	240	A	400A	2V	7.5MA	3VDC	1VDC	1KΩ
E6-4040	40A	3-32VDC	480	A	400A	2V	8MA	3VDC	1VDC	1KΩ
SERIES E22										
E22N	4A	3-32VDC	260	A	60A	1.6V	5MA	3VDC	1VDC	2200Ω

1. Max current load when proper heat sink applied.

Telemecanique

Telemecanique Inc.
901 Baltimore Boulevard
Westminster, MD 21157
Tel. (301) 876-2214

Allied Control Relays

Industrial Sockets — Class 50
Slimline Design — Self-lifting Wire Clips
Compact Construction — Unbreakable Polycarbonate Body

APPLICATIONS

- Electro-mechanical relays
- Thermal timers
- Solid state and hybrid time delay relays
- Solid state controls for liquid level sensing and other processes

FEATURES

- **UL Recognized File No. 48784. CSA Certified File No. 28098.**
- UL rated for flammability to 94V2 with high-voltage arc track characteristics.
- Screw terminals and captive self-lifting wire clips for reliable and easy wire insertion.*
- Patented design assures positive connection that exceeds UL486 requirements for wire pull-out specifications, including heat and security standards.
- Dielectric strength: 2000V.
- Contrasting all-black bodies and accessories with nickel color terminals that facilitate easy wiring and/or trouble shooting.
- Integral molded barrier construction. Durable polycarbonate body. Back plate ultrasonically welded to body, eliminating need for additional panel insulation.
- Choice of mountings: direct panel or track.
- Track: strong, lightweight aluminum; standard length 3 feet.

* Combination slot/Phillips head screw available on request.

Octal Sockets for Cradle Relay

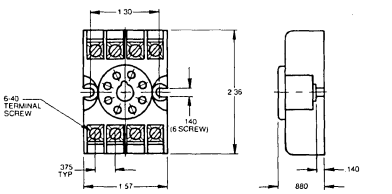
Catalog No.	Contact Arrangement
H50SL608	8 pin — 2 pole double throw
H50SL611	11 pin — 3 pole double throw

Blade Socket for Midget Power Relay

Catalog No.	Contact Arrangement
H50SL708	2 pole double throw
H50SL711	3 pole double throw
H50SL715	4 pole double throw

H50SL608

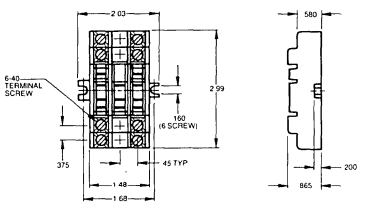
Industrial 8-pin octal socket. Rating: UL and CSA, 10 amperes, 300 VAC. Wire sizes: up to #12 AWG. Terminals: pan head 6-40 screw.



NOTE: SL608A is same as Model SL608 except Terminals: standard pan head 6-40 screw.

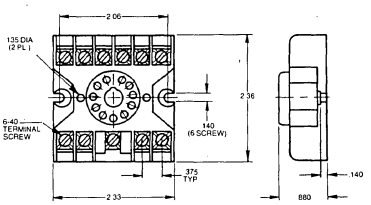
H50SL708

Industrial 8-pin blade type socket. Rating: UL, 15 amperes, 300 VAC; CSA, 10 amperes, 300 VAC. Wire sizes: up to #12 AWG. Terminals: pan head 6-40 screw.



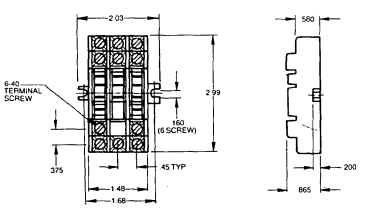
H50SL611

Industrial 11-pin magnol socket. Rating: UL and CSA, 10 amperes, 300 VAC. Wire sizes: up to #12 AWG. Terminals: pan head 6-40 screw.



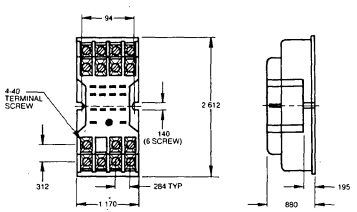
H50SL711

Industrial 11-pin blade type socket. Rating: UL, 15 amperes, 300 VAC; CSA, 10 amperes. Wire sizes: up to #12 AWG. Terminals: pan head 6-40 screw.



H50SL715

Industrial 14-pin blade type socket. Rating: UL and CSA, 5 amperes, 300 VAC. Wire sizes: up to #14 AWG. Terminals: pan head 4-40 screw.



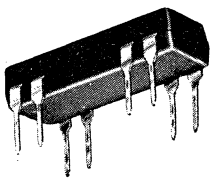
Telemecanique

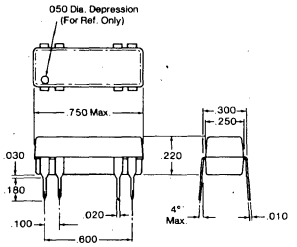
Telemecanique Inc.
901 Baltimore Boulevard
Westminster, MD 21157
Tel. (301) 876-2214

wabash®
A Kearney-National Company

Wabash Relay & Electronics Div., Dept. GB, 1st & Webster Streets • Wabash, IN 46992 • (219) 563-2191 • TWX 810-290-2722

DIP PACKAGE DRY REED RELAYS
814 SERIES





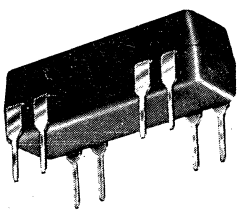
The 814 Series offers dry reed reliability and total isolation in a low profile IC type package, with DTL/TTL compatible coil drive available in most configurations.

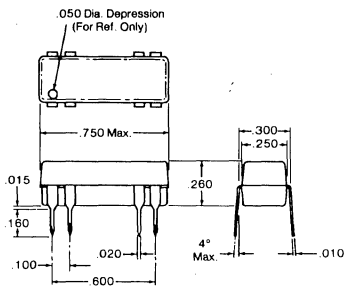
SPECIFICATIONS — Contact Rating: 28 VDC or 0.110 Amps (switching); 3 watts; 200 milliohms max. initial contact resistance; 200 Volt pk. bkdn. **Temperature:** −55°C to +105°C. **Shock:** 100G max., 8 ±1 mSec. ½ wave. **Vibration:** 20G @ 10-5000 Hz. **Insulation Resistance:** 10^{10} Ohms min. **Capacitance:** 0.2 pf. **Operate Time (Typical):** to 0.5 mSec. **Release Time (Typical):** 0.1 mSec. **Life Expectancy:** 50 x 10^6 operations at signal level; 1 x 10^6 operations at rated load.

Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	16	365	814-101-01
	5	19	500	814-102-01
	6	19	500	814-103-01
	12/15	24	800	814-104-01
	24	30	1250	814-105-01

▲ Measured at 25°C.

815 SERIES

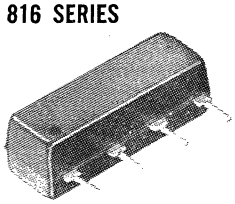


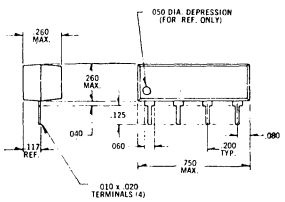


The 815 Series, with a profile slightly higher than the 814, offers increased versatility while maintaining the DIP package approach to hi-density printed circuit applications. Standard part numbers listed are subject to specifications shown for the 814 Series, however, the 815 has the capacity to offer dry reed switches to ½ Amp rating plus up to a 200 VDC max. switching voltage. Optional features include diode suppression, magnetic shielding and electrostatic shielding.

Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	14	200	815-101-01
	5/6	19	500	815-102-01
	12/15	19	500	815-103-01
	24	40	2150	815-104-01
2A	5/6	14	200	815-201-01
	12/15	19	500	815-202-01
	24	38	2000	815-203-01
1B	5/6	7	200	815-221-01
	12/15	16	500	815-222-01
	24	32	2000	815-223-01
1C	5/6	8	80	815-241-01
	12/15	19	500	815-242-01
	24	38	2000	815-243-01

816 SERIES

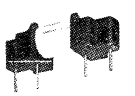


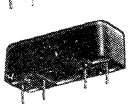


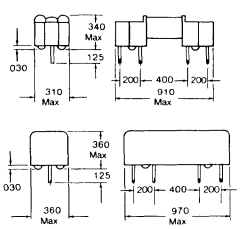
The 816 Series SIP (Single-Inline Package) provides the power handling capabilities of the 815 DIP while taking up less printed circuit board space. Standard part numbers listed are subject to specifications shown for the 814 Series; however, the 816 has the capacity to offer dry reed switches with ratings to 0.5 amps and 200 VDC. Optional features include diode suppression and magnetic shielding.

Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A SPST NO	5/6	14	200	816-101
	5/6	19	500	816-102
	12/15	19	500	816-103
	24	40	2150	816-104
1B SPST NC	5/6	7	200	816-221
	12/15	16	500	816-222
	24	32	2000	816-223

802/803 SERIES



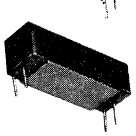


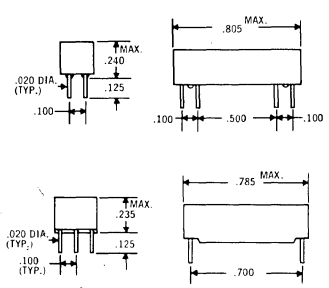


The 802 and 803 are sub-miniature reed relays in a Single-Inline package. They are both available in a 1 Form A configuration and are P.C. mountable. Contact ratings of 200 volts DC with total power handling of 10 watts is standard.

Contact Form	Nominal Voltage	Coil Resistance ±10%▲	Part Number
1A	5/6	500	802-101
	12/15	500	802-102
	24	2000	802-103
	5/6	125	802-104
Enclosed 1A	5/6	500	803-101
	12/15	500	803-102
	24	2000	803-103
	5/6	125	803-104

SUB-MINIATURE RR
804/806 SERIES



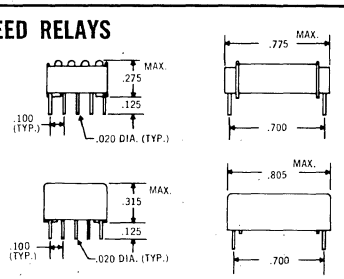


The 804 and 806 sub-miniature reed relays come in a 1 Form A configuration. Both relays are P.C. mountable and are completely enclosed for environmental protection, extended life and easy cleaning. Call Wabash Relay & Electronics for complete details.

SPECIFICATIONS — Contact Ratings: (max.) 200 VDC, 0.5 Amp (switching), 1.0 Amp (carry), 10 Watts DC, 15 V-A (AC suppressed), 250 Volts peak breakdown, 200 milliohms max. initial contact resistance. **Temperature:** −55°C to +105°C. **Shock:** 30 G max., 11 ±1 mSec. **Vibration:** 10 G max. @ 0 to 1700 Hz. **Insulation Resistance:** 10^{10} ohms min. **Capacitance:** 0.5 pf. **Life Expectancy:** 100 x 10^6 operations at dry ckt.; 50 x 10^6 operations at signal levels; 20 x 10^6 operations at rated load.

Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	8	60	804-101
	12/15	18	370	804-102
	24	27	950	804-103
1A	5/6	12	500	806-101
	12/15	24	1200	806-102
	24	38	2000	806-103

SUB-MINIATURE DRY REED RELAYS
807/808 SERIES



Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1B†	5/6	8	200	807/808-211
	12/15	16	800	807/808-212
	24	32	2000	807/808-213
1C† *	5/6	8	125	807/808-316
	12/15	16	500	807/808-317
	24	32	2000	807/808-318

Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	13	350	807/808-101
	12/15	24	1200	807/808-102
	24	39	3200	807/808-103
2A	5/6	10	200	807/808-201
	12/15	20	800	807/808-202
	24	32	2000	807/808-203

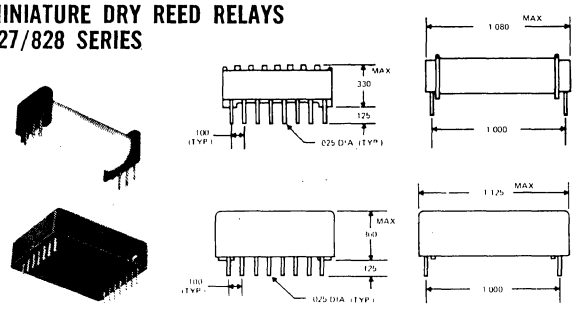
* (1A1B guarantee break-before-make)

Contact Forms Available: 1, 2, 3 Pole. Forms A, B, & C.

wabash®
A Kearney-National Company

Wabash Relay & Electronics Div., Dept. GB, 1st & Webster Streets • Wabash, IN 46992 • (219) 563-2191 • TWX 810-290-2722

MINIATURE DRY REED RELAYS 827/828 SERIES



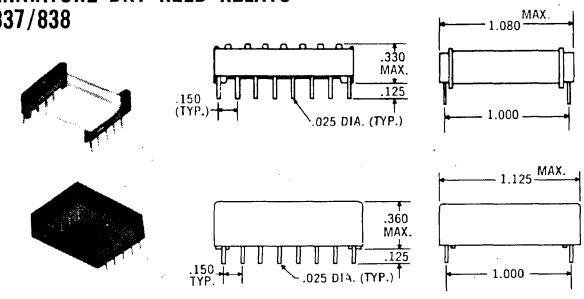
Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number	Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	22	500	827/828-101	1B†	5/6	8	200	827/828-211
	12/15	28	800	827/828-102		12/15	16	800	827/828-212
	24	44	2000	827/828-103		24	32	2000	827/828-213
2A	5/6	14	200	827/828-201	1C†	5/6	8	60	827/828-316
	12/15	29	800	827/828-202		12/15	16	240	827/828-317
	24	46	2000	827/828-203	*	24	32	960	827/828-318

* (1A1B guarantee break-before-make)

Contact Forms Available: 1, 2, 3, 4, & 6 Poles. Forms A, B, & C including magnetic latchers.

SPECIFICATIONS — Contact Ratings: (max.) 200 VDC, 150 VAC, 0.5 Amp (switching), 3 Amp (Carry), 10 Watts DC, 25 V-A (AC suppressed), 300 Volts peak breakdown, 200 milliohms max. initial contact resistance. **Temperature:** −55°C to +105°C. **Shock:** 30 G max., 11 ±1 mSec. **Vibration:** 10 G max. @ 0 to 1700 Hz. **Insulation Resistance:** 10^9 Ohms min. **Capacitance:** 0.5 pf. **Life Expectancy:** 100 x 10^6 ops @ dry ckt.; 50 x 10^6 ops @ signal levels; 20 x 10^6 ops @ rated load.

MINIATURE DRY REED RELAYS 837/838



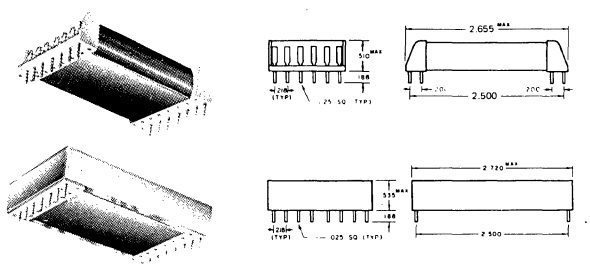
Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number	Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	22	500	837/838-101	1B†	5/6	8	200	837/838-211
	12/15	28	800	837/838-102		12/15	16	800	837/838-212
	24	44	2000	837/838-103		24	32	2000	837/838-213
2A	5/6	14	200	837/838-201	1C†	5/6	8	60	837/838-342
	12/15	29	800	837/838-202		12/15	16	240	837/838-343
	24	46	2000	837/838-203	*	24	32	960	837/838-344

* (1A1B guarantee break-before-make)

Contact Forms Available: 1, 2, 3, 4, & 6 Pole. Forms A, B, & C including magnetic latchers.

SPECIFICATIONS — Contact Ratings: (max.) 200 VDC, 150 VAC, 0.5 Amp (switching), 3 Amp (carry), 10 Watts DC, 25 V-A (AC suppressed), 300 Volts peak breakdown, 200 milliohms max. initial contact resistance. **Temperature:** −55°C to +105°C. **Shock:** 30 G max., 11 ±1 mSec. **Vibration:** 10 G max. @ 0 to 1700 Hz. **Insulation Resistance:** 10^9 Ohms min. **Capacitance:** 0.5 pf. **Life Expectancy:** 100 x 10^6 ops @ dry ckt.; 50 x 10^6 ops @ signal levels; 20 x 10^6 ops @ rated load.

STANDARD REED RELAYS 842/843 SERIES



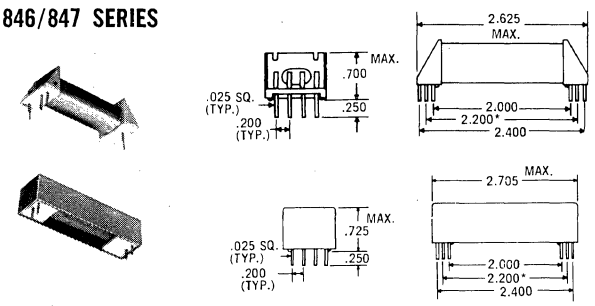
Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number	Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	22	150	842/843-101	1B†	5/6	9	100	842/843-209
	12/15	45	600	842/843-102		12/15	18	400	842/843-211
	24	90	2400	842/843-103		24	36	1600	842/843-213
	48	175	9000	842/843-104		48	72	6400	842/843-215
2A	5/6	20	100	842/843-201	1C†	6	9	100	842/843-311
	12/15	41	400	842/843-202		12	18	400	842/843-315
	24	82	1600	842/843-203	*	24	36	1600	842/843-319
	48	165	6400	842/843-204		48	72	6400	842/843-323

* (1A1B guarantee break-before-make)

Contact Forms Available: 1, 2, 3, 4, 5, 6, 8, & 12 Pole. Forms A, B, & C including magnetic latchers.

SPECIFICATIONS — Contact Ratings: 400 VDC, 250 VAC, 1.5 Amp (switching) 6 Amp (carry), 25 Watts, 40 V-A (AC suppressed) 50 milliohm max. initial contact resistance 500 volts peak breakdown. **Temperature:** −55°C to +105°C. **Shock:** 30 G max., 11 ±1 mSec. **Vibration:** 10 G max.@ 0-1700 Hz. **Insulation Resistance:** 10^9 Ohms min. **Capacitance:** 1.5 pf. **Life Expectancy:** Dry ckt., 100 x 10^6 ops; signal level, 50 x 10^6 ops; rated power, 20 x 10^6 ops.
Available to 12 form A. True form C also available.

846/847 SERIES



Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number	Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	22	150	846/847-101	1B†	5/6	9	100	846/847-209
	12/15	45	600	846/847-102		12/15	18	400	846/847-211
	24	90	2400	846/847-103		24	36	1600	846/847-213
2A	5/6	20	100	846/847-201					
	12/15	41	400	846/847-202					
	24	82	1600	846/847-203					

Contact Forms Available: 1 & 2 Pole. Forms A, B, & C including magnetic latchers.

SPECIFICATIONS — Contact Ratings: 400 VDC, 250 VAC, 1.5 Amp (switching) 6 Amp (carry), 25 Watts, 40 V-A (AC suppressed) 75 milliohm max. initial contact resistance 500 volts peak breakdown. **Temperature:** −55°C to +105°C. **Shock:** 30 G max., 11 ±1 mSec. **Vibration:** 10 G max. @ 0-1700 Hz. **Insulation Resistance:** 10^9 Ohms min. **Capacitance:** 1.5 pf. **Life Expectancy:** Dry ckt., 100 x 10^6 ops; signal level, 50 x 10^6 ops; rated power, 20 x 10^6 ops.
True form C also available.

* Spacing not available in 1 pole package.

The relays shown here are just a sampling of the many designs and configurations manufactured by Wabash Relay & Electronics as standard products. We also offer design assistance and custom designed relays through our fully staffed engineering department. Should you require a custom designed relay, here are some parameters to consider:

U.L. and C.S.A. Recognition

Several relay series are recognized under the Component Program of Underwriters' Laboratories. Most of these relays also have C.S.A. recognition. Regardless of which series you are interested in, Wabash Relay can help you obtain the U.L. or C.S.A. recognition your design requires.

Wabash Relay & Electronics Division

1st & Webster Streets, Wabash, Indiana 46992
(219) 563-2191 TWX: 810-290-2722

Prints and specifications, if available, are the best design tool. The minimum information required for Wabash Relay to design a relay is:

Mechanical Specifications

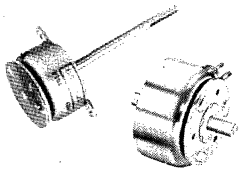
- Maximum length
- Maximum width
- Maximum height above P.C. board
- Pin configuration
- Open or covered
- Type of environment relay will be exposed to
- End Use

Electrical Specifications

- Switch configuration
- Nominal voltage
- Must operate voltage or current
- Must release voltage or current
- Coil resistance
- Switching current
- Contact resistance
- Carry current
- U.L. recognition required
- Special considerations (ESS, low thermal, high insulation resistance, etc.)

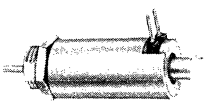
LEDEX® Solenoids

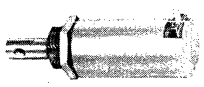
Over 300 choices of standard solenoid designs are available off-the-shelf from Ledex. But, if none of these meet your unique requirements, we'll provide you with custom engineered prototypes. Either way, Ledex offers you the widest variety of solenoids for your design.



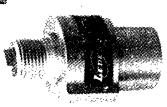
Rotary Solenoids
Step-turn-index-lock-punch-lift. For millisecond fast torque and endurance, specify a Ledex rotary solenoid.

Eight basic sizes, right or lefthand strokes from 10 to 110 degrees. Torque output to 117 pound-inches. Life of over 100 million cycles with endurance engineered models.

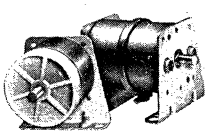




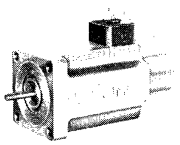
Linear Solenoids
Short-medium-long strokes are all available from one source – Ledex. Choose our low profile flat face push/pull for high force/short stroke; our low profile conical face push/pull for medium force/stroke and our tubular solenoids for long strokes. New Series 20 tubular solenoids provide 100 million actuations, quiet operation, push or pull, and economy – from stock. Rugged construction provides accurate repeatability after long usage. Our tubular solenoids have built-in impact cushions to absorb energy at the end of the stroke and electroless nickel plated plungers for longer life.



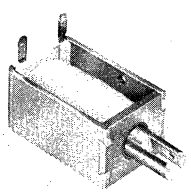
Custom Designed Solenoids
The Ledex Model 515 Dot Matrix solenoid has a special patented construction to control bounce, is easy to mount, uses standard terminals, operates at 1300 Hz., and has a life of 300 million actuations. Our printhammer solenoid was specially designed for quiet actuation to interface with plastic or metal daisy wheels while delivering variable force depending on the character.



Stepping Solenoids
Step 10-15-20 or 30 degrees with the highest torque a stepping solenoid makes – the Ledex Series 50-L. Square wave pulse drives either the unidirectional or bidirectional model for 10,000,000 steps with a non-accumulative accuracy of ±1°. Direct couple for mechanical ease and avoid linkages. Can be manually overridden in case of power failure.



Proportional Solenoids
Open loop/closed loop, variable position sensing is now possible by using the Ledex proportional solenoid with the Ledex controller for smooth, accurate response. Hydraulic systems can use our wet plunger type which requires no dynamic seals and provides up to 50 pounds force. Do away with pilot stages and expensive servo valves.



D-Frame Solenoids
Ledex D-Frame solenoids offer economical, long term service for users whose needs must be matched by a dependable product and reliable source. Eight standard models are available from stock with strokes up to 1.25". Quick connect terminals and class "B" coils are standard.

LEDEX INC., P.O. Box 427 • Vandalia, Ohio 45377 • USA

Call 513-898-3621

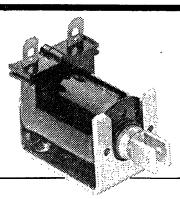
SEE OUR PAGES **B**•1468-**B**•1470 THIS SECTION.
ALSO SEE OUR PAGES IN SECTION 5100 **B**•1672-**B**•1614

SOLENOIDS

Manufacturer	EEM Page No.	Model/Series	Linear			Rotary	Proportional (Servo)	Stepping	
			Frame Type		Tubular			Unidirectional	Bidirectional
			C	D					
Airpax	B•1293	7019			○				
		7007		○					
Deltrol Controls	B•1464	C-6	○				●		
		C-9	○				◕		
		D-11		○			●		
		D-22		◕			◕		
		D-28		○			●		
	B•1464	D-2		◕			◕		
		D-3HD		○			○		
		D-4		○			◕		
		D-4HD		◕			◕		
Electro-Mechanisms	B•1466	SP	○				◕		
		PO	○				○		
	B•1467	SP-100	◕				◕		
		PO-100	◕				◕		
		SP-375	○				◕		
		SP-650	○				○		
		SP-750	○				◕		
		PO-375	○				○		
		PO-650	◕				●		
		PO-750	●				●		
Guardian Electric	B•1387	All	○	○	○		○	○	○
ITT Components	B•1471	All	●	●	○				
Ledex Inc.	B•1468	Rotary				○	○		
	B•1469	20			○		○		
	B•1470	Stepping						○	○
		D-Frame		○			●		
Liberty Controls	B•1472	L-9	○				○		
		L-11		◕			◕		
		L-22		◕			◕		
		L-24	◕				◕		
		L-25	◕				◕		
		L-26	◕				◕		
		L-28		●			●		
		L-61	●				●		
	B•1473	L-62	●				●		
		L-63	●				●		
		L-81		◕			◕		
		L-82		◕			◕		
		L-88		◕			◕		
		L-89		○			○		
		L-90		◕			●		
		L-20	Clickers & Clappers						
		L-30	Push Type						
		L-40	Hinge Type Flapper						
Regdon	B•1475	312		●			◕		
		5U5	○				●		
		5U7	○				◕		
		809		◕			◕		
		827		◕			◕		
		930		◕			◕		
		940		◕			◕		
		960		●			●		
		970		◕			◕		
		RX			◕		◕		

DELTROL SOLENOIDS

SEE SECTION 4500 FOR RELAYS



C-6 PULL TYPE

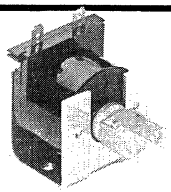
L = 1-1/8
W = 55/64
H = 1-17/64
.187 QUICK CONNECT/SOLDER TERMINALS

NOTE: Standard intermittent duty cycle at nominal voltage is one (1) minute on and three (3) minutes off.

			Coil	
Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53685-83	24VDC	Cont.	124	4.7W
53686-83	24VDC	Int.	50.8	12W
53687-94	120VAC	Cont.	776	6.8VA
53688-94	120VAC	Int.	327	19.6VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4
DC Cont.	7	3	2	1-1/2
DC Int.	15	8	5	3-1/2
AC Cont.	10	7	5	4
AC Int.	21	13	11	8



C-9 PULL TYPE

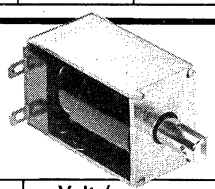
L = 1-1/16
W = 1-3/8
H = 1-13/16
.187 QUICK CONNECT/SOLDER TERMINALS

NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off. AC intermittent duty cycle is one (1) minute on and four (4) minutes off. Approx. 10 sq. in. heat sink required.

Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53676-83	24VDC	Cont.	66.5	8.6W
53677-83	24VDC	Int.	37.6	15.5W
53673-94	120VAC	Cont.	240	13.7VA
53674-94	120VAC	Int.	84.1	52VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2
DC Cont.	26	17	12	9	3
DC Int.	42	28	22	16	5
AC Cont.	21	16	15	14	10
AC Int.	54	43	39	37	27



D-11 PULL TYPE

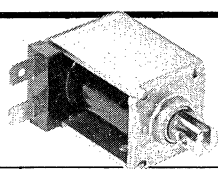
L = 1-27/32
W = 15/16
H = 1-3/16
.187 QUICK CONNECT/SOLDER TERMINALS

NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off.

Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53736-81	12VDC	Cont.	18	8W
53736-82	24VDC	Cont.	72	8W
53736-87	12VDC	Int.	8	18W
53736-88	24VDC	Int.	32	18W
53738-84	120VAC	Cont.	200	12VA
53738-90	120VAC	Int.	85	42VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2	3/4
DC Cont.	38	28	16	11	4	3
DC Int.	55	40	24	22	10	6
AC Cont.	14	12	9	8	7	6
AC Int.	45	25	20	18	15	14



D-22 PULL TYPE

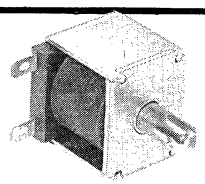
L = 1-1/4
W = 3/4
H = 3/4
.187 QUICK CONNECT/SOLDER TERMINALS

NOTE: Standard intermittent duty cycle at nominal voltage is 25% with three (3) minutes max. on and nine (9) minutes min. off in a repetitive cycle. Approx. 10 sq. in. heat sink required.

Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53723-81	12VDC	Cont.	35	4.2W
53723-82	24VDC	Cont.	141	4.2W
53723-87	12VDC	Int.	14.8	9.6W
53723-88	24VDC	Int.	60	9.6W
53724-84	120VAC	Cont.	1,090	6.5VA
53724-90	120VAC	Int.	724	8.5VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	3/8
DC Cont.	9	4	2-1/2	1-3/4	1
DC Int.	20	10	6	4	2
AC Cont.	6	3-1/2	2-3/4	2-1/2	1-3/4
AC Int.	8-1/2	5-1/2	4	3-1/2	2-1/2



D-28 PULL TYPE

L = 1-1/4
W = 1
H = 1-7/32
.187 QUICK CONNECT/SOLDER TERMINALS

NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off.

Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53708-81	12VDC	Cont.	27.1	5.5W
53708-82	24VDC	Cont.	108	5.5W
53708-87	12VDC	Int.	12.7	11.5W
53708-88	24VDC	Int.	51	11.5W
53706-84	120VAC	Cont.	420	8VA
53706-90	120VAC	Int.	220	21VA

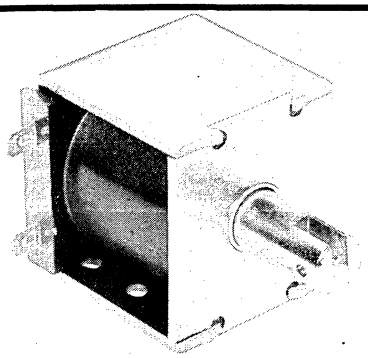
STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2
DC Cont.	20	10	6	4	2
DC Int.	35	19	12	8	3
AC Cont.	16	12	10	8	4
AC Int.	29	20	17	14	6

DELTROL SOLENOIDS

SEE SECTION 4500 FOR RELAYS

D-2 PULL TYPE



L = 1-9/16
W = 1-7/16
H = 1-5/8

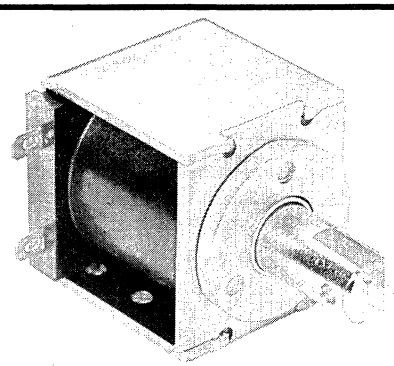
NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off.

Stock No.	Volts/ Type	Duty	Coil Resist. (Ohms)	Coil Power
53728-81	12VDC	Cont.	13.6	10.5W
53728-82	24VDC	Cont.	54.7	10.5W
53728-87	12VDC	Int.	4.92	29W
53728-88	24VDC	Int.	20.0	29W
53729-84	120VAC	Cont.	139	13VA
53729-90	120VAC	Int.	47.0	44VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2	3/4
DC Cont.	84	50	34	23	8	4
DC Int.	122	97	74	56	21	9
AC Cont.	27	20	17	16	14	5
AC Int.	69	56	50	45	36	15

D-3HD PULL TYPE



L = 1-3/4
W = 1-7/16
H = 1-5/8

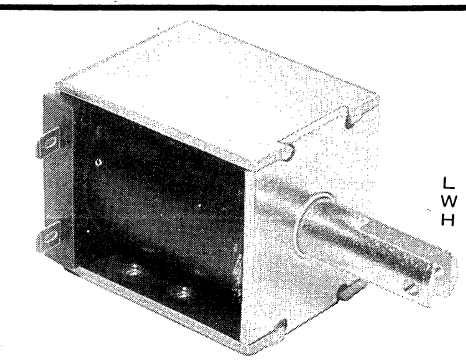
NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off.

Stock No.	Volts/ Type	Duty	Coil Resist. (Ohms)	Coil Power
53732-81	12VDC	Cont.	12.8	11.2W
53732-82	24VDC	Cont.	51.5	11.2W
53732-87	12VDC	Int.	5.3	27W
53732-88	24VDC	Int.	21.4	27W
53733-84	120VAC	Cont.	109	20VA
53733-90	120VAC	Int.	27	115VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2	3/4
DC Cont.	110	72	45	31	10	4
DC Int.	150	124	96	72	25	10
AC Cont.	35	26	23	22	21	13
AC Int.	112	88	80	78	68	40

D-4 PULL TYPE



L = 2
W = 1-7/16
H = 1-5/8

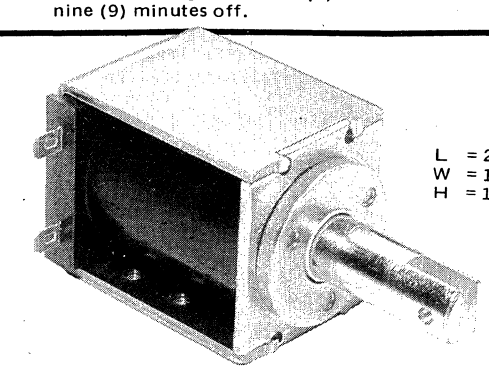
NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off.

Stock No.	Volts/ Type	Duty	Coil Resist. (Ohms)	Coil Power
53717-81	12VDC	Cont.	12.3	11.5W
53717-82	24VDC	Cont.	50.4	11.5W
53717-87	12VDC	Int.	3.0	47.6W
53717-88	24VDC	Int.	12.3	47.6W
53718-84	120VAC	Cont.	133	11.5VA
53718-90	120VAC	Int.	37	60VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2	3/4
DC Cont.	94	66	46	34	14	7
DC Int.	142	122	106	92	52	30
AC Cont.	12	10	9	9	10	13
AC Int.	44	38	34	32	38	46

D-4HD PULL TYPE



L = 2-3/16
W = 1-7/16
H = 1-5/8

NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off.

Stock No.	Volts/ Type	Duty	Coil Resist. (Ohms)	Coil Power
53719-81	12VDC	Cont.	12.1	11.7W
53719-82	24VDC	Cont.	49.2	11.7W
53719-87	12VDC	Int.	3.8	38W
53719-88	24VDC	Int.	15.2	38W
53720-84	120VAC	Cont.	72.4	32VA
53720-90	120VAC	Int.	19.1	170VA

STROKE (INCHES) FORCE (OUNCES)

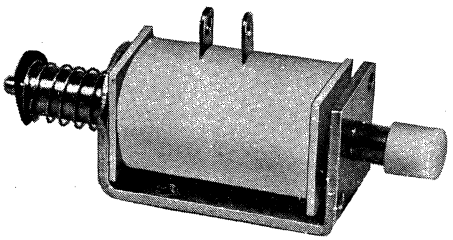
	1/16	1/8	3/16	1/4	1/2	3/4
DC Cont.	116	85	60	42	16	8
DC Int.	160	136	114	98	46	26
AC Cont.	24	20	19	18	21	24
AC Int.	84	72	64	60	66	76

ALL DIMENSIONS ARE NOMINAL.

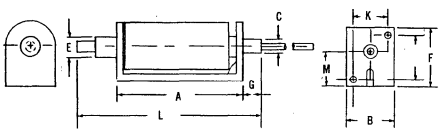
DELTROL controls DIVISION OF DELTROL CORP
2745 S. 19th Street, Milwaukee, Wisconsin 53215 Phone (414) 671-6800, Telex 2-6871

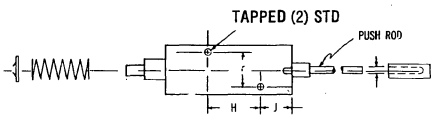
electro-mechanisms INCORPORATED
P.O. BOX A
AZUSA, CALIF. 91702
AREA CODE (818) 359-2535

MINI-SOLENOID ACTUATORS



SP SERIES PUSH TYPE





Frame: ..... C1006 Iron — Cad-II Plated
Core: ..... C1002 Electroless Nickel Plated
Plunger: ..... C1002 Electroless Nickel Plated
Wire: ..... 130°C Magnet Wire
Termination: ..... Heavy Leads — PVC, Type BU, 5" Terminals — Solder Lugs
Tape: ..... Mylar
Bobbin: ..... 30% Glass Filled Nylon
Tip: ..... Delrin
Pushrod: ..... Phosphor Bronze
Tol: ..... .xxx ±.005

3, 6, 12, 24, 48 VDC

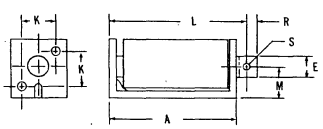
SPECIFICATIONS

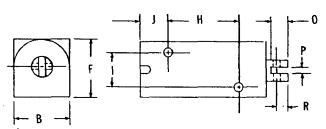
Note: Dimension L is shown with solenoid in energized position. Return Spring and Delrin Tip are Standard on all SP Series.

Part No.	A	B	C	D	E	F	G	H	I	J	K	L	M	S	Max. Stroke*	Weight Oz.	Tapped Holes	Wattage Nom.
SP-18	.403	.180	.062	.025	.068	.235	.085	3/16	3/32	1/8	*	.67	.145		3/16	.05	0-80	1.5
SP-25	.548	.236	.093	.036	.100	.298	.093	1/4	.136	1/8	*	.84	.180		1/4	.1	1-72	2
SP-37	.820	.360	.125	.051	.150	.430	.125	5/16	1/4	3/16	1/4	1.22	.250		3/8	.3	1-72	3
SP-50	.980	.488	.125	.051	.187	.530	.150	1/2	3/8	7/32	5/16	1.44	.285		1/2	.7	1-72	4.5
SP-62	1.215	.600	.187	.091	.250	.691	.178	5/8	7/16	1/4	7/16	1.732	.391		5/8	1.2	4-40	6
SP-75	1.621	.730	.240	.091	.306	.838	.172	5/8	7/16	1/4	1/2	2.15	.473		3/4	2.7	4-40	9

Standard Coils 105°C, Hi Temp Available. * Max Stroke, Standard Pushrod length.

PO SERIES PULL TYPE





Frame: ..... C1006 Iron — Cad-II Plated
Core: ..... C1002 Electroless Nickel Plated
Plunger: ..... C1002 Electroless Nickel Plated
Wire: ..... 130°C Magnet Wire
Termination: ..... Heavy Leads — PVC, Type BU, 5" Terminals — Solder Lugs
Tape: ..... Mylar
Bobbin: ..... 30% Glass Filled Nylon
Tip: ..... Delrin
Pushrod: ..... Phosphor Bronze
Tol: ..... .xxx ±.005

SPECIFICATIONS

Note: Dimension L is shown with solenoid in energized position.

Part No.	A	B	E	F	H	I	J	K	L	M	O	P	R	S	Max. Stroke	Weight Oz.	Tapped Holes	Wattage Nom.
PO-25	.548	.236	.100	.298	1/4	.136	1/8	*	.734	.180	.100	.025	.062	.031	1/4	.1	1-72	2
PO-37	.820	.360	.150	.430	5/16	1/4	3/16	1/4	.892	.250	.150	.051	.075	.031	3/8	.3	1-72	3
PO-50	.980	.488	.187	.530	1/2	3/8	7/32	5/16	1.180	.285	.200	.063	.106	.063	1/2	.7	1-72	4.5
PO-62	1.215	.600	.250	.691	5/8	7/16	1/4	7/16	1.434	.391	.200	.063	.094	.063	5/8	1.2	4-40	6
PO-75	1.621	.730	.306	.838	5/8	7/16	1/4	1/2	1.891	.473	.200	.063	.094	.063	3/4	2.7	4-40	9

Standard Coils 105°C, Hi Temp Available.

SPECIALS

ELECTRO-MECHANISMS, INC., is completely equipped, both engineering and production wise, to supply you with variations of our solenoids that you might need for your application. We are also capable of designing special types that you might need within the size range of our products. We would appreciate the opportunity to help you solve design and application problems you may have in the area of miniature solenoid actuators.

The force charts below represent three different duty cycles.

Nominal voltage represents continuous duty.

2X Nominal voltage represents a 25%, intermittent duty cycle 4X Nominal voltage represents a 6% intermittent duty cycle.

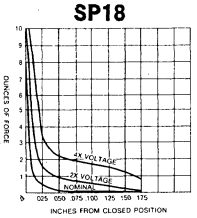
The duty cycle consists of two factors:

1. Percentage of time solenoid is energized in one complete operating cycle.

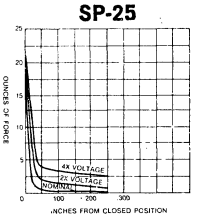
$$\text{(Ref: DUTY CYCLE} = \frac{\text{Time On}}{\text{Time On} + \text{Time Off}} \times 100\text{)}$$

2. Length of time of the longest single energization in one complete operating cycle.

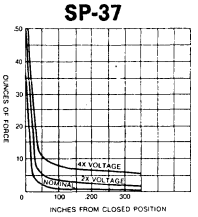
SP18



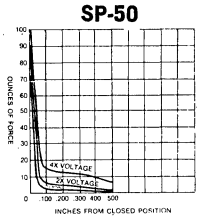
SP-25



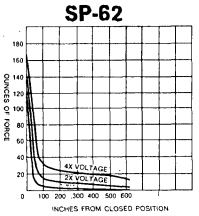
SP-37



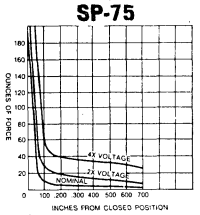
SP-50



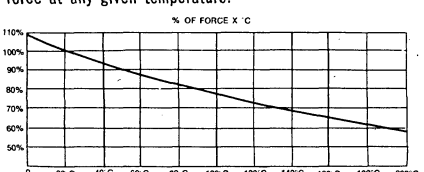
SP-62



SP-75



All forces shown are at 25° ambient. For use at higher ambient temperatures use the chart below to determine force at any given temperature.



FEATURES

ELECTRO-MECHANISMS micro-miniature solenoids offer you static and impact forces equal to standard solenoids 2 to 3 times the size of these units.

Because of their small size, they have extremely fast reaction time. As fast as 2 msec at 4x nominal voltage.

The unique design of PUSH or PULL action, offers many applications beyond the conventional pull type solenoid.

A complete line of 15 solenoids from 3/16" O.D. to 1.250" O.D. allows you to choose the correct solenoid with the force you require, from stock items.

The units are highly reliable with life of many millions of operations.

The solenoids are also available with coils in Class F and Class H for high temperature requirements.

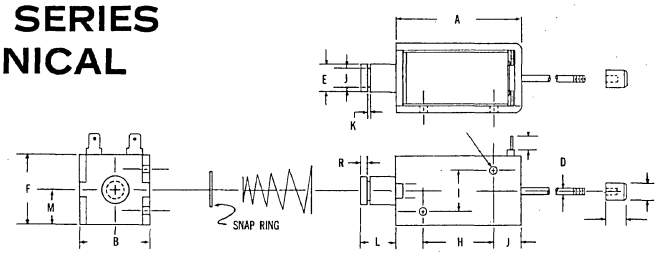
Simplicity of design helps keep the costs down and allows us to pass these savings on to you, our customer.

TYPICAL APPLICATIONS

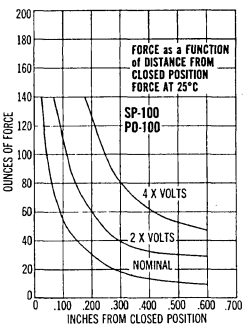
- Hammers for high speed printers
- Camera shutter actuators
- Locking mechanisms for switches, adding machines and typewriters
- Interpossers for card punching and tape perforation
- Cam actuation
- Pen lifters for plotters
- Event markers for chart recorders
- Key actuators for numerical readouts on typewriters and adding machines
- For life testing different devices
- For indicator flags
- Sensing devices
- Remote switching and actuation

electro-mechanisms INCORPORATED
P.O. BOX A
AZUSA, CALIF. 91702
AREA CODE (818) 359-2535

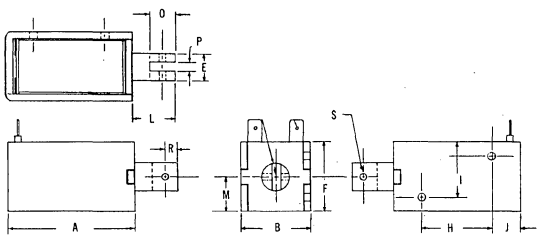
SP-100 SERIES
60° CONICAL



11.5 WATTS VDC
3, 6, 12, 24, 48, 110
60° CONICAL



PO-100 SERIES
60° CONICAL



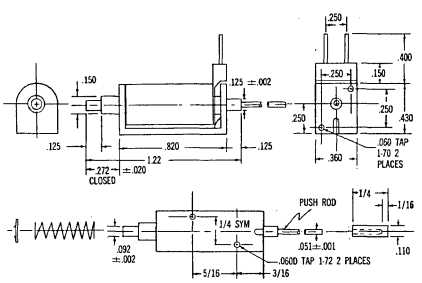
SPECIFICATIONS

Part No.	A	B	D	E	F	H	I	J	K	L	M	O	P	R	S	T	Height of Terms	Max. Stroke	Tapped Holes	Weight Oz.
SP-100	2.270	1.254	.092	.500	1.254	1.115	.750	.430	.040	.752	.627	*	*	.100	*	.343	.365	1	6-32	10
PO-100	2.270	1.254	*	.500	1.254	1.115	.750	.430	*	.700	.627	.375	.143	.168	.100	*	.365	1	6-32	10

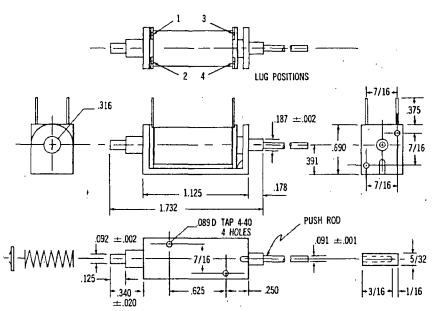
Standard Coils 130°C, Hi Temp Coils Available. * Not Applicable.

SOLENOIDS WITH MOLDED TERMINAL PINS

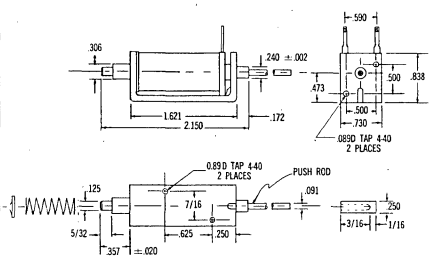
SERIES SP-375



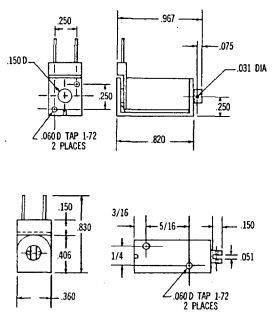
SERIES SP-650



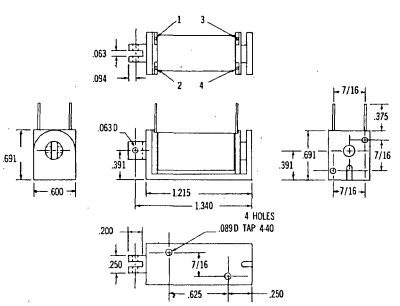
SERIES SP-750



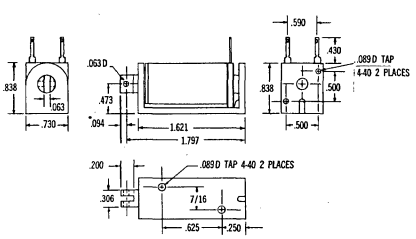
SERIES PO-375



SERIES PO-650



SERIES PO-750



Ledex Solenoids & Switches

Solenoids and switches—Ledex has both the products and the people to help you with the quickest and best solutions to your design problems. Our wide selection of stock models lets you get a fast start on your prototype, and our expert engineering staff will work closely with you on custom designs. Ledex is where you'll find helpful solenoid and switch technology.

Solenoids

Rotary solenoids—choose from 250 standard stock models for prototype work. Shipped within 48 hours.

Series 20 tubular push or pull solenoids have life expectancies in excess of 100 million actuations.

Low profile push/pull, flat face, or conical solenoids are built for high force to size, and fast response.

Stepping solenoids—highest torque solenoid available. Extended life up to 10 million cycles minimum on unidirectional models or each direction on bidirectional models.

D-frame solenoids—eight standard models offer economical long term service.

Custom-designed solenoids feature unique construction and designs for special applications.

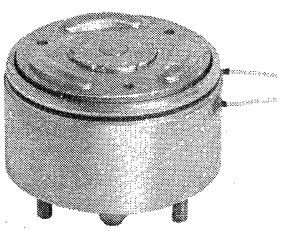
Pushbutton switches—All models stocked. Individual pushbuttons, flat panel pushbuttons, low profile rotary, binary selector, and keylock switches. Ganged and panel mounted switches with the look and feel of quality, by Rafi of West Germany.

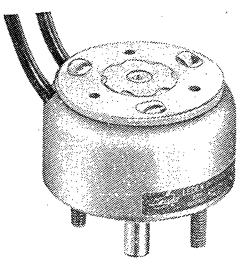
Rotary manual switches provide economy by simplifying circuitry, eliminating auxiliary circuit components and minimizing wiring. Reliable for military and commercial uses.

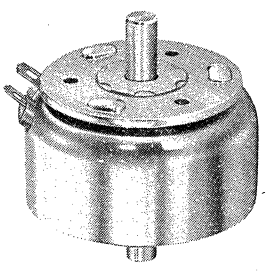
Stepping switches operate in −55°C to +80°C and switch 1A @ 120 VAC or 2A @ 28 VDC. More switching—less space.

Packaged switches handle high density transfer switching without relays in extreme environments. Meet relevant MIL specs.

Lucas surge suppressors provide sharp breakdown, low slope resistance, and long term voltage stability. They operate between −55°C and +175°C with response times as fast as 1 x 10^{-12} seconds. They feature improved energy ratings over standard zener diodes, and fail safe to short circuit.







Rotary Solenoids

Gross Torque in Pound-Inches by duty cycle for standard rotary strokes.

			25°		35°		45°		67½°		95°	
Model	O.D.(")	Ht. in.	Cont. (stroke)	1/20 (duty)	Cont. (stroke)	1/20 (duty)	Cont. (stroke)	1/20 (duty)	Cont. (stroke)	1/20 (duty)	Cont. (stroke)	1/20 (duty)
1E	1	5/8	–	1.10			–	.62				
2E	1 1/8	21/32	.20	1.70	.15	1.30	.10	.89				
3B	1 5/8	7/8	.35	3.2	.25	2.3	.15	1.7	.09	.8		
3E	1 5/16	51/64	.35	3.2	.25	2.3	.15	1.18	.09	.89		
4E	1 9/16	61/64	.9	5.2	.6	3.5	.4	3.1	.2	1.9	.15	1.2
5B	1 7/8	1 13/64	1.8	10.0	0.9	8.3	.7	6.0	.5	4.0	.19	1.9
5S	1 7/8	1 3/64	1.9	13.2	.9	9.2	.7	6.9	.5	4.9	.20	2.6
6S	2 1/4	1 27/64	4.6	30.6	3.4	20.5	1.7	12.1	1.6	9.7	0.9	5.7
7B	2 3/4	2 5/64	9	35.5	5	32.0						
7S	2 3/4	1 55/64	11	46.6	6	42.0	5	32.8	2.5	19.3	1.5	11.6
8S	3 3/8	2 5/16	16	117	12	77	10	65	4.2	35	3.5	20

For detailed performance curves, write for Bulletin RS-1000. Many stock models to choose from.

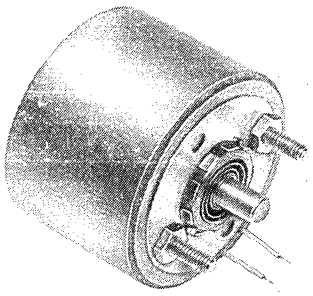
LEDEX®
Ledex Inc.
P.O. Box 427
Vandalia, Ohio 45377-0427 U.S.A.

Phone: 513-898-3621
TWX: 810-450-2526
Telex: 28-8228

Magton Rotary Solenoids

New Magton solenoids from Ledex give you hundreds of millions of cycles of life, severe environmental operating capabilities, low noise, and true rotary motion with no axial displacement. They may be what you need to handle shock or vibration in aerospace, or any demanding application where extremely long life is required.

Design uses a balanced armature mounted on ball bearings. Four sizes up to 2.42" dia. provide 30°, 45°, or 60°, (90° optional) at CW or CCW travel stop to stop; wide range of output torques (to 50 in.-oz.) and 5 to 400 VDC available. Request Bulletin MRS-1070.

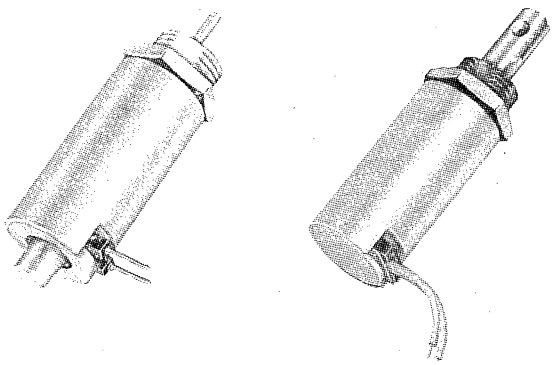


Series 20 Tubular Solenoids

Available push or pull
Typical output, 1/10 duty

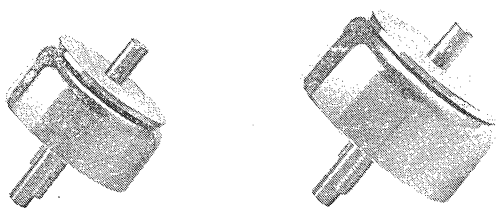
Model	½"	¾"	1"
Size	½" x 1"	1½" x ¾"	2" x 1"
Force .25 Stroke	1 oz. to 8½ oz.	¼ to 2½ lb.	¾ to 5½ lb.
Shaft diameter, push	.062"	.31"	.44"
Mounting	Thr'd Bushing	Thr'd Bushing	Thr'd Bushing
Weight	.84 oz.	2.6 oz.	6 oz.

For detailed performance curves, write for Series 20 literature.
Stock models available both push and pull, ½", ¾" and 1".



The new Ledex Series 20 offers the economical solution to your long life actuating needs. A low friction bobbin assembly provides for a life expectancy of millions of actuations. The problem of powdered metal flaking is eliminated through the metal-to-plastic bearing surface construction. The terminal version mates with standard connectors such as Berg Electronics. A special mounting nut is supplied, packed loose.

The Ledex Series 20 is ideal for applications where field servicing is prohibitive. Its quietness and high reliability provides definite advantages in applications involving peripheral equipment, business machine mechanisms, door inter-locks, interposers, and gate releases.



Low Profile Solenoids

Typical output, 1/10 duty

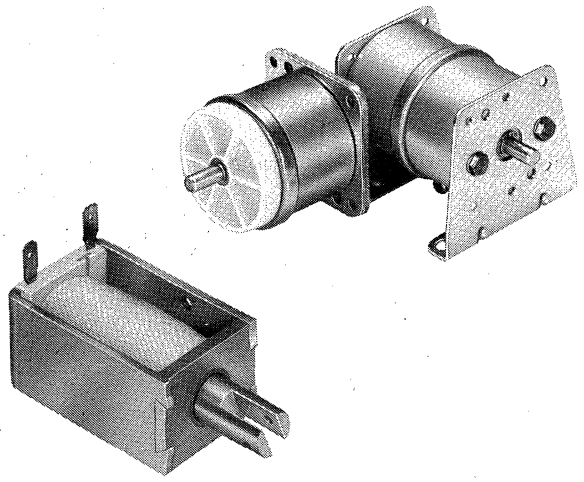
Model	0	1		2		3		4		5SF		5EC		6	
Size	.75"D x ½" Conical Face	1.0"D x 7/32" Conical Face	Flat Face	1.125"D x 37/64" Conical Face	Flat Face	1.312"D x 11/16" Conical Face	Flat Face	1.562"D x 55/64" Conical Face	Flat Face	1.875"D x 1-1/16" Conical Face	Flat Face	1.875"D x 1-1/16" Conical Face	Flat Face	2.250D" x 1-21/64" Conical Face	Flat Face
Stroke (in.)	.020	.040	.040	.040	.040	.040	.040	.020	.020	.010	.010	.050	.050	.020	.020
Force (lbs.)	4.4	7.8	12.8	11.0	16.5	16.0	27.0	17.8	46.0	35.5	95.0	35.5	95.5	65.0	16.0
Stroke (in.)	.120	.120	.060	.120	.060	.120	.060	.200	.100	.250	.100	.250	.100	.250	.190
Force (lbs.)	1.0	2.4	3.3	3.6	5.3	7.8	10.0	6.1	11.8	16.2	20.0	16.2	20.0	33.0	30.0
Weight	⅞ oz.	1½ oz.		2¼ oz.		3¾ oz.		6 oz.		9 oz.		10½ oz.		1 lb. 5½ oz.	

For detailed performance curves, write for catalog LS 1017. Many stock models to choose from.

LEDEX®
Ledex Inc.
P.O. Box 427
Vandalia, Ohio 45377-0427 U.S.A.

Phone: 513-898-3621
TWX: 810-450-2526
Telex: 28-8228

Stepping Solenoids



Summary Specifications	Unidirectional	Bidirectional
Voltage	6 to 220 VDC	6 to 220 VDC
High temperature	+85°C	+85°C
Low temperature	−40°C	−40°C
Length	1.9"	2.8"
Height	2¼" (sq. plate)	2¼"
Weight	14 oz.	24 oz.

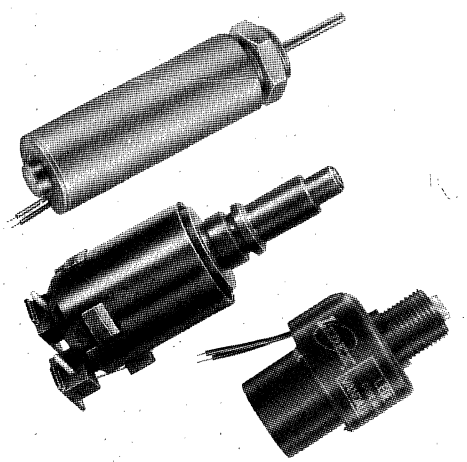
For more detailed specifications on 64 stock models, Catalog SS-7004.

D-Frame and Open Frame Solenoids

Model	L6-22	L25-11H	L44-02H	L51-04H
Voltages	6,12,24,120 VAC or DC	6,12,24,120,240 VAC or DC	6,12,24,120,240 VAC or DC	6,12,24,120,240 VAC or DC
AC operating freq.	Std. 60 Hz.	Std. 60 Hz.	Std. 60 Hz.	Std. 60 Hz.
Dielectric strength	1000 VRMS	1000 VRMS	1000 VRMS	1000 VRMS
Plunger weight	.22 oz.	1.5 oz.	1.25 oz.	2.3 oz.
Total weight	1.7 oz.	6.25 oz.	13 oz.	15 oz.
Holding force (DC continuous)	@ 24 VDC cold 35 oz. @ 24 VDC hot 32 oz.	@ 24 VDC cold 7 lbs. @ 24 VDC hot 5 lbs.	@ 24 VDC cold 144 oz. @ 24 VDC hot 133 oz.	@ 24 VDC cold 176 oz. @ 24 VDC hot 152 oz.
Holding force (DC intermittent)	@ 24 VDC cold 37 oz. @ 24 VDC hot 35 oz.	@ 24 VDC cold 8 lbs. @ 24 VDC hot 5.5 lbs.	@ 24 VDC cold 180 oz. @ 24 VDC hot 158 oz.	@ 24 VDC cold 260 oz. @ 24 VDC hot 250 oz.
Holding force (AC continuous)	@ 120 VAC cold 9 oz. @ 120 VAC hot 6 oz.	@ 120 VAC cold 59 oz. @ 120 VAC hot 50 oz.	@ 120 VAC cold 60 oz. @ 120 VAC hot 55 oz.	@ 120 VAC cold 50 oz. @ 120 VAC hot 43 oz.
Holding force (AC intermittent)	@ 120 VAC cold 8 oz. @ 120 VAC hot 7 oz.	@ 120 VAC cold 90 oz. @ 120 VAC hot 85 oz.	@ 120 VAC cold 75 oz. @ 120 VAC hot 70 oz.	@ 120 VAC cold 110 oz. @ 120 VAC hot 88 oz.

For more information, write for Catalog DF-1201. New comprehensive line of open frame solenoids now available. Request Open Frame Bulletin.

Other Solenoids — Capability



	Dot Matrix Print Solenoid	Printhammer Solenoid
Force	3 lb. (1.36 kg) min. first pulse	.011 to .019 joules @ 5A typ.
Stroke	.018" (.5 mm) min. stroke	.150"-.250" travel
Insulation resistance	1000 megohms min.	1000 megohms
Dielectric	500 VDC min.	500 VDC min.
Coil resistance	5.3 to 5.9 ohms @ 25°C ±2°	1.9 ohm ±1 ohm @ +20°C
Weight	.33 oz. (9.1 gr)	1.14 oz (32 gr)
Life	300 million actuations	200 million actuations
Operating temperature	−10°C to 105°C	+70°C typ.

For more information, consult Ledex engineers.

New magnetic latching open frame, tubular, and low profile solenoids from Ledex hold the plunger in the actuated position without using any power. Request Magnetic Latching Solenoid Bulletin.

Dot matrix print solenoids and printhammer solenoids are examples of Ledex custom designs where exceptional accuracy over long performance life is paramount for the user's requirements.

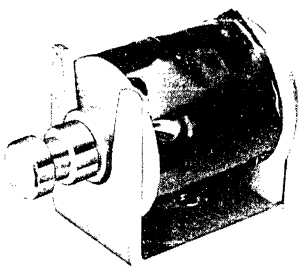
LEDEX®

Ledex Inc.
P.O. Box 427
Vandalia, Ohio 45377-0427 U.S.A.

Phone: 513-898-3621
TWX: 810-450-2526
Telex: 28-8228

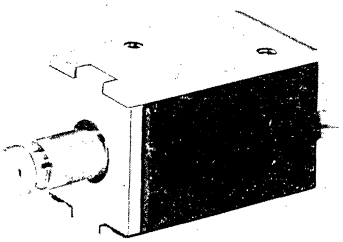
ITT Components
A Unit of ITT Corporation

General Purpose Solenoids
Push & Pull Types

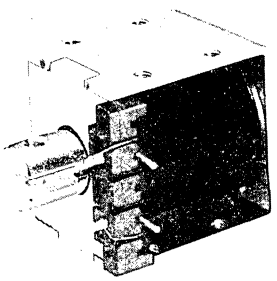


C-FRAME

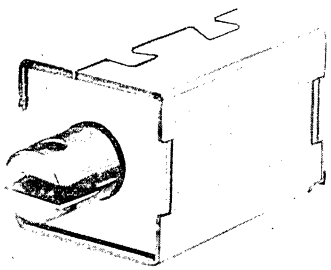
D-FRAME



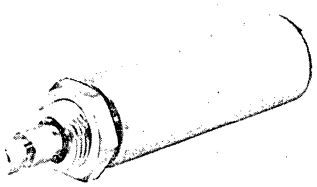
PIN TYPE



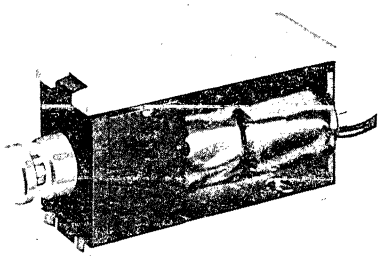
SHIELD TYPE



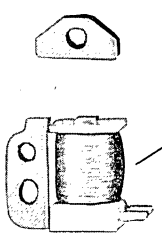
TUBULAR TYPE



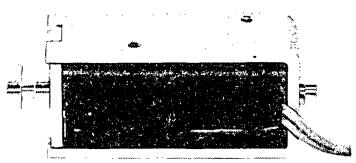
KEEP TYPE



MAGNET TYPE



LEAKAGE FLUX SOLENOIDS



FEATURES

- High pull efficiency — 20% greater than conventional electromagnets.
- Enclosed design for increased safety.
- Outstanding reliability — a life exceeding 500,000 cycles of operation.
- Conforms to UL requirements.
- Free from a magnetic leakage, contributing to your compact and high-density set design and planning.
- A wide selection in total travel and width offers move design possibilities.

For more information please write or call and receive a comprehensive catalog.

SPECIFICATIONS

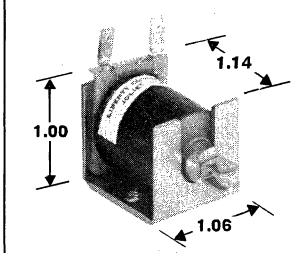
A wide choice of optional features are available to meet varying individual needs.

- COIL FINISH
- COIL RESISTANCE
- CURRENT DRAIN
- DIMENSION
- DUTY CYCLE
- ENVIRONMENTAL PROTECTION
- FORCE
- TERMINATIONS
- TWO COILS
- VOLTAGE
- DC SOLENOIDS
- DIELECTRIC STRENGTH
- INSULATING MATERIALS
- INSULATION RESISTANCE
- KEEP SOLENOIDS
- LEAKAGE FLUX SOLENOIDS
- LIFE
- LINKAGE
- MARKING
- PUSH TYPE SOLENOIDS
- PLUNGER END CONFIGURATION
- MOUNTING

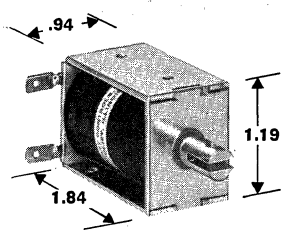
ITT COMPONENTS • 1201 E. McFadden Avenue • Santa Ana, California 92705 • Phone: (714) 836-0351 • TWX: 910-595-1744 • Telex: 69-1389

LIBERTY CONTROLS, INC. SOLENOIDS

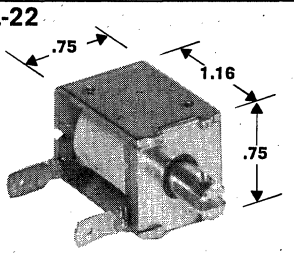
L-9



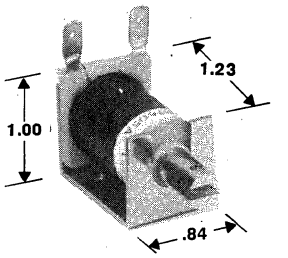
L-11



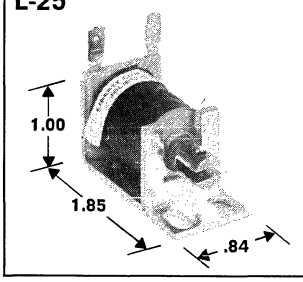
L-22



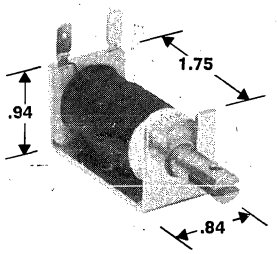
L-24



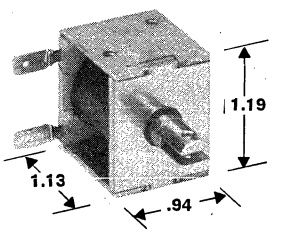
L-25



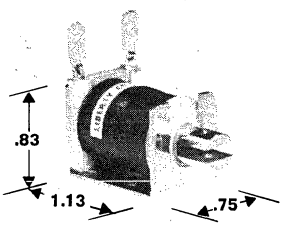
L-26



L-28



L-61



FORCE CURVE DATA

CONTINUOUS DUTY DC

TYPE	1/16"	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
L-22	13	5	2	1	0.5	—	—	—	—	—
L-61	18	9	3	1	1	—	—	—	—	—
L-20	21	11	4	2	1	—	—	—	—	—
L-9	27	13	6.5	2.5	1.5	—	—	—	—	—
L-24	28	14	6	3	2	2	—	—	—	—
L-25	28	14	6	3	2	2	—	—	—	—
L-28	31	15	5	3	1	—	—	—	—	—
L-26	33	18	7	4	3	2	1	—	—	—
L-81	38	19	9.5	4	—	—	—	—	—	—
L-62	46	26	11	5	3	—	—	—	—	—
L-11	48	32	14	8	5	4	3	—	—	—
L-63	56	31	14	8	5	3	2	—	—	—
L-82	55	40	19	10	5	3	2	—	—	—
L-88	120	74	30	15	8	4	—	—	—	—
L-89	144	102	49	27	16	11	7	—	—	—
L-90	148	114	62	35	23	17	13	11	8	5

CONTINUOUS DUTY AC

TYPE	1/16"	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
L-22	5.5	4	2.5	1.5	0.5	—	—	—	—	—
L-20	10	7	5	3.5	2	—	—	—	—	—
L-61	10	7	5	4	2	—	—	—	—	—
L-90	12	9	7	7	7	8	8	9	9	7
L-24	14	10	7	6	4	2	—	—	—	—
L-25	14	10	7	6	4	2	—	—	—	—
L-9	15	10.5	6.5	4.5	2.5	—	—	—	—	—
L-28	15	11	7	4.5	2	—	—	—	—	—
L-26	16	12	9	8	6	5	3	—	—	—
L-82	17	12	10	10	11	11	11	—	—	—
L-89	17	13	10.5	10	9.5	9	7	—	—	—
L-11	18	13	10	10	10	8	6	—	—	—
L-81	19	13	9	5	—	—	—	—	—	—
L-63	20	15	13	13	11	9	6	—	—	—
L-88	24	18	14	11	8	—	—	—	—	—
L-62	24	19	15	13	10	—	—	—	—	—

INTERMITTENT DUTY DC

TYPE	1/16"	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
L-22	22	10	3	2	1	—	—	—	—	—
L-20	34	21	8	4	2	—	—	—	—	—
L-61	38	21	8	4	2	—	—	—	—	—
L-9	38	21	9	5	3	—	—	—	—	—
L-24	46	27	12	7	4	3	—	—	—	—
L-25	46	27	12	7	4	3	—	—	—	—
L-28	47	32	12	6	3	—	—	—	—	—
L-81	53	34	16	7	—	—	—	—	—	—
L-62	80	47	20	10	5	—	—	—	—	—
L-26	52	36	21	11	7	5	3	—	—	—
L-11	67	53	31	19	13	11	7	—	—	—
L-63	84	54	27	15	10	6	4	—	—	—
L-82	92	70	43	24	14	9	7	—	—	—
L-88	184	136	68	36	20	11	—	—	—	—
L-89	200	156	99	60	36	25	16	—	—	—
L-90	208	176	131	95	72	56	44	36	28	16

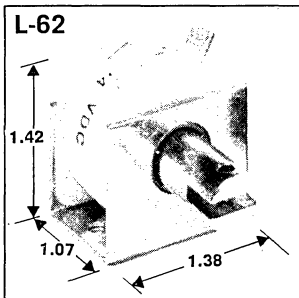
INTERMITTENT DUTY AC

TYPE	1/16"	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
L-22	10	6	4	2	1.5	—	—	—	—	—
L-20	20	14	9	7	4	—	—	—	—	—
L-61	22	15	12	9	5	—	—	—	—	—
L-24	26	19	14	11	8	5	—	—	—	—
L-25	26	19	14	11	8	5	—	—	—	—
L-26	25	19	15	13	11	9	6	—	—	—
L-28	29	20	14	9	4	—	—	—	—	—
L-90	27	22	18	17	18	19	20	21	21	17
L-81	34	23	15	8	—	—	—	—	—	—
L-9	35	25	17	12	7	—	—	—	—	—
L-11	33	25	20	18	18	16	13	—	—	—
L-82	46	31	26	26	28	29	28	—	—	—
L-89	42	33	27	25	24	22	18	—	—	—
L-88	49	36	28	23	17	10	4	—	—	—
L-63	56	44	38	36	34	27	18	—	—	—
L-62	64	55	42	36	26	—	—	—	—	—

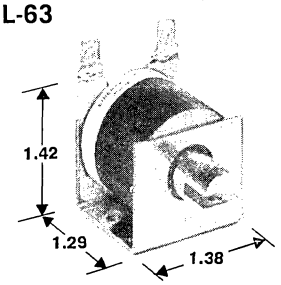
LIBERTY CONTROLS, INC., 500 BROOKFOREST AVENUE, SHOREWOOD, IL. 60435 • (815) 725-2241

LIBERTY CONTROLS, INC. SOLENOIDS

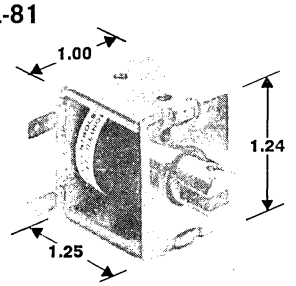
L-62



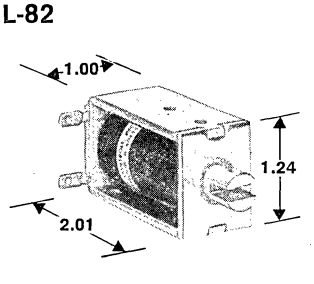
L-63



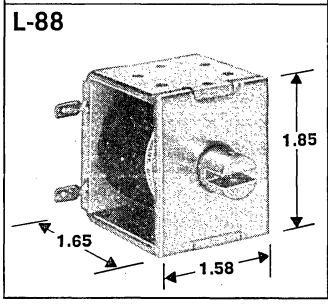
L-81



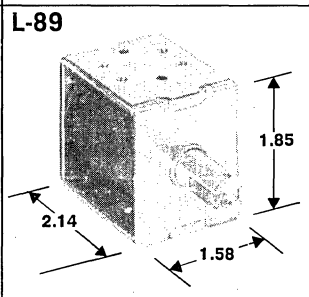
L-82



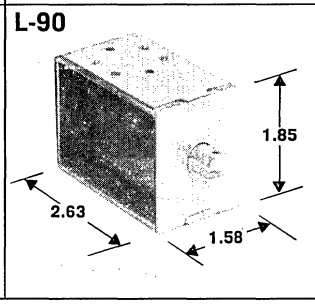
L-88



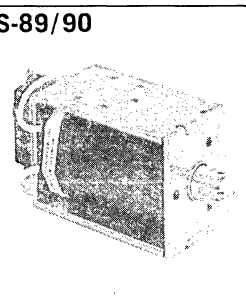
L-89



L-90



PS-89/90



FORCE CURVE DATA

STANDARD VOLTAGES: 6, 12, 24, 48, 120, 240 AC
6, 12, 24, 48, 110, 220 DC

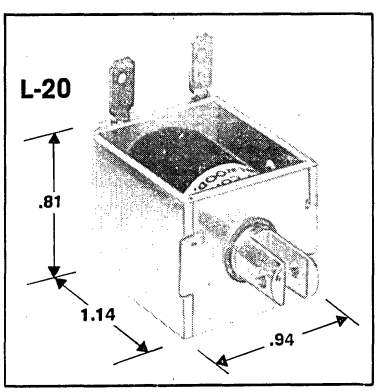
PULSE DUTY DC

TYPE	1/16"	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
L-22	38	25	11	6	3	—	—	—	—	—
L-20	62	50	27	14	8	—	—	—	—	—
L-61	67	51	27	14	8	—	—	—	—	—
L-24	68	52	32	20	13	8	—	—	—	—
L-25	68	52	32	20	13	8	—	—	—	—
L-26	74	62	43	30	22	17	11	—	—	—
L-9	84	63	35	18	11	—	—	—	—	—
L-28	83	70	43	23	13	—	—	—	—	—
L-11	90	80	53	42	37	34	26	—	—	—
L-81	107	89	64	34	—	—	—	—	—	—
L-82	136	117	90	62	40	26	16	—	—	—
L-62	172	142	89	43	27	—	—	—	—	—
L-63	168	147	105	67	45	28	16	—	—	—
L-88	276	241	180	94	71	40	—	—	—	—
L-89	265	234	190	149	110	82	58	—	—	—
L-90	266	230	188	154	126	106	94	89	68	40

PULSE DUTY AC

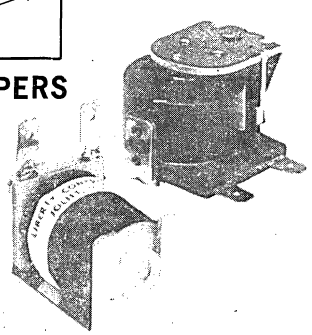
TYPE	1/16"	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
L-22	19	14	9	6	3	—	—	—	—	—
L-61	44	32	24	20	11	—	—	—	—	—
L-20	48	36	26	19	11	—	—	—	—	—
L-24	52	38	30	25	18	—	—	—	—	—
L-25	52	38	30	25	18	—	—	—	—	—
L-11	54	42	34	32	30	27	23	—	—	—
L-28	62	46	34	21	11	—	—	—	—	—
L-9	72	53	34	24	15	—	—	—	—	—
L-26	72	53	43	39	36	30	20	—	—	—
L-90	80	58	47	45	46	47	50	51	51	43
L-81	90	61	41	25	—	—	—	—	—	—
L-82	96	66	53	52	54	55	51	—	—	—
L-89	98	75	61	57	54	50	43	—	—	—
L-63	103	80	70	67	60	50	34	—	—	—
L-62	117	91	76	66	48	—	—	—	—	—
L-88	138	101	76	63	47	31	13	—	—	—

L-20

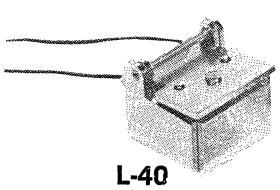


CLICKERS AND CLAPPERS

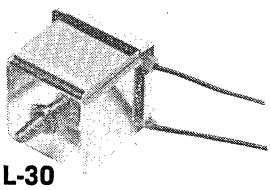
Now Liberty Controls offers a line of clickers and clappers. Especially designed for use on today's solid state keyboards, and disc drives.



MINIMIZE MAGNETIC LEAKAGE IN YOUR DESIGN



L-40



L-30

Hinge Type Flapper Solenoid Push Type Solenoid
Available Only From Liberty Controls.

LIBERTY CONTROLS, INC., 500 BROOKFOREST AVENUE, SHOREWOOD, IL. 60435 • (815) 725-2241

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

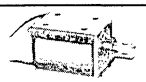
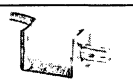
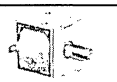
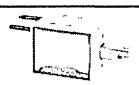
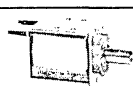
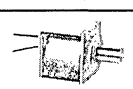
WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

regdon solenoids CORPORATION
3715 Grand Blvd.
Brookfield, IL 60513
312/485-5152
1-800-635-3778

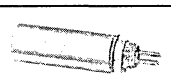
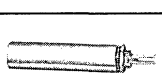
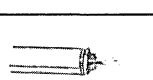
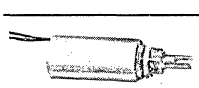
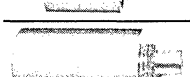
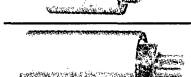
Box-Frame Solenoids (Pull Version)

Push Version Also Available.

	Type	Volts	Duty	Oms	Forces and Strokes ounces @ inches (min.)	(max.)	Body inches H x L x W
	312-6005	24VDC	Cont.	144	22@1/32"	2@1/4"	3/4 x 1 5/32 x 3/4
	312-6006	24VDC	Int.	60	28@1/32"	4@1/4"	3/4 x 1 5/32 x 3/4
	312-6011	120VAC	Cont.	390	12@1/32"	2.5@1/4"	3/4 x 1 5/32 x 3/4
	312-6012	120VAC	Int.	100	20@1/32"	4@1/4"	3/4 x 1 5/32 x 3/4
	5U5-6053	24VDC	Cont.	114	14@1/16"	2.5@3/8"	15/16 x 1 1/4 x 27/32
	5U5-6054	24VDC	Int.	52	27@1/16"	5@3/8"	15/16 x 1 1/4 x 27/32
	5U5-6059	120VAC	Cont.	500	10@1/16"	4.5@3/8"	15/16 x 1 1/4 x 27/32
	5U5-6060	120VAC	Int.	310	17@1/16"	8.5@3/8"	15/16 x 1 1/4 x 27/32
	5U7-6065	24VDC	Cont.	85	15@1/8"	3@1/2"	15/16 x 1 3/4 x 27/32
	5U7-6066	24VDC	Int.	33	32@1/8"	7@1/2"	15/16 x 1 3/4 x 27/32
	5U7-6071	120VAC	Cont.	250	11@1/8"	7.5@1/2"	15/16 x 1 3/4 x 27/32
	5U7-6072	120VAC	Int.	140	18@1/8"	12@1/2"	15/16 x 1 3/4 x 27/32
	809-6101	24VDC	Cont.	104	12@1/8"	2@1/2"	1 3/16 x 1 1/8 x 15/16
	809-6102	24VDC	Int.	50	22@1/8"	3@1/2"	1 3/16 x 1 1/8 x 15/16
	809-6107	120VAC	Cont.	400	12@1/8"	5@1/2"	1 3/16 x 1 1/8 x 15/16
	809-6108	120VAC	Int.	220	24@1/8"	7@1/2"	1 3/16 x 1 1/8 x 15/16
	827-6113	24VDC	Cont.	72	24@1/8"	4@5/8"	1 3/16 x 1 7/8 x 15/16
	827-6114	24VDC	Int.	32	40@1/8"	8@5/8"	1 3/16 x 1 7/8 x 15/16
	827-6119	120VAC	Cont.	200	12@1/8"	6@5/8"	1 3/16 x 1 7/8 x 15/16
	827-6120	120VAC	Int.	85	20@1/8"	13@5/8"	1 3/16 x 1 7/8 x 15/16
	930-6125	24VDC	Cont.	54	63@1/8"	7@3/4"	1 5/8 x 2 x 1 7/16
	930-6126	24VDC	Int.	15	113@1/8"	25@3/4"	1 5/8 x 2 x 1 7/16
	930-6131	120VAC	Cont.	133	8@1/8"	7@3/4"	1 5/8 x 2 x 1 7/16
	930-6132	120VAC	Int.	37	36@1/8"	26@3/4"	1 5/8 x 2 x 1 7/16
	940-6137	24VDC	Cont.	50	78@1/8"	8@3/4"	1 5/8 x 2 3/16 x 1 7/16
	940-6138	24VDC	Int.	15	140@1/8"	18@3/4"	1 5/8 x 2 3/16 x 1 7/16
	940-6143	120VAC	Cont.	53	24@1/8"	15@3/4"	1 5/8 x 2 3/16 x 1 7/16
	940-6144	120VAC	Int.	15	100@1/8"	65@3/4"	1 5/8 x 2 3/16 x 1 7/16
	960-6149	24VDC	Cont.	58	50@1/8"	8@1/2"	1 5/8 x 1 9/16 x 1 7/16
	960-6150	24VDC	Int.	21	100@1/8"	18@1/2"	1 5/8 x 1 9/16 x 1 7/16
	960-6155	120VAC	Cont.	166	14@1/8"	10@1/2"	1 5/8 x 1 9/16 x 1 7/16
	960-6156	120VAC	Int.	60	45@1/8"	30@1/2"	1 5/8 x 1 9/16 x 1 7/16
	970-6161	24VDC	Cont.	58	65@1/8"	9@1/2"	1 5/8 x 1 25/32 x 1 7/16
	970-6162	24VDC	Int.	20	120@1/8"	24@1/2"	1 5/8 x 1 25/32 x 1 7/16
	970-6167	120VAC	Cont.	100	22@1/8"	16@1/2"	1 5/8 x 1 25/32 x 1 7/16
	970-6168	120VAC	Int.	125	85@1/8"	58@1/2"	1 5/8 x 1 25/32 x 1 7/16

Tubular Solenoids (Pull Version)

Push Version Also Available.

	Type	Volts	Duty	Oms	Forces and Strokes ounces @ inches (min.)	(max.)	Body inches Length x Dia.
	R7X9-6171	12VDC	Cont.	80	5@1/32"	1.2@5/32"	1 1/8 x 7/16
	R7X9-6172	12VDC	Int.	14	9@1/32"	2.5@5/32"	1 1/8 x 7/16
	R7X9-6173	24VDC	Cont.	260	5@1/32"	1.2@5/32"	1 1/8 x 7/16
	R7X9-6174	24VDC	Int.	57	9@1/32"	2.5@5/32"	1 1/8 x 7/16
	R8X7-6362	12VDC	Cont.	55	2.5@1/16"	1@3/16"	7/8 x 1/2
	R8X7-6363	12VDC	Int.	20	6@1/16"	1.5@3/16"	7/8 x 1/2
	R8X7-6364	24VDC	Cont.	240	2.5@1/16"	1@3/16"	7/8 x 1/2
	R8X7-6365	24VDC	Int.	80	6@1/16"	1.5@3/16"	7/8 x 1/2
	R8X12-6372	12VDC	Cont.	40	7@1/32"	1.5@1/4"	1 1/2 x 1/2
	R8X12-6373	12VDC	Int.	10	14@1/32"	4@1/4"	1 1/2 x 1/2
	R8X12-6374	24VDC	Cont.	160	7@1/32"	1.5@1/4"	1 1/2 x 1/2
	R8X12-6375	24VDC	Int.	38	14@1/32"	4@1/4"	1 1/2 x 1/2
	R8X16-6384	24VDC	Cont.	145	2.8@1/8"	1.5@3/4"	2 x 1/2
	R8X16-6385	24VDC	Int.	24	7@1/8"	4@3/4"	2 x 1/2
	R12X12-6211	12VDC	Cont.	41	6.5@1/8"	1.2@5/8"	1 1/2 x 3/4
	R12X12-6212	12VDC	Int.	6	20@1/8"	6@5/8"	1 1/2 x 3/4
	R12X12-6213	24VDC	Cont.	165	6.5@1/8"	1.2@5/8"	1 1/2 x 3/4
	R12X12-6214	24VDC	Int.	25	20@1/8"	6@5/8"	1 1/2 x 3/4
	R16X9-6221	12VDC	Cont.	36	22@1/16"	2.5@1/2"	1 1/8 x 1
	R16X9-6222	12VDC	Int.	8	33@1/16"	4@1/2"	1 1/8 x 1
	R16X9-6223	24VDC	Cont.	145	22@1/16"	2.5@1/2"	1 1/8 x 1
	R16X9-6224	24VDC	Int.	30	33@1/16"	4@1/2"	1 1/8 x 1
	R16X16-6231	12VDC	Cont.	26	21@1/8"	6.5@5/8"	2 x 1
	R16X16-6232	12VDC	Int.	3.8	56@1/8"	20@5/8"	2 x 1
	R16X16-6233	24VDC	Cont.	105	21@1/8"	6.5@5/8"	2 x 1
	R16X16-6234	24VDC	Int.	15	56@1/8"	20@5/8"	2 x 1
	R24X13-6243	24VDC	Cont.	85	50@1/8"	5@5/8"	1 5/8 x 1 1/2
	R24X13-6244	24VDC	Int.	14	150@1/8"	20@5/8"	1 5/8 x 1 1/2
	R24X19-6253	24VDC	Cont.	59	80@1/8"	8@1"	2 3/8 x 1 1/2
	R24X19-6254	24VDC	Int.	10	140@1/8"	32@1"	2 3/8 x 1 1/2

Sales Representatives in major cities. Complete catalog available upon request.

When you order a Hall effect sensor, is this all you get?

Order a Hall effect sensor from other suppliers, and you get a basic sensor. One you have to turn into something workable by yourself.

Order one from MICRO SWITCH, however, and you get something a little different. A sensor that's ready to work.

You see, in addition to our broad line of sensors, MICRO SWITCH is the only supplier that offers customized Hall effect products.

In many cases we can give you the proper sensor right off the shelf. Because we offer such choices as basic sensors packaged as mechanically operated basic switches. Vane sensors. And proximity sensors (including versions designed for industrial use).

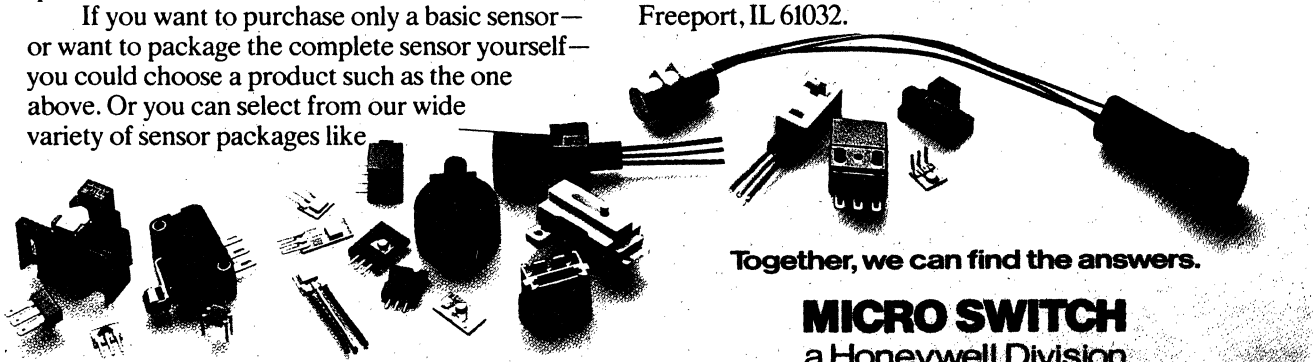
However, our design engineers can also work with you to design a custom package to your size, performance, material, environment, and electrical specifications.

If you want to purchase only a basic sensor—or want to package the complete sensor yourself—you could choose a product such as the one above. Or you can select from our wide variety of sensor packages like those shown below which we can modify to your designs. We'll change the size of the ceramic substrate. Provide a holder for the sensor. Attach leadwires. Form terminals. Give you multiple sensor packages. To name a few.

In short, we free you from designing your sensors yourself. So you lower your design and production costs, while maintaining consistent performance. And of course, all our Hall effect sensors are designed with precision characteristics and are easy to mount and interface with logic-level circuitry.

So talk with the Sensor Consultants at MICRO SWITCH. After all, you should get a sensor that's ready to work. Instead of one that's ready to work on.

For more information on our Hall effect products and customization capabilities, or the location of a sales office or Authorized Distributor near you, call 815-235-6600. Or write MICRO SWITCH, Freeport, IL 61032.



Together, we can find the answers.

MICRO SWITCH
a Honeywell Division

SWITCHES

Manufacturer	DIP	Lever	Pushbutton				Reed	Rocker/ Paddle	Rotary		Slide	Snap Action	Thumb-wheel	Toggle	Mercury	Features											Hard-ware	Other Type
			Position			Push-on/ Push-off			Single Section	Multi-Section						Decade	Explo. Proof	Illum.	High Volt.	Key Lock	Power	RF	Sealed	Touch	Coded		
			Momentary Action	Positive Action	Interlock																						
Alcoswitch	B•1481		B•1481	B•1481		B•1481		B•1481	B•1481		B•1481	B•1481		B•1481						●	●		●		●		B•1481 Surface Mount
AME																							●			B•1485	
American Resch. & Engrg.	B•1486										B•1486												●			B•1486	
American Switch		B•1488 B•1489 B•1490	 B•1490 B•1491	 B•1490 B•1491		 B•1490 B•1491		B•1489 B•1490				B•1489 B•1491		B•1488				● ● ● ●			● ● ● ●					
AMP	B•1492								B•1493	B•1493			B•1493												●		
Arcolectric		B•1499						B•1497			B•1501	B•1500						●			●						
Armtec/Daven	B•1502								B•1502	B•1502													●		●		
Aromat Corp.												B•1503									●						
Arrow Hart								B•1507 B•1508			B•1509			B•1504- B•1506							●		●				
Burgess Switch		B•1510- B•1512										B•1510- B•1512									●		●				
C & K Comps.	B•1513	B•1513	B•1513	B•1513		B•1513		B•1513	B•1513	B•1513	B•1513	B•1513	B•1513	B•1513				●		●	●		●		●		
Carlingswitch								B•1514						B•1515				●			●						
Cherry		B•1521 B•1522	B•1523- B•1526	B•1523- B•1526		B•1523- B•1526						B•1521- B•1524	B•1526- B•1533				●	●			●		●		●	B•1533	B•1523 Low Torque
Chicago Lock									B•1534	B•1534							●			●							
Coba, Inc.			B•1535- B•1537	B•1536 B•1537	B•1536 B•1537																	● ●					
Cole Instr.									B•1538	B•1538						●				●	●				●		
Crosspoint																									●	B•1539	B•1539 Matrix
Crouzet Controls								B•1541					B•1541												●		
CTS/Paso Robles	B•1542- B•1546								B•1546		B•1542 B•1546												●				
Dai-Ichi Shoji		B•1548 B•1549	B•1548 B•1549	B•1548 B•1549		B•1548 B•1549		B•1548 B•1549			B•1548 B•1549			B•1548 B•1549				●			●						
Dialight			 B•1551	B•1550				B•1550				B•1550		B•1550				●			●		●				

* Mil. Spec.

SWITCHES

Manufacturer	DIP	Lever	Pushbutton: Position: Momentary Action	Pushbutton: Position: Positive Action	Pushbutton: Position: Interlock	Pushbutton: Push-on/Push-off	Reed	Rocker/Paddle	Rotary: Single Section	Rotary: Multi-Section	Slide	Snap Action	Thumb-wheel	Toggle	Mercury	Features: Decade	Features: Explo. Proof	Features: Illum.	Features: High Volt.	Features: Key Lock	Features: Power	Features: RF	Features: Sealed	Features: Touch	Features: Coded	Hard-ware	Other Type
Dreefs Switch			B•1555			B•1555		B•1553 B•1554	B•1555	B•1555								●			●						B•1555 Thermostat
EAO Switch			B•1557	B•1557	B•1557	B•1557						B•1557					●	●		●	●		●				
EECO	B•1560								B•1558-B•1560				B•1558-B•1560										●	●	●		B•1561 Membrane
Electro-Mech			B•1562 B•1563	B•1562 B•1563	B•1562 B•1563	B•1562 B•1563												●			●						
Electronic Comps.			B•1566	B•1566	B•1566	B•1566					B•1566	B•1566		B•1566				●			●				●		
Electro Switch									B•1564	B•1564		B•1565					●			●	●		●		●		B•1565 Detent
Fifth Dimension															B•1567								●				B•1567 Tilt
Gordos/Std. Grigsby									B•1568	B•1569 B•1570															●		
Grayhill	B•1571-B•1575		B•1576 B•1577					B•1571	B•1574	B•1578-B•1587	B•1572	B•1576 B•1577		B•1572							●		●		●		
Hamlin							B•1588								B•1588		●		●		●		●				
Hasco Comps.						B•1591	B•1589	B•1590 B•1591						B•1590 B•1591			●						●				
Hermetic Switch							B•1592										●		●		●		●				
Illinois Lock																				●	●						B•1593-B•1595 Locks, Dial & Shaft
Inter-Market													B•1597												●	B•1597	B•1597 Indexing
ITT Schadow			B•1600 B•1604		B•1600 B•1601				B•1602									●			●			●			
IVO Industries					B•1603	B•1603							B•1603					●							●		
JAE	B•1604		B•1606	B•1607		B•1607			B•1604		B•1604		B•1606					●		●							B•1605 Clerk Key
Janco									B•1608 B•1609	B•1608 B•1609										●	●	●	●	●		B•1608	B•1609 Communications, Jet Engine Start
Jennings																				●		●	●				B•1610 Vacuum Contactors
Judco				B•1611		B•1611		B•1611													●						
Ledex			B1612 B•1613	B•1612	B•1613	B•1612			B•1612	B•1613 B•1614										●	●		●	●	●		B•1614 Surge Suppressors

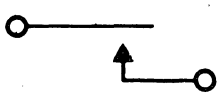
* Mil. Spec.

SWITCHES

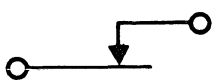
Manufacturer	DIP	Lever	Pushbutton				Reed	Rocker/ Paddle	Rotary		Slide	Snap Action	Thumb-wheel	Toggle	Mercury	Features										Hard-ware	Other Type	
			Position																									
			Momentary Action	Positive Action	Interlock	Push-on/ Push-off			Single Section	Multi-Section						Decade	Explo. Proof	Illum.	High Volt.	Key Lock	Power	RF	Sealed	Touch	Coded			
Littelfuse								B•1616 B•1617						B•1617				●										
LVC Industries											B•1619 B•1620															B•1621	B•1619	Matrix
Marquardt Switches			B•1622					B•1622			B•1622	B.1622						●			●		●				B•1622	Keyboard; Line Voltage Selector
McGill Mfg.			B•1623	B•1623				B•1623				B•1623					●	●			●		●				B•1623	Photoelectric Sensors
Mechanical Enterprises			B•1624															●										
Micro Switch			B•1625	B•1625	B•1625	B•1625		B•1625				B•1625		B•1625			●	●		●	●		●	●			B•1625	Position Sensors
Molex			B•1671															●					●	●	●			
NKK Switches		B•1678	B•1673- B•1677 B•1681	B•1673- B•1677		B•1673- B•1677		B•1673 B•1674 B•1681	B•1680 B•1681	B•1680 B•1681				B•1673- B•1675				●			●		●		●			
Omega Engineering									B•1683																		B•1683	Temperature; Pressure; Strain
Oslo Controls			B•1685					B•1684 B•1685										●			●							
Otto Controls			B•1686 B•1687	B•1686 B•1687								B•1686 B•1687		B•1686 B•1687			●				●						B•1687	Two-Position Pushbutton
Power Dynamics									B•1689											●	●		●					
Pres:Air:Trol																	●				●		●				B•1690	Pressure; Vacuum; Potentiometers
Radio Switch									B•1691	B•1691									●		●	●	●					
Shallco									B•1692 B•1695	B•1692- B•1695									●		●							
Switchcraft			B•1696 B•1697	B•1696 B•1697	B•1696	B•1696 B•1697		B•1696			B•1696							●			●		●					Voltage Selectors
Tapeswitch																					●		○	●			B•1699	Foot Pedal, Mat, Ribbon; Touch Actuated
Tech Labs.									B•1700	B•1700			B•1700 B•1701						●		●		●		●			Attenuators
Unimax Switch			B•1702	B•1702								B•1702	B•1702	B•1702			●	●		●	●		●		●			
Veetronix			B•1703				B•1703											●			●		●					

MINIGLOSSARY
RELAY CONTACT FORMS

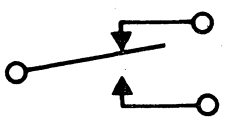
A
Make
SPST-NO



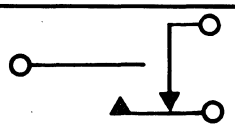
B
Break
SPST-NC



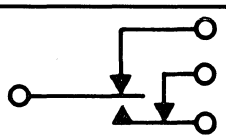
C
Break, Make
(Transfer)
SPDT



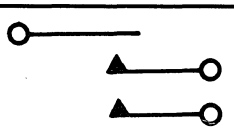
D
Make, Break
(Continuity
Transfer)



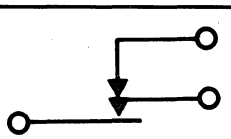
E
Break,
Make,
Break



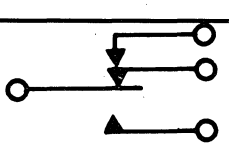
F
Make,
Make



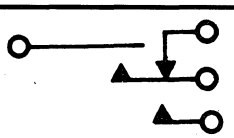
G
Break,
Make



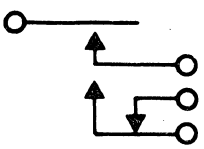
H
Break,
Break,
Make



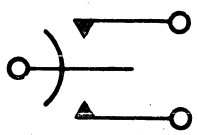
I
Make,
Break,
Make



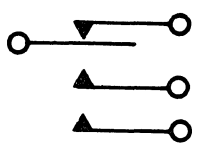
J
Make,
Make,
Break



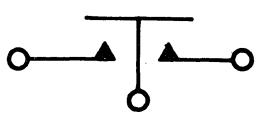
K
Center off
SPDT



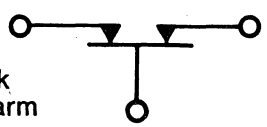
L
Break,
Make,
Make



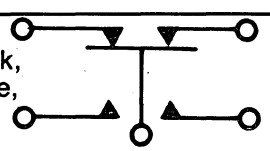
U
Double
make
Contact
on arm



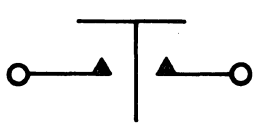
V
Double break
Contact on arm



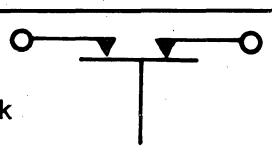
W
Double break,
Double make,
Contact
on arm



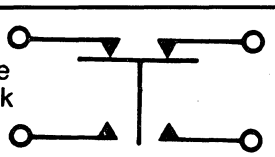
X
Double
make



Y
Double break

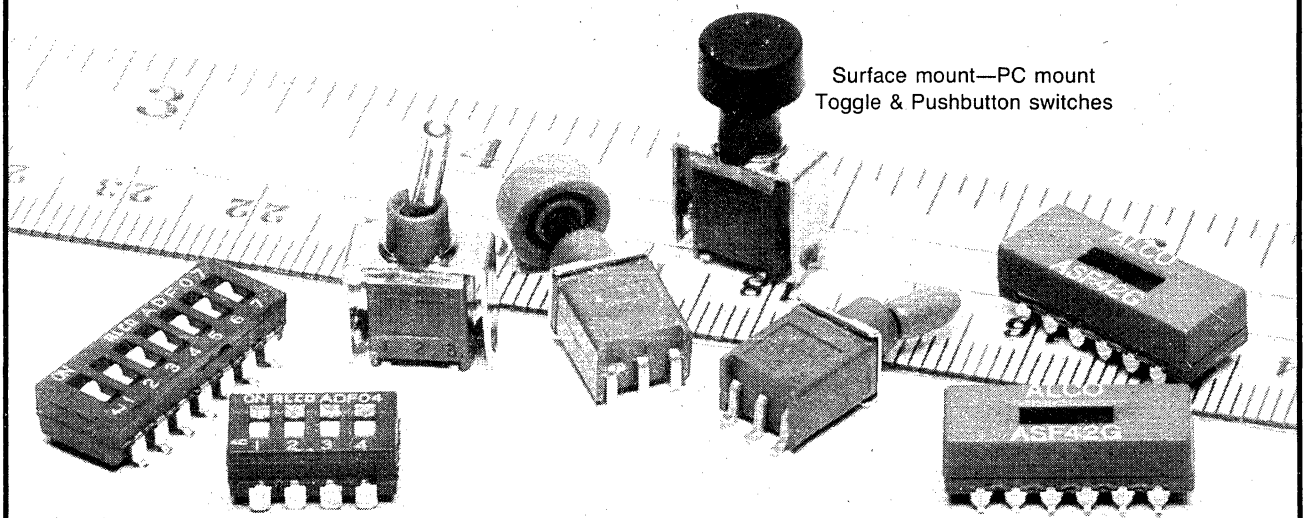


Z
Double make
Double break
SPDT-DB



NEW PRODUCT from ALCOSWITCH®

—AUTO-INSERTABLE—SURFACE MOUNTABLE—
—WAVE SOLDERABLE—IMMERSION CLEANABLE—



Surface mount—PC mount
Toggle & Pushbutton switches

Auto-Insertable—Surface mountable
DIP Switch series

Auto-Insertable—Surface mountable
Slide switches

DIP SWITCH FEATURES:

- Unique ceramic substrate allows soldering temperatures of 245⁰ for up to 30 seconds.
- Surface mountable with BUTT or L-BEND terminals. (PC terminals available)
- Auto-Insertable using standard TO-116 IC insertion equipment.
- Gas tight contacts (280,000 PSI).
- Allows wave soldering and aqueous or solvent cleaning **without tape seal.**
- 2 through 10 poles.
- Flush/Extended and Piano style actuators available.

SUB-MINI TOGGLE & PUSHBUTTON SWITCH FEATURES:

- High temperature thermoplastic materials
- Fully sealed, will withstand surface mount vapor phase reflow or wave soldering.
- Insert molded terminals and toggle.
- Surface mountable with BUTT, J-BEND or L-BEND terminals. (PC terminals available)
- Ultrasonically welded assembly.
- Selectively plated contacts.
- Various colored actuator accessories, including plastic toggle levers and pushbutton caps.
- Custom colors and options are invited.

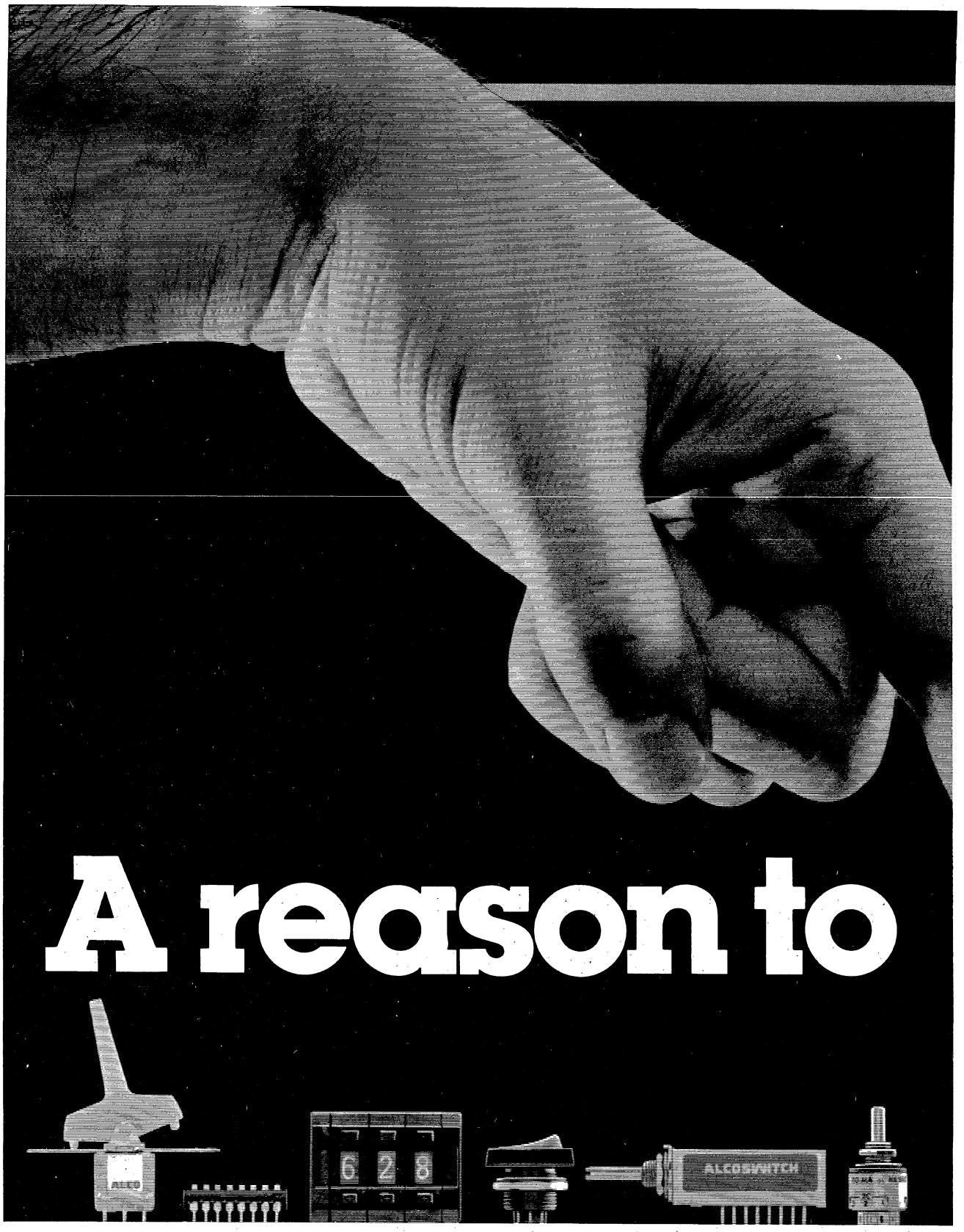
SLIDE SWITCH FEATURES:

- Auto-Insertable on standard TO-116 IC insertion equipment.
- Surface mountable with BUTT or L-BEND terminals. (PC terminals available)
- Side, Flush and extended actuators available.
- 1, 2, 4 and 6 pole versions available.
- Bifurcated, double wipe contacts provide dependable, telcom grade switching.
- Closed case construction with tape seal, provides process sealing.

AUGAT® ALCOSWITCH®

Quality and Innovation

1551 OSGOOD ST. NORTH ANDOVER, MA 01845 Tel: (617) 685-4371 TWX: 710 342 0552


A reason to
ALCO
6 2 8
ALCOSWITCH

If you use switches, here are some persuasive reasons to buy them from Augat ALCOSWITCH.

Experience and breadth of line. Augat ALCOSWITCH practically pioneered the modern miniature switch. We've got the comprehensive product line you'd expect from one of the world's largest switch companies. DIPS, slides, toggles, push-buttons, rotaries, pushwheels, rockers, keylocks, indicators, and knobs. We cover every function from low energy to power, from basic on/off to programming and encoding.

Quality and innovation. We subject our switches to unparalleled quality, environmental, and performance tests. That's why you'll find our switches hard at work in so many critical areas: in computers and peripherals; instruments and controls; telecommunications, medical, military, aerospace, and broadcast equipment. Our product managers constantly research the industry to determine exactly what our customers want in the way of new switch products. So we're generally first with state-of-the-art switches.

Customer support. We maintain close personal touch with our customers. Need applications help? Just ask. Need custom switches? We're ready.

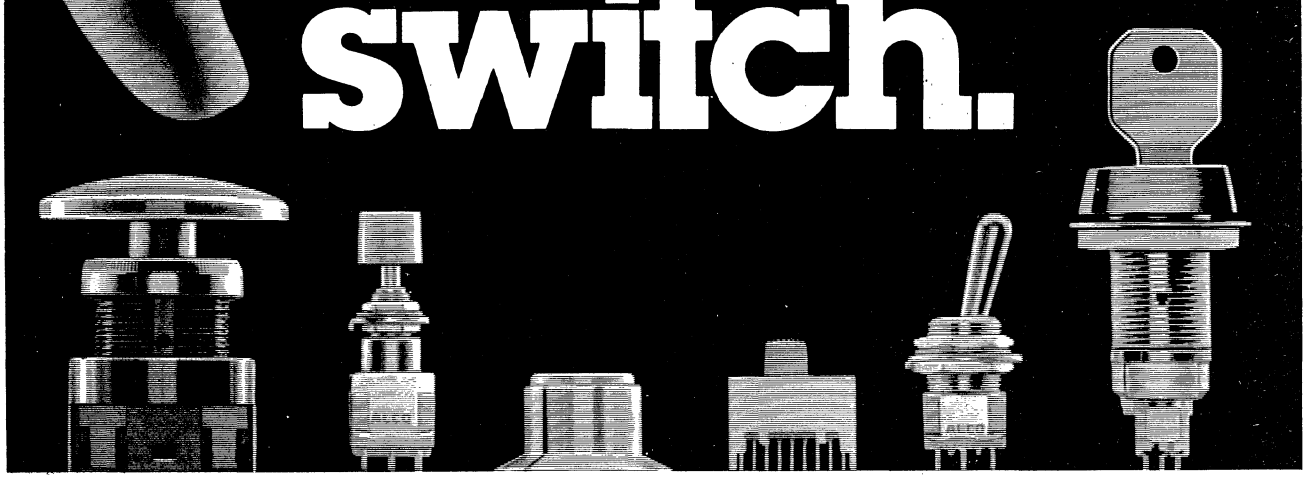
Whatever your switching needs, come to Augat ALCOSWITCH. You'll find the perfect reason to switch.

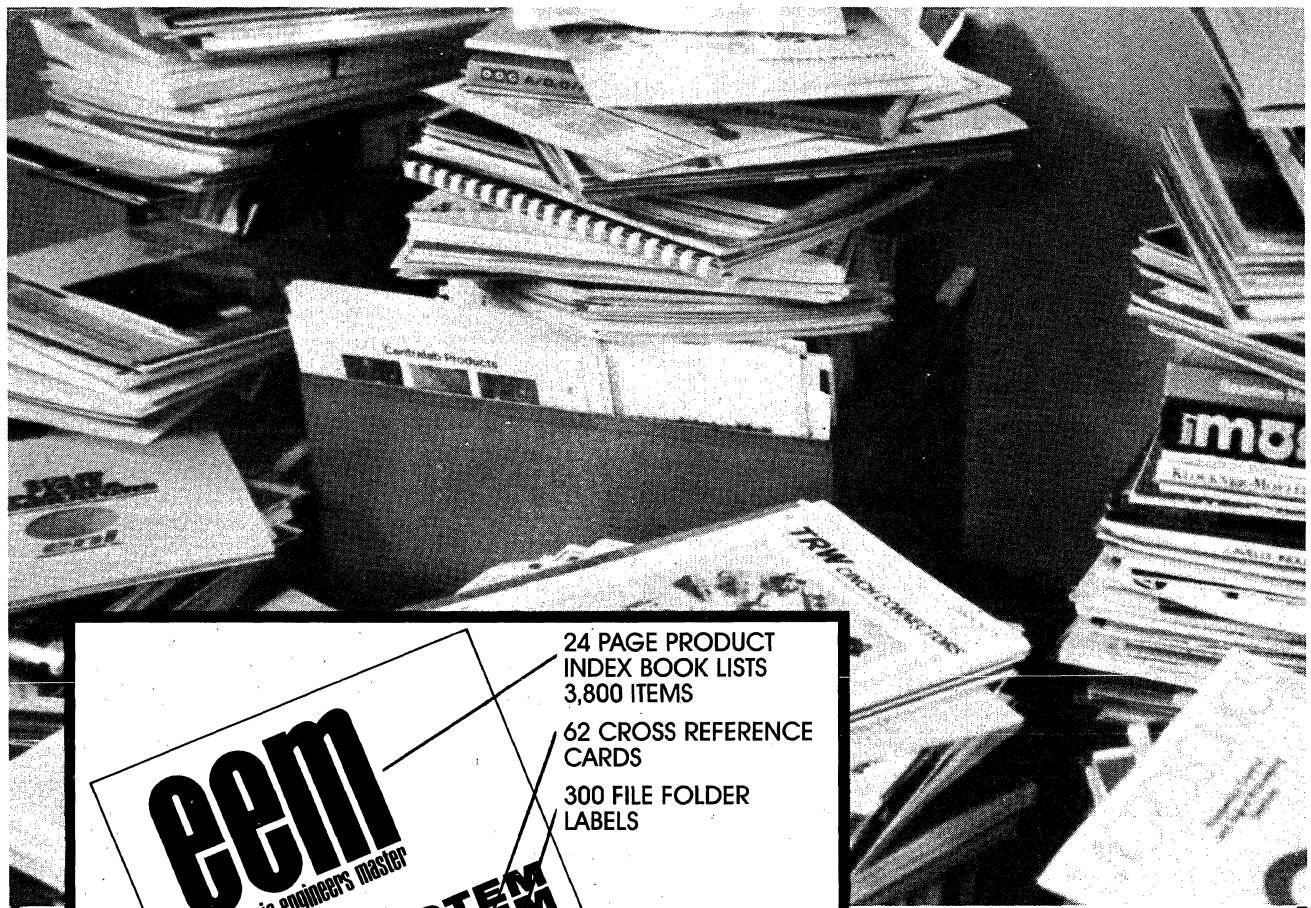
Free Augat ALCOSWITCH Catalog. To place an order or get more information, call or write Customer Service at Augat ALCOSWITCH, 1551 Osgood St., N. Andover, MA 01845, (617) 685-4371. For a free copy of our comprehensive product catalog, call our 24-hour literature hotline, (617) 685-6153.

AUGAT® ALCOSWITCH®

Quality and Innovation

switch.





24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS

62 CROSS REFERENCE CARDS

300 FILE FOLDER LABELS

ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

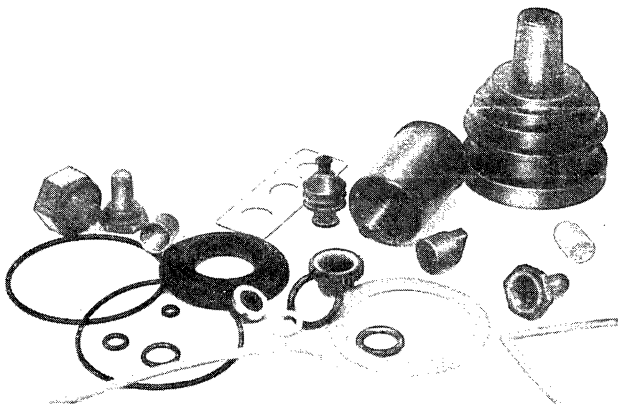
There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

AME SWITCH SEALS



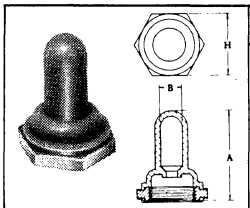
Backed by over 25 years of engineering solutions — for an ever-changing and demanding market.

The wide demand for custom-molded panel and switch seals, threaded inserts bonded to rubber, O-rings, boots and seals, etc., translated is really a demand for talent and know-how to handle the engineering and molding of particularly thorny or unusual custom requirements that frequently plague industry. AME meets the demand. . . with experience, service and unique production techniques.

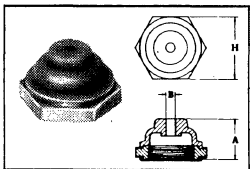
CUSTOM ENGINEERED PRECISION MOLDED ELASTOMERS

- Color filters for incandescent lamps
- Rubber to metal bonding
- Clear silicone products
- Self-sealing hex nuts
- Self-sealing washers
- Extrusions
- O-rings
- Boots
- Gaskets
- Seals
- Conductive rubber
- Die cutting

TOGGLE SWITCH SEALS

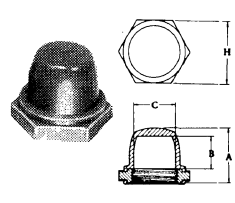


Part Number	Equiv. Military Part Number	Thread Size	Unit	A	B	H	Material Specifications
1100	M5423/01-01	15/32-32 UNS-2B	in.	.86	.22	.625 Hex	Nut-Brass, Nickel Plated, Rubber-Silicone per ZZ-R-765 Class III, Grade 50 Gray
			mm	(21.84)	(5.59)	(15.88)	
1102	None	15/32-32 UNS-2B	in.	.86	.22	.625 Hex	
			mm	(21.84)	(5.59)	(15.88)	
1103	None	15/32-32 UNS-2B	in.	.90	.22	.625 Hex	Nut-Brass, Rubber-Neoprene, 50 Durometer Black
			mm	(22.86)	(5.59)	(15.88)	
1105	M5423/05-01	1/4-40 UNS-2B	in.	.50	.064	.375 Hex	Nut-Brass, Nickel Plated, Rubber-Silicone per ZZ-R-765 Class III, Grade 30 Gray
			mm	(12.70)	(1.63)	(9.53)	



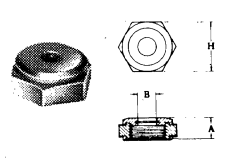
Part Number	Equiv. Military Part Number	Thread Size	Unit	A	B	H	Material Specifications
1101	M5423/02-01	15/32-32 UNS-2B	in.	.40	.09	.625 Hex	Nut-Brass, Nickel Plated, Rubber-Silicone per ZZ-R-765 Class III, Grade 50 Gray
			mm	(10.16)	(2.29)	(15.88)	
1104	None	5/8-24 UNEF-2B	in.	.75	.09	.812 Hex	
			mm	(19.05)	(2.29)	(20.62)	
1106	M5423/11-01	1/4-40 UNS-2B	in.	.25	.05	.375 Hex	
			mm	(6.35)	(1.27)	(9.53)	

PUSH BUTTON SWITCH SEALS



Part Number	Equiv. Military Part Number	Thread Size	Unit	A	B	C	H	Material Specifications
2100	M5423/07-01	15/32-32 UNS-2B	in.	.55	.32	.42	.625 Hex	Nut-Brass, Nickel Plated, Rubber-Silicone per ZZ-R-765 Class III, Grade 60 Gray
			mm	(13.97)	(8.13)	(10.67)	(15.88)	
2101	None	1/2-32 UNS-2B	in.	.46	.29	.41	.750 Dia.	
			mm	(11.68)	(7.37)	(10.41)	(19.05)	
2102	M5423/07-02	15/32-32 UNS-2B	in.	.72	.48	.42	.625 Hex	
			mm	(18.29)	(12.19)	(10.67)	(15.88)	
2103	M5423/10-01	1/4-32 UNEF-2B	in.	.31	.20	.19	.375 Hex	
			mm	(7.87)	(5.08)	(4.83)	(9.53)	
2104	M5423/10-02	1/4-40 UNS-2B	in.	.31	.20	.19	.375 Hex	
			mm	(7.87)	(5.08)	(4.83)	(9.53)	

ROTARY SWITCH & POTENTIOMETER SEALS



Part Number	Equiv. Military Part Number	Thread Size	Unit	A	Size of Shaft B	H	Material Specifications
3100	M5423/09-02	3/8-32 UNEF-2B	in.	.22	.250	.500 Hex	Nut-Brass, Nickel Plated, Rubber-Silicone per ZZ-R-765 Class III, Grade 60 Gray
			mm	(5.59)	(6.35)	(12.70)	
3101	M5423/09-01	3/8-32 UNEF-2B	in.	.22	.125	.500 Hex	
			mm	(5.59)	(3.18)	(12.70)	
3102	M5423/09-04	15/32-32 UNS-2B	in.	.22	.250	.625 Hex	
			mm	(5.59)	(6.35)	(15.88)	

MANY OTHER SIZES AND TYPES AVAILABLE

Pressure capabilities: Internal Pressure
1 Atmosphere, 15 psi (103.4 kPa)
External Pressure
2 Atmospheres, 30 psi (206.8 kPa)
For Part #1106 — Internal pressure
.7 Atmosphere, 10 psi (69 kPa)
External pressure
1.4 Atmospheres, 20 psi (138 kPa)

Endurance: Exceeds 100,000 actuations (depending on environment).

Useful life: 20 years to unlimited (depending on environment).

Switch Seals are designed and manufactured to meet or exceed applicable military specifications.

Switch Seals

An elastomeric boot which seals, thus protecting a switch and internal components against hazardous foreign elements. AME's one piece switch seal is constructed of a flexible rubber boot element bonded during molding to a threaded metal insert that fully encapsulates the switch and bushing to the panel.

This assembly replaces the panel mounting nut and seals the mounting hole making it watertight. It protects against moisture, oil, dirt, dust, most solvents; many acids (see elastomer selection guide).

Switch seals provide vibration resistant mounting and act as double insulation with no interference to switch movement.

CAST URETHANE & SILICONE

AME supplies cast urethane and silicone products precision engineered to meet your most demanding requirements.

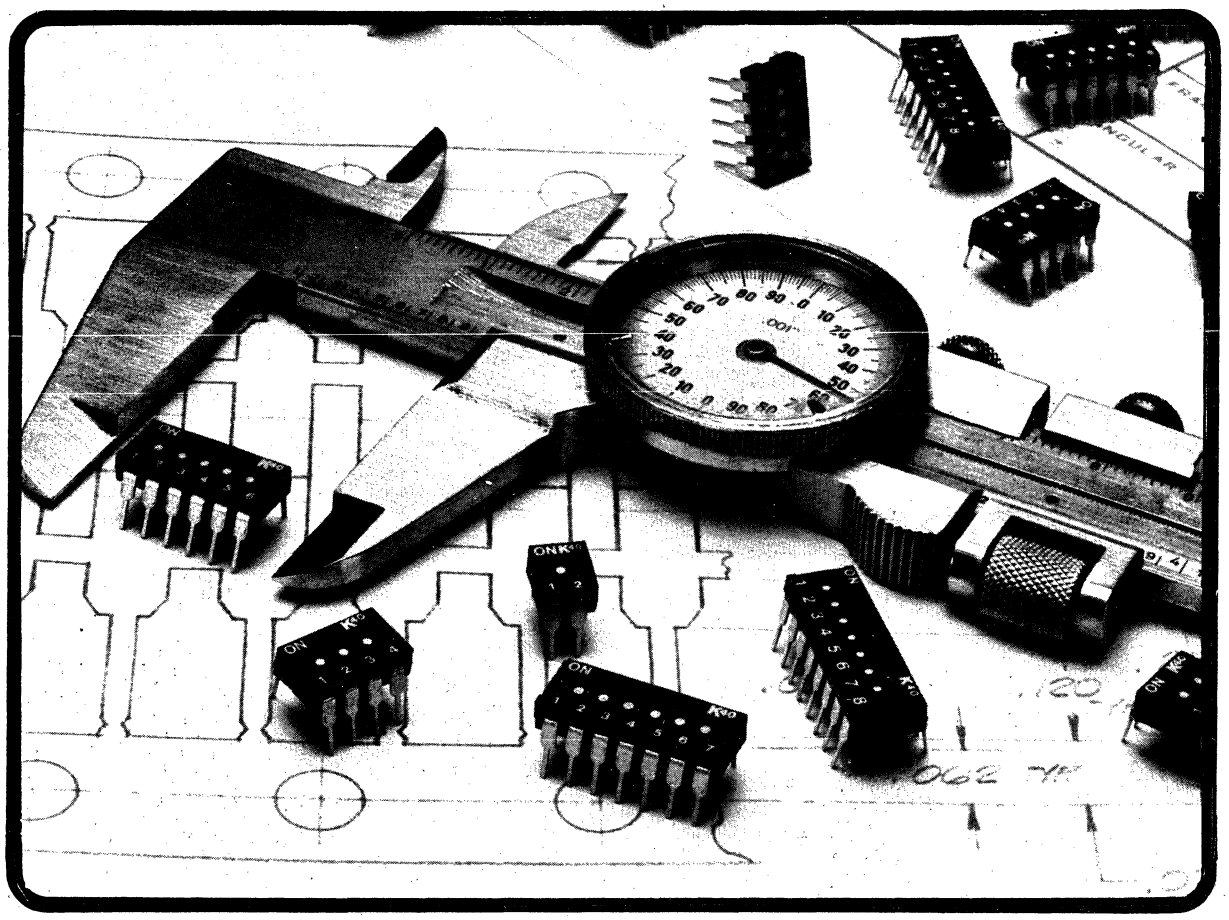
If you need high tensile/tear strength, excellent resistance to abrasion and high impact capability, our cast urethane is ideally suited for the job. Superb temperature resistance to the damaging sub-zero cold or searing heat extremes is found in the cast silicone custom engineered by AME Corporation.

AME CORPORATION
Dept. EM,101 E. Main St.
P.O. Box 191
Little Falls, NJ 07424
(201) 256-3939

SWITCH SEALS

AMERICAN RESEARCH & ENGINEERING

DIP SWITCHES



MACHINE INSERTABLE
SAVINGS FROM AUTOMATIC INSERTION

LOWEST PROFILE AVAILABLE
SAME SIZE AS AN IC PACKAGE

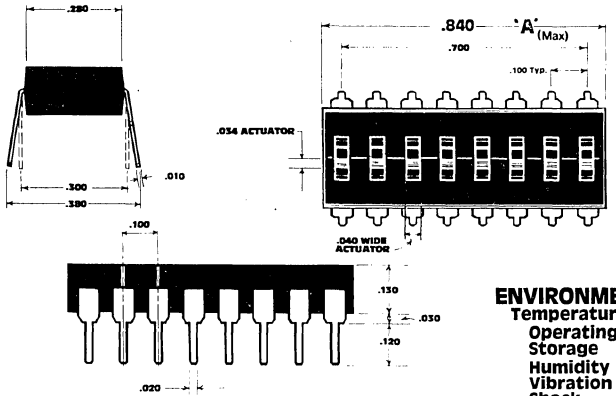
BIFURCATED SLIDE CONTACTS
FOR LOW, LOW, CONTACT RESISTANCE

FLUSH SWITCH ACTUATORS
PREVENTS ACCIDENTAL SWITCHING

TAPE SEALED SWITCH ACTUATORS
PREVENTS CONTAMINATION DURING ASSEMBLY

TEL: (312) 888-7245 • TWX: 910-251-3008

SPECIFICATIONS



SPST-FLUSH ACTUATORS "A" OVERALL DIMENSION	NUMBER OF SWITCH POSITIONS	PART NUMBER
.840	8	K40 8S
.720	7	K40 7S
.620	6	K40 6S
.520	5	K40 5S
.420	4	K40 4S
.320	3	K40 3S
.220	2	K40 2S

ELECTRICAL

Contact Resistance	
Initial, max.	20 Milliohms
After 2000 actuation, max.	80 Milliohms
Current and Voltage Ratings, max.	
Switching	100 mA @ 20 VDC
Non-switching	100 mA @ 50 VDC
Insulation Resistance, initial	1000 meg Ω 500 VDC
Dielectric Withstanding Voltage, min.	500 VDC
Capacitance, max., between adjacent switches	5 Picofarads

ENVIRONMENTAL

Temperature Rating	
Operating	- 40° C to + 100° C
Storage	- 60° C to + 125° C
Humidity	95% RH, 40° C for 96 Hours
Vibration	Per MIL-STD-202, Method 204B
Shock	Per MIL-STD-202, Method 213C
Solderability	Per MIL-STD-202, Method 208
Mechanical Life	2000 Actuations, 80 Milliohms, Max.

PHYSICAL

Housing	30% Glass Filled 6/6 Nylon (UL 94V0)
Lead Frame Contacts	Brass, 10 Microinch Gold Over 50 Microinch Nickel at Contact Points
Leads	Available in Solder Plating or Gold Flash Plating
Slide Contacts	Beryllium Copper, 10 Microinch Gold Over 100 Microinch Nickel

Note: Certified test reports are available. Ask your K40 contact person for a copy.

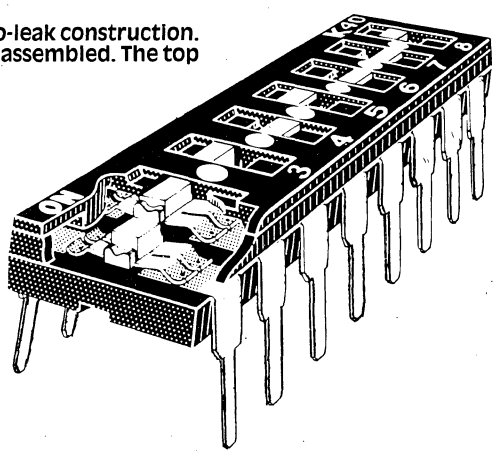
THE NEW K40 DIP SWITCH CONSTRUCTION DETAILS

Lowest profile **dip switch in the world! Same size as a standard integrated circuit package, allowing** ***automatic insertion*** **with existing equipment.**

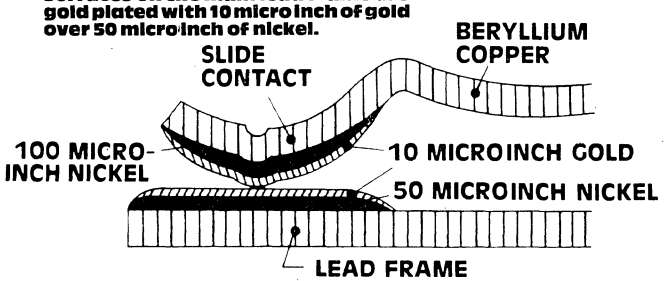
The lead frame is molded into the housing to provide a one piece, no-leak construction. The cover is ultrasonically welded to the housing after the switch is assembled. The top is sealed with easily removable tape.

Slides are bifurcated, lowering contact resistance and improving contact reliability since there are *two independent,* gold plated, *contacts at each switch point.*

Slides are also available in a non-bifurcated, cross-bar contact configuration, providing the same low contact resistance as the bifurcated version.



Every one of the switch contact surfaces on the main lead frame are gold plated with 10 micro inch of gold over 50 micro inch of nickel.



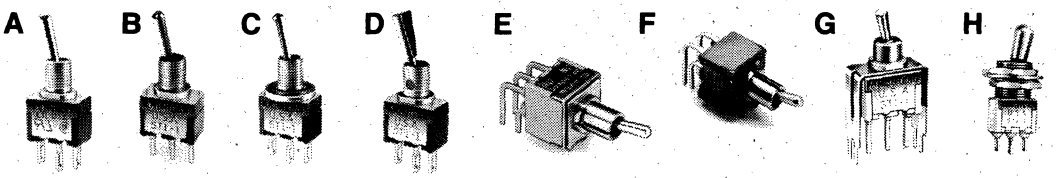
Slides are made from beryllium copper, heat tempered to a full hardness, plated with 100 micro inch nickel and then spot gold plated 10 micro inch deep at all the contact points.

FOR A FREE SAMPLE
SEND YOUR BUSINESS CARD TO:

AMERICAN RESEARCH & ENGINEERING

1500 EXECUTIVE DRIVE, ELGIN ILLINOIS 60120

ASC American Switch Corp. Subminiature Toggle Switches



Power rating (Q): 6 Amps @ 125 VAC, 3 Amps @ 250 VAC or 7 Amps @ 30 VDC (resistive lds.). Dry ckt. rating (B): 0.4 Volt-Amps max. @ 20 V max. AC or DC. Operating Temp: -20C to 65C. Dielectric Str: 2 KV RMS @ sea level. Brass, Chrome pltd. toggle handle. Brass, nickel pltd. bushing. Brass contacts w/silver inlay and silver plt. for power models. Brass contacts w/gold over nickel plt. for dry ckt. models. Stainless st. strap. Red thermoset case. pnl. mtg. models supplied w/mtg. hdw. No hdw. supplied w/P.C. models. Body sizes: SP, .290wX.500lX.420d. DP, .500wX.500lX.420d. Pin spacing: SP, .185 DP, .185X.210. Epoxy term. seal is optional. Add 'E' to model no. and add .14¢ for SP and .29¢ for DP. Parenthesis below indicates momentary action.

A PANEL MOUNT, 1/4" HOLE, BAT HANDLE, SOLDER TERMS., POWER RATING.

MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1KMZQ	SPDT	ON-NONE-ON	2.72	2.27	1.96
ST1-2KMZQ	SPDT	ON-OFF-ON	3.00	2.48	2.15
ST1-3KMZQ	SPDT	(ON)-OFF-(ON)	3.00	2.48	2.15
ST1-4KMZQ	SPDT	ON-OFF-(ON)	3.00	2.48	2.15
ST1-5KMZQ	SPDT	ON-NONE-(ON)	3.09	2.54	2.22
ST2-1KMZQ	DPDT	ON-NONE-ON	3.85	3.30	2.91
ST2-2KMZQ	DPDT	ON-OFF-ON	4.33	3.66	3.23
ST2-3KMZQ	DPDT	(ON)-OFF-(ON)	4.33	3.66	3.23
ST2-4KMZQ	DPDT	ON-OFF-(ON)	4.40	3.73	3.27
ST2-5KMZQ	DPDT	ON-NONE-(ON)	4.47	3.78	3.37
ST2-6KMZQ	DPDT	ON-ON-ON	4.76	4.03	3.56

B PANEL MOUNT, 1/4" HOLE, BAT HANDLE, P.C. TERMS., POWER RATING.

MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1KMCQ	SPDT	ON-NONE-ON	2.74	2.29	1.98
ST1-2KMCQ	SPDT	ON-OFF-ON	3.02	2.50	2.17
ST1-3KMCQ	SPDT	(ON)-OFF-(ON)	3.02	2.50	2.17
ST1-4KMCQ	SPDT	ON-OFF-(ON)	3.02	2.50	2.17
ST1-5KMCQ	SPDT	ON-NONE-(ON)	3.11	2.56	2.24
ST2-1KMCQ	DPDT	ON-NONE-ON	3.88	3.33	2.94
ST2-2KMCQ	DPDT	ON-OFF-ON	4.36	3.69	3.26
ST2-3KMCQ	DPDT	(ON)-OFF-(ON)	4.36	3.69	3.26
ST2-4KMCQ	DPDT	ON-OFF-(ON)	4.43	3.76	3.30
ST2-5KMCQ	DPDT	ON-NONE-(ON)	4.50	3.81	3.40
ST2-6KMCQ	DPDT	ON-ON-ON	4.79	4.06	3.59

C PNL. MT., SPLASHPROOF, 1/4" HOLE, BAT HANDLE, SOLDER TERMS., POWER RATING.

MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1KHZQ	SPDT	ON-NONE-ON	3.23	2.78	2.47
ST1-2KHZQ	SPDT	ON-OFF-ON	3.51	2.99	2.66
ST1-3KHZQ	SPDT	(ON)-OFF-(ON)	3.51	2.99	2.66
ST1-4KHZQ	SPDT	ON-OFF-(ON)	3.51	2.99	2.66
ST1-5KHZQ	SPDT	ON-NONE-(ON)	3.60	3.05	2.73
ST2-1KHZQ	DPDT	ON-NONE-ON	4.36	3.81	3.42
ST2-2KHZQ	DPDT	ON-OFF-ON	4.84	4.17	3.74
ST2-3KHZQ	DPDT	(ON)-OFF-(ON)	4.84	4.17	3.74
ST2-4KHZQ	DPDT	ON-OFF-(ON)	4.91	4.24	3.78
ST2-5KHZQ	DPDT	ON-NONE-(ON)	4.98	4.29	3.88
ST2-6KHZQ	DPDT	ON-ON-ON	5.27	4.54	4.07

D PANEL MOUNT, 1/4" HOLE, FLATTED HANDLE, SOLDER TERMS., POWER RATING.

MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1F1MZQ	SPDT	ON-NONE-ON	3.47	3.02	2.71
ST1-2F1MZQ	SPDT	ON-OFF-ON	3.75	3.23	2.90
ST1-3F1MZQ	SPDT	(ON)-OFF-(ON)	3.75	3.23	2.90
ST1-4F1MZQ	SPDT	ON-OFF-(ON)	3.75	3.23	2.90
ST1-5F1MZQ	SPDT	ON-NONE-(ON)	3.84	3.29	2.97
ST2-1F1MZQ	DPDT	ON-NONE-ON	4.60	4.05	3.66
ST2-2F1MZQ	DPDT	ON-OFF-ON	5.08	4.41	3.98
ST2-3F1MZQ	DPDT	(ON)-OFF-(ON)	5.08	4.41	3.98
ST2-4F1MZQ	DPDT	ON-OFF-(ON)	5.15	4.48	4.02
ST2-5F1MZQ	DPDT	ON-NONE-(ON)	5.22	4.53	4.12
ST2-6F1MZQ	DPDT	ON-ON-ON	5.51	4.78	4.31

E P.C. MOUNT, RT ANGLE HOR., SMOOTH BUSH, BAT HANDLE, DRY CIRCUIT RATING.

MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1L3S3A-1B	SPDT	ON-NONE-ON	2.96	2.51	2.20
ST1-2L3S3A-1B	SPDT	ON-OFF-ON	3.24	2.72	2.39
ST1-3L3S3A-1B	SPDT	(ON)-OFF-(ON)	3.24	2.72	2.39
ST1-4L3S3A-1B	SPDT	ON-OFF-(ON)	3.24	2.72	2.39
ST1-5L3S3A-1B	SPDT	ON-NONE-(ON)	3.33	2.78	2.46
ST2-1L3S3A-1B	DPDT	ON-NONE-ON	4.30	3.75	3.36
ST2-2L3S3A-1B	DPDT	ON-OFF-ON	4.78	4.11	3.68
ST2-3L3S3A-1B	DPDT	(ON)-OFF-(ON)	4.78	4.11	3.68
ST2-4L3S3A-1B	DPDT	ON-OFF-(ON)	4.85	4.18	3.72
ST2-5L3S3A-1B	DPDT	ON-NONE-(ON)	4.92	4.23	3.82
ST2-6L3S3A-1B	DPDT	ON-ON-ON	5.21	4.48	4.01

F P.C. MOUNT, RIGHT ANGLE VERTICAL, SMOOTH BUSHING, BAT HANDLE, DRY CIRCUIT RATING.

MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1L3S3V-1B	SPDT	ON-NONE-ON	3.01	2.56	2.25
ST1-2L3S3V-1B	SPDT	ON-OFF-ON	3.29	2.77	2.44
ST1-3L3S3V-1B	SPDT	(ON)-OFF-(ON)	3.29	2.77	2.44
ST1-4L3S3V-1B	SPDT	ON-OFF-(ON)	3.29	2.77	2.44
ST1-5L3S3V-1B	SPDT	ON-NONE-(ON)	3.38	2.83	2.51
ST2-1L3S3V-1B	DPDT	ON-NONE-ON	4.38	3.83	3.44
ST2-2L3S3V-1B	DPDT	ON-OFF-ON	4.86	4.19	3.76
ST2-3L3S3V-1B	DPDT	(ON)-OFF-(ON)	4.86	4.19	3.76
ST2-4L3S3V-1B	DPDT	ON-OFF-(ON)	4.93	4.26	3.80
ST2-5L3S3V-1B	DPDT	ON-NONE-(ON)	5.00	4.31	3.90
ST2-6L3S3V-1B	DPDT	ON-ON-ON	5.29	4.56	4.09

G P.C. MOUNT, VERTICAL WITH BRACKET, SMOOTH BUSHING, BAT HANDLE, DRY CIRCUIT RATING.

MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1L3S3V30B	SPDT	ON-NONE-ON	2.98	2.53	2.22
ST1-2L3S3V30B	SPDT	ON-OFF-ON	3.26	2.74	2.41
ST1-3L3S3V30B	SPDT	(ON)-OFF-(ON)	3.26	2.74	2.41
ST1-4L3S3V30B	SPDT	ON-OFF-(ON)	3.26	2.74	2.41
ST1-5L3S3V30B	SPDT	ON-NONE-(ON)	3.35	2.80	2.48
ST2-1L3S3V30B	DPDT	ON-NONE-ON	4.06	3.51	3.12
ST2-2L3S3V30B	DPDT	ON-OFF-ON	4.54	3.87	3.44
ST2-3L3S3V30B	DPDT	(ON)-OFF-(ON)	4.54	3.87	3.44
ST2-4L3S3V30B	DPDT	ON-OFF-(ON)	4.62	3.94	3.48
ST2-5L3S3V30B	DPDT	ON-NONE-(ON)	4.68	3.99	3.58
ST2-6L3S3V30B	DPDT	ON-ON-ON	4.97	4.24	3.77

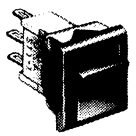
H PANEL MOUNT, 15/32" HOLE, LARGE BAT HANDLE, SOLDER TERMS., POWER RATING.

MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1T1M4ZQ	SPDT	ON-NONE-ON	3.92	3.47	3.16
ST1-2T1M4ZQ	SPDT	ON-OFF-ON	4.20	3.68	3.35
ST1-3T1M4ZQ	SPDT	(ON)-OFF-(ON)	4.20	3.68	3.35
ST1-4T1M4ZQ	SPDT	ON-OFF-(ON)	4.20	3.68	3.35
ST1-5T1M4ZQ	SPDT	ON-NONE-(ON)	4.29	3.74	3.42
ST2-1T1M4ZQ	DPDT	ON-NONE-ON	5.05	4.50	4.11
ST2-2T1M4ZQ	DPDT	ON-OFF-ON	5.53	4.86	4.43
ST2-3T1M4ZQ	DPDT	(ON)-OFF-(ON)	5.53	4.86	4.43
ST2-4T1M4ZQ	DPDT	ON-OFF-(ON)	5.60	4.93	4.47
ST2-5T1M4ZQ	DPDT	ON-NONE-(ON)	5.67	4.98	4.57
ST2-6T1M4ZQ	DPDT	ON-ON-ON	5.96	5.23	4.76

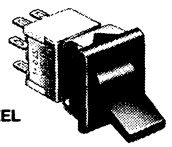
AMERICAN SWITCH CORP. / 134 WATER STREET, WAKEFIELD, MASS. 01880 TEL. (617) 246-1007 TWX 710-348-6756

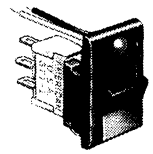
ASC American Switch Corp. Subminiature Rocker and Lever Switches with Snap In Bezel

with or without L.E.D. light

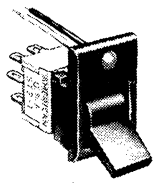

J3 ACTUATOR

J90 BEZEL


J4 ACTUATOR


J3 ACTUATOR

J61 BEZEL


J4 ACTUATOR

Power rating (Q): 6 Amps @ 125 VAC, 3 Amps @ 250 VAC or 7 Amps @ 30 VDC (resistive lds.). Dry ckt. rating (B): 0.4 Volt-Amps max. @ 20 V max. AC or DC. Op. Temp: -20C to 65C. Diel. str: 2 KV RMS @ sea level. Black nylon actuator, Black, red or white nylon bezel, Stainless st. spring, Brass contacts w/silver inlay and silver plt. for power models. Brass contacts w/gold over nickel plt. for dry ckt. models. Stainless st. strap. Red thermoset case. Mounts in .500X.600 cutout (J61 requires ext. LED hole). Depth from frt. pnl. 1". Pnl. Tk'ness-.047 to .125. Red LED supplied for J61, G.I. #MV57640 or equiv., Epoxy term seal is optional. Add 'E' to model no. and add 14¢ for SP and 29¢ for DP. Parenthesis below indicates momentary action.

PANEL MOUNT, J3 ROCKER SOLDER TERMS., POWER RATING.

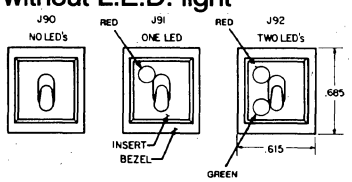
MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1J3J61ZQ	SPDT	ON-NONE-ON	3.92	3.47	3.16
ST1-2J3J61ZQ	SPDT	ON-OFF-ON	4.20	3.68	3.35
ST1-3J3J61ZQ	SPDT	(ON)-OFF-(ON)	4.20	3.68	3.35
ST1-4J3J61ZQ	SPDT	ON-OFF-(ON)	4.20	3.68	3.35
ST1-5J3J61ZQ	SPDT	ON-NONE-(ON)	4.29	3.74	3.42
ST2-1J3J61ZQ	DPDT	ON-NONE-ON	5.05	4.50	4.11
ST2-2J3J61ZQ	DPDT	ON-OFF-ON	5.43	4.86	4.43
ST2-3J3J61ZQ	DPDT	(ON)-OFF-(ON)	5.43	4.86	4.43
ST2-4J3J61ZQ	DPDT	ON-OFF-(ON)	5.50	4.83	4.37
ST2-5J3J61ZQ	DPDT	ON-NONE-(ON)	5.57	4.88	4.47
ST2-6J3J61ZQ	DPDT	ON-ON-ON	5.86	5.13	4.66

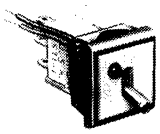
PANEL MOUNT, J4 LEVER SOLDER TERMS., POWER RATING.

MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1J4J61ZQ	SPDT	ON-NONE-ON	3.92	3.47	3.16
ST1-2J4J61ZQ	SPDT	ON-OFF-ON	4.20	3.68	3.35
ST1-3J4J61ZQ	SPDT	(ON)-OFF-(ON)	4.20	3.68	3.35
ST1-4J4J61ZQ	SPDT	ON-OFF-(ON)	4.20	3.68	3.35
ST1-5J4J61ZQ	SPDT	ON-NONE-(ON)	4.29	3.74	3.42
ST2-1J4J61ZQ	DPDT	ON-NONE-ON	5.05	4.50	4.11
ST2-2J4J61ZQ	DPDT	ON-OFF-ON	5.43	4.86	4.43
ST2-3J4J61ZQ	DPDT	(ON)-OFF-(ON)	5.43	4.86	4.43
ST2-4J4J61ZQ	DPDT	ON-OFF-(ON)	5.50	4.83	4.37
ST2-5J4J61ZQ	DPDT	ON-NONE-(ON)	5.57	4.88	4.47
ST2-6J4J61ZQ	DPDT	ON-ON-ON	5.86	5.13	4.66

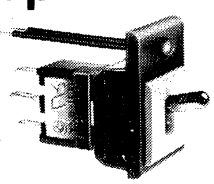
Subminiature Toggle Switches with Snap In Bezel

with or without L.E.D. light




J91 BEZEL

J61 BEZEL



Power rating (Q): 6 Amps @ 125 VAC, 3 Amps @ 250 VAC or 7 Amps @ 30 VDC (resistive lds.). Dry ckt. rating (B): 0.4 Volt-Amps max. @ 20 V max. AC or DC. Op. Temp: -20C to 65C. Diel. str: 2 KV RMS @ sea level. Brass chrome pltd. toggle handle, Black, red or white nylon bezel and insert, Stainless st. spring, Brass contacts w/ silver inlay and silver plt. for power models. Brass contacts w/gold over nickel plt. for dry ckt. models. Stainless st. strap. Red thermoset case. Mounts in .500X.600 cutout (J61 requires ext. LED hole). Depth from frt. pnl. 1". Pnl. tk'ness-.047 to .125. Red LED supplied for J61, G.I. #MV57640 or equiv., J90 has no LED, J91 has 1 LED. Litronix #LDH3521 or equiv., J92 has 2 LED's.1 red and 1 green, Litronix #LDG3571 or equiv., Epoxy term seal is optional. Add 'E' to model no. and add 14¢ for SP and 29¢ for DP. Parenthesis below indicates momentary action.

PANEL MOUNT, J91 BEZEL, SOLDER TERMS., POWER RATING.

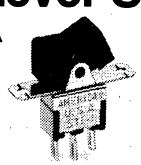
MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1KJ91ZQ	SPDT	ON-NONE-ON	4.14	3.69	3.38
ST1-2KJ91ZQ	SPDT	ON-OFF-ON	4.42	3.90	3.57
ST1-3KJ91ZQ	SPDT	(ON)-OFF-(ON)	4.42	3.90	3.57
ST1-4KJ91ZQ	SPDT	ON-OFF-(ON)	4.42	3.90	3.57
ST1-5KJ91ZQ	SPDT	ON-NONE-(ON)	4.51	3.96	3.64
ST2-1KJ91ZQ	DPDT	ON-NONE-ON	5.27	4.72	4.33
ST2-2KJ91ZQ	DPDT	ON-OFF-ON	5.75	5.08	4.65
ST2-3KJ91ZQ	DPDT	(ON)-OFF-(ON)	5.75	5.08	4.65
ST2-4KJ91ZQ	DPDT	ON-OFF-(ON)	5.82	5.15	4.69
ST2-5KJ91ZQ	DPDT	ON-NONE-(ON)	5.89	5.20	4.79
ST2-6KJ91ZQ	DPDT	ON-ON-ON	6.18	5.45	4.98

PANEL MOUNT, J61 BEZEL, SOLDER TERMS., POWER RATING.

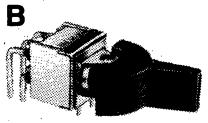
MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1KJ61ZQ	SPDT	ON-NONE-ON	4.12	3.67	3.36
ST1-2KJ61ZQ	SPDT	ON-OFF-ON	4.40	3.88	3.55
ST1-3KJ61ZQ	SPDT	(ON)-OFF-(ON)	4.40	3.88	3.55
ST1-4KJ61ZQ	SPDT	ON-OFF-(ON)	4.40	3.88	3.55
ST1-5KJ61ZQ	SPDT	ON-NONE-(ON)	4.49	3.94	3.62
ST2-1KJ61ZQ	DPDT	ON-NONE-ON	5.25	4.70	4.31
ST2-2KJ61ZQ	DPDT	ON-OFF-ON	5.73	5.06	4.63
ST2-3KJ61ZQ	DPDT	(ON)-OFF-(ON)	5.73	5.06	4.63
ST2-4KJ61ZQ	DPDT	ON-OFF-(ON)	5.80	5.13	4.67
ST2-5KJ61ZQ	DPDT	ON-NONE-(ON)	5.87	5.18	4.77
ST2-6KJ61ZQ	DPDT	ON-ON-ON	6.16	5.43	4.96

Subminiature Rocker and Lever Switches

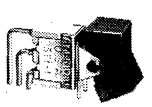
A



B



C



D

Power rating (Q): 6 Amps @ 125 VAC, 3 Amps @ 250 VAC or 7 Amps @ 30 VDC (resistive lds.). Dry ckt. rating (B): 0.4 Volt-Amps max. @ 20 V max. AC or DC. Operating Temp: -20C to 65C. Dielectric Str: 2 KV RMS @ sea level. Nylon or polyester rocker or lever actuator. Brass, nickel pltd. bushing. Brass contacts w/silver inlay and silver plt. for power models. Brass contacts w/gold over nickel plt. for dry ckt. models. Stainless st. strap. Red thermoset case. Pnl. mtg. models supplied w/mtg. hdw. No hdw. supplied w/P.C. models. Body sizes: SP, .290wX.500lX.420d. DP, .500wX.500lX.420d. Pin spacing: SP, .185 DP, .185X.210. Epoxy term. seal is optional. Add 'E' to model no. and add .14¢ for SP and .29¢ for DP. Parenthesis below indicates momentary action. J1 and J2 actuator-specify black, white or red. J3 and J4 actuator-black only.

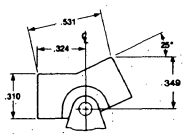
(CONTINUED)

AMERICAN SWITCH CORP. / 134 WATER STREET, WAKEFIELD, MASS. 01880 TEL. (617) 246-1007 TWX 710-348-6756

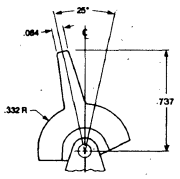
ASC American Switch Corp.

Subminiature Rocker and Lever Switches (CONTINUED)

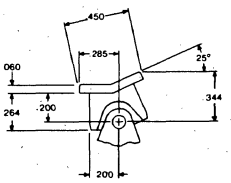
ACTUATOR OPTIONS



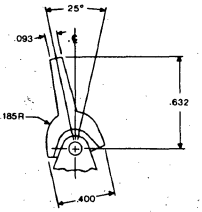
.365w
J1 ROCKER



.365w
J2 LEVER



.460w
J3 ROCKER



.396w
J4 LEVER

A PANEL MOUNT, J1 ROCKER, SOLDER TERMS., POWER RATING.

MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1J1ZQ	SPDT	ON-NONE-ON	3.23	2.78	2.47
ST1-2J1ZQ	SPDT	ON-OFF-ON	3.51	2.99	2.66
ST1-3J1ZQ	SPDT	(ON)-OFF-(ON)	3.51	2.99	2.66
ST1-4J1ZQ	SPDT	ON-OFF-(ON)	3.51	2.99	2.66
ST1-5J1ZQ	SPDT	ON-NONE-(ON)	3.60	3.05	2.73
ST2-1J1ZQ	DPDT	ON-NONE-ON	4.36	3.81	3.42
ST2-2J1ZQ	DPDT	ON-OFF-ON	4.84	4.17	3.74
ST2-3J1ZQ	DPDT	(ON)-OFF-(ON)	4.84	4.17	3.74
ST2-4J1ZQ	DPDT	ON-OFF-(ON)	4.91	4.24	3.78
ST2-5J1ZQ	DPDT	ON-NONE-(ON)	4.98	4.29	3.88
ST2-6J1ZQ	DPDT	ON-ON-ON	5.27	4.54	4.07

B P.C. MOUNT, RT. ANGLE HOR., J2 LEVER, DRY CIRCUIT RATING.

MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1J2A-1B	SPDT	ON-NONE-ON	3.41	2.96	2.65
ST1-2J2A-1B	SPDT	ON-OFF-ON	3.69	3.17	2.84
ST1-3J2A-1B	SPDT	(ON)-OFF-(ON)	3.69	3.17	2.84
ST1-4J2A-1B	SPDT	ON-OFF-(ON)	3.69	3.17	2.84
ST1-5J2A-1B	SPDT	ON-NONE-(ON)	3.78	3.23	2.91
ST2-1J2A-1B	DPDT	ON-NONE-ON	4.75	4.20	3.81
ST2-2J2A-1B	DPDT	ON-OFF-ON	5.23	4.56	4.13
ST2-3J2A-1B	DPDT	(ON)-OFF-(ON)	5.23	4.56	4.13
ST2-4J2A-1B	DPDT	ON-OFF-(ON)	5.30	4.63	4.17
ST2-5J2A-1B	DPDT	ON-NONE-(ON)	5.37	4.68	4.27
ST2-6J2A-1B	DPDT	ON-ON-ON	5.66	4.93	4.46

C P.C. MOUNT, RIGHT ANGLE VERTICAL J1 ROCKER, DRY CIRCUIT RATING.

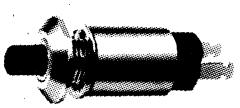
MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1J1V-1B	SPDT	ON-NONE-ON	3.46	3.01	2.70
ST1-2J1V-1B	SPDT	ON-OFF-ON	3.74	3.22	2.89
ST1-3J1V-1B	SPDT	(ON)-OFF-(ON)	3.74	3.22	2.89
ST1-4J1V-1B	SPDT	ON-OFF-(ON)	3.74	3.22	2.89
ST1-5J1V-1B	SPDT	ON-NONE-(ON)	3.83	3.28	2.96
ST2-1J1V-1B	DPDT	ON-NONE-ON	4.83	4.28	3.89
ST2-2J1V-1B	DPDT	ON-OFF-ON	5.31	4.64	4.21
ST2-3J1V-1B	DPDT	(ON)-OFF-(ON)	5.31	4.64	4.21
ST2-4J1V-1B	DPDT	ON-OFF-(ON)	5.38	4.71	4.25
ST2-5J1V-1B	DPDT	ON-NONE-(ON)	5.45	4.76	4.35
ST2-6J1V-1B	DPDT	ON-ON-ON	5.74	5.01	4.54

D P.C. MOUNT, VERTICAL WITH BRACKET, J2 LEVER, DRY CIRCUIT RATING.

MODEL NO.	DESC.	CIRCUITRY	1-24	25-99	100-499
ST1-1J2V40B	SPDT	ON-NONE-ON	3.53	3.08	2.77
ST1-2J2V40B	SPDT	ON-OFF-ON	3.81	3.29	2.96
ST1-3J2V40B	SPDT	(ON)-OFF-(ON)	3.81	3.29	2.96
ST1-4J2V40B	SPDT	ON-OFF-(ON)	3.81	3.29	2.96
ST1-5J2V40B	SPDT	ON-NONE-(ON)	3.90	3.35	3.03
ST2-1J2V40B	DPDT	ON-NONE-ON	4.79	4.24	3.85
ST2-2J2V40B	DPDT	ON-OFF-ON	5.27	4.60	4.17
ST2-3J2V40B	DPDT	(ON)-OFF-(ON)	5.27	4.60	4.17
ST2-4J2V40B	DPDT	ON-OFF-(ON)	5.34	4.67	4.21
ST2-5J2V40B	DPDT	ON-NONE-(ON)	5.41	4.72	4.31
ST2-6J2V40B	DPDT	ON-ON-ON	5.70	4.97	4.50

Panel mount snap action audible click mechanism. Power rating (Q): 3 Amps @ 120 VAC or 28 VDC, or 1.5 Amps @ 250 VAC (resistive lds.). Dry ckt. rating (B): 0.4 Volt-Amps max. @ 20 V max. AC or DC. Op. Temp: -20C to 65C. Diel. Str: 1KV RMS @ sea level. White nylon act., Brass, nickel pltd. bush. Brass contact w/silver inlay and silver plt. for power models. Brass contacts w/gold over nickel plt. for dry ckt. models. Red thermoset body. Body size– 3/8″dX5/8″ l. Mounts in 1/4″ hole. Dec. nut and lk'wshr supplied. Epoxy term seal optional–add 'E' to model no. and .13¢ to price. Color caps available: A235-.250d, A420-.375d, B366-.410 sq. (external keying req'd) Cement securely.

Subminiature Pushbutton Switches



POWER CIRCUIT MODELS SPST

MOD.#	DESCRIPTION	CIRCUITRY	1-24	25-99	100-499
401ZQ	SOLDER TERMS.	PUSH ON/PUSH OFF	2.92	2.39	2.11
402ZQ	SOLDER TERMS.	N.O. MOMENTARY	2.92	2.39	2.11
401CQ	P.C. TERMS.	PUSH ON/PUSH OFF	2.94	2.41	2.13
402CQ	P.C. TERMS.	N.O. MOMENTARY	2.94	2.41	2.13

Subminiature Pushbutton Switches

A

B

C

D

E

Power rating (Q): 6 Amps @ 125 VAC, 3 Amps @ 250 VAC or 7 Amps @ 30 VDC (resistive lds.). Dry ckt. rating (B): 0.4 Volt-Amps max. @ 20 V max. AC or DC. Op. Temp:-20C to 65C. Dielectric str: 2 KV RMS @ sea level. Black polyester actuator. Brass, nickel pltd. bushing. Brass contacts w/silver inlay and silver plt. for power models. Brass contacts w/gold over nickel plt. for dry ckt. models. Stainless st. strap. Red thermoset case. Pnl. mtg. models supplied w/mtg. hdw. No hdw. supplied w/P.C. models. Body size: .290wX.500 lX.420d. Pin spacing: .185. Epoxy term. seal is optional. Add 'E' to model no. and add 14¢. PB1-1 actuation force–2 lbs, PB1-2 actuation force–13 oz.

(CONTINUED)

Color caps available: A180-.210d, A212-.375d, B366-.410 sq. cement securely.

FIG.	MODEL NO.	SPDT MOMENTARY MODELS DESCRIPTION	1-24	25-99	100-499
A	PB1-1P2Y1ZQ	PANEL MT., 1/4″ HOLE, SOLDER TERMS.	3.36	2.73	2.44
B	PB1-1P2Y1CQ	PANEL OR P.C. MT., 1/4″ HOLE, P.C. TERMS.	3.38	2.75	2.46
C	PB1-1P2Y2A-1B	PC. MT., SMOOTH BUSHING, RT. ANGLE HOR.	3.54	2.91	2.62
D	PB1-1P2Y2V-1B	PC. MT., SMOOTH BUSHING, RT. ANGLE VERT.	3.59	2.96	2.67
E	PB1-1P2Y2V30B	PC. MT., SMOOTH BUSHING, VERT. W/BRKT.	3.56	2.93	2.64

AMERICAN SWITCH CORP. / 134 WATER STREET, WAKEFIELD, MASS. 01880 TEL. (617) 246-1007 TWX 710-348-6756

ASC American Switch Corp.

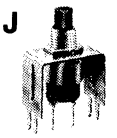
Subminiature Pushbutton Switches (CONTINUED)

F

G

H

I

J 

Power rating (Q): 1 Amp @ 120 VAC or 28 VDC, or 0.5 Amps @ 250 VAC (resistive lds.). Dry ckt. rating (B): 0.4 Volt-Amps max. @ 20 V max. AC or DC. Op. Temp: -20C to 65C. Diel. str: 1 KV RMS @ sea level. Black nylon actuator except for T1 option which is white. Brass, nickel pltd. bush., Brass contacts w/silver inlay and silver plt. for power models. Brass contacts w/gold over nickel plt. for dry ckt. models. Red thermoset body. Body sizes: 301 and 303–.375dX.427l. 302 and 304–.375dX.315l, T1 option–15/32dX.655 l. Mtg. hardware supplied for panel mt. models. No hardware supplied for P.C. mt. models. Epoxy term. seal optional on models 301 and 302–add 'E' to model no. and 13¢ to price.

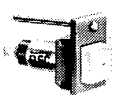
Color caps available: A235–.250d, A420–.375d, B366–.410 square (external keying req'd). Cement securely.

FIG.	MODEL NO.	CIRCUITRY	SPST N.C. AND N.O. MOMENTARY MODELS DESCRIPTION	1–24	25–99	100–499
—	301ZQ	N.O. W/OVERTRAVEL	PANEL MT., 1/4" HOLE, SOLDER TERMS.	1.73	1.46	1.30
F	302ZQ	N.O.	PANEL MT., 1/4" HOLE, SOLDER TERMS.	1.73	1.46	1.30
—	303ZQE	N.C. W/PRETRAVEL	PANEL MT., 1/4" HOLE, SOLDER TERMS.	2.01	1.69	1.50
F	304ZQE	N.C.	PANEL MT., 1/4" HOLE, SOLDER TERMS.	1.99	1.67	1.48
G	301CQ	N.O. W/OVERTRAVEL	PANEL OR P.C. MT., 1/4" HOLE, P.C. TERMS.	1.76	1.49	1.33
—	302CQ	N.O.	PANEL OR P.C. MT., 1/4" HOLE, P.C. TERMS.	1.76	1.49	1.33
G	303CQE	N.C. W/PRETRAVEL	PANEL OR P.C. MT., 1/4" HOLE, P.C. TERMS.	2.04	1.72	1.53
—	304CQE	N.C.	PANEL OR P.C. MT., 1/4" HOLE, P.C. TERMS.	2.02	1.70	1.51
H	301T1CQ	N.O. W/OVERTRAVEL	PANEL MT., 15/32" HOLE, P.C. TERMS.	2.81	2.41	2.25
H	303T1CQE	N.C. W/PRETRAVEL	PANEL MT., 15/32" HOLE, P.C. TERMS.	2.96	2.64	2.45
I	301VBE	N.O. W/OVERTRAVEL	P.C. MT., RIGHT ANGLE	2.22	1.95	1.79
I	303VBE	N.O. W/PRETRAVEL	P.C. MT., RIGHT ANGLE	2.50	2.18	1.99
J	301V30BE	N.O. W/OVERTRAVEL	P.C. MT., VERTICAL WITH BRACKET	2.04	1.77	1.61
J	302V30BE	N.O.	P.C. MT., VERTICAL WITH BRACKET	2.04	1.77	1.61

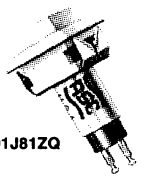
Subminiature Pushbutton Switches with Snap In Bezel

with or without L.E.D. light

Snap action audible click mechanism. Power rating (Q): 3 Amps @ 120 VAC or 28 VDC, or 1.5 Amps @ 250 VAC (resistive lds.). Dry ckt. rating (B): 0.4 Volt-Amps max. @ 20 V max. AC or DC. Op. Temp: -20C to 65C. Diel. str: 1 KV RMS @ sea level. White, red or black nylon actuator and bezel, Stainless st. spring, Brass, nickel pltd. bushing, Red thermoset body, Brass contacts w/silver inlay and silver plt. for power models. Brass contacts w/gold over nickel plt. for dry ckt. models. Mounts in .500X.600 cutout (J61 requires ext. LED hole), Depth from frt. pnl. 1.062. Pnl. tk'ness–.047 to .125. Red LED supplied for J61, GI #MV57640 or equiv. Epoxy term seal optional–add 'E' to model no. and 13¢ to price.



401J61ZQ



401J81ZQ

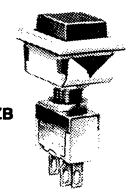
POWER CIRCUIT MODELS SPST

MODEL NO.	DESCRIPTION	CIRCUITRY	1–24	25–99	100–499
401J61ZQ	SOLDER TERM	PUSH ON/PUSH OFF	4.35	3.82	3.54
402J61ZQ	SOLDER TERM	N.O. MOMENTARY	4.35	3.82	3.54
401J81ZQ	SOLDER TERM	PUSH ON/PUSH OFF	4.37	3.84	3.56
402J81ZQ	SOLDER TERM	N.O. MOMENTARY	4.37	3.84	3.56

Power rating (Q): 6 Amps @ 125 VAC, 3 Amps @ 250 VAC or 7 Amps @ 30 VDC (resistive lds.). Dry ckt. rating (B): 0.4 Volt-Amps max. @ 20 V max. AC or DC. Op. temp: -20C to 65C. Diel. str: 2 KV RMS @ sea level. White, black or red nylon actuator and bezel, Stainless st. spring, Brass contacts w/silver inlay and silver plt. for power models. Brass contacts w/gold over nickel plt. for dry ckt. models. Stainless st. strap. Red thermoset case. Mounts in .500X.600 cutout (J61 requires ext. LED hole). Depth from frt. pnl. .975". Pnl. tk'ness–.047 to .125. Red LED supplied for J61, G.I. #MV57640 or equiv., Epoxy term seal is optional. Add 'E' to model no. and add 14¢. PB1-1 actuation force–2 lbs., PB1-2 actuation force–13 oz.

SPDT MOMENTARY MODELS

MODEL NO.	DESCRIPTION	1–24	25–99	100–499
PB1-1J61ZQ	SOLDER TERM	4.85	4.22	3.93
PB1-2J61ZQ	SOLDER TERM	4.85	4.22	3.93
PB1-1J81ZQ	SOLDER TERM	4.25	3.62	3.33
PB1-2J81ZQ	SOLDER TERM	4.25	3.62	3.33

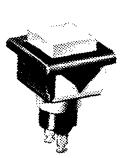
PB1-1J81ZB 

PB1-1J61ZQ

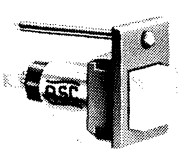
Power rating (Q): 1 Amp @ 120 VAC @ 28 VDC, or 0.5 Amps @ 250 VAC (resistive lds.). Dry ckt. rating (B): 0.4 Volt-Amps max. @ 20 V max. AC or DC. Op. Temp: -20C to 65C. Diel. str: 1 KV RMS @ sea level. White, red or black nylon actuator and bezel, Stainless st. spring, Brass, nickel pltd. bushing, Red thermoset body, Brass contacts w/silver inlay and silver plt. for power models. Brass contacts w/gold over nickel plt. for dry ckt. models. Mounts in .500X.600 cutout (J61 requires ext. LED hole). Depth from frt. pnl.–301 and 303–.929", 302 and 304–.820". Pnl. tk'ness–.047 to .125. Red LED supplied for J61, G.I. #MV57640 or equiv. Epoxy term seal optional on models 301 and 302–add 'E' to model no. and 13¢ to price.

SPST N.C. AND N.O. MOMENTARY MODELS

MODEL NO.	CIRCUITRY	1–24	25–99	100–499
301J61ZQ	N.O. W/OVERTRAVEL	3.16	2.89	2.73
302J61ZQ	N.O.	3.16	2.89	2.73
303J61ZQE	N.C. W/PRETRAVEL	3.44	3.12	2.93
304J61ZQE	N.C.	3.42	3.10	2.91
301J81ZQ	N.O. W/OVERTRAVEL	2.55	2.89	2.12
302J81ZQ	N.O.	2.55	2.89	2.12
303J81ZQE	N.C. W/PRETRAVEL	2.83	2.51	2.93
304J81ZQE	N.C.	2.81	2.49	2.91



302J81ZQE



303J61ZQE

AMERICAN SWITCH CORP. / 134 WATER STREET, WAKEFIELD, MASS. 01880 TEL. (617) 246-1007 TWX 710-348-6756

AMP Dual In-Line Package Switches

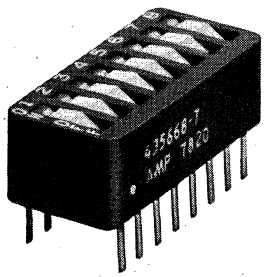
Features: ■ High Density — Low profile, compact design requires a minimum of pc board area ■ Available in standard, low profile, right angle and multipole versions ■ Simple Operation — Rocker actuators instantly change program ■ Easy Mounting — Switches can be flow-soldered directly to pc board or simply inserted into DIP headers or IC packaging receptacles ■ Low profile switches available with sealing tape and standard profile switches available with Plastisol sealant to keep out contaminants during assembly operations ■ Economical — Board mounted switches eliminate the need for interconnection wiring to perform switching functions ■ High Reliability — Fully enclosed design protects contact surfaces from environmental hazards. Optional transparent cover is also available ■ Versatile Application — Switches furnished in various sizes, ranging from 2 to 12 positions

Standard Switches

7000 Series, Single Pole Single Throw

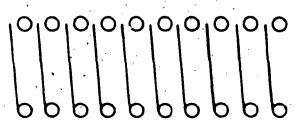
Economy Switches

7100 Series, Single Pole Single Throw



No. of Switch Positions	7000 Series				7100 Series	
	Std. Profile Part No.	Std. Profile (with Plastisol Sealant) Part No.	Low Profile (without Tape) Part No.	Low Profile (with Tape) Part No.	Std. Profile Part No.	Std. Profile (with Plastisol Sealant) Part No.
2	2-435166-9	4-435166-7	1-435626-9	3-435626-6	2-435640-9	3-435640-3
3	3-435166-0	4-435166-8	2-435626-0	3-435626-7	3-435640-0	3-435640-4
4	435166-2	4-435166-9	435626-1	3-435626-8	435640-2	3-435640-5
5	435166-3	5-435166-0	435626-2	3-435626-9	435640-3	3-435640-6
6	435166-4	5-435166-1	435626-3	4-435626-0	435640-4	3-435640-7
7	435166-1	5-435166-2	435626-4	4-435626-1	435640-1	3-435640-8
8	435166-5	5-435166-3	435626-5	4-435626-2	435640-5	3-435640-9
9	435166-6	5-435166-4	435626-6	4-435626-3	435640-6	4-435640-0
10	435166-7	5-435166-5	435626-7	4-435626-4	435640-7	4-435640-1
11	3-435166-1	5-435166-6	2-435626-1	4-435626-5	3-435640-1	4-435640-2
12	3-435166-2	5-435166-7	2-435626-2	4-435626-6	3-435640-2	4-435640-3

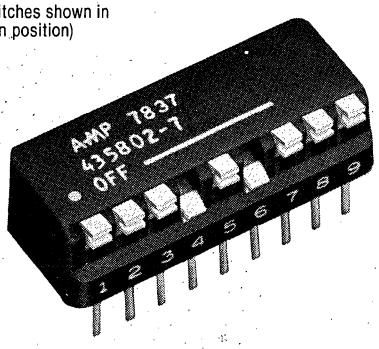
Contact Arrangement



Pin 1

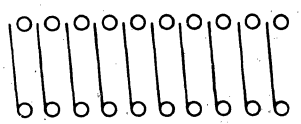
(Switches shown in open position)

7000 Series, Single Pole Single Throw Side Actuated



No. of Switch Positions	Side Actuated Part No.	Side Actuated (with Plastisol Sealant) Part No.
2	1-435802-0	1-435802-3
3	435802-2	1-435802-4
4	435802-3	1-435802-5
5	435802-4	1-435802-6
6	435802-5	1-435802-7
7	435802-6	1-435802-8
8	435802-1	435802-9
9	435802-7	1-435802-9
10	435802-8	2-435802-0
11	1-435802-1	2-435802-1
12	1-435802-2	2-435802-2

Contact Arrangement

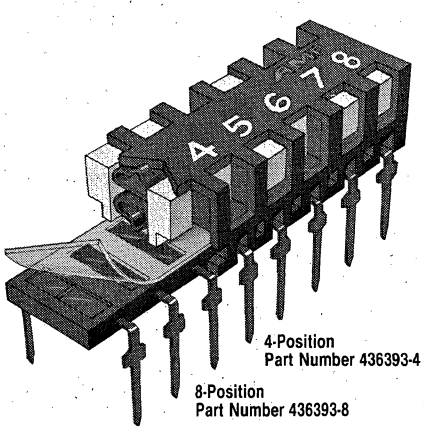


Pin 1

(Switches shown in open position)

AUTOSERT Sealed DIP Switches

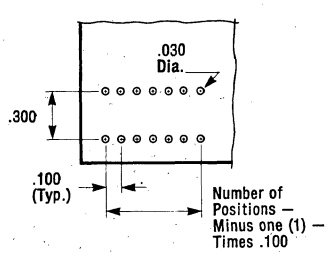
Single Pole Single Throw



4-Position Part Number 436393-4

8-Position Part Number 436393-8

Printed Circuit Board Layout



Request Catalog No. 75-332 for complete listing

Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

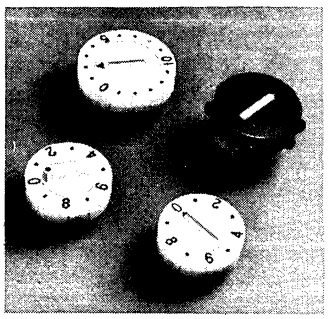
Specifications subject to change. Consult AMP Incorporated for latest design specifications.

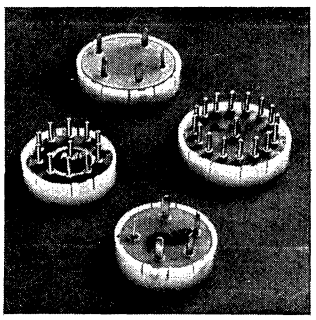
AMP, AUTOSERT — Trademarks of AMP Incorporated.

AMP INCORPORATED

Printed Circuit Board Rotary Switches

6000 Series With Screw Driver Slot, Bar Type Knob, Thumb-wheel Actuation

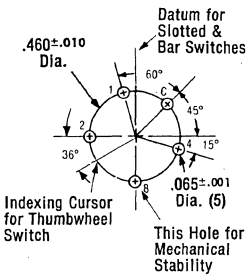




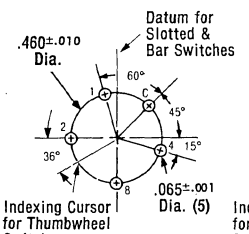
■ Compact Design — Small diameter, low profile switches are ideal for pc board mounting ■ Wide Choice of Outputs — 8 position binary coded octal, 10 position binary coded decimal, 16 position hexadecimal and 8, 10 or 16 position single pole ■ Versatile Application — Available styles include slotted version for screwdriver or coin actuation, plus bar-type knob and thumbwheel versions for hand rotation ■ Economical — Board mounting eliminates need for input/output wiring to perform switching functions ■ Positive Switching — Contacts have positive detent action; all switch positions easily identified by large readable numerals ■ Optimum Reliability — Fully enclosed design protects contact surfaces from dust, dirt and other environmental contaminants

Typical Board Hole Pattern (Switch Side)

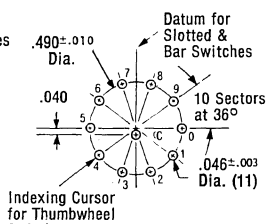
8-Position (Binary Coded Octal)



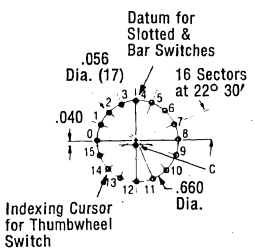
10-Position (Binary Coded Decimal)



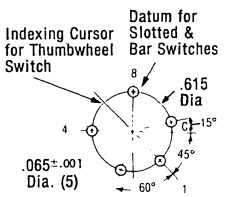
10-Position (Single Pole)



16-Position (Single Pole)



16-Position (Hexadecimal)



8-Position BCD

Switch Position	Common to: 1 2 4
0	
1	●
2	●
3	● ●
4	●
5	● ●
6	● ●
7	● ● ●

10-Position BCD

Switch Position	Common to: 1 2 4 8
0	
1	●
2	●
3	● ●
4	●
5	● ●
6	● ●
7	● ● ●
8	●
9	● ●

10-Position SP

Switch Position	Common to: 0 1 2 3 4 5 6 7 8 9
0	●
1	●
2	●
3	●
4	●
5	●
6	●
7	●
8	●
9	●

16-Position SP

Switch Position	Common to: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
0	●
1	●
2	●
3	●
4	●
5	●
6	●
7	●
8	●
9	●
10	●
11	●
12	●
13	●
14	●
15	●

16-Position HD

Dial Position	Common to: 1 2 4 8
0	
1	●
2	●
3	● ●
4	○
5	● ●
6	● ●
7	● ● ●
8	●
9	● ●
10	● ●
11	● ● ●
12	● ●
13	● ● ●
14	● ● ●
15	● ● ● ●

Specifications

Electrical
Contact Life Expectance: 10,000 Cross Points
Contact Current Rating: 250 Milliamperes
Initial Contact Resistance (at 50 Millivolts, 20 Milliamperes): 50 Milliohms
Insulation Resistance: 1 x 10^8 Ohms
Dielectric Breakdown Voltage: 500 Volts, DC
Circuit Capacitance (at 135 KHz): 3 Picofarads

Materials

Contacts: Phosphor Bronze, Gold-over-Nickel Plated
Solder Tabs and Pins: Coded Switches — Beryllium Copper, Tin Plated Single Pole Switches — Brass, Tin Plated
Structural Parts: Polyacetal Printed Circuit Boards: Glass Epoxy

Switch Type	Screwdriver/ Coin-Actuated	Bar-Type Knob	Thumbwheel
8 BCD	435174-1	1-435174-1	2-435174-1
10 BCD	435005-1	435123-1	435128-1
10 SP	1-435097-1	2-435097-1	435097-1
16 SP	435304-1	1-435304-1	2-435304-1
16 HD	435167-1	1-435167-1	2-435167-1

Request Catalog No. 74-276

Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

Specifications subject to change. Consult AMP Incorporated for latest design specifications.

AMP — Trademark of AMP Incorporated

AMP INCORPORATED

EEM PRODUCT SELECTION GUIDES

Use the EEM Product Selection Guides. There are 34 Guides in this edition of EEM. See page 2 (A•2, B•2, C•2, D•2) of each volume to locate the Product Selection Guides that pertain to your needs.

Your source

Your local AMP Distributor is more than just a place to get any of the hundreds of AMP quality products. He's also the place to get the high level of service and fast delivery to make those products doubly useful.

AMP Distributors maintain broad inventories of popular products to meet local market needs. Call your AMP Distributor for on time delivery of AMP products.

ALABAMA
Powell Electronics, Inc.
Huntsville, 205-539-2731

ARIZONA
Dalis Electronic Supply
Phoenix, 602-275-2626
Hamilton/Avnet Electronics
Tempe, 602-231-5100
Sterling Electronics
Phoenix, 602-268-2121

CALIFORNIA
Cypress Electronics, Inc.
San Jose, 408-945-8400
Electro-Sonic Components, Inc.
Hawthorne, 213-970-0997
Hamilton/Avnet Electronics
Sacramento, 916-925-2216
Hamilton/Avnet Electronics
Sunnyvale, 408-743-3355
Marshall Industries
Canoga Park, 819-999-5001
Marshall Industries
El Monte, 818-442-7204
Marshall Industries
Irvine, 714-556-6400
Marshall Industries
San Diego, 619-578-9600
Powell Electronics, Inc.
San Jose, 408-943-9020
Pyramid Electronics
Fullerton, 714-773-0781
Pyramid Electronics
Santa Clara, 408-727-9810
RPS Electronics, Inc.
Buena Park, 213-744-0355
714-521-5230
RPS Electronics, Inc.
San Diego, 619-292-5611

COLORADO
CSID, Inc.
Denver, 303-292-9594
Marshall Industries
Denver, 800-525-8821

CONNECTICUT
Cronin Electronics
Wallingford, 203-265-3134
Marshall Industries
Wallingford, 203-265-3822

FLORIDA
Hammond Electronics, Inc.
Orlando, 305-849-6060
Schweber Electronics
Hollywood, 305-927-0511
Schweber Electronics
Altamonte Springs, 305-331-7555

GEORGIA
Schweber Electronics
Norcross, 404-449-9170

ILLINOIS
Schweber Electronics
Elk Grove Village, 312-364-3750
Semiconductor Specialists
Elmhurst, 312-279-1000

INDIANA
Graham Electronics
Indianapolis, 317-634-8202

KANSAS
C. Tennant, Sons & Company
Edwardsville, 913-441-1801

MARYLAND
Hamilton/Avnet Electronics
Columbia, 301-995-3500
MS Electronics
Gaithersburg, 301-921-0200
Powell Electronics
Columbia, 301-621-4070

MASSACHUSETTS
Cronin Electronics
Needham, 617-449-5000
Hamilton/Avnet Electronics
Woburn, 617-273-7500
Rush Industries
Winchester, 617-729-5800

MICHIGAN
RS Electronics
Livonia, 313-525-1155

MINNESOTA
Schweber Electronics
Edina, 612-941-5280

MISSOURI
Lectronix, Inc.
St. Charles, 314-946-6424

NEW HAMPSHIRE
C & H Electronics Supply
Hudson, 603-882-1133

AMP is a trademark of AMP Incorporated.

NEW JERSEY
Federated Purchaser
Kenilworth, 201-272-0505
Hamilton/Avnet Electronics
Cherry Hill, 609-424-0110
Marshall Industries
Fairfield, 201-882-0320

NEW YORK
Harrison Radio Corporation
Farmingdale, 516-293-7990
Peerless Radio Corporation
Lynbrook LI, 516-593-2121
Schweber Electronics
Westbury, 516-334-7474
Summit Distributors, Inc.
Buffalo, 716-884-3450

NORTH CAROLINA
Hammond Electronics
Greensboro, 919-275-6391
Schweber Electronics
Raleigh, 919-876-0000
Southeastern Electronics
Raleigh, 919-828-2311

OHIO
Akron Electronic Supply Company
Akron, 216-762-8818
Hughes-Peters, Inc.
Columbus, 614-294-5351

PENNSYLVANIA
Almo Electronics, Inc.
Philadelphia, 215-698-4000
Powell Electronics
Philadelphia, 215-365-1900
Schweber Electronics
Horsham, 215-441-0600

TENNESSEE
Graham Electronics
Nashville, 615-242-2682

TEXAS
Hamilton/Avnet Electronics
Austin, 512-837-8911
Hamilton/Avnet Electronics
Houston, 713-780-1971
Hamilton/Avnet Electronics
Irving, 214-659-4100
Kent Electronics
Austin, 512-834-1900
Kent Electronics
Houston, 713-780-7770
Kent Electronics
Richardson, 214-669-2600

UTAH
Kimball Electronics, Inc.
Salt Lake City, 801-328-2075

WASHINGTON
Pyramid Electronics, Inc.
Kent, 206-872-5800

AMP Interconnecting ideas

for AMP

Arcolectric manufactures a wide range of electro-mechanical switches and indicator lights. Switches include rocker, toggle, slide, push button and rotary. World wide electrical approvals and automated production make Arcolectric products highly competitive and of superior quality. For further details refer to pages **B**•1018-1020, **B**•1497-1501 and **C**•1153 in EEM.

For your catalog, contact

ARCOLECTRIC CORPORATION 9001 CANOGA AVENUE, CANOGA PARK, CA 91304

818/700-1933 TELEX 19-4645

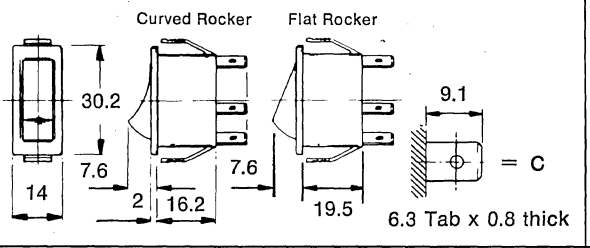
ARCOLECTRIC CORPORATION

1400 Ranges:
10A, 250V AC. Resistive
3A, 250V AC. Inductive

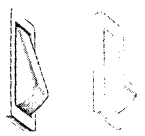
1500 Ranges:
16A 250V AC. Resistive
4A, 250V AC. Inductive

Dimensions in mm

TERMINATION

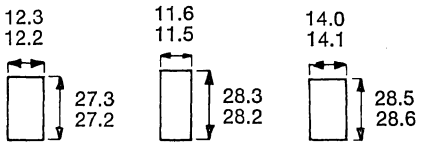


ROCKER CODES



Flat 'F' Curved 'V'

PANEL CUT-OUTS



Ref. 'A' Ref. 'Q' Ref. 'R' *

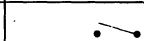
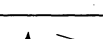
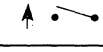
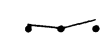
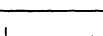
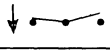
For other cut outs splash proof versions contact factory.

FIXING CLIPS

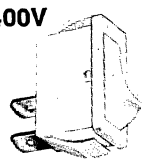
Solid

Ref. Q, A, M, R cut-outs

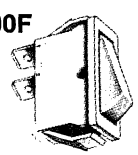
Panel thickness: .75 min., 2.5 max. for solid fixing clips. For thicker panels please inquire for correct length for cut-out.

	Terminal style	Circuit	Rocker codes V or F	Panel Cut out A, Q or R	Specify colors Body/Rocker
ORDER EXAMPLE:	C	1400	V	A	BB
	ON - OFF	C1400 C1500	V or F	A, Q or R	Standard colors
	(ON) - OFF	C1401	V	A	
	ON - (OFF)	C1402	V	A	Body B = Black W = White
	ON -ON	C1410 C1510	V	A	
	(ON) - ON	C1411	V	A	Rocker B = Black R = Red W = White
	ON OFF ON	C1420 C1520	V	A	
	ON OFF (ON)	C1421	V	A	For other colors or matt finish, consult factory
	(ON) OFF (ON) ( )=Momentary	C1422 C1522	V	A	

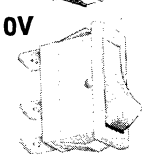
C1400V



C1400F

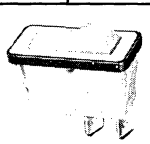


C1410V



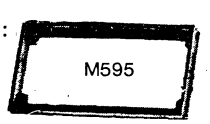
*** BEZEL ADAPTOR**

By using this adaptor our "Q" range rocker switches will convert to fit cut-outs 1.125" x .550" (Ref. 'R').



Model M595 can be ordered in following colors:

1=Brown 2=Red 3=Orange
4=Yellow 5=Green 8=Grey
9=White 0=Black

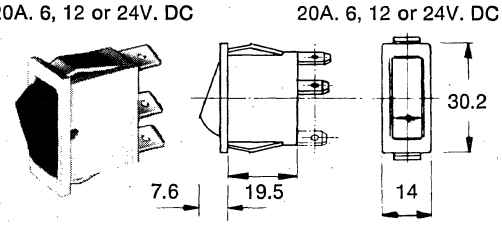


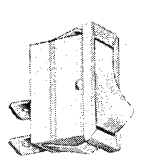
LIGHTED ROCKER

12V, 125 and 250V

5400 Ranges:
10A. 250V AC. Resistive
3A. 250V AC. Inductive
20A. 6, 12 or 24V. DC

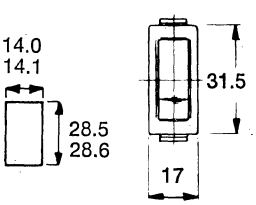
5500 Ranges:
16A. 250V AC. Resistive
4A. 250V AC. Inductive
20A. 6, 12 or 24V. DC

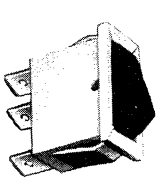




Sloping beveled bezel in matt "soft" look style. Snap in mounting without bezel adapter.

ON/OFF





ON/OFF with light Flat Rocker only

16A. 250V AC. Resistive
4A. 250V AC. Inductive
20A. 6, 12, or 24V. DC

SEE OTHER "EEM" PAGES B•1018-1020 FOR INDICATOR LIGHTS.

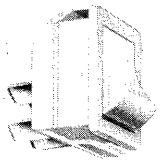
9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 19-4645

ARCOLECTRIC CORPORATION

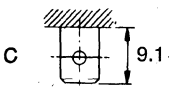
Terminal Letter + Style No. + Rocker Letter + Details Letter Body +

C 1453 V A

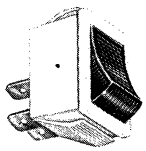
The above approvals cover the majority of models in these ranges, but not necessarily all versions.

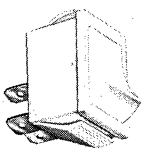


Terminations



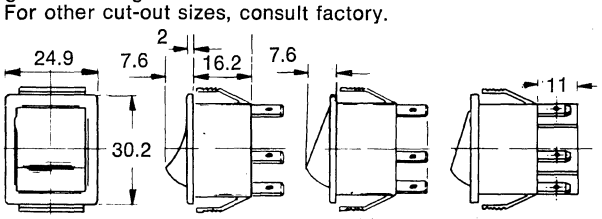
6.3 Tab Terminal 0.8mm thick





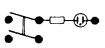
Panel thickness between .75 and 3.3mm.

Standard rocker and body colors black, white and red.
Lighted models lens colors red, amber or green—voltages 125V or 250V.
For other cut-out sizes, consult factory.

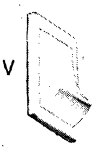


Curved Rocker | Flat Rocker | With M441 Terminal Barrier

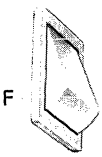
For splash proof version consult factory.

	Function	Style No. 10 AMP 125/250VAC	Style No. 16 AMP 125/250VAC
	ON/OFF	1450	1550
	ON/OFF with light	1453	1553
	2-position changeover	1460	1560
	3-position changeover centre off	1470	1570
	3-position changeover centre off Momen. 1-side	1471	1571
	3-position changeover centre off Momen. 2-sides	1472	1572
	S.P. Switch with Light	1458	1558
	Single Pole changeover Isol. Light	1466	1566
	D.P. Switch Light in one Line	1490	1590

Rocker Code

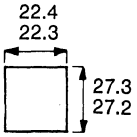


Curved



Flat

PANEL CUT-OUT

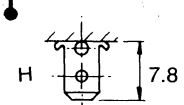


REF 'A'

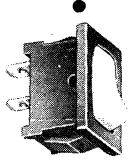
6 AMP 125/250VAC
10 AMP 125/250VAC

Terminal Letter + Style No. + Rocker Letter + Body Detail Letter + Body Color + Rocker Color

H 8400 V B Black White

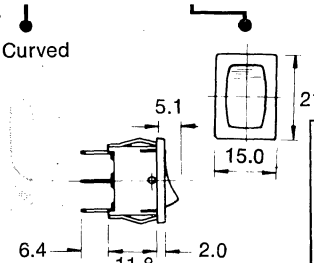


4.8 Tab Terminal 0.8mm thick

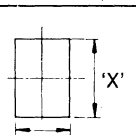


8400 Single Pole ON/OFF | 8410 Single Pole 2 Position

V Curved

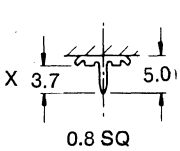


Body Colors (Specify) | Matt Only | Rocker Colors (Specify)

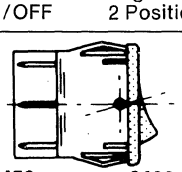


PANEL CUT-OUT B

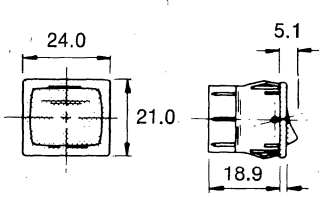
Panel Thickness	Dimn. 'X'	Dimn. 'Y'
0.75-1.25	19.2/19.1	13.0/12.9
1.25-2.0	19.4/19.3	13.0/12.9
2.0-3.0	19.8/19.7	13.0/12.9



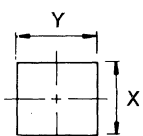
0.8 SQ



8450 Double Pole ON/OFF | 8460 Double Pole 2 Position



DOUBLE POLE
PANEL CUT-OUT B



Panel Thickness	Dimn. 'X'	Dimn. 'Y'
0.75-1.25	19.2/19.1	21.9/22.0
1.25-2.0	19.4/19.3	21.9/22.0
2.0-3.0	19.8/19.7	21.9/22.0

For other circuits contact factory.

SEE OTHER "EEM" PAGES B•1018-1020 FOR INDICATOR LIGHTS.

9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 19-4645

ARCOLECTRIC CORPORATION

1800 10 AMP 125/250VAC **T85** **1700** 16 AMP 125/250VAC **T85**

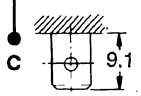
TO ORDER USE THE FOLLOWING METHOD:

Terminal Letter + Style No. + Lever Letter

Example C 1810 H

C 1810 H Black

This means a single pole two position change-over switch with 6.3mm tab terminals, and black H shape lever.

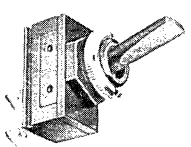


6.3 Tab Terminal 0.8mm thick

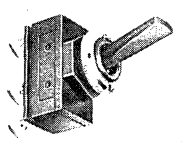
Style No. 1700 range 16A 1800 range 10A

Lever Letter

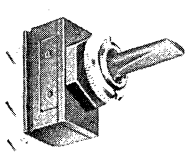
SINGLE POLE



C 1800 H

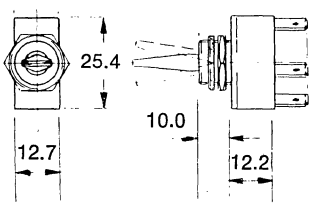


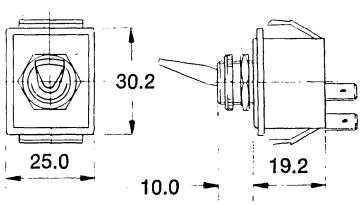
C 1810 H



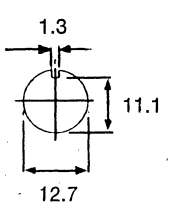
C 1820 H

Terminal Number		
ON/OFF	1700 1800	G
ON/OFF Momen. on	1801	H
ON-ON	1710 1810	N
ON-OFF-ON	1720 1820	





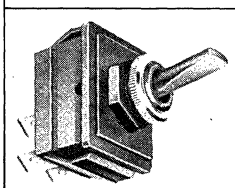
12.7mm panel hole, or cut-out of following size:



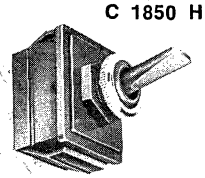
Max. Panel thickness: 3.5mm. This may be increased by omitting back nut.

Chrome finish slotted fixing rings are supplied.

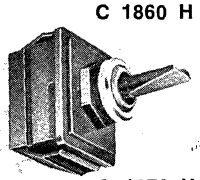
DOUBLE POLE



C 1850 H



C 1860 H



C 1870 H

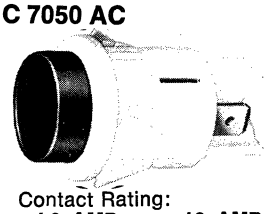
Terminal Number		G
ON/OFF	1750 1850	H
ON-ON	1760 1860	
ON-OFF-ON	1770 1870	

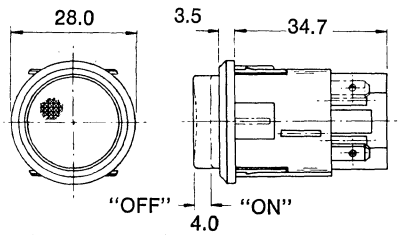
SEE OTHER "EEM" PAGES B•1018-1020 FOR INDICATOR LIGHTS.

9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 19-4645

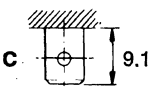
ARCOLECTRIC CORPORATION

C 7050 AC

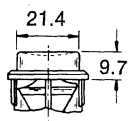




Contact Rating:
10 AMP 125/250VAC **16 AMP 125/250VAC**
20A. 6, 12 or 24V. DC
Snap-in fixing into panels, thickness between 0.8 and 5mm
STANDARD BODY COLORS:
Switch only black matt.
Light only 12V black matt, Light only 125V white matt.
Lighted Switch 12V black matt, Lighted Switch 125V white matt.
For other variations and approval listings, consult factory.

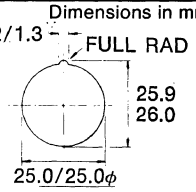


ROUND



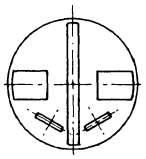
Ref. 'A'

Dimensions in mm

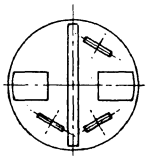


Ref. 'C'

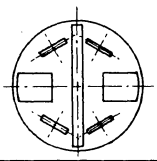
Rear View SP



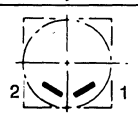
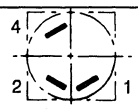
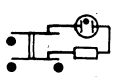
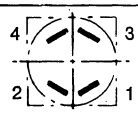
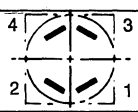
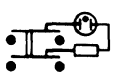
Rear View SP Illuminated



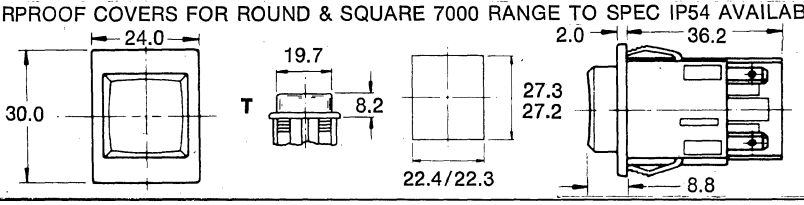
Rear View DP



C = Terminal type, 7000 = Circuit, A = Button Type. C = Cut-out, + Body color, + Button or lens color, + Voltage.
CATALOG NUMBERS SHOWN ARE FOR 16 AMP VERSIONS

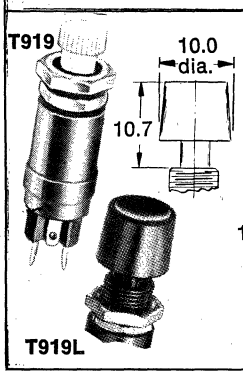
Style		Action	Color Button or Lens	Non Lighted	Lighted 12 Volt Filament Lamps	Lighted 125VAC Neon Tubes
		Single Pole ON/OFF Alternate	Black Green Red	C7000ACBB C7000ACBG C7000ACBR		
		Single Pole ON/OFF Momentary	Black Green Red	C7001ACBB C7001ACBG C7001ACBR		
		Single Pole ON/OFF Alternate Illuminated	Amber Green Red		C7003ACBA7 C7003ACBG7 C7003ACBR7	C7003ACWA2 C7003ACWG2 C7003ACWR2
		Double Pole ON/OFF Alternate	Black Green Red	C7050ACBB C7050ACBG C7050ACBR		
		Double Pole ON/OFF Momentary	Black Green Red	C7051ACBB C7051ACBG C7051ACBR		
		Double Pole ON/OFF Alternate Illuminated	Amber Green Red			C7053ACWA2 C7053ACWG2 C7053ACWR2

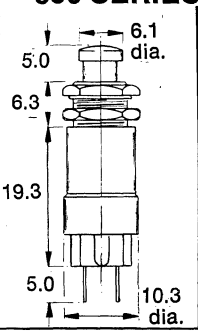
WATERPROOF COVERS FOR ROUND & SQUARE 7000 RANGE TO SPEC IP54 AVAILABLE

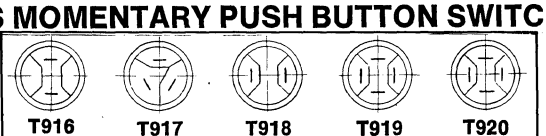


Square version of above series, consult factory for further information.

900 SERIES MOMENTARY PUSH BUTTON SWITCHES 0.5A 250V AC







T916 Push for ON N/O		Max. plunger movement 2.5
T917 Change-over	50 Volt only	
T918 Push for OFF N/C		
T919 2-Circuit		
T920 Push for ON N/O		

Fixing necks:
7.04
6.95 dia. x 40 TPI Whit.
Panel hole: 7.1 dia.
Operating pressure:
600 gr. approx.
To order large button add "L" to p.n.
Black, Red, White, or Green.
Selfcleaning silver plated contacts.
Slow make and break action.
Max. panel thickness:
Both nuts 2.5. Less Back nut 4.0.

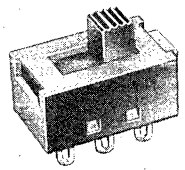
SEE OTHER "EEM" PAGES B•1018-1020 FOR INDICATOR LIGHTS.

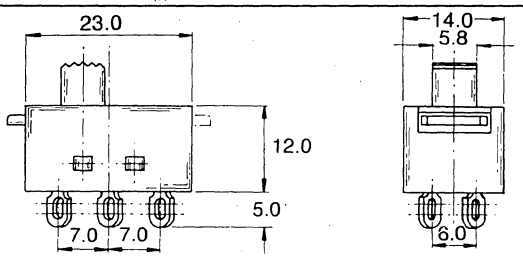
9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 19-4645

ARCOLECTRIC CORPORATION

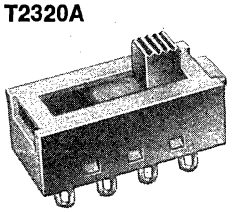
2000 SERIES
SLIDE SWITCHES 6 AMP and 12 AMP Approvals Pending

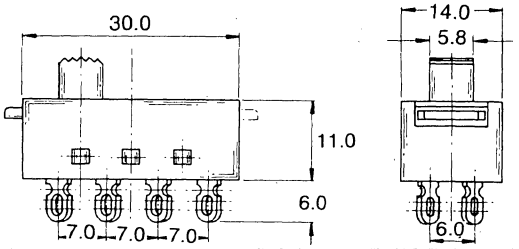
T2220A



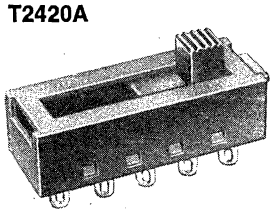


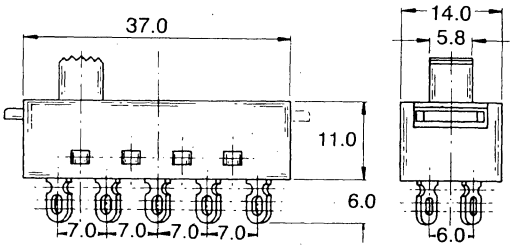
T2320A



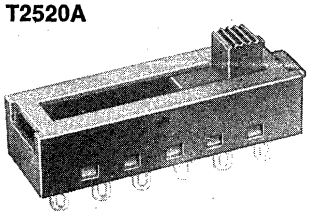


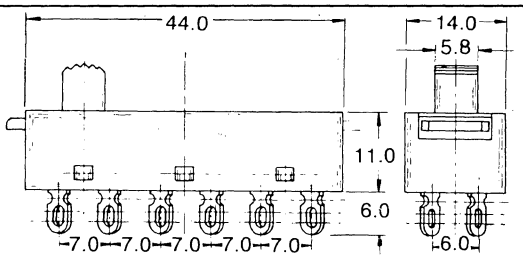
T2420A



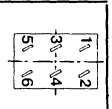


T2520A

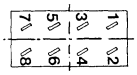




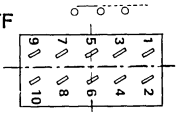
These Style Nos. are for switches with No. 0 slider. Change last figure for alternatives.



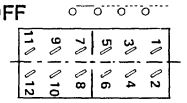
2210 2-Pos. C/O
2230 ON/OFF
2220 2-Pos C/O
2240 ON/OFF



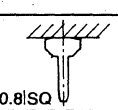
2310 3-Position
2330 3 Position Including OFF
2320 3-Position
2340 3-Position Including OFF



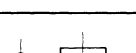
2410 4-Position SP
2430 4-Position SP Including OFF
2420 4-Position DP
2440 4-Position DP Including OFF



2510 5-Position SP
2530 5-Position SP Including OFF
2520 5-Position DP
2540 5-Position DP Including OFF

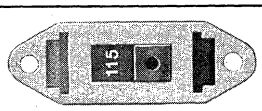


Printed Circuit Terminal **'X'**



Panel Cut-out **'B'**

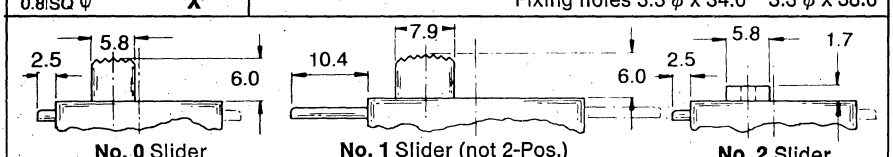
	2-Position	3-Position
Cut-out	13.3 x 6.25	22.3 x 6.25
Fixing holes	3.3 ϕ x 34.0	3.3 ϕ x 38.0

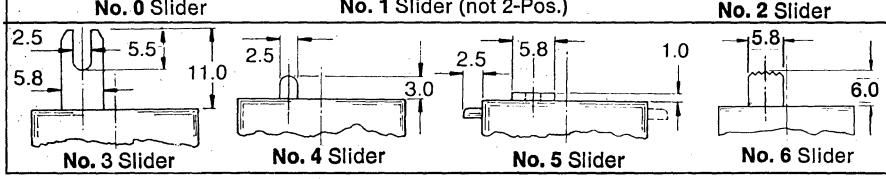


'A' (at rear of Style No.) = standard version, as illustrated.
'B' (in place of **'A'**) = flanged version, for 2-hole fixing, see small drawing **'B'**.

Solder tag terminals. When ordering with these terminals, place letter **'T'** in front of Style No.

Printed circuit board terminals. When ordering with these terminals, place letter **'X'** in front of Style No. See small drawing.



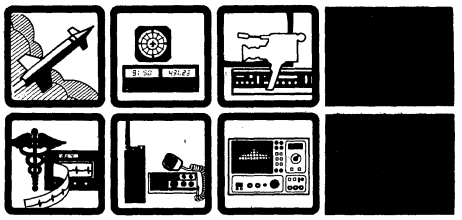


SEE OTHER "EEM" PAGES B•1018-1020 FOR INDICATOR LIGHTS.

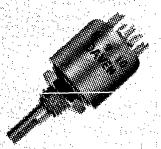
9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 19-4645

Daven

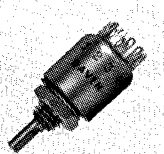
Miniature Switches



NEW!



C, G/K & 126/127 Series



NEW!

P Series

½ Inch C Series (Die Cast)
Competitively Priced

Subminiature C Series rotary switches are available in one pole, (2- to 12-position) through four pole, (2- and 3-position) types.

- ☐ Internal construction identical to military switches for long life
- ☐ Indexing: 30°, 36°, 45°, 60°
- ☐ Shorting or non-shorting
- ☐ Pin compatible with other major manufacturers

Ask for Bulletin 14/C-STD

½ Inch G/K Series
Military Approved

Subminiature G Series (sealed) and K Series (unsealed) rotary switches are available in one-pole (2- to 12-position) through four-pole (2- and 3-position) types.

- ☐ Shorting or non-shorting
- ☐ Switching capacity: up to 1 Amp
- ☐ Indexing: 30°, 36°, 45°, 60°
- ☐ QPL per MIL-S-3786/20E
- ☐ Ideally suited for high shock and vibration applications

Ask for Bulletin 14/G-K

½ Inch BCD 126/127 Series
Coded Outputs

The Series 126 is available with up to 12 positions fixed stop or continuous rotation binary coded decimal (BCD) with 30° indexing. Its complement, the Series 127, is also furnished with up to 12 positions $\overline{BCD}$.

- ☐ Gold plated contacts and terminals
- ☐ P/C and standard solder terminals
- ☐ Pin compatible with other major manufacturers
- ☐ One piece bushing and housing

Ask for Bulletin 14/126 BCD

P Series

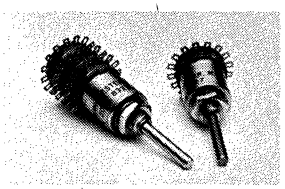
Subminiature P Series rotary switches are available in one-pole (up to 10 positions) and two-pole (up to 5 positions) types.

- ☐ Shorting or non-shorting
- ☐ Switching capacity: up to ½ Amp
- ☐ Indexing: 36°
- ☐ Printed circuit terminals
- ☐ Life: 25,000 cycles
- ☐ Sealed for wave soldering

S Series

The S Series provides up to 10 decks, 20 positions per deck (200 poles), in a miniature (¾" over terminals) bushing mounted rotary switch. Coded outputs.

Ask for Bulletins 14/S STD, 14/S BCD



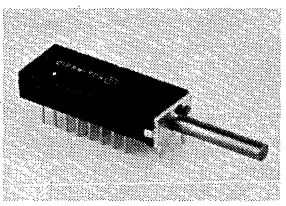
S Series

16-Pin DIPSWITCH®

Versatile 8-pole rotary switch. Application oriented features are:

- ☐ Any combination up to 8 contact closures in any shaft position
- ☐ Coded outputs
- ☐ 1.125 L x .440 W x .232 H
- ☐ 60°, 45°, 36° indexing

Also available is a 14-pin DIPSWITCH with any combination up to 6 contact closures in any shaft position.



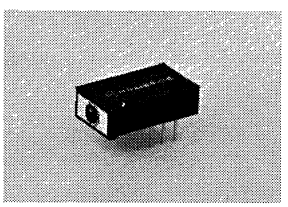
16-pin 12300 Series

8-Pin DIPSWITCH®

Versatile 4-pole, 8-pin rotary switch. Application oriented features are:

- ☐ Any combination up to 4 contact closures in any shaft position
- ☐ Coded outputs
- ☐ 35,000 cycle life @ .250 Amp
- ☐ .730 L x .440 W x .232 H
- ☐ 60°, 45°, 36° indexing

The 16, 14 and 8 pin switches are available with a bushing mounted front panel adapter.

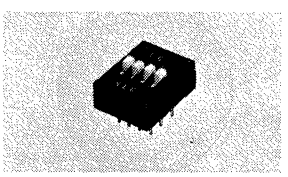


8-pin 12100 Series

Center-Off DIPSWITCH®

This 12-pin center-off DIPSWITCH provides four electrically isolated switches, each with distinct center-off positions. Switches may be simultaneously operated with our optional adapter. Low contact capacitance. Less than .5 pf.

Ask for Bulletin 18/DIP



Center-off 12000 Series

(Covers all DIPSWITCHES including the 14-pin 11700 series not shown above.)

For More Information

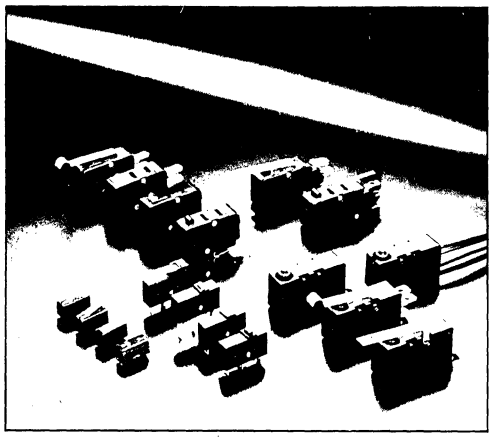
Many standard switches and accessories are available for immediate delivery from stock. Standard switches can be modified quickly and economically by our custom design service to meet special application requirements. Contact our sales department, or your local representative, for application assistance and prices. Detailed information is available in free bulletins as noted.

ARMTEC

Daven Components Group
Manchester Airport, Manchester, NH 03103 Tel: (603) 669-0940 TWX: 710 220 1747

Armtec Industries, Inc.

High Reliability Versatile Range SNAP-ACTION SWITCHES



Aromat Snap-Action Switches Help You to Increase the Total Reliability of Your Equipment.

Aromat snap-action switches can solve all the environmental and contact problems which you may encounter.

- For low-level circuits—Low-level circuit types
- For low-level, stand-by circuits—Bifurcated contact types
- In adverse environments—AH8 miniature switches
- In high ambient temperature—AH7 heat resistant types
- For low-level circuits in high ambient temperature—AH7 heat resistant, low-level circuit types

Switch Selector Chart

Size	Type		Features	O.F. by pin plunger (g, max.)	Contact capacity (250 V AC, cos φ ≒ 1) 0.5 1 3 5 10 15(A)	Max. contact rating (resistive)	Low-level rating	Expected life (min. ope.) Electrical	Mechanical
Miniature	AH7	Standard	• Extra long-lived spring mechanism	200, 400, 600		15A 250VAC	—	10^5	10^7
				100		10A 250VAC			
				50		5A 250VAC			
		Low-level circuit	• High contact reliability in low-level circuit	25, 50, 100, 200		3A 250VAC	5mA 6VDC 2mA 12VDC 1mA 24VDC	10^5	10^7
				15		1A 250VAC			
		Heat resistant	• Continuous use at 120°C (248°F) possible	200, 400, 600		15A 250VAC	—	10^5	10^7
				100		10A 250VAC			
				50		5A 250VAC			
		Heat resistant, low-level circuit	• High contact reliability in low-level circuit • Continuous use at 120°C (248°F) possible	25, 50, 100, 200		3A 250VAC	5mA 6VDC 2mA 12VDC 1mA 24VDC	10^5	10^7
				15		1A 250VAC			
	AH8	Terminal sealed	• Sealed construction for use in adverse environments	300		3A 250VAC	5mA 6VDC 2mA 12VDC 1mA 24VDC	10^5	3×10^6
		Wire sealed	• Sealed construction for use in adverse environments	300		3A 250VAC	5mA 6VDC 2mA 12VDC 1mA 24VDC	10^5	3×10^6
	AH4	Standard	• Wide insulation distance • High dielectric strength	35	(125VAC)	5A 125VAC	—	5×10^4	10^6
					(250VAC)	3A 250VAC			
	AV5		• High contact rating of 21 A 250 VAC • Continuous use at 100°C (212°F) possible	300 400 600	21A	21A 250VAC	—	10^5	10^7
Subminiature	AH3	Standard	• High contact reliability and welding resistance	180		5A 250VAC	—	10^5	10^7
				50		3A 250VAC			
		Low-level circuit	• High contact reliability in low-level circuit	50, 180		3A 250VAC	5mA 6VDC 2mA 12VDC 1mA 24VDC	10^5	10^7
				25		2A 250VAC			
	AV3	Standard	• High contact reliability and welding resistance	50, 100		3A 250VAC	—	5×10^4	5×10^5
		Low-Level circuit	• High contact reliability in low-level circuit	50, 100		3A 250VAC	5mA 6VDC 2mA 12VDC 1mA 24VDC	5×10^4	5×10^5
Ultra-miniature	AH1	Standard	• Ultra-miniature size (6×12.7×6 mm) • Flux-resistant construction	150	(125VAC)	3A 125VAC	—	3×10^4	3×10^5
		Low-level circuit	• High contact reliability in low-level circuit	150	(125VAC)	3A 125VAC	5mA 6VDC 2mA 12VDC 1mA 24VDC	3×10^4	3×10^5

For detailed information, contact Aromat at your nearest address.

Northeast Sales Offices
250 Sheffield St.,
Mountainside, NJ 07092
Tel: (201) 232-4260
TWX: 710-997-9536

Southeast Sales Offices
2480 Sand Lake Rd.,
Orlando, FL 32809
Tel: (305) 855-1075
TWX: 810-850-0256

North Central Sales Offices
311 Lively Blvd.,
Elk Grove Village, IL 60007
Tel: (312) 593-8535
TWX: 910-222-1423

South Central Sales Offices
850 East Arapaho Road,
Suite 210, Richardson, TX 75081
Tel: (214) 235-0415

Northwest Sales Offices
10400 North Tantau Ave.,
Cupertino, CA 95014
Tel: (408) 446-5000
TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street,
Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

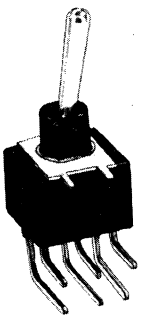
Canada
Aromat Canada Inc.
919 Kamato Road
Mississauga, Ontario
Canada L4W 2R5
Tel: (416) 624-3777

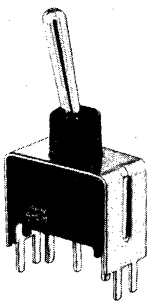
Our second decade of advanced relay technology.

Aromat®
Member of Matsushita Group

COOPER INDUSTRIES
ARROW HART
103 HAWTHORN STREET/HARTFORD, CT 06101/(203) 249-8471

ARROW HART WASHABLE MINIATURE SWITCHES





Electrical Specifications

Class	Minimum	Maximum	Contact Option	With Approval Code 1
Low-level	10mA, 50mVAC or DC 10μA, 5VAC or DC	.4VA, 20VAC or DC	"B" Gold	Not applicable
Power	100mA, 10VAC or DC	5A, 125VAC 2A, 250VAC	"Q" Silver	UL, CSA pending
Low-level or Power (See Note below)	10mA, 50mVAC or DC 10μA, 5VAC or DC OR 100mA, 10VAC or DC	.4VA, 20VAC or DC OR 5A, 125VAC 2A, 250VAC	"G" Gold over silver	UL, CSA pending

All loads resistive	
Life:	Circuit 01: 100,000 switch operations. All other circuits: 50,000 switch operations
Initial Contact Resistance:	10 milliohms maximum @ 50 millivolts, 10 milliamps
Dielectric Strength:	1000 VRMS minimum
Insulation Strength:	1000 megohms minimum

NOTE: The advantage of gold plate on silver is that the switch can be used in low-level circuits with loads of 0.4 VA and below as well as in circuits with a maximum load of 5 amps at 125VAC. If the low-level rating is exceeded, the gold plating is removed from the contact, rendering the switch unusable at low-levels.

Mechanical Specifications

Temperature Range:	
Operating:	−20°C to +85°C (−4°F to +185°F)
Storage:	−40°C to +85°C (−40°F to +185°F)
Materials:	
Contacts:	Brass with gold (B) or silver (Q) or both (G)
Terminals:	Brass with gold (B) and (G) or silver (Q) (tin-plate available on special basis)
Housing:	Thermoplastic, high temperature UL 94VO
Bracket/Support:	Tin-plated steel
Toggle:	Chrome-plated brass
Rocker:	Nylon 6/6
Approximate Net Weight:	SP: 2.50 grams (.09 oz) DP: 3.70 grams (.13 oz)

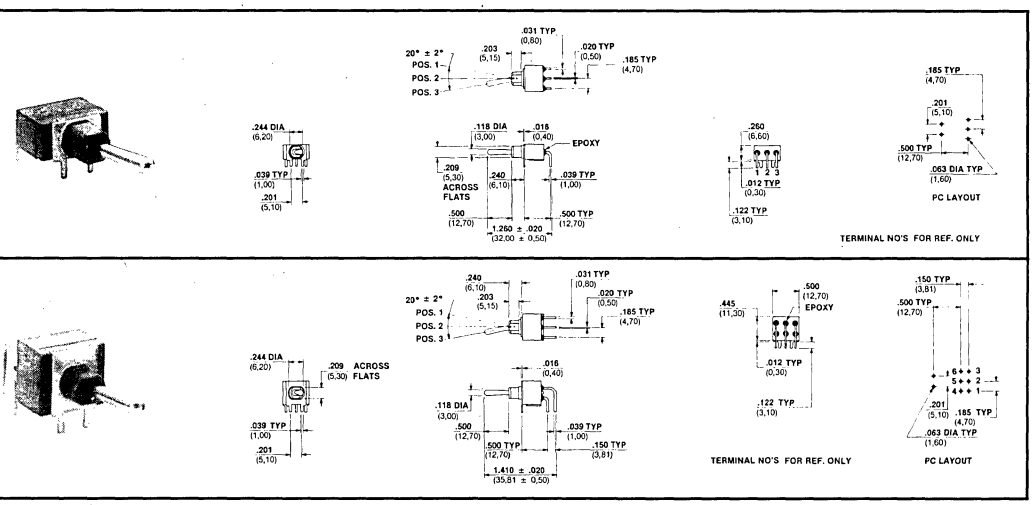
COOPER INDUSTRIES
ARROW HART
103 HAWTHORN STREET/HARTFORD, CT 06101/(203) 249-8471

L Series Washable Toggles

A TERMINATION OPTION

Switching Function			
MODEL NO.	Pos 3	Pos 2	Pos 1
L1010	ON	NONE	ON
L1030	ON	OFF	ON
L1050	(ON)	OFF	(ON)
L1070	ON	OFF	(ON)
L1080	ON	NONE	(ON)
Term. Conn.	2-3	OPEN	2-1
Schematic			

MODEL NO.	Pos 3	Pos 2	Pos 1
L2010	ON	NONE	ON
L2030	ON	OFF	ON
L2050	(ON)	OFF	(ON)
L2070	ON	OFF	(ON)
L2080	ON	NONE	(ON)
L2110	ON	ON	ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic			

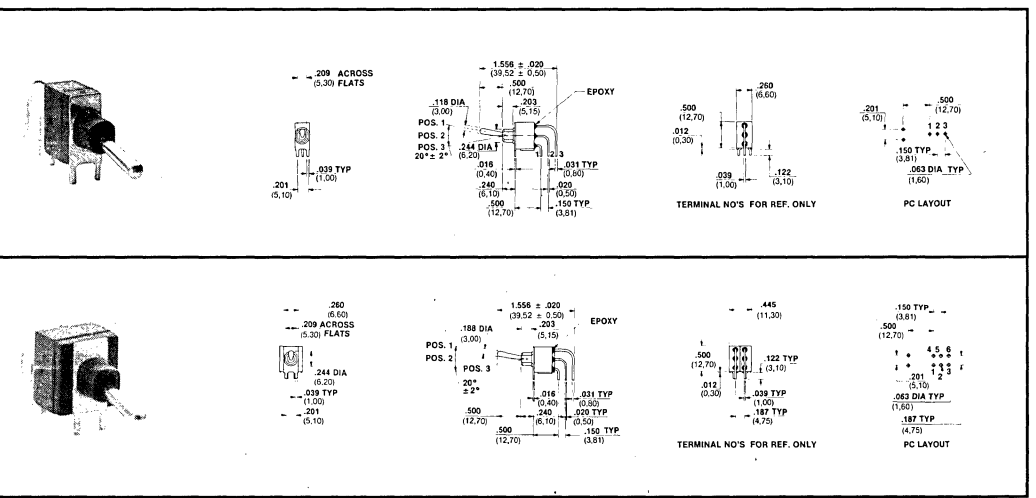


Circuit 11 Connections/Schematic on following page.

AV2 TERMINATION OPTION

Switching Function			
MODEL NO.	Pos 3	Pos 2	Pos 1
L1010	ON	NONE	ON
L1030	ON	OFF	ON
L1050	(ON)	OFF	(ON)
L1070	ON	OFF	(ON)
L1080	ON	NONE	(ON)
Term. Conn.	2-3	OPEN	2-1
Schematic			

MODEL NO.	Pos 3	Pos 2	Pos 1
L2010	ON	NONE	ON
L2030	ON	OFF	ON
L2050	(ON)	OFF	(ON)
L2070	ON	OFF	(ON)
L2080	ON	NONE	(ON)
L2110	ON	ON	ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic			

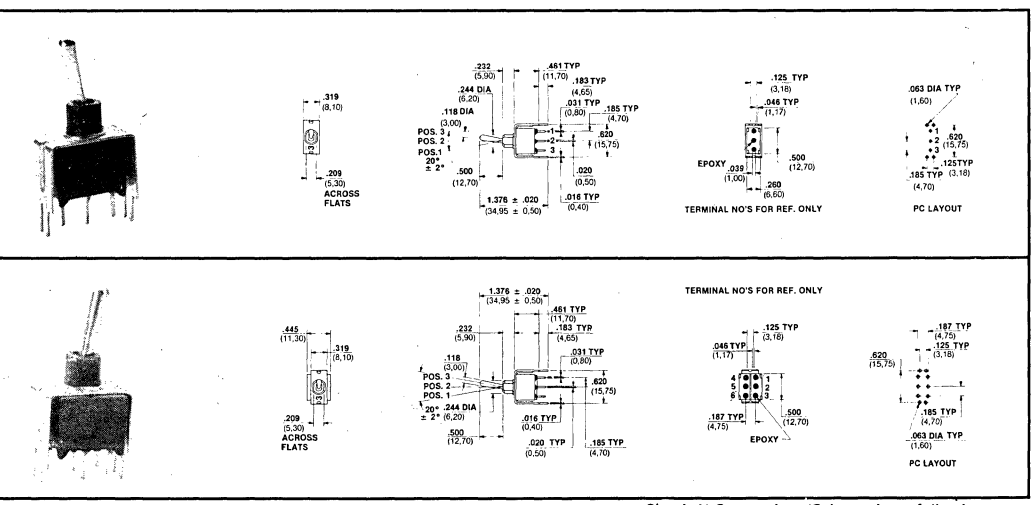


Circuit 11 Connections/Schematic on following page.

V30 TERMINATION OPTION

Switching Function			
MODEL NO.	Pos 3	Pos 2	Pos 1
L1010	ON	NONE	ON
L1030	ON	OFF	ON
L1050	(ON)	OFF	(ON)
L1070	ON	OFF	(ON)
L1080	ON	NONE	(ON)
Term. Conn.	2-3	OPEN	2-1
Schematic			

MODEL NO.	Pos 3	Pos 2	Pos 1
L2010	ON	NONE	ON
L2030	ON	OFF	ON
L2050	(ON)	OFF	(ON)
L2070	ON	OFF	(ON)
L2080	ON	NONE	(ON)
L2110	ON	ON	ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic			



Circuit 11 Connections/Schematic on following page.

COOPER INDUSTRIES
ARROW HART
103 HAWTHORN STREET/HARTFORD, CT 06101/(203) 249-8471

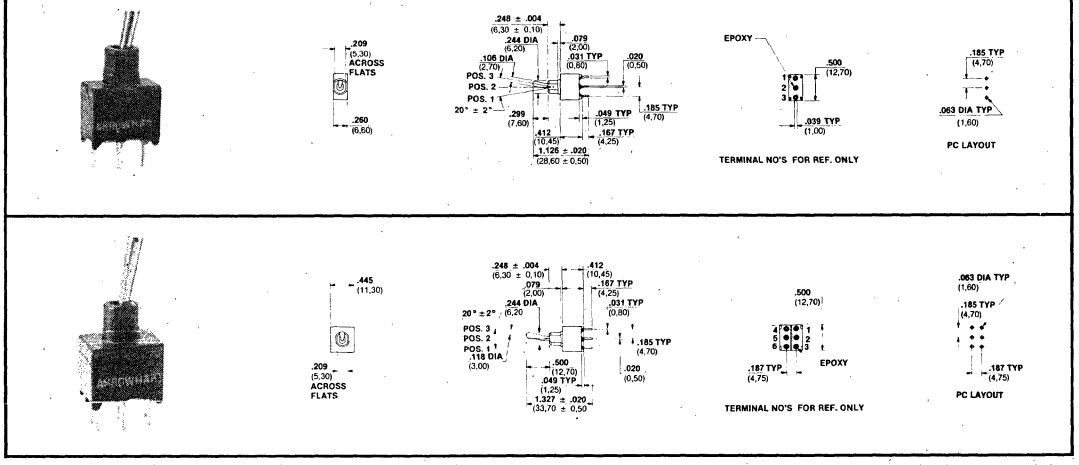
L Series Washable Toggles

C TERMINATION OPTION (Recommended ONLY for applications providing proper bushing support.)

Switching Function

MODEL NO.	Pos 3	Pos 2	Pos 1
L1010	ON	NONE	ON
L1030	ON	OFF	ON
L1050	(ON)	OFF	(ON)
L1070	ON	OFF	(ON)
L1080	ON	NONE	(ON)
Term. Conn.	2-3	OPEN	2-1
Schematic			

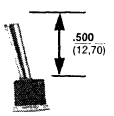
MODEL NO.	Pos 3	Pos 2	Pos 1
L2010	ON	NONE	ON
L2030	ON	OFF	ON
L2050	(ON)	OFF	(ON)
L2070	ON	OFF	(ON)
L2080	ON	NONE	(ON)
L2110	ON	ON	ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic			



Circuit 11 Connections / Schematic below.

Toggle Options

S

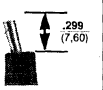


S1

Color chart below.

Plastic cap U270 may be ordered separately. Specify color per chart below. Example: U272 = Black

M



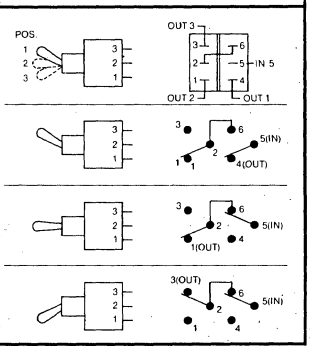
Contact/Rating Options

B Gold plate over brass. .4VA max. @ 20VAC or DC.

Q Silver plate over brass. 5A, 125VAC 2A, 250VAC

G Gold plate over silver plate. .4VA max. @ 20VAC or DC. OR 5A, 125VAC 2A, 250VAC

Circuit 11 Connections/Schematic



To specify switch, insert desired codes and suffixes. Write catalog number: L1010SCRV30BE* (example).
Packaging note: Add * to catalog number for 250/carton OEM packaging. Without *, packaging is 25/carton individually polybagged.

MODEL NO.

L	1	0	1	0	S		C	R	V	3	0	B	E	

SERIES	POLES NO.		CIRCUIT 3	2	1			APPROVALS TYPE	
L	SINGLE	1	ON	—	ON	0	1	NONE	0
	DOUBLE	2	ON	OFF	ON	0	3	(PENDING)	
			(ON)	OFF	(ON)	0	5		
			ON	OFF	(ON)	0	7		
			ON	—	(ON)	0	8		
			ON	ON	ON	1	1		

ACTUATOR TYPE		
STD. 12.7 mm	S	
STD. w/cap	S	1
SHORT 7.6 mm	M	

BUSHING TYPE		
O-RING INT.	C	R

TERMINATION TYPE			
HORIZ. MT. 4.7 × 12.7 mm	A		
VERT. MT. 3.81 × 12.7 mm	A	V	2
SUP. BKT. 12.8 × 15.75 mm	V	3	0
STRAIGHT PC 4.7	C		
.200" spacing available. Consult factory.			

CONTACT TYPE		SEAL TYPE	
GOLD	B	EPOXY	E
SILVER	Q		
Gold/ Silver	G		

COLOR (S1 Only)	
Blue	1
Black	2
Green	3
Grey	4
Yellow	5
Red	6
White	7
Orange	9

( ) indicates momentary

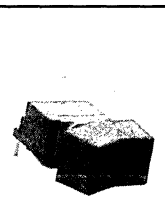
COOPER INDUSTRIES
ARROW HART
103 HAWTHORN STREET/HARTFORD, CT 06101/(203) 249-8471

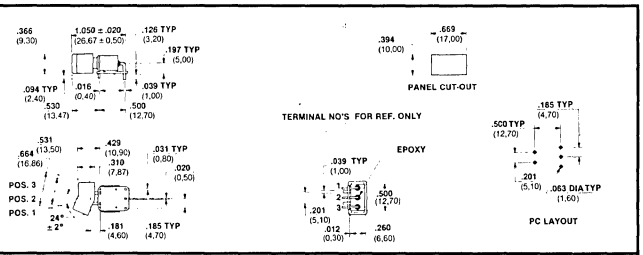
L Series Washable Rockers

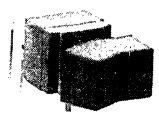
A TERMINATION OPTION

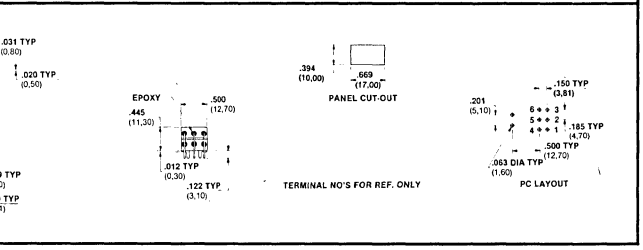
Switching Function			
MODEL NO.	Pos 3	Pos 2	Pos 1
L1010	ON	NONE	ON
L1030	ON	OFF	ON
L1050	(ON)	OFF	(ON)
L1070	ON	OFF	(ON)
L1080	ON	NONE	(ON)
Term. Conn.	2-3	OPEN	2-1
Schematic			

MODEL NO.	Pos 3	Pos 2	Pos 1
L2010	ON	NONE	ON
L2030	ON	OFF	ON
L2050	(ON)	OFF	(ON)
L2070	ON	OFF	(ON)
L2080	ON	NONE	(ON)
L2110	ON	ON	ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic			







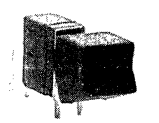


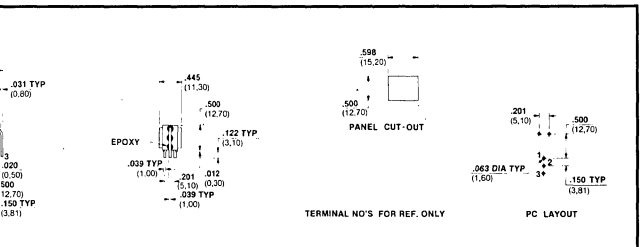
Circuit 11 Connections/Schematic on opposite page.

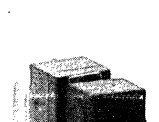
AV2 TERMINATION OPTION

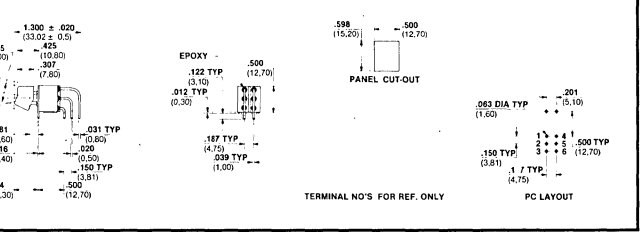
Switching Function			
MODEL NO.	Pos 3	Pos 2	Pos 1
L1010	ON	NONE	ON
L1030	ON	OFF	ON
L1050	(ON)	OFF	(ON)
L1070	ON	OFF	(ON)
L1080	ON	NONE	(ON)
Term. Conn.	2-3	OPEN	2-1
Schematic			

MODEL NO.	Pos 3	Pos 2	Pos 1
L2010	ON	NONE	ON
L2030	ON	OFF	ON
L2050	(ON)	OFF	(ON)
L2070	ON	OFF	(ON)
L2080	ON	NONE	(ON)
L2110	ON	ON	ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic			









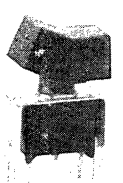
May differ from industry standard.

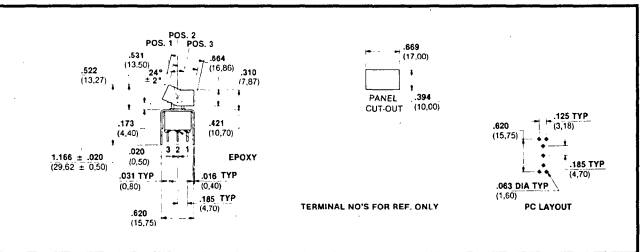
Circuit 11 Connections/Schematic on opposite page.

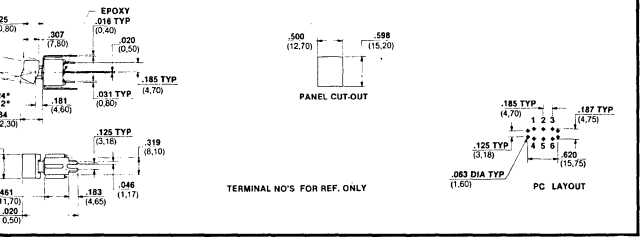
V3 TERMINATION OPTION

Switching Function			
MODEL NO.	Pos 3	Pos 2	Pos 1
L1010	ON	NONE	ON
L1030	ON	OFF	ON
L1050	(ON)	OFF	(ON)
L1070	ON	OFF	(ON)
L1080	ON	NONE	(ON)
Term. Conn.	2-3	OPEN	2-1
Schematic			

MODEL NO.	Pos	Pos 2	Pos 1
L2010	ON	NONE	ON
L2030	ON	OFF	ON
L2050	(ON)	OFF	(ON)
L2070	ON	OFF	(ON)
L2080	ON	NONE	(ON)
L2110	ON	ON	ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic			







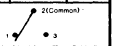
Circuit 11 Connections/Schematic on opposite page.

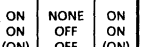
COOPER INDUSTRIES
ARROW HART
103 HAWTHORN STREET/HARTFORD, CT 06101/(203) 249-8471

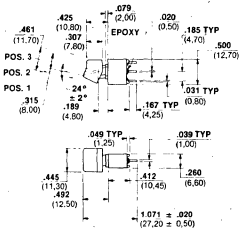
L Series Washable Rockers

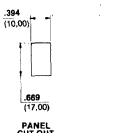
C TERMINATION OPTION (Recommended ONLY for applications providing proper bushing support.)

Switching Function

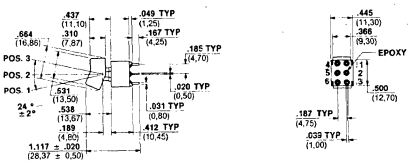
MODEL NO.	Pos 3	Pos 2	Pos 1
L1010	ON	NONE	ON
L1030	ON	OFF	ON
L1050	(ON)	OFF	(ON)
L1070	ON	OFF	(ON)
L1080	ON	NONE	(ON)
Term. Conn.	2-3	OPEN	2-1
Schematic			

MODEL NO.	Pos 3	Pos 2	Pos 1
L2010	ON	NONE	ON
L2030	ON	OFF	ON
L2050	(ON)	OFF	(ON)
L2070	ON	OFF	(ON)
L2080	ON	NONE	(ON)
L2110	ON	ON	ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic			





TERMINAL NO'S FOR REF. ONLY



Circuit 11 Connections / Schematic below.

Rocker Options (See drawings for dimensions.)

J	J1	J50
	Color chart below.	Color chart below.
This option is for use with rockers ordered separately.	Plastic rocker U2210 may be ordered separately. Specify color per chart below. Example: U2212 = Black	Plastic rocker U2420 may be ordered separately. Specify color per chart below. Example: U2422 = Black.

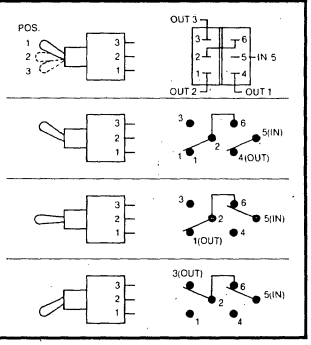
Contact/Rating Options

B Gold plate over brass. .4VA max. @ 20VAC or DC.

Q Silver plate over brass. 5A, 125VAC 2A, 250VAC

G Gold plate over silver plate. .4VA max. @ 20VAC or DC. OR 5A, 125VAC 2A, 250VAC

Circuit 11 Connections/Schematic



To specify switch, insert desired codes and suffixes. Write catalog number: L1010J1V3BE* (example).
Packaging note: Add * to catalog number for 250/carton OEM packaging. Without *, packaging is 25/carton individually polybagged.

MODEL NO.

L	1	0	1	0	J	1		V	3		B	E	

SERIES	POLES NO.		CIRCUIT 3	2	1			APPROVALS TYPE	
L	SINGLE	1	ON	—	ON	0	1	NONE	0
	DOUBLE	2	ON	OFF	ON	0	3	(PENDING)	
			(ON)	OFF	(ON)	0	5		
			ON	OFF	(ON)	0	7		
			ON	—	(ON)	0	8		
			ON	ON	ON	1	1		

ACTUATOR TYPE			
ROCKER OPT.	J		
ROCKER 13.5 mm	J	1	
ROCKER 15 mm	J	5	0

TERMINATION TYPE				
HORIZ. MT. 4.7 × 12.7 mm	A			
VERT. MT. 3.81 × 12.7 mm	A	V	2	
SUP. BKT. 12.8 × 15.75 mm	V	3		
STRAIGHT PC 4.7	C			
.200" spacing available. Consult factory.				

CONTACT TYPE		SEAL TYPE		COLOR (J1 J50)	
GOLD	B	EPOXY	E	Blue	1
SILVER	Q			Black	2
Gold/ Silver	G			Green	3
				Grey	4
				Yellow	5
				Red	6
				White	7
				Orange	9

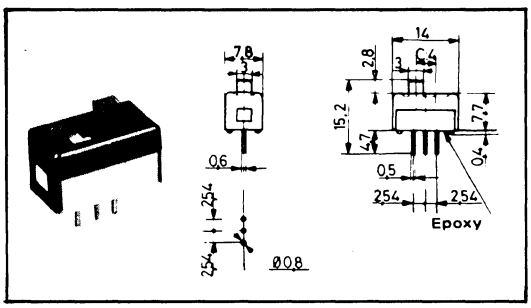
( ) indicates momentary

COOPER INDUSTRIES
ARROW HART
103 HAWTHORN STREET/HARTFORD, CT 06101/(203) 249-8471

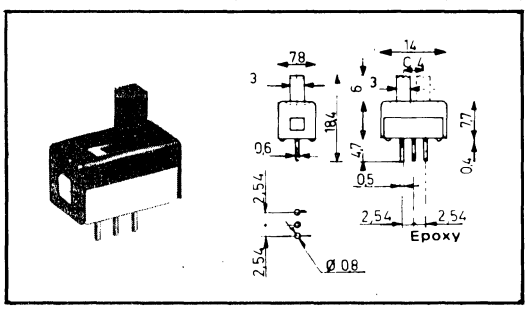
Miniature AC And DC Slide Switches
K Series - Single And Double Pole

Catalog Number Selection - Single Pole
Terminal Spacing 0.100 Inch (2,54 Millimeters)

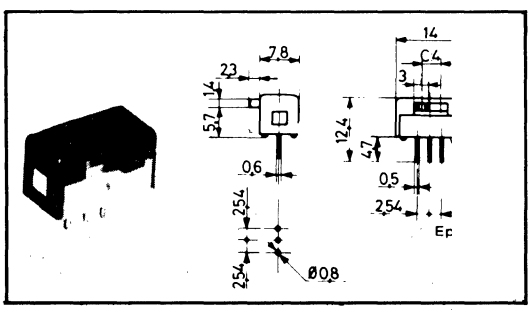
Rating	Circuit	Action	Lever Type	Type Of Termination	Catalog Number
Max.: 100mA, 30V DC Min.: 10μA, 5V DC: 10mA, 50mV	SPDT	On — On	Slide(VS2)	Straight PC(C)	K1010VS2CBE
Max.: 4A, 125V AC; 2A, 250V AC Min.: 100mA, 10V	SPDT	On — On	Slide(VS2)	Straight PC(C)	K1010VS2CQE
		On — On	Slide(HS1)	Straight PC(C)	K1010HS1CQE
		On — On	Slide(VS3)	Straight PC(C)	K1010VS3CQE



High Slide (VS2), Straight PC(C) - Single Pole



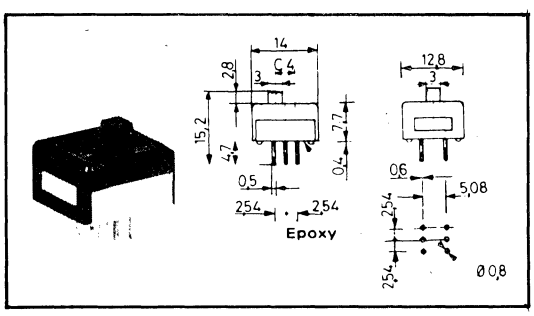
Extra High Slide(VS3), Straight PC(C) - Single Pole



Side Slide (HS1), Straight PC(C) - Single Pole

Catalog Number Selection - Double Pole
Terminal Spacing 0.100 Inch (2,54 Millimeters)

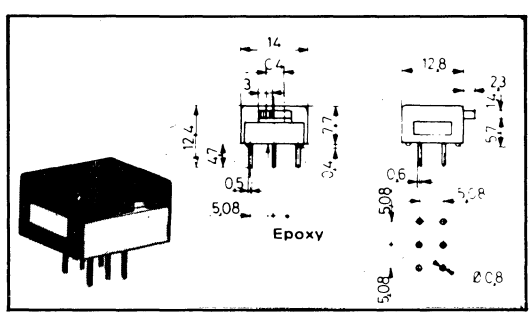
Rating	Circuit	Action	Lever Type	Type Of Termination	Catalog Number
Max.: 100mA, 30V DC Min.: 10μA, 5V DC: 10mA, 50mV	DPDT	On — On	Slide(VS2)	Straight PC(C)	K2010VS2CBE
Max.: 4A, 125V AC; 2A, 250V AC Min.: 100mA, 10V	DPDT	On — On	Slide(VS2)	Straight PC(C)	K2010VS2CQE



High Slide(VS2), Straight PC(C) - Double Pole

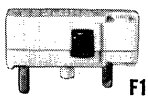
Catalog Number Selection - Double Pole
Terminal Spacing 0.200 Inch (5,08 Millimeters)

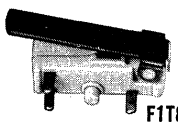
Rating	Circuit	Action	Lever Type	Type Of Termination	Catalog Number
Max.: 4A, 125V AC 2A, 250V AC Min.: 100mA, 10V	DPDT	On — On	Slide(HS1)	Straight PC(C2)	K2010HS1C2QE

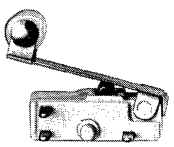


Side Slide(HS1), Straight PC(C2) - Double Pole

Burgess Precision Switches
BURGESS SWITCH CO., INC.
638 Anthony Trail, Northbrook, Illinois 60062
Telephone (312) 291-1760 / Telex 206774


F1T8


F1T8Y1

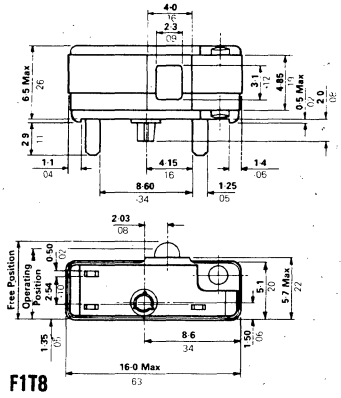

F1T8YR1

ULTRA MINIATURE MICRO SWITCHES
F1 SERIES

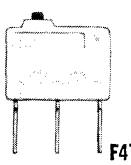
Low profile switches with side-protruding, gold-flashed terminals for printed circuit boards. Mounting by terminals assisted by moulded spigot. Low and standard force, changeover switching mechanisms. Contacts normally silver; add '-GP' to reference for gold. Plunger, plain lever or roller-lever may be depressed to case in overtravel.

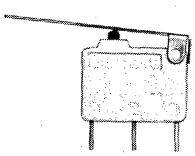
Ordering Reference	Actuator	Dimensions L	B	H	Actuating Force N	Ozf	Rec. max. Rating 125/250 VAC
F1T8	Plunger	16	10	7	1.4	5	5
F12T8	Plunger	16	10	7	0.5	1.8	2
F1T8Y1	Lever	20	10	11	0.5	1.8	5
F12T8Y1	Lever	20	10	11	0.2	0.6	2
F1T8YR1	Roller-lever	19	10	16	0.5	1.8	5
F12T8YR1	Roller-lever	19	10	16	0.2	0.6	2

A variety of different lever lengths (to 2¼") and shapes are available.



F1T8


F4T6

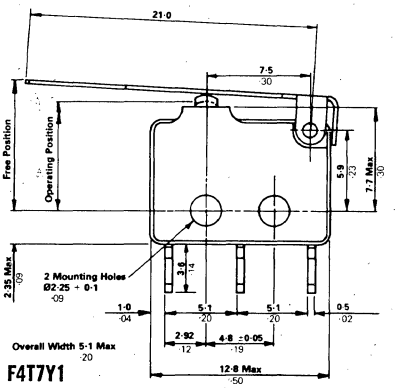

F4T7Y1

F4 SERIES

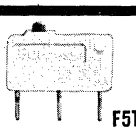
Similar to F5 Series but provided with side mounting holes. Changeover mechanism, recommended maximum rating 7 Amperes at 125/250 volts AC. Silver or gold contacts — add '-GP' to reference for the latter. Plunger, plain lever or cam-following lever actuators, all may be depressed to case in overtravel. 2 mm quick connect tab (QC in table) or solder tag terminals.

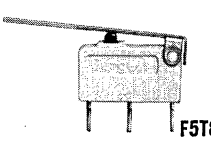
Ordering Reference	Actuator	Terminals	Dimensions L	B	H	Actuating Force N	Ozf
F4T6	Plunger	QC	13	5	18	1.2	4.3
F4T7	Plunger	Solder	13	5	15	1.2	4.3
F4T6Y1	Plain lever	QC	23	5	20	0.4	1.4
F4T7Y1	Plain lever	Solder	23	5	17	0.4	1.4
F4T6YC	Cam lever	QC	21	5	23	0.5	1.7
F4T7YC	Cam lever	Solder	21	5	21	0.5	1.7

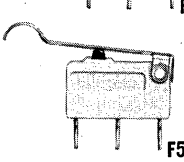
MF4 Lug mounting frame for all F4 models. Switch secured without screws.



F4T7Y1


F5T8

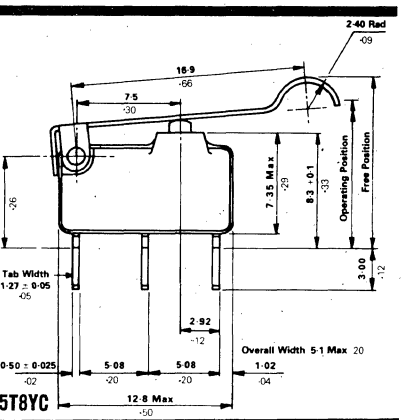

F5T8Y1


F5T8YC

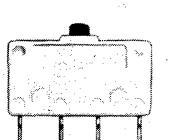
F5 SERIES

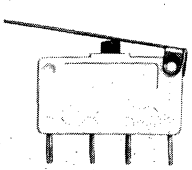
One of the world's smallest precision switches with power capabilities, the F5T8 has no mounting holes and may be mounted on a printed circuit board by means of its 5.08 mm pitched, gold-flashed, base-protruding terminal tags. Also available with plain or cam-following lever actuators. Changeover switching mechanism, recommended maximum rating 7 amperes at 125/250 volts AC resistive load. Silver contacts or add '-GP' to reference for gold. Actuators may be depressed to case in overtravel.

Ordering Reference	Actuator	Dimensions L	B	H	Actuating Force N	Ozf
F5T8	Plunger	13	5	12	1.2	4.3
F5T8Y1	Plain lever	23	5	14	0.4	1.4
F5T8YC	Cam lever	21	5	15	0.5	1.7



F5T8YC

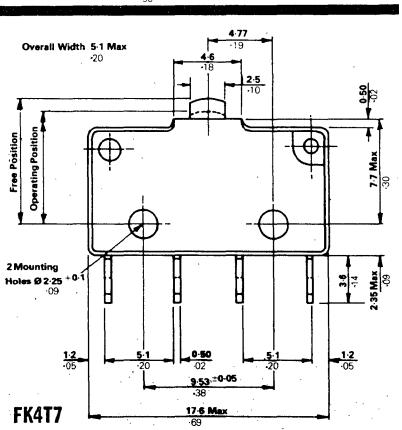

FK4T6


FK4T7Y1

FK4 SERIES

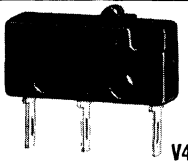
Double-break, two-circuit switches with four terminals. They are slightly smaller than V4 Series switches but have interchangeable mounting position. Lever actuators and terminals as for F4 Series. Recommended maximum rating 7 amperes, 125/250 VAC. Silver contacts, or add '-GP' to references for gold. All actuators may be depressed to case in overtravel.

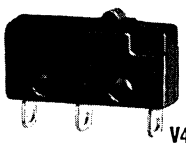
Ordering Reference	Actuator	Terminals	Dimensions L	B	H	Actuating Force N	Ozf
FK4T6	Plunger	QC	18	5	18	1.5	5.4
FK4T7	Plunger	Solder	18	5	15	1.5	5.4
FK4T6Y1	Plain lever	QC	21	5	21	0.5	1.8
FK4T7Y1	Plain lever	Solder	21	5	18	0.5	1.8
FK4T6YC	Cam lever	QC	21	5	22	0.7	2.3
FK4T7YC	Cam lever	Solder	21	5	19	0.7	2.3

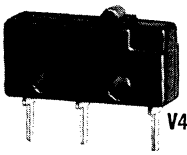


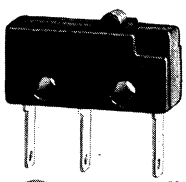
FK4T7

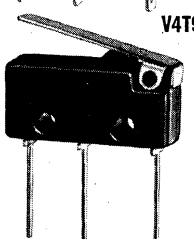
Burgess Precision Switches
BURGESS SWITCH CO., INC.
638 Anthony Trail, Northbrook, Illinois 60062
Telephone (312) 291-1760 / Telex 206774

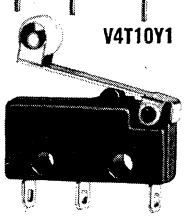

V4T6


V4T7


V4T8


V4T9


V4T10Y1


V4T7YR1

SUB-MINIATURE MICRO SWITCHES
V4 SERIES

Popular sub-miniature, changeover Micro Switches. Standard and low-force mechanisms; plunger, plain lever and roller-lever actuators all capable of being depressed to the case in over-travel; four types of terminals. Contacts normally silver, but models marked * also available with gold contacts; add '-GP' to reference.

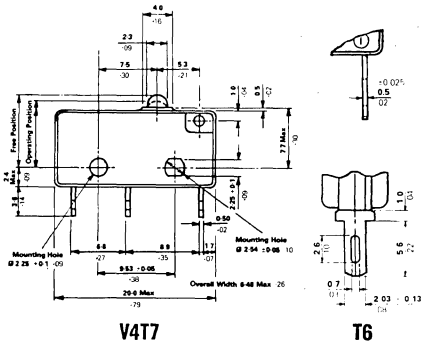
Ordering Reference	Actuator	Terminals	Dimensions L	B	H	Actuating Force N	Ozf	Rec. Max. Rating 125/250 VAC
V4T6*	Plunger	2mm QC	20	6	18	1.4	5	5
V42T6*	Plunger	2mm QC	20	6	18	0.5	1.7	2
V4T7*	Plunger	Solder	20	6	15	1.4	5	5
V42T7*	Plunger	Solder	20	6	15	0.5	1.7	2
V4T8*	Plunger	PC tab	20	6	17	1.4	5	5
V42T8*	Plunger	PC tab	20	6	17	0.5	1.7	2
V4T9*	Plunger	2.8mm QC	20	6	20	1.4	5	5
V42T9*	Plunger	2.8mm QC	20	6	20	0.5	1.7	2
V4T10	Plunger	Wire-wrap	20	6	20	1.4	5	5
V4T6Y1*	Plain lever	2mm QC	21	6	22	0.5	1.7	5
V42T6Y1*	Plain lever	2mm QC	21	6	22	0.2	0.7	2
V4T7Y1*	Plain lever	Solder	21	6	19	0.5	1.7	5
V42T7Y1*	Plain lever	Solder	21	6	19	0.2	0.7	2
V4T8Y1*	Plain lever	PC tab	21	6	21	0.5	1.7	5
V42T8Y1*	Plain lever	PC tab	21	6	21	0.2	0.7	2
V4T9Y1*	Plain lever	2.8mm QC	21	6	24	0.5	1.7	5
V42T9Y1*	Plain lever	2.8mm QC	21	6	24	0.2	0.7	2
V4T10Y1	Plain lever	Wire-wrap	21	6	24	0.5	1.7	5
V4T6YR1*	Roller lever	2mm QC	21	6	24	0.5	1.7	5
V42T6YR1	Roller lever	2mm QC	21	6	24	0.2	0.7	2
V4T7YR1*	Roller lever	Solder	21	6	21	0.5	1.7	5
V42T7YR1*	Roller lever	Solder	21	6	21	0.2	0.7	2
V4T8YR1	Roller lever	PC tab	21	6	23	0.5	1.7	5
V42T8YR1	Roller lever	PC tab	21	6	23	0.2	0.7	2
V4T9YR1	Roller lever	2.8mm QC	21	6	26	0.5	1.7	5
V42T9YR1	Roller lever	2.8mm QC	21	6	26	0.2	0.7	2
V4T10YR1	Roller lever	Wire-wrap	21	6	32	0.5	1.7	5

A variety of different lever lengths (to 2¼") and shapes are available including cam-followers.

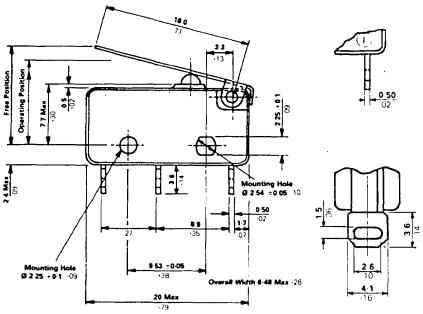
HIGH TEMPERATURE MODEL
Suitable for continuous service in temperatures up to 150°C. Otherwise as V4T7. Ordering reference: SV4T7

DOUBLE-POLE MODEL
Six solder tag terminals. Mounts by one M2 screw and spigot. 5 amperes max. rating. LBH = 20, 14, 24. AF = 2.2N, 8 Ozf. Ordering reference: V24T7.

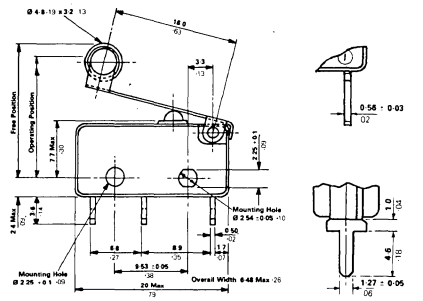
TELECOMMUNICATION SWITCHES
Burgess offers an unrivaled range of gravity, add-on and other switching assemblies for the telecommunication industry. Many are based on designs featured on this page. Please apply for details.


V4T7

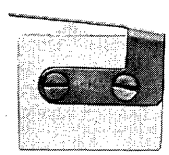
T6

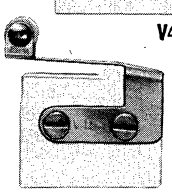

V4T7Y1

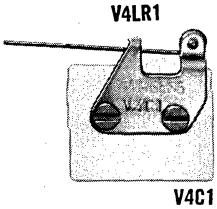
T7


V4T7YR1

T8


V4L1

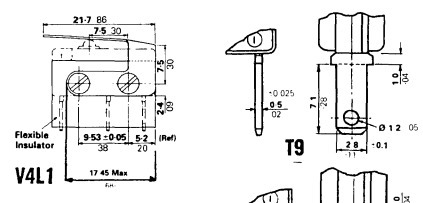

V4LR1


V4C1

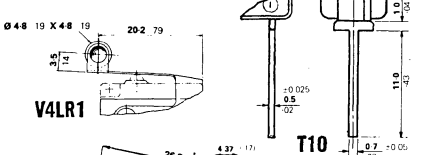
V4 AUXILIARY ACTUATORS

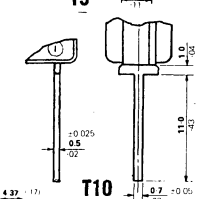
Fit all plunger actuated, single-pole V4 switches. The following references cover the actuators and mounting hardware only — the switches should be ordered separately.

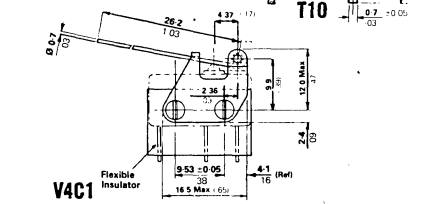
Ordering Reference	For 1 or 2 V4 Switches	Type of Lever	Lever Ratio
2V4A1	2	Plain	2.5:1
2V4AR1	2	with roller	2.4:1
V4A1	1	Plain	2.5:1
V4C1	1	hinged wire	6.0:1
V4L1	1	flexing leaf	—
V4LR1	1	leaf with roller	2.0:1
V4S1	1	hinged strip	6.0:1
V4S2	1	hinged strip	13.0:1
V4SR1	1	strip with roller	4.0:1
MF3 Lug-mounting frame, suitable for all single-pole V4 switches. Switch secured in frame without screws.			


V4L1

T9


V4LR1

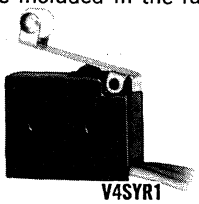

T10

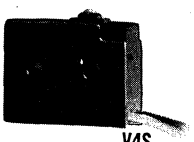

V4C1

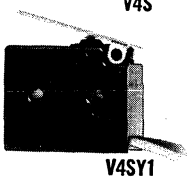
Burgess Precision Switches
BURGESS SWITCH CO., INC.
638 Anthony Trail, Northbrook, Illinois 60062
Telephone (312) 291-1760 / Telex 206774

SEALED MINIATURE MICRO SWITCHES FOR DIFFICULT ENVIRONMENTS

A range of single and multi-pole miniature and sub-miniature Micro Switches with mechanisms totally enclosed to the standard indicated by IEC Code IP67 and NEMA Type 6. Efficient sealing is proved by a pressure test. Explosion-proof models are included in the range. Single-pole switches have plunger actuators which may be used alone or with plain lever or roller-lever auxiliary actuators. Multi-pole models are available with either plunger or integral lever actuators (plain or with roller). With one exception, all models are supplied with factory fitted, PVC insulated wires.


V4SYR1


V4S

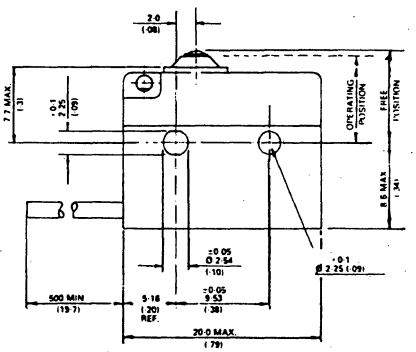

V4SY1

SINGLE POLE SUB-MINIATURE SWITCHES V4S MODELS

Glass-loaded nylon case and lid; acetal plunger; a neoprene cowl is fitted around the plunger and bonded to the lid. The well-proven Burgess V4 changeover mechanism is fitted within the enclosure. Three 16/0.2 mm p.v.c. insulated wires are potted in position. Silver contacts are standard. Temperature range −10° to +70°C and recommended maximum rating 3 amperes, 125/250 VAC. Silicone cowl/lead versions available for −50°C operation.

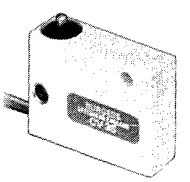
Ordering Reference	Actuator	Dimensions L	B	H	Actuating Force N	Ozf
V4S	Plunger	22*	7	18	2.5	9.0
V4SY1	Plain lever	22	7	23	0.9	3.2
V4SYR1	Roller lever	22	7	26	0.9	3.2

A variety of different lever lengths (to 2¼") and shapes are available; also auxiliary actuators in single and double pole configuration. (See page 2).
* excluding cables.



V4S

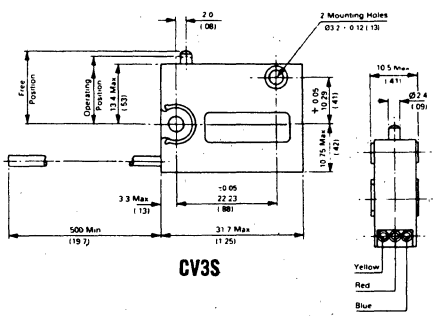
SINGLE POLE MINIATURE SWITCH CV3S MODELS


CV3S

The CV3S Micro Switch is encapsulated in a glass-loaded nylon case and provided with three cables of approximately 0.5m length. It has a protected, stainless steel plunger and will interchange with standard V3 Series Switches. All of the auxiliary actuators designed for the V3 Series may be used with the CV3S (contact Burgess for full details). The CV3S9 is a similarly constructed sealed unit but instead of cables it is fitted with open 2.8 mm quick-connect tab terminals. Recommended maximum rating 5 amperes, 125/250 VAC.

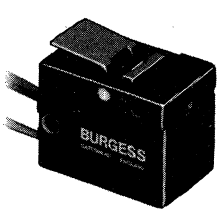
Ordering Reference	Dimensions L	B	H	Overtravel	Actuating Force N	Ozf
CV3S	32*	10	26	Depress to case	3.9	14
CV3S9	32	10	28	Depress to case	3.9	14

Integral actuators similar to those on the multiple versions also available.
* excluding cables

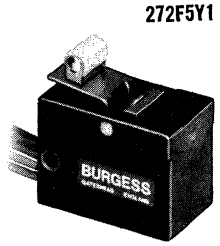


CV3S

MULTI-POLE MINIATURE SWITCHES 272- & 372-MODELS



272F5Y1

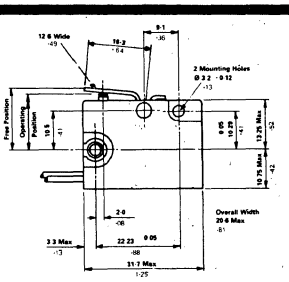


372F5YR1

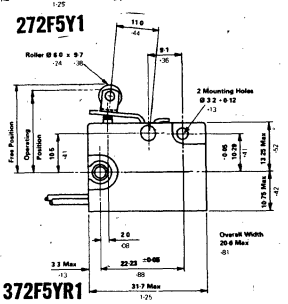
Twice as wide but otherwise physically similar to single-pole switch CV3S, these multi-pole models use two or three F5T8 Ultra Miniature Micro Switches (see page 1) as their switching elements. They are adjusted individually during assembly to ensure that all operate within 0.8 mm of plunger travel. The complete units are sealed and six or nine cables approximately 0.5m in length are provided. Available actuators are plunger, wide plain lever and wide roller and lever; all may be depressed to case in overtravel. Recommended maximum rating is 5 amperes, 125/250 VAC.

Ordering Reference	Poles	Actuator	Dimensions L*	B	H	Actuating Force N	Ozf
272F5	2	Plunger	32	21	26	4.0	14.5
272F5Y1	2	Plain lever	32	21	27	4.0	14.5
272F5YR1	2	Roller lever	32	21	34	4.0	14.5
372F5	3	Plunger	32	21	26	4.5	16.0
372F5Y1	3	Plain lever	32	21	27	4.5	16.0
372F5YR1	3	Roller lever	32	21	34	4.5	16.0

Similar models approved by BASEEFA as components with 'Type of Protection N' to BS4683, Part 3, 1972—a requirement for usage in Zone 2 hazardous areas—may be ordered by adding the prefix 'E2' to the above V3S and Multi-pole ordering references.
* excluding cables



272F5Y1

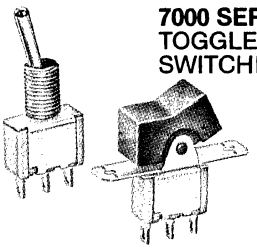


372F5YR1

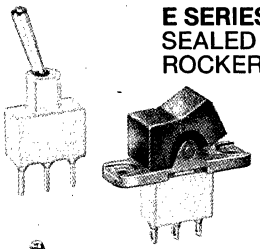
C&K

The Primary Source Worldwide . . .

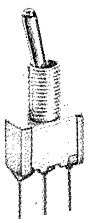
Miniature Switches



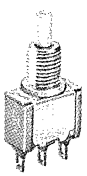
7000 SERIES
TOGGLE, ROCKER & LEVER HANDLE SWITCHES
Reliable Proven Design



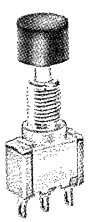
E SERIES
SEALED TOGGLE, ANTI-STATIC ROCKER & LEVER HANDLE SWITCHES
Wave Solderable



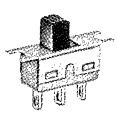
W SERIES
.025 WIRE-WRAP TOGGLE SWITCHES
Terminal Spacing for WIRE-WRAP Boards



8020 SERIES
SNAP-ACTING MOMENTARY PUSHBUTTON SWITCHES
Light Crisp Feel

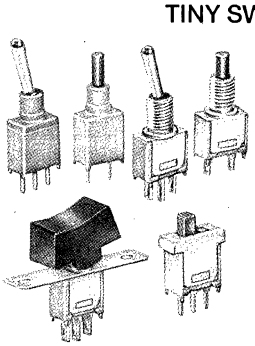


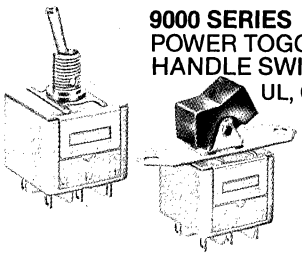
8060 SERIES
ALTERNATE ACTION & MOMENTARY PUSHBUTTON SWITCHES
Higher Current



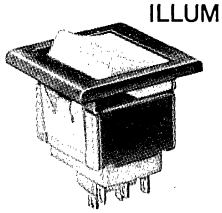
1000 SERIES
MINIATURE SLIDE SWITCHES
SP & DP With Proven Design

ET/EP/T/TP/TS SERIES
TINY SWITCHES
ET Series Sealed Tiny Toggle Switches
EP Series Sealed Tiny Pushbutton Switches
T Series Tiny Toggle Switches
TP Series Tiny Pushbutton Switches
T Series Tiny Rocker Switches
TS Series Tiny Slide Switches

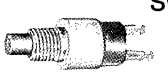




9000 SERIES
POWER TOGGLE, ROCKER & LEVER HANDLE SWITCHES
UL, CSA & VDE Listed



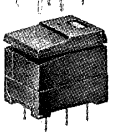
5000 SERIES
ILLUMINATED ROCKER SWITCHES
Indicator Light Available



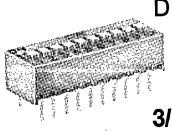
8500 SERIES
SUBMINIATURE PUSHBUTTON SWITCHES

8600 SERIES
MICROMINIATURE PUSHBUTTON SWITCHES

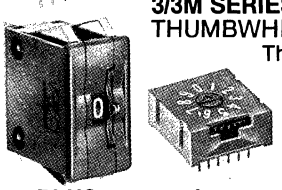
MP SERIES
MECHANICAL PUSHBUTTON SWITCHES
Clean Modern Appearance



SS SERIES
SOLID STATE PUSHBUTTON SWITCHES
Bounce Free



BD SERIES
DIP SWITCHES
Wave Solderable



3/3M SERIES
THUMBWHEEL SWITCHES
Thousands of Varieties

PLUS many other products from our Clayton, N.C. Division

Y Series Switchlocks
A Series Switchlocks
A Series Rotary Switches
H Series Power ROTA-SLIDE® Rotary Switches
R Series ROTA-SLIDE Switches
F Series Miniature ROTA-SLIDE Rotary Switches
V Series Power & Line Voltage Select Slide Switches
S Series Slide Switches
L Series Miniature Slide Switches
C Series Power Rocker Switches
J Series Rocker Switches
K Series Pushbutton Switches

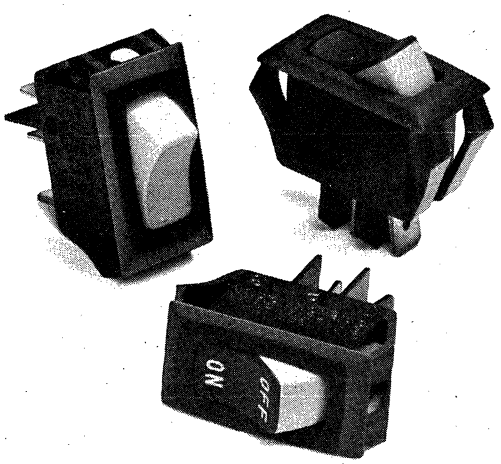
CALL FOR A C&K FULL LINE CATALOG and/or ONE OF OUR OVER 300 DISTRIBUTION LOCATIONS

Answering service operators on duty until 8:00 pm EST
NOTE: This 800 number is for catalog requests and distribution location information only.
1-800-243-8160

C&K **C&K COMPONENTS, INC.** 15 Riverdale Ave., Newton, MA 02158-1082 Tel: (617) 964-6400, Telex: 92-2544, TWX: 710-335-1163

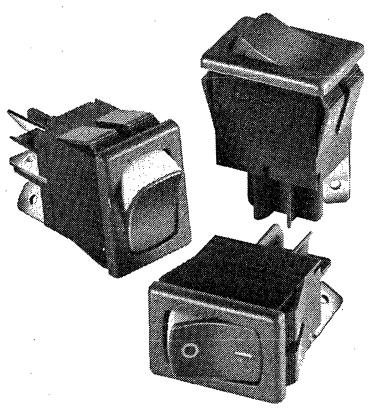
CARLINGSWITCH. CUSTOM QUALITY AT CATALOG PRICES.

Solving design problems with quality 'standard' and 'custom' switching devices is our specialty. Our industry-leading new product innovations incorporate modern materials, innovative styling, and patented switching mechanisms—at competitive catalog prices.



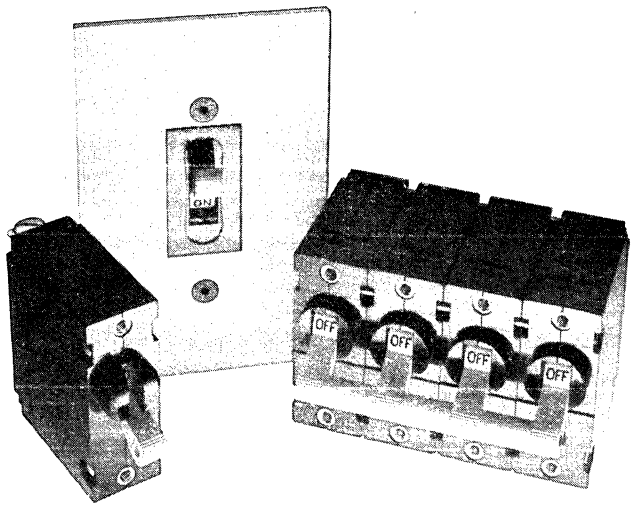
Curvette™ Rocker Switches.

Our compound-curve rocker offers more performance at the lowest price anywhere. In most applications, Curvette's switching mechanism stops arcing before it starts—without expensive arc-suppressing fibre. Curvette withstands 50,000 maximum load actuations at high ambient temperatures. Curvette's smaller size and patent-pending mounting ear design mean snug fit in openings from .48″ × 1.072″ to .55″ × 1.125″. Curvette is UL-listed and CSA-approved for 16AMP 125VAC and 10AMP 250VAC; VDE approvable for 12(6) AMP 250VAC. Available in one-color, two-color and lighted (AC or DC) versions. Visi Rocker™ model has second color molded in for low cost "on" indication. Available with custom legends and in double-pole configurations.



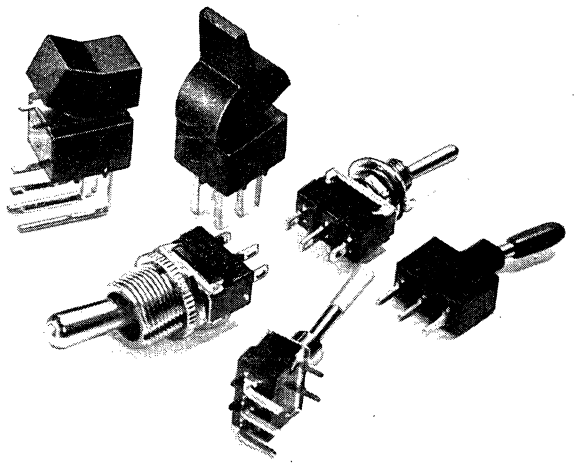
Mini Curvette™ Rocker Switches.

Small in size and price; big in performance, with elegant smooth, matte finish. Mini Curvette is available in four ratings up to 8 amps, 125 VAC and in single- or double-pole models in a variety of circuits and terminals, including .187″ tabs with barriers and spacing to meet export specs. UL listed, CSA approved. On-Off and On-On circuits VDE and TUV approved. Available with wiping contacts or innovative silver butt contacts for high performance/high inrush switching power supplies. *Single and double pole models fit the same opening.* The Mini Curvette Visi Rocker™ also features second color for low-cost "on" indication. All components manufactured by Carlingswitch for consistent quality and lowest cost.



Magnetic Circuit Breakers.

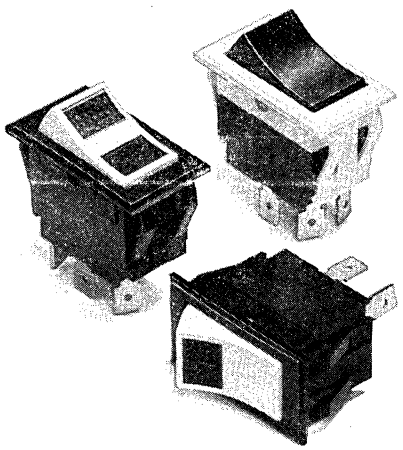
Industry-standard breakers are available in single- or multi-pole configurations, with single or multiple actuators. Available with instantaneous, ultra short, short, medium, and long time delays. In series, shunt, and relay trip circuits at ratings up to 50 amp. UL recognized and CSA certified; B Series meets the spacing requirements of VDE and IEC. Compact design uses less mounting space. With snap-on adapter, breakers fit larger 'standard' openings. Caps in eight attractive colors. Well-suited for new designs or as direct replacements for competitive products.



Miniature Rocker and Toggle Switches.

Single- and double-pole metal-toggle miniatures in all popular ratings for PC board applications. Rocker toggle and paddle-actuated models available. Variations include heavy-duty large pinned toggle models with 15/32" bushing; gold-plated PC terminals and contacts for dry circuits; WIREWRAP® terminals with ultra short actuator; rightangle PC terminals; built-in front panel splash protection for moist environments.

®Gardner-Denver Co. Registered Trademark



Full Size Tippette® Rocker Switches.

In an endless variety of circuits, circuit ratings, actuator and bezel styles, mounting brackets, and termination types. Options include legend imprinting, standard or custom matched bezel and actuator colors. Patented "Drip Dry" option for inexpensive protection from dirt, moisture and other contaminants. Lighted versions feature single or multiple indicator lights. Voltages from 6VDC to 240VAC. European-approved versions available soon.

Catalogs of Value.

Complete specifications for thousands of switching devices are yours free in our new Full Line and Magnetic Circuit Breaker Catalogs—available from your nearest Carlingswitch representative or distributor. For the one nearest you, call toll free—**1-800-243-8160.** Or contact Carlingswitch, Inc., 505 New Park Avenue, West Hartford, CT 06110; (203) 233-5551; Telex: 710-425-0034.

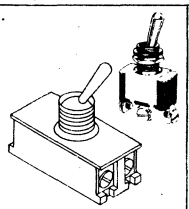
CARLINGSWITCH
INNOVATION BY DESIGN

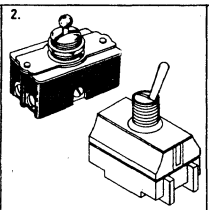
ELECTRIC SWITCHES

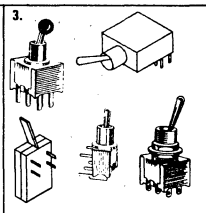
INCORPORATED

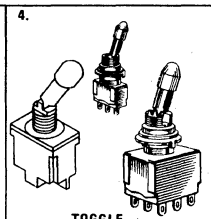
ONE COMPLETE SOURCE FOR all types of switches...

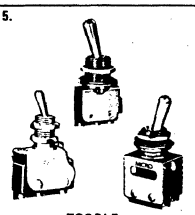
AEROSPACE – COMMERCIAL

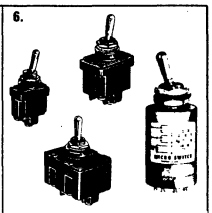
1. 
TOGGLE
General Purpose

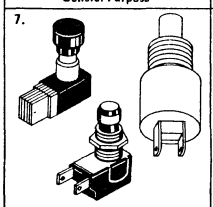
2. 
TOGGLE
High Capacity

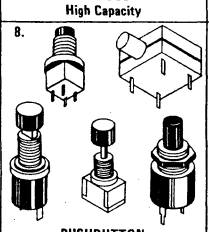
3. 
TOGGLE
Miniature & Ultra Miniature

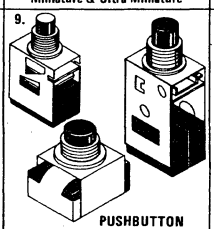
4. 
TOGGLE
Locking Lever

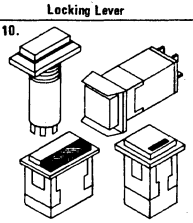
5. 
TOGGLE
Precision

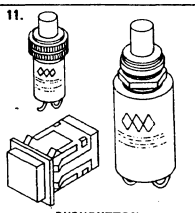
6. 
TOGGLE
Environmentally Sealed

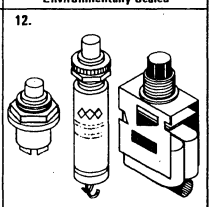
7. 
PUSHBUTTON
General Purpose

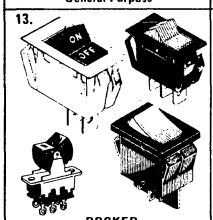
8. 
PUSHBUTTON
Miniature & Ultra Miniature

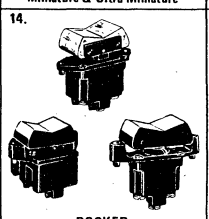
9. 
PUSHBUTTON
Precision

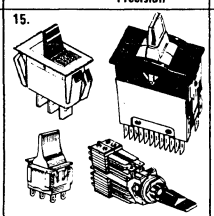
10. 
PUSHBUTTON
Lighted

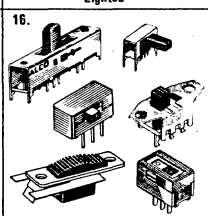
11. 
PUSHBUTTON
Reed & Solid State

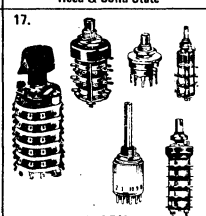
12. 
PUSHBUTTON
Environmentally Sealed

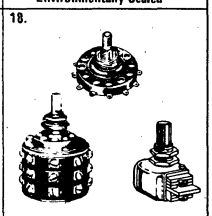
13. 
ROCKER
Lighted & Unlighted

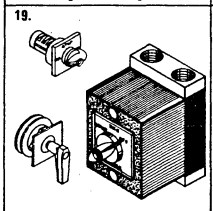
14. 
ROCKER
Heavy Duty / Sealed

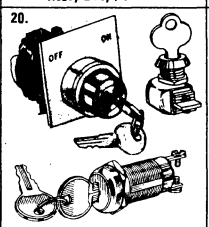
15. 
PADDLE

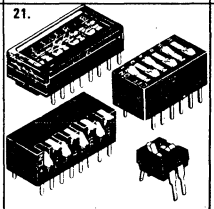
16. 
SLIDE

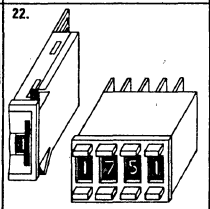
17. 
ROTARY
Electronic Duty

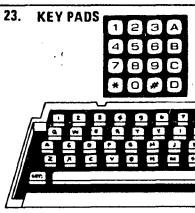
18. 
ROTARY
General Purpose

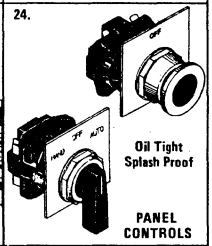
19. 
CAM–ROTARY
High Capacity HP Rated

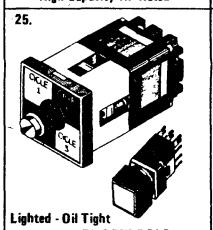
20. 
KEY LOCK

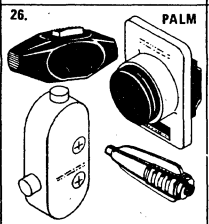
21. 
DIP SWITCH

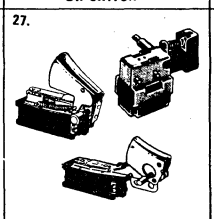
22. 
PB/ROTARY THUMBWHEEL
Programmable Code Switch

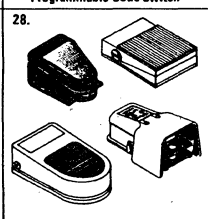
23. KEY PADS

KEY BOARDS

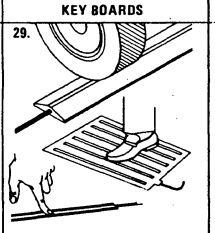
24. 
Oil Tight
Splash Proof
PANEL
CONTROLS

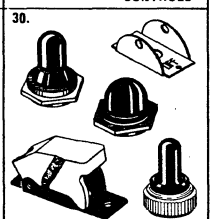
25. 
Lighted - Oil Tight
PANEL CONTROLS

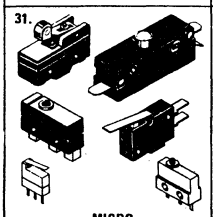
26. PALM

PENDANT FEED THRU

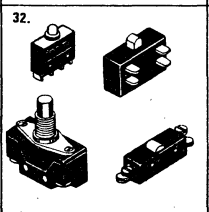
27. 
TOOL HANDLE

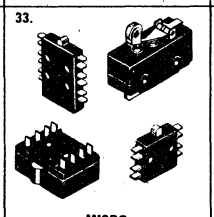
28. 
FOOT SWITCH

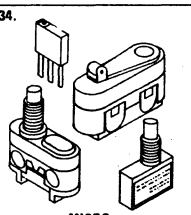
29. 
TAPE/AIR SWITCHES

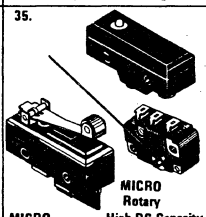
30. 
SWITCH GUARDS & SEALS

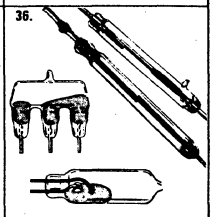
31. 
MICRO
Single Break

32. 
MICRO
Double Break

33. 
MICRO
2 & 3 Poles

34. 
MICRO
Sealed & Hi-Temperature

35. 
MICRO
Rotary
MICRO High DC Capacity
Magnetic Blow-Out Switches

36. 
REED & MERCURY

CALL TOLL FREE

NATIONAL:
800–421–8855

CALIFORNIA:
800–252–4640

THE PICTORIAL DISPLAY REPRESENTS PART OF THE WIDE VARIETY OF SWITCHES, CONTROLS AND ELECTRONICS HARDWARE STOCKED BY ELECTRIC SWITCHES, INC. FOR DETAILED INFORMATION, CALL OR WRITE US. CATALOGS WILL BE SENT UPON REQUEST.

(213) 660–1310

TWX 910-321-2971

...control devices & hardware

— ELECTRONIC – INDUSTRIAL – MILITARY

37. Screw Driver Actuated & PULSE SWITCHES

38. Push Type — Magnetic Actuated DOOR SWITCHES

39. DOOR INTERLOCK

40. ENCLOSED SWITCHES

41. LIMIT SWITCHES

42. LIMIT SWITCHES Sealed & Hi-Temperature

43. LIMIT SWITCHES Explosion Proof

44. PHOTO–ELECTRIC CONTROLS Fiber Optics-LED-Incandescent

45. PHOTO-ELECTRIC Self-Contained

46. PROXIMITY CONTROLS

47. LIQUID LEVEL CONTROLS Capacitance & Resistance Type

48. PC Programmable Controller

49. RELAYS Electro-Mechanical

50. RELAYS Reeds & Solid State

51. MANUAL MOTOR STARTERS

52. MAGNETIC MOTOR STARTERS

53. MAGNETIC CONTACTOR

54. MOTOR PROTECTION Thermal - OverCurrent Open & Reverse Phase

55. PRESSURE TRANSDUCERS TEMPERATURE CONTROLS

56. COUNTERS

57. TIMERS

58. SOLENOIDS & TRANSFORMERS

59. IMPACT PRINTERS

60. FANS & POWER SUPPLIES

61. CIRCUIT PROTECTION FUSES & FUSEHOLDERS

62. BATTERIES/BUZZERS–ELECT, Audio Transducers

63. LEDS & NEON Incandescents Mini-Lamps

64. INDICATOR LIGHTS LED DISPLAYS

65. WIRING DEVICES

66. INSTRUMENT KNOBS Commercial & Military

67. INSTRUMENT CASES BAILS & HANDLES

68. DIGIBEZELS PC RACKS & BOARDS

69. SOCKET SNAP–TRACKS

70. PLUGS JACKS & CONNECTORS

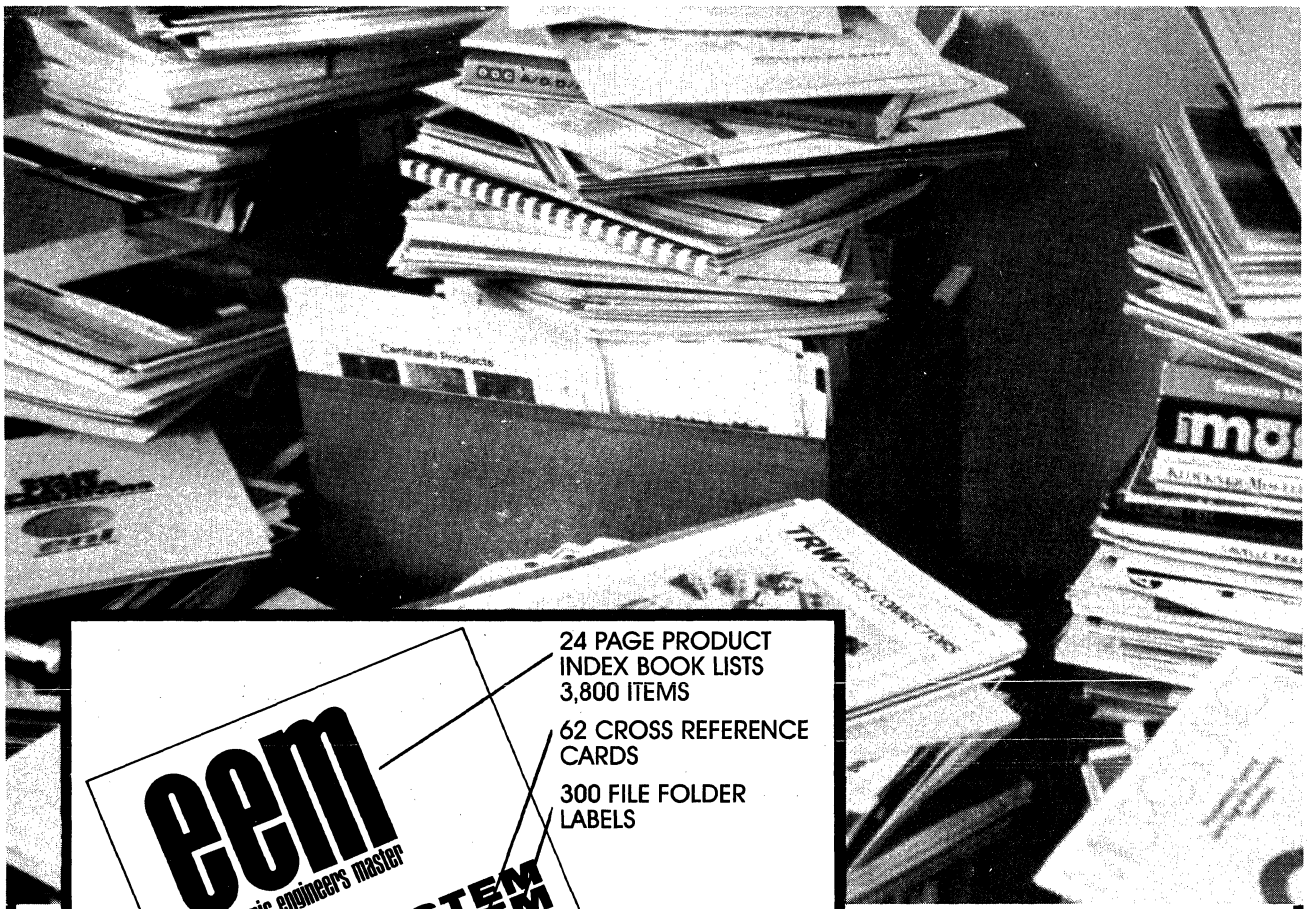
71. TERMINALS & HARDWARE

72. CUSTOMER ENGRAVING

Send for a Free Copy of Our New SWITCHLOG NO. 20, Write to:

ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Dr, Los Angeles, California 90039

Electric Switches, Inc.
Dept. EEM 85
P.O. Box 3085, Terminal Annex
Los Angeles, California 90051



ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,

645 stewart ave., garden city, ny 11530

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C
CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J
JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K
kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L
LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P
PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

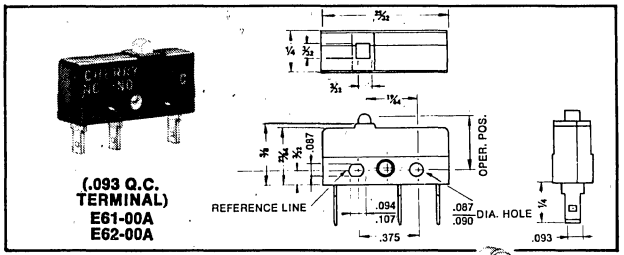
W
WPS word processing software

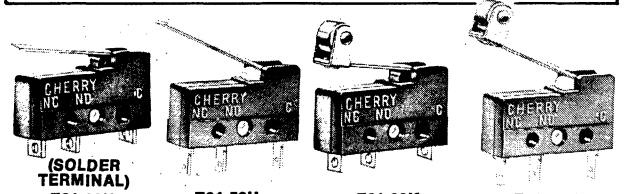
Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

CHERRY Subminiature Snap Action Switches

SERIES E61 — Light Force/SERIES E62 — Standard Force

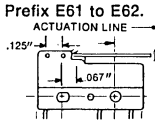




Part No.	Circuitry	Description
E61-00A	SPDT	Button, .093 Q.C. Terminals
E61-10A	SPDT	Button, Solder Terminals
E61-30A	SPDT	Button, .110 Q.C. Terminals
E61-00H	SPDT	9/32" Actr, Std. Lever Ratio, .093 Q.C. Terminals
E61-10H	SPDT	9/32" Actr, Std. Lever Ratio, Solder Terminals
E61-30H	SPDT	9/32" Actr, Std. Lever Ratio, .110 Q.C. Terminals
E61-50H	SPDT	13/32" Actr, High Lever Ratio, .093 Q.C. Terminals
E61-60H	SPDT	13/32" Actr, High Lever Ratio, Solder Terminals
E61-80H	SPDT	13/32" Actr, High Lever Ratio, .110 Q.C. Terminals
E61-00K	SPDT	13/64" Roller Actr, Std. Lever Ratio, .093 Q.C. Terminals
E61-10K	SPDT	13/64" Roller Actr, Std. Lever Ratio, Solder Terminals
E61-30K	SPDT	13/64" Roller Actr, Std. Lever Ratio, .110 Q.C. Terminals
E61-50K	SPDT	21/64" Roller Actr, High Lever Ratio, .093 Q.C. Terminals
E61-60K	SPDT	21/64" Roller Actr, High Lever Ratio, Solder Terminals
E61-80K	SPDT	21/64" Roller Actr, High Lever Ratio, .110 Q.C. Terminals

Note: To specify 10.1 Amps. merely change the Prefix E61 to E62.

ACTUATORS — Actuator lengths are dimensioned from centerline of switch mounting hole as shown. Other actuators available on request.



TERMINALS — Subminiature series is available with quick connect .093" wide (mates with AMP part no. 60432-1) and .110" wide (mates with AMP part no. 42399-2). Also available in short solder terminal .139" wide x .125" long.

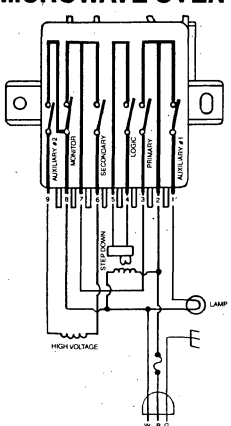
NOTE: .093" Quick Connect terminals are standard. To order solder terminals add 10 to suffix number. To order .110" QC terminals add 30 to suffix number. (Example: basic E61-00A becomes E61-10A for solder terminals and E61-30A for .110" QC terminals.

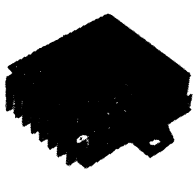
SWITCH BODY: 25/32" x 23/64" x 1/4"

RATINGS: E61 — 5 Amps. 125/250 VAC
E62 — 10.1 Amps. 125/250 VAC — 1/4 H.P. 125 VAC

Und. Lab. Inc. listed and CSA approved.

MICROWAVE OVEN DOOR INTERLOCK SWITCH—HL SERIES





Typical Wiring Diagram—Door Open

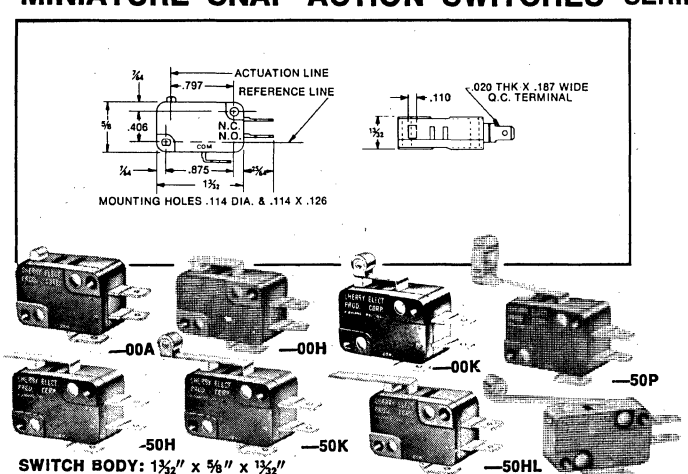
Circuit Ratings
Logic . . . . . 0.1A @ 32VDC
Aux. #1,S3 . . . . . 3A @ 125/250VAC 60 Hz
2.4A @ 125/250VAC 50 Hz
All Others . . . . . 20.1A @ 125/250VAC 60 Hz
16A @ 125/250VAC 50 Hz

Cherry's Microwave Oven Door Interlock Switch meets all UL-923 standards and your requirements for a simple, durable and economical door interlock system that is ideal for high-volume production. One, singly housed Cherry Interlock Switch can replace all individual door switches and still achieve a long mechanical life span.

Switch Characteristics

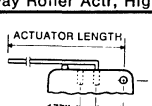
Mechanical Life on Standard Test Fixture . . . . . 1,000,000 Actuation Cycles
Electrical Life @ Rated Load . . . . . 100,000 Actuation Cycles
Max. Term. Temp. Rise @ Rated Load . . . . . 30°C
Max. Actuator Force @ Full Travel . . . . . 650 Grams
Max. Plunger Force @ Full Travel . . . . . 800 Grams
*Displacement, Actuator . . . . . Aux. #1, S3 0.055" to break
Secondary 0.085" to make
Primary 0.115" to make
Logic 0.135" to make
*Displacement, Plunger . . . . . Aux. #2, S1 0.100" to make
Monitor 0.20" to break
Operating Temp. Range . . . . . −20° to 85°C
Storage Temp. Range . . . . . −40° to +90°C
Humidity Range . . . . . 5% to 95% RH
Insulation Resistance . . . . . 1000 Megohms @ 500VDC
Voltage Withstand . . . . . 1000V RMS Term. to Term.
*Standard Sequence—Options Available

MINIATURE SNAP ACTION SWITCHES SERIES E22/E23/E33/E34 (Standard Force)

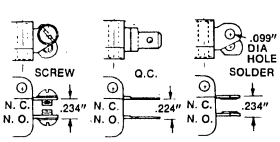


Part No.	Circuitry	Terminal	Description
STANDARD FORCE			
E23-00A	SPDT	QC	Button
E23-10A	SPDT	Screw	Button
E23-20A	SPDT	Solder	Button
E23-00H	SPDT	QC	27/32" Actr, Std. Ratio
E23-50H	SPDT	QC	1 13/32" Actr, Std. Ratio
E23-70H	SPDT	Solder	1 13/32" Actr, Std. Ratio
E23-50HL	SPDT	QC	1 1/16" Actr, High Ratio
E23-00K	SPDT	QC	13/16" Roller Actr, Std. Ratio
E23-10K	SPDT	Screw	13/16" Roller Actr, Std. Ratio
E23-20K	SPDT	Solder	13/16" Roller Actr, Std. Ratio
E23-50K	SPDT	QC	1 11/32" Roller Actr, Std. Ratio
E23-70K	SPDT	Solder	1 11/32" Roller Actr, Std. Ratio
E23-50KL	SPDT	QC	1 1/2" Roller Actr, High Ratio
E23-00P	SPDT	QC	13/16" One-Way Roller Actr., Std. Ratio
E23-50P	SPDT	QC	1 11/32" One-way Roller Actr, Std. Ratio
E23-50PL	SPDT	QC	1 1/2" One-way Roller Actr, High Ratio

ACTUATORS — Standard type integral hinged lever and roller actuators are available in choice of 2 pivot positions. Actuator lengths are dimensioned from centerline of switch mounting hole as shown here. Other actuators available on request.



TERMINALS — Choice of Screw, Solder, or Quick Connect Terminals. .187" wide Quick Connect terminals are standard x .020" thick. Also available are .250" wide x .032" thick QC terminals. To order screw terminals add 10 to suffix number. To order solder terminals add 20 to suffix number. For example: the basic E23-00A becomes E23-10A for screw terminals and E23-20A for solder terminals.



SWITCH BODY: 1 13/32" x 5/8" x 13/32"

OPERATING FORCES: E22 — 75 gms. max. E33 — 285 gms. max.
E23 — 170 gms. max. E33 — 400 gms. max.

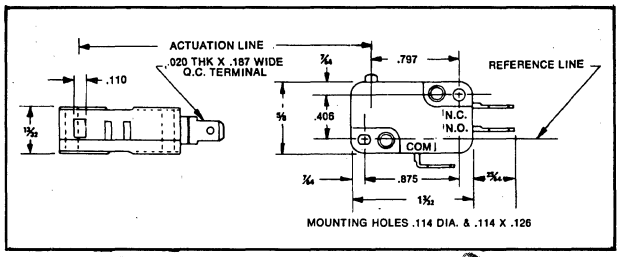
RATINGS: E22 — 3 Amps. 125/250 VAC.
E23 — 5 Amps. 1/4 H.P. 125/250 VAC
E33 — 10 Amps. 1/2 H.P. 125/250 VAC
E34 — 15 Amps. 1/2 H.P. 125/250 VAC

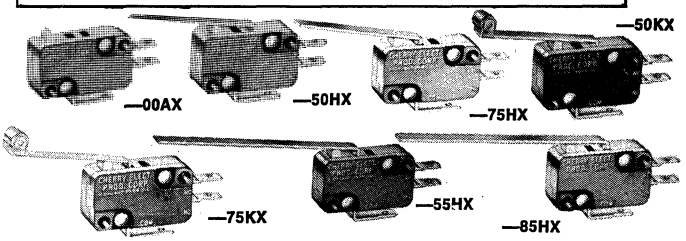
Und. Lab. Inc. listed and CSA approved.

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Light Force Miniature Snap Action Switches

SERIES E22 — SERIES E23/SERIES E33 — SERIES E34 LIGHT FORCE





SWITCH BODY: 1 3/32" x 5/8" x 1 3/32"

RATINGS: E22 Series — 3 Amps., 125/250 VAC
E23 Series — 5 Amps., ¼ H.P., 125/250 VAC
E33 Series — 10 Amps., ½ H.P., 125/250 VAC
E34 Series — 15 Amps., ½ H.P., 125/250 VAC

Und. Lab. Inc. listed, and CSA approved.

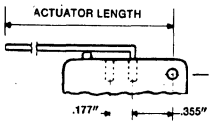
OPERATING FORCES: E22 — 15 gms. max. E33 — 75 gms. max.
E23 — 45 gms. max. E34 — 100 gms. max.

Terminal Types	S.P.D.T.
QC	E22-00AX
Screw	E22-10AX
Solder	E22-20AX

NOTE: .187" Quick Connect terminals are standard. Normally, to order screw terminals add 10 to suffix number. To order solder terminals add 20 to suffix number. For example: The basic E22-00AX becomes E22-10AX for screw terminals and E22-20AX for solder terminals.

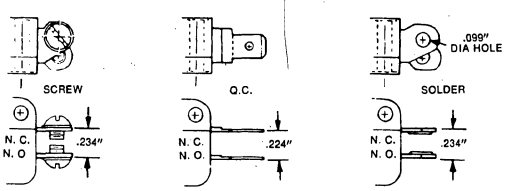
EXCEPTIONS: When ordering —55HX, —75HX, —75KX or —85HX switches, do **not** change suffix number. Simply state on order whether QC, screw or solder terminal types are desired.

ACTUATORS—Standard type integral hinged lever and roller actuators are available in choice of 2 pivot positions. Actuator lengths are dimensioned from centerline of switch mounting hole as shown here. Other actuators available on request.

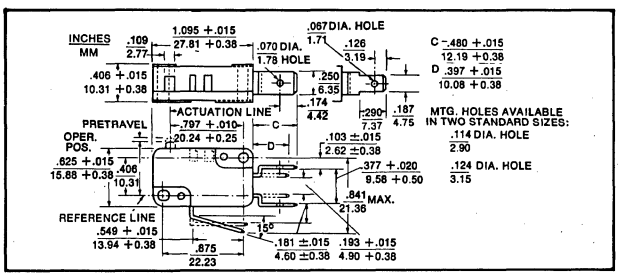


ACTUATOR LENGTH INCHES: 1.400, 1.580, 1.340, 1.516, 2.757, 2.932.

TERMINALS — Choice of Screw, Solder, or Quick Connect Terminals. Unless otherwise specified switches are furnished with QC terminals .187 wide x .020 thick. Also available are .250 wide x .032 QC terminals.



D4 INTERNATIONAL MINIATURE SNAP ACTION SWITCH



SWITCH BODY: 1 3/32" x 5/8" x 1 3/32"

RATINGS: D42 — 3 Amps., 125/250 VAC
D43 — 5 Amps., ¼ H.P., 125/250 VAC**
D44 — 10 Amps., ½ H.P., 125/250 VAC
D45 — 15 Amps., ½ H.P., 125/250 VAC***

Und. Lab. Inc. listed, and CSA approved.

CONTACTS AND RATINGS

	Rating	Contact Material
SERIES (E22) D42	3 amps., 125/250 VAC	Fine Silver
SERIES (E23) D43	5 amps., ¼ H.P.,* 125/250 VAC	Silver Cadmium Oxidized
SERIES (E33) D44	10 amps, ½ H.P., 125/250 VAC	Silver Cadmium Oxidized
SERIES (E34) D45	15 amps., ½ H.P.,** 125/250 VAC	Silver Cadmium Oxidized

* VDE (Germany) rating: 6 amps. ** VDE (Germany) rating: 16 amps.

1. FOREIGN APPROVED VERSIONS

Designations:
Standard Force: Series D413, D423, D433, D443 and D453
Light Force: Series D419, D429, D439, D449 and D459

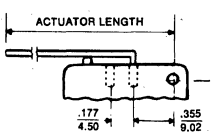
These D4 switches have foreign as well as UL/CSA approvals. They have .250" (6.35mm) x .032" (0.81 mm) thick "offset" terminals and metric mounting holes. They are also available with English (U.S.) mounting holes. (See drawings.)

2. U.S. VERSIONS

Designations:
Standard Force: Series D41C, D42C, D43C, D44C and D45C
Light Force: Series D41L, D42L, D43L, D44L and D45L

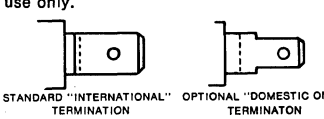
These are D4 switches with UL and CSA approvals for domestic use only. Terminals are "straight" and measure .187" (4.75 mm) x .020" (0.50 mm) thick. (See drawings.)

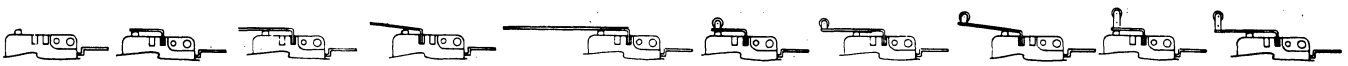
ACTUATORS: Standard type integral hinged lever and roller actuators are available in choice of 2 pivot positions. Actuator lengths are dimensioned from centerline of switch upper mounting hole as shown here. Other actuators available on request.



ACTUATOR LENGTH INCHES: .865, 1.400, 1.580, 2.757, .810, 1.340, 1.516, .810, 1.340.

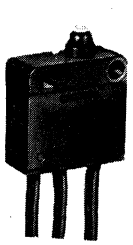
TERMINALS: Choice of two QC terminations: .250" (6.35 mm) x .032" (0.81 mm) thick "offset" terminals with foreign as well as UL/CSA approvals . . . or .187" (4.75 mm) x .020" (0.50 mm) thick with UL and CSA approval for domestic use only.

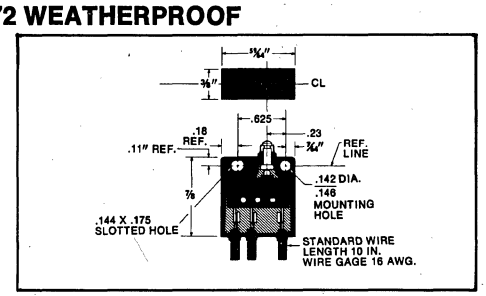




C-R1AA/3-Q3AA* (Similar to Conventional —00A) | C-R1LA/3-Q3LA* (Similar to Conventional —00H) | C-R1LD/3-Q3LD* (Similar to Conventional —50H) | C-R1MD/3-Q3MD* (Similar to Conventional —50HL) | C-R1JL/3-Q3JL* (Similar to Conventional —55H) | C-R1RA/3-Q3RA* (Similar to Conventional —00K) | C-R1RC/3-Q3RC* (Similar to Conventional —50K) | C-R1TC/3-Q3TC* (Similar to Conventional —50KL) | C-R1GA/3-Q3GA* (Similar to Conventional —00P) | C-R1GD/3-Q3GD* (Similar to Conventional —50P)

SERIES E72 WEATHERPROOF





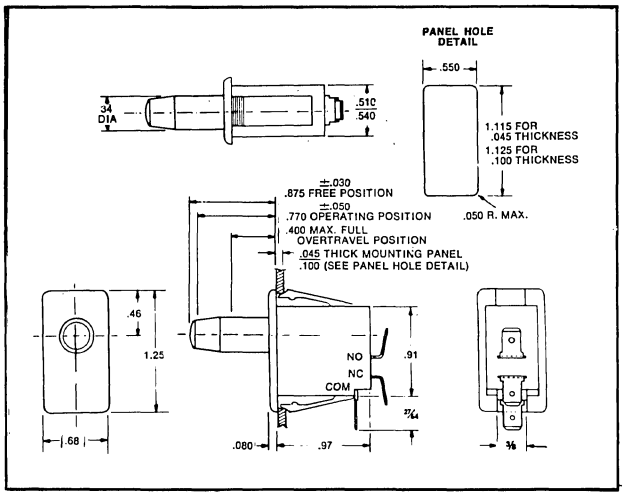
Cherry put a switch inside a switch . . . so it's water-resistant and weatherproof!

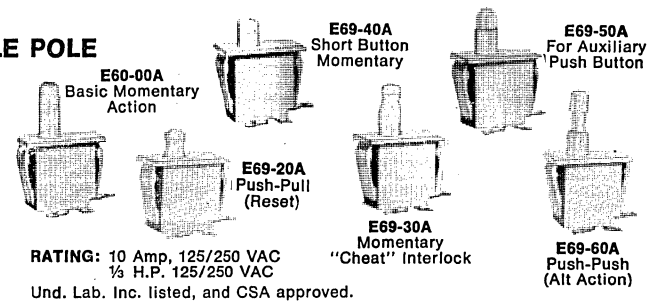
Cherry's basic E72-40A is moisture resistant. It comes with insulated, 10 inch, 16 gauge leads attached. The E72-40A is rated at 10.1 Amps., ¼ H.P. and 125/250 VAC. Listed by Underwriters' Laboratories, Inc.

The E72 series is also available with hinged external actuators, Cherry part number E72-40H.

CHERRY Panel Mount Pushbutton Switches

SERIES E69 — PANEL MOUNT PUSHBUTTON/SINGLE POLE





RATING: 10 Amp, 125/250 VAC
⅓ H.P. 125/250 VAC

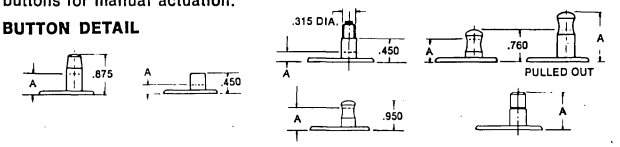
Und. Lab. Inc. listed, and CSA approved.

TERMINALS — This switch series has quick connect terminals .187″ x .020″.

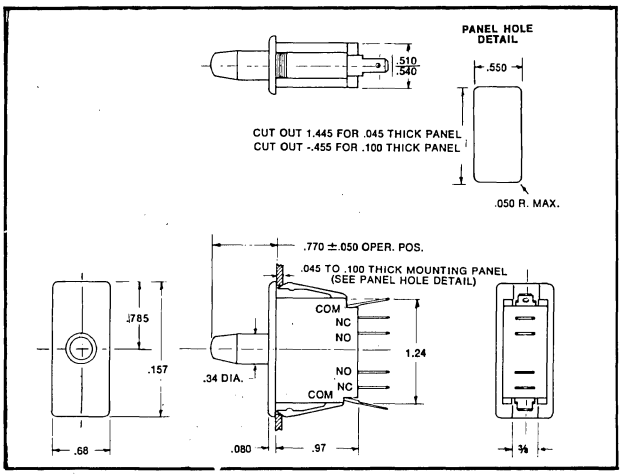
APPLICATIONS — Door and drawer light/interlock switch; test function switch; EDP and business machine starts switch; photocopy machines and other equiment requiring either manual or mechanical actuation and panel mounting.

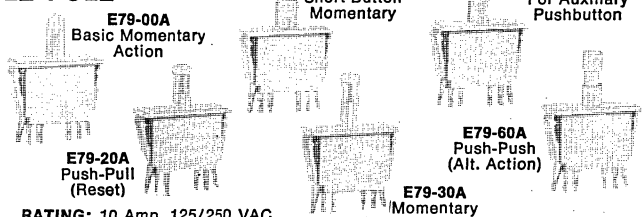
Switch E69-50A has button with special shaft to accept auxiliary push buttons for manual actuation.

BUTTON DETAIL



SERIES E79 — PANEL MOUNT PUSHBUTTON/DOUBLE POLE





RATING: 10 Amp, 125/250 VAC
⅓ H.P. 125/250 VAC

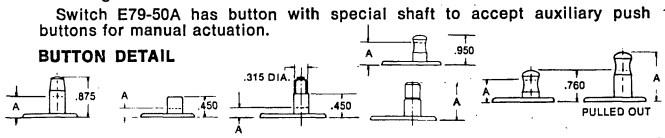
Und. Lab. Inc. listed, and CSA approved.

TERMINALS — This switch series has quick connect terminals .187″ x .020″.

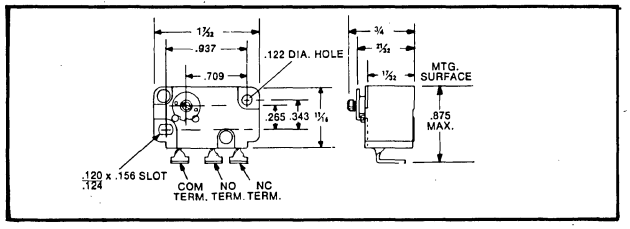
APPLICATIONS — Door and drawer light/interlock switch; test function switch; EDP and business machine start switch; photocopy machines and other equipment requiring either manual or mechanical actuation and panel mounting.

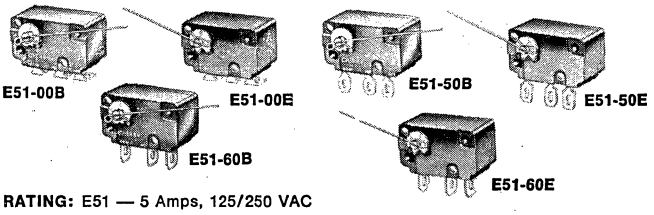
Switch E79-50A has button with special shaft to accept auxiliary push buttons for manual actuation.

BUTTON DETAIL



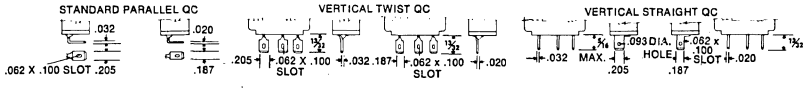
SERIES E51 — LOW TORQUE SWITCHES



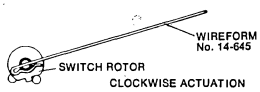


RATING: E51 — 5 Amps, 125/250 VAC
Und. Lab. Inc. listed, and CSA approved.

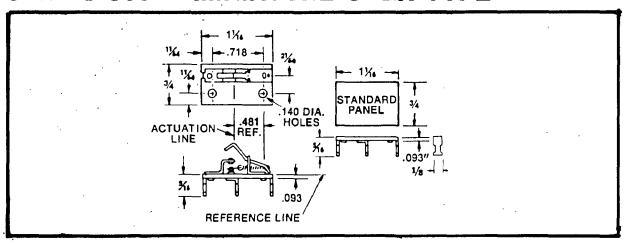
TERMINALS — All terminals are combination quick connect and solder. Several types are available as shown.

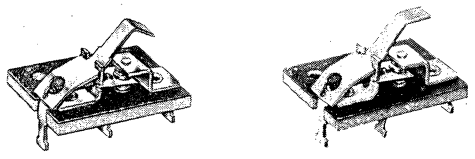


ACTUATORS—Wireform actuators are supplied unassembled for each E51 switch. Wireforms may be readily assembled to switch rotor as illustrated below.



SERIES S30 — MINIATURE OPEN TYPE

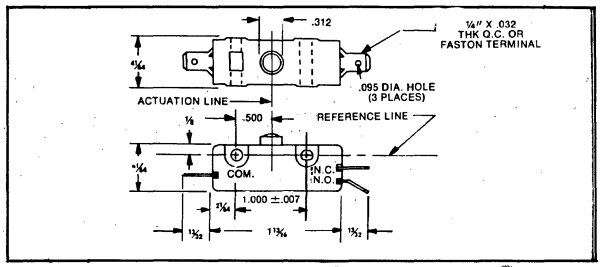


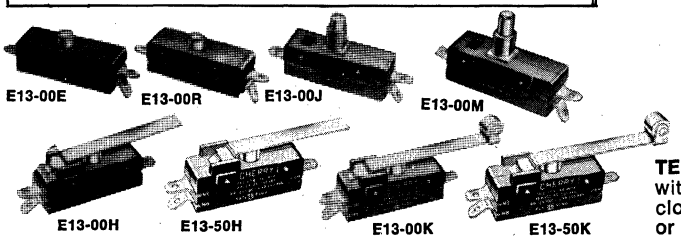


CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY General Purpose Switches

SERIES E13 — STANDARD/SERIES E14 — HIGH CAPACITY GENERAL PURPOSE

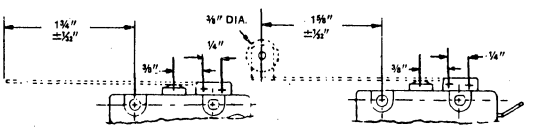




RATING: E13 — 15 Amps, 125/250 VAC
¾ H.P., 125 VAC — 1½ H.P., 250 VAC
E14 — 25 Amps, 125/250 VAC
1 H.P., 125 VAC — 2 H.P., 250 VAC

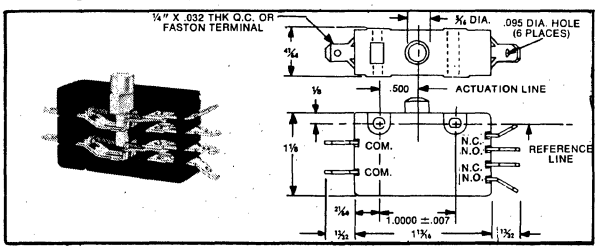
Und. Lab. Inc. listed, and CSA approved.

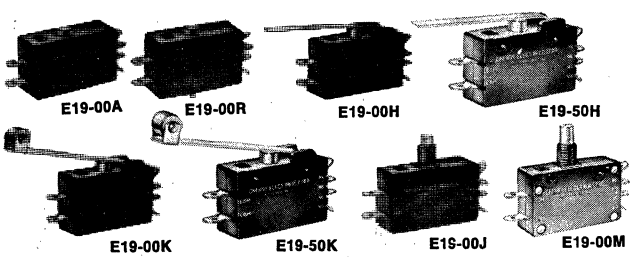
ACTUATORS — Many special forms and lengths of actuators are available. Standard type integral hinged lever and roller actuators are available in choice of 2 pivot positions. Actuator lengths are dimensioned from centerline of switch mounting hole as shown here.



TERMINALS — Standard ¼ inch QC terminals can be furnished with angle formed up or down on common as well as open or closed terminal. Forms include straight, 30, 45, 85 degrees up or down. Other forms can be provided at nominal extra charge.

SERIES E19 — STANDARD/SERIES E20 — HIGH CAPACITY — DOUBLE POLE

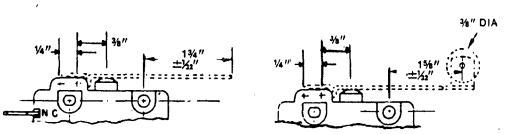




RATING: E19 — 15 Amps, 125/250 VAC
¾ H.P., 125 VAC — 1½ H.P., 250 VAC
E20 — 20 Amps, 125/250 VAC
1 H.P., 125 VAC — 2 H.P., 250 VAC

Und. Lab. Inc. listed, and CSA approved.

ACTUATORS — Many special forms and lengths of actuators are available. Standard type integral hinged lever and roller actuators are available in choice of 2 pivot positions. Actuator lengths are dimensioned from centerline of switch mounting hole as shown here.



TERMINALS — Standard ¼ inch QC terminals can be furnished with angle formed up or down on common as well as open or closed terminal. Forms include straight, 30, 45, 85 degrees up or down. Other forms can be provided at nominal extra charge.

GOLD "CROSSPOINT" CONTACT SWITCHES FOR LOW ENERGY CIRCUITS

Engineers can now take a completely new approach to switching of low energy circuits. The Gold "Crosspoint" Contact switch design provides reed switch reliability, with snap action switch precision and utility. No need for magnets and installation adjustments. The result is much lower installed cost.

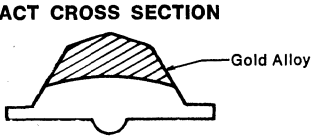
Positive Snap-Action Switching of Low Energy Solid State Circuits

- High reliability in low level switching applications from 4 to 100 milliamperes at 4 to 30 volts
- Long Life . . . measured in millions of operations
- Initial insertion resistance far below 50 milliohms (lower than reed switches)
- Very high force per unit area (contact pressures)
- Reduced susceptibility to contact closure interference from foreign particles

VERSATILITY IN APPLICATION

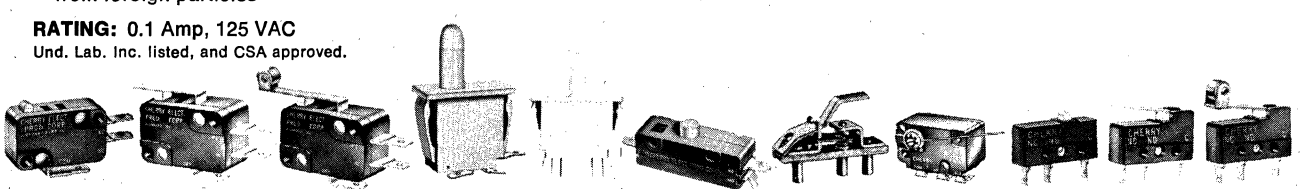
Cherry Gold "Crosspoint" Contact switches are available in a wide variety of switch types, sizes, and mountings for a broad range of electronic applications. In addition, many other configurations are available with gold crosspoint contacts.

CONTACT CROSS SECTION



The contacts in these switches are W/E Alloy # . . .
69% Gold, 25% Silver, 6% Platinum

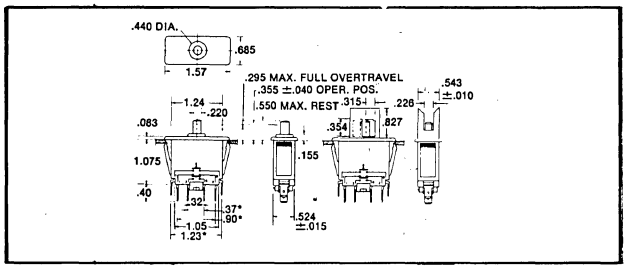
RATING: 0.1 Amp, 125 VAC
Und. Lab. Inc. listed, and CSA approved.

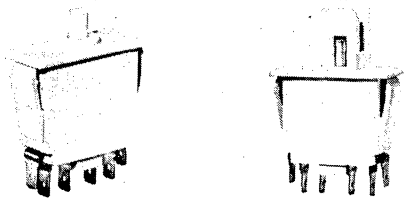


CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Pushbutton Switches

SERIES F81, F82, F83 AND F84 LINE INTERRUPT SWITCHES





Designed for worldwide safety specifications these line interrupt switches incorporate direct action, double make/double break shorting bars and 3 mm minimum contact gap. Two parallel return springs, either of which could safely break the circuit alone, give added protection. UL listed and CSA approved. Meets other international requirements.

CONTACT ARRANGEMENT

Choice of Form X, Form Y or Form Z contact arrangement is basic (A1) case or (B1) case with barrier. Form X (SPST NO DB), Form Y (SPST NC DB), Form Z (SPDT DB).

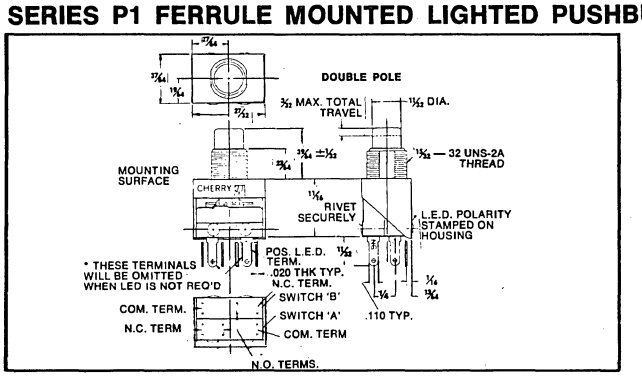
CONTACT RATINGS

F81: rated 10 Amps at 125 or 250 VAC (¾ HP at 125 VAC, 1½ HP at 250 VAC).
F82: rated 16 Amps at 125 or 250 VAC (¾ HP at 125 VAC, 1½ HP at 250 VAC).
F83: gold crosspoint contacts for low energy switching. Rated 0.1 Amp at 1250 or 250 VAC.
F84: combines two different ratings in a single switch.

TERMINALS

Either 3/16" (10) or ¼" (20) male push-on terminals are standard. Others can be tooled. In most cases terminal sizes may be mixed on a switch to help minimize wiring errors.

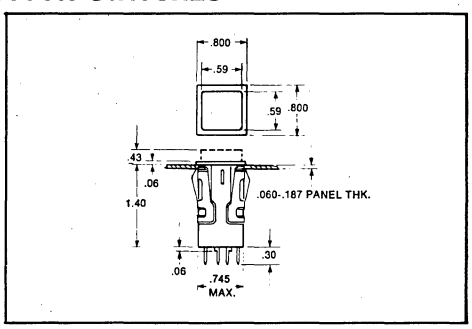
SERIES P1 FERRULE MOUNTED LIGHTED PUSHBUTTON SWITCH



The Series P1: An entirely new kind of pushbutton switch... from Cherry. Pushbutton housing holds one — or two — famous Cherry series E62 or E63 subminiature snap action switches. E62 switches are rated 10.1 Amps, 125/250 VAC — ¼ H.P., 125 VAC. E63 switches are gold crosspoint contact rated 0.1 Amp, 125 VAC for your low energy circuits. Because the P1 houses one **or** two switches, you have your choice of 10.1 Amp, 0.1 Amp — or both! — in the same pushbutton switch.

Cherry Switch Co.	Description
P162-C3RA	10.1 Amp/S.P.D.T./Red Button/L.E.D.
P162-C3BU	10.1 Amp/S.P.D.T./Black Button/No Lite
P162-D3RA	10.1 Amp/D.P.D.T./Red Button/L.E.D.
P162-D3BU	10.1 Amp/D.P.D.T./Black Button/No Lite
P163-C3RA	0.1 Amp/S.P.D.T./Red Button/L.E.D.
P163-C3BU	0.1 Amp/S.P.D.T./Black Button/No Lite
P163-D3RA	0.1 Amp/D.P.D.T./Red Button/L.E.D.
P163-D3BU	0.1 Amp/D.P.D.T./Black Button/No Lite

P4 PUSHBUTTON SWITCHES



SWITCHES

Cherry's P4 switches are available in the popular square configuration with:
- choice of momentary or alternate action
- choice of QC or PCB terminals
- choice of 3 amp @ 125 VAC/2 Amp @ 250 VAC or 0.1 Amp @ 24 VDC
- choice of several contact arrangements

P4 SWITCH PART NUMBERS

Part Number	Contacts	Contact Action	Terminal	Contact Configuration
P4 Series — Square Non Lighted				
P41B-021C P43A-021C	Silver Gold	Momentary Alt. Act.	.110 QC .110 QC	1 Form C 1 Form C
P4 Series Square One 6.3V Incandescent Lamp Installed				
P41A-621C P41B-621C	Silver Gold	Momentary Alt. Act.	.110 QC .110 QC	1 Form C 1 Form C
P4 Series Square One 14V Incandescent Lamp Installed				
P41A-722C P41B-721C	Silver Gold	Momentary Alt. Act.	.110 QC .110 QC	1 Form C 1 Form C
P4 Series Square One 28V Incandescent Lamp Installed				
P41A-821C P41B-821C	Silver Gold	Momentary Alt. Act.	.110 QC .110 QC	1 Form C 1 Form C

Silver Rating: 3A @ 125 VAC/2A @ 250 VAC
Gold Rating: 0.1A @ 24 VDC

- Three button styles
- Snaps into industry standard mounting hole from front of panel

Mixed ratings can be provided. P4 switches may be specified with or without lamp sockets. Sockets mate with widely accepted wedge-base T 1¾ incandescent lamps.

EXPLANATION OF PART NUMBER

P4 SERIES — **1 — A — 0 — 3 — 1C**

Rating
1 = 3A @ 125 VAC
2A @ 250 VAC
3 = 0.1A @ 24 VAC

Contact Action
A = Alternate Action
B = Momentary Action

Temperature
0 = No lamp
1 = 1 lamp socket
6 = 6.3V lamp installed
7 = 14V lamp installed
8 = 28V lamp installed

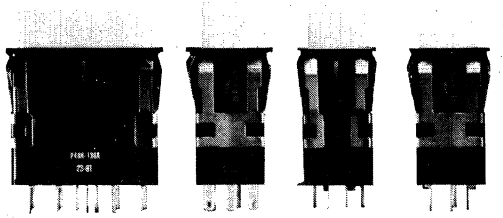
Terminal
2 = .110 QC terminal
3 = .020 pin terminal

Contact Configuration
1 C = 1 Form C contact
2 C = 2 Form C contact
4 A = 4 Form A contact
8 A = 8 Form A contact

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Pushbutton and Thumbwheel

CHERRY 3-BIT ENCODER



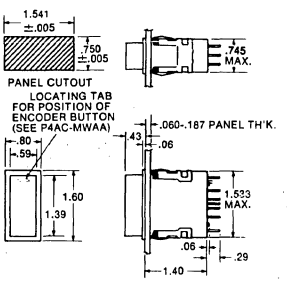
- Up to 8 different 3-bit codes, single common
- Choice of termination
- Base keyed for foolproof P.C. board orientation
- All industry-standard available from stock

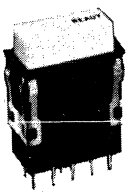
P4 Series Square 3 Bit Encoder
P43C-124A
P43C-134A

P4 Series Encoder Button Square — 3 Bit Button Only
P4AC-B3SO .43 High Translucent

P4 Series Switch Button — Blank White
P4AB-C1WN .19″ high
P4AB-B1WN .43″ high
P4AB-A1WN .32″ high

CHERRY 8-BIT ENCODER





- Up to 256 different 8-bit codes
- Dual commons for convenience on printed circuit board
- User-programmable: set code yourself for the ultimate in flexibility. Encoding instructions are supplied with 1 x 2 encoder buttons.
- Choice of termination — PCB or .110 Q.C.

P4 Standard 8-Bit Encoders
P44H-138A 8-Bit encoder body, .020 x .025 PCB terminals, empty lamp socket

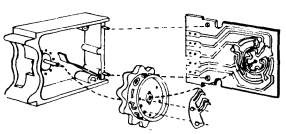
P4 Series Rectangular — 8 Bit Encoder
P44H-138A Coded (Gold) 1 lamp socket — 8 Form A .020″ pin term.

P4 Series Encoder Buttons Rectangular — Button Only
P4AC-XWAA 8 bit

THUMBWHEEL, LEVERWHEEL, PUSHWHEEL

BASIC OPERATING PRINCIPLE

A set of comb-like wiping contacts, rotated manually, shorts together predetermined combinations of traces on a stationary printed circuit board. These same traces also serve as electrical input/output lines. Here's a simplified diagram of the mechanism:



ACTUATION

Cherry offers three kinds of actuation for these rotary multi-position switches. Thumbwheel, Leverwheel and Pushwheel.

Thumbwheel
Rotate the dial directly

Leverwheel
Drive the dial by means of a lever. Convenient for fast resetting to zero position.

Pushwheel
Push one button to index the dial up . . . the other to index down.

MOUNTING

Cherry provides you with 3 mounting styles and choices. Back mount, front mount, and snap in mount.

TERMINATION

Cherry is tooled to supply terminals just right for your application.

PC BOARD

Parallel rows of holes approximately .040″ diameter.

F-PINS

Specify F-pin termination for direct mating with motherboard.

J-PINS

Specify J-pins for wire-wrap applications. More economical than F-pins.

LIGHTED SWITCHES

Cherry's T20 thumbwheel can be supplied with a socketed, replaceable lamp that requires no tools or soldering.

Cherry's T56 pushwheel is available with a permanently installed grain-of-wheat lamp. Also available with LED illumination.

COLOR

In high volume applications Cherry can provide switches in any color. Black is standard.

FINISH

Choice of glass or matte.

LEGENDS

Standard legends are spelled out in the product selection charts accompanying each catalog family.

Standard character color is white on black dial. For lighted versions, standard is black on transluscent white dial.

DUSTPROOF THUMBWHEELS

A clear plastic window covers dial character opening for resistance to dust, dirt and moisture. Available on Cherry's T24 series and T38 series.

ASSEMBLIES AND COMBINATIONS

Within a given family size, you may gang into multi-digit assemblies, specifying any combination of standard-window switches, and spacers. Simply specify exactly the combination that fits your application. Your local distributor is available to assemble these switches.

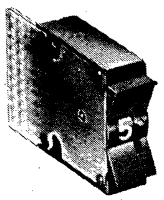
STOPS

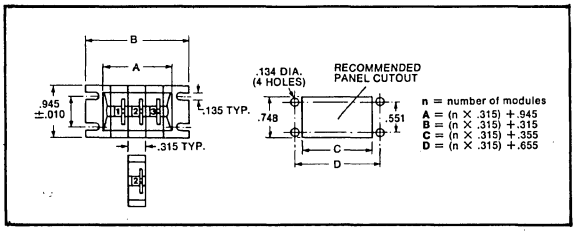
Cherry provides many standard combinations of rotation-limiting stops to help tailor our switches exactly to your application needs.

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Thumbwheel, Leverwheel, Pushwheel

SERIES T-50 — BACK MOUNT





Available in 8, 10 and 16 positions. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory or in the field to control dial rotation. Stops not available on 16 position.

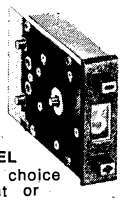
SWITCH CHARACTERISTICS:

Dielectric Strength ..... 500 VAC

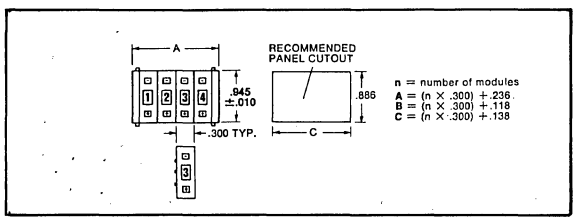
Temperature ..... −40°C to +70°C

Note: Applies to all thumbwheel switches

SERIES T56 — FRONT, SNAP-IN MOUNT

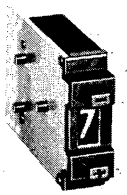


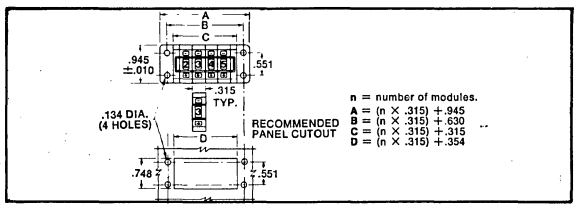
T56 PUSHWHEEL
Available with choice of incandescent or LED illumination.



Ideal for cramped control panels. Dustproof design. Offered in a wide variety of positions and output codes. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory to control dial rotation.

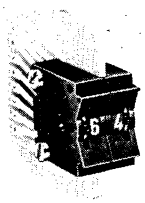
SERIES T57 — BACK MOUNT

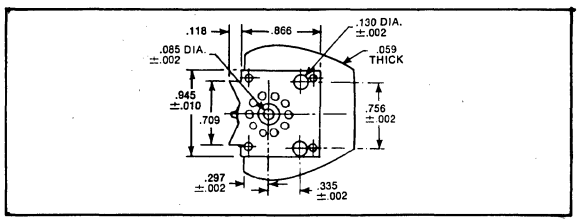




Ideal for cramped control panels. Dustproof design. Offered in a wide variety of positions and output codes. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory to control dial rotation.

SERIES T54



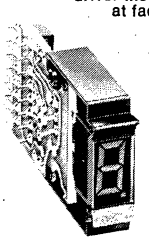


CIRCUIT BOARD MOUNT

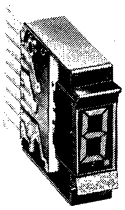
Special elevated mounting of contact wiper set permits direct mounting of this thumbwheel on PC board without modifying the board to recess into the switch housing. Configuration, dimensions and stops information the same as Series T50.

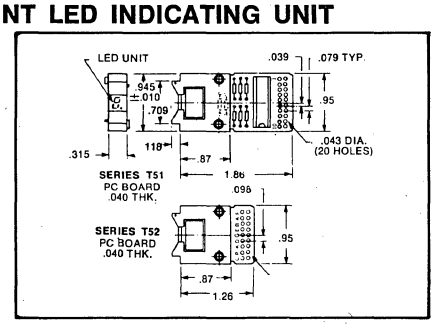
SERIES T51 & T52 — BACK MOUNT LED INDICATING UNIT

Series T51 comes with driver installed at factory.



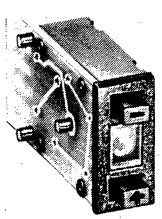
Series T52 does not include driver.

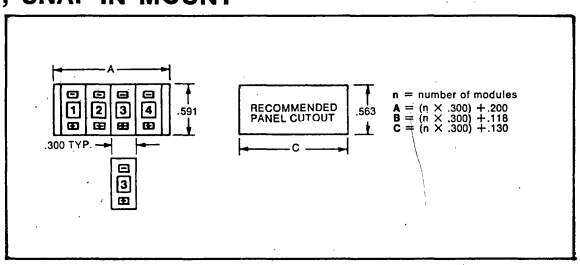




A seven segment LED indicating unit in a thumbwheel type package. Features bright red, .362″ high digit that operates at logic level voltages. Can be used with any BDC type coded thumbwheel and is also available with supplementary inputs of the ripple-blanking input and blanking input/ripple blanking output type with an automatic zero blanking feature. Additional lamp test input renders possible functional control of the indicating segments. Recommended panel cutout, endcaps and spacers are the same as Series T50.

SERIES T55 — FRONT, SNAP-IN MOUNT





The smallest of them all! Dustproof design. Offered in a wide variety of positions and output codes. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory to control dial rotation.

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Thumbwheel, Leverwheel, Pushwheel

HOW TO USE THIS CHART FOR ORDERING

When ordering standard Cherry Thumbwheel / Leverwheel switches or switch assemblies, please call out the applicable information as at right:

T35J-01 A 3

- *Series
- *Optional Pin Terminations
  - *J = J-pin terminations
  - F = F-pin terminations
- Code Suffix
- Finish**
- Number of Switches in Assembly

**A = Gloss finish M = Matte finish

SUFFIX NO.	POS.	DESCRIPTION	READ OUT SYMBOL	INDUSTRIAL				STANDARD					MINIATURE		
				T10	L10	T11	L11	T64	T65	T71	T72	T75	T20	L20	T24
-07	8	Binary Coded Octal (BCO)	0-7	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●	●‡	●‡
-77	8	BCO Complement Only	0-7					●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡
-27	8	BCO with decimal point on case	0-7	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡
-47	8	BCO with separate C to not true bits	0-7	●‡		●‡							●‡	●‡	
-57	8	BCO with Diode Provisions	0-7	●‡		●‡		●‡	●‡	●‡	●‡	●‡	●‡	●‡	
-17	8	1 of 8 Code	0-7	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●	●‡	●‡
-71	10	Aiken Code Modern 1-2-4-2'	0-9					*	●	●	●	●			
-70	10	Aiken Code 1-2-4-2'	0-9					●	●	●	●	●			
-02	10	Binary Coded Decimal (BCD)	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-04	10	BCD + Complement, 1 Common	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-24	10	BCD + Complement, 1 Common with decimal point on case	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-54	10	BCD + Complement, 1 Common with Diode Provisions	0-9	●		●							●	●	
-05	10	BCD + Complement with separate Commons	0-9		●		●								
-10	10	BCD + Even Parity	0-9		●		●	●	●	●	●	●	●	●	
-30	10	BCD + Even Parity with decimal point on case	0-9		●		●	●	●	●	●	●	●	●	
-06	10	BCD + Odd Parity	0-9					●	●	●	●	●	●	●	
-26	10	BCD + Odd Parity with decimal point on case	0-9					●	●	●	●	●	●	●	
-12	10	BCD Complement Only	0-9					●	●	●	●	●	●	●	●
-45	10	BCD Make Before Break	0-9					●	●	●	●	●	●	●	
-46	10	BCD Make Before Break with Diode Provisions	0-9					●	●	●	●	●			
-32	10	BCD with black case and white wheel	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-22	10	BCD with decimal point on case	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-25	10	BCD with separate C to not true bits with decimal point on case	0-9	●		●							●	●	
-52	10	BCD with Diode Provisions	0-9	●		●		●	●	●	●	●	●	●	
-15	10	BCD with separate C to not true bits	0-9	●		●							●	●	
-73	10	Berkley Code	0-9										●	●	
-74	10	Berkley Code with Diode Provisions	0-9										●	●	
-90	10	Complement of 7 segment indicator	0-9					●	●	●	●	●			
-75	10	Complement of 9's Complement	0-9												
-72	10	Complement of 9's Complement with Diode Provisions	0-9										●	●	
-01	10	Decimal	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-11	10	Decimal—Double Pole	0-9	●	●	●	●	●	●	●	●	●	●	●	
-69	10	Decimal Make Before Break	0-9					●	●	●	●	●	●	●	
-31	10	Decimal with black case and white wheel	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-21	10	Decimal with decimal point on case	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-78	10	Decimal with Common in Middle	0-9	●		●							●	●	
-79	10	Decimal with Common in Middle with Diode Provisions	0-9												
-51	10	Decimal with Diode Provisions	0-9					●	●	●	●	●			
-49	10	Excess 3 Grey Code Negative	0-9					●	●	●	●	●			
-50	10	Excess 3 Grey Code Positive	0-9					●	●	●	●	●			
-84	10	Repeating—Double Pole	−,+										●	●	
-85	10	Repeating—Double Pole	0-1										●	●	
-86	10	Repeating—Double Pole	0-5										●	●	
-92	10	Repeating—Double Pole	0-1					●	●	●	●	●			
-93	10	Repeating—Double Pole	0-5					●	●	●	●	●			
-97	10	Repeating—Double Pole	+,−					●	●	●	●	●			
-80	10	Repeating—Single Pole	+,−	●‡	●‡	●‡	●‡	●	●	●	●	●	●	●	●
-94	10	Repeating—Single Pole	−,+	●‡	●‡	●‡	●‡	●	●	●	●	●	●	●	●
-95	10	Repeating—Single Pole	0-1	●‡	●‡	●‡	●‡	●	●	●	●	●	●	●	●
-96	10	Repeating—Single Pole	0-5	●‡	●‡	●‡	●‡	●	●	●	●	●	●	●	●
-81	10	Repeating—Single Pole with extended PCB	+,−	●‡		●‡		●	●	●	●	●			
-82	10	Repeating—Single Pole with extended PCB	0-1	●‡		●‡		●	●	●	●	●			
-83	10	Repeating—Single Pole with extended PCB	0-5	●‡		●‡		●	●	●	●	●			
-68	10	2 out of 5 Code	0-9					●	●	●	●	●	●	●	
-62	10	9's Complement of BCD	0-9										●	●	
-91	10	9's Complement of BCD with Diode Provisions	0-9										●	●	
-14	10	9's Complement of BCD + Complement	0-9												
-20	12	1 of 12 Code	0-11					●	●		●	●		●	
-61	12	1 of 12 Code	0-9 A-B					●	●		●	●		●	
-99	12	1 of 12 Code Make Before Break	0-11											●	
-60	12	4 Bit Binary	0-11	●‡		●‡		●	●		●	●	●‡	●	
-76	12	4 Bit Binary + Odd Parity	0-11											●	
-64	16	Grey Code	0-15					●	●		●	●			
-03	16	Hexidecimal (HEX)	0-15	●		●		●	●		●	●	●	●	
-13	16	Hexidecimal (HEX)	0-9 A-F	●		●		●	●		●	●	●	●	
-08	16	HEX + Complement, 1 Common	0-15	●		●		●	●		●	●	●	●	
-88	16	HEX + Complement, 1 Common	0-9 A-F	●		●		●	●		●	●	●	●	
-28	16	HEX + Complement, 1 Common with decimal point on case	0-15	●		●		●	●		●	●	●	●	
-29	16	HEX + Complement, 2 Commons with decimal point on case	0-15	●		●							●	●	
-09	16	HEX + Complement with separate Commons	0-15	●		●							●	●	
-89	16	HEX + Complement with separate Commons	0-9 A-F	●		●							●	●	
-23	16	HEX with decimal point on case	0-15	●		●		●	●		●	●	●	●	
-53	16	HEX with Diode Provisions	0-15	●		●		●	●		●	●	●	●	
-63	16	HEX with Diode Provisions	0-9 A-F	●		●		●	●		●	●	●	●	
-16	16	HEX with separate C to not true bits	0-15										●	●	
-18	16	HEX with separate C to not true bits	0-9 A-F										●	●	
-98	16	1 of 16 Code Make Before Break	0-15										●	●	

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Thumbwheel, Leverwheel, Pushwheel

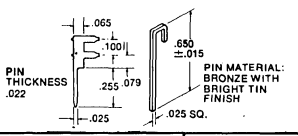
COMPLETE PRODUCT LISTING

The example at left calls out a **T-35 Series** backmount Thumbwheel, with **J-pin terminations, 10 position decimal** code, **black gloss finish,** in a **three switch assembly.**

AVAILABLE PC BOARD TERMINATIONS

All PC boards have a .040″ diameter hole to accommodate a wire for each output. Pin terminations for mother-board insertion or for wire-wrap capabilities can be applied upon request. Two types of pin terminations are available:

P SERIES **J SERIES**



SUFFIX NO.	POS.	DESCRIPTION	READ OUT SYMBOL	MINIATURE				SUBMINIATURE						SUB-SUBMINIATURE	
				T35	T38	T62	T63	T50	T51	T52	T54	T56	T57	T55	SUFFIX NO.
-07	8	Binary Coded Octal (BCO)	0-7	●‡	●‡	●‡	●‡	●‡			●‡	●‡		●‡	-07
-77	8	BCO Complement Only	0-7	●‡	●‡	●‡	●‡	●‡			●‡	●‡		●‡	-77
-27	8	BCO with decimal point on case	0-7	●‡	●‡	●‡	●‡	●‡			●‡	●‡		●‡	-27
-47	8	BCO with separate C to not true bits	0-7												-47
-57	8	BCO with Diode Provisions	0-7			●‡	●‡	●‡			●‡	●‡		●‡	-57
-17	8	1 of 8 Code	0-7	●‡	●‡	●‡	●‡	●‡			●‡	●‡		●‡	-17
-71	10	Aiken Code Modern 1-2-4-2'	0-9			●	●								-71
-70	10	Aiken Code 1-2-4-2'	0-9			●	●								-70
-02	10	Binary Coded Decimal (BCD)	0-9	●	●	●	●	●	●	●	●	●	●	●	-02
-04	10	BCD + Complement, 1 Common	0-9	●	●	●	●	●			●	●	●	●	-04
-24	10	BCD + Complement, 1 Common with decimal point on case	0-9	●	●	●	●	●			●	●	●	●	-24
-54	10	BCD + Complement, 1 Common with Diode Provisions	0-9												-54
-05	10	BCD + Complement with separate Commons	0-9												-05
-10	10	BCD + Even Parity	0-9			●	●								-10
-30	10	BCD + Even Parity with decimal point on case	0-9			●	●								-30
-06	10	BCD + Odd Parity	0-9			●	●								-06
-26	10	BCD + Odd Parity with decimal point on case	0-9			●	●								-26
-12	10	BCD Complement Only	0-9	●	●	●	●	●			●	●		●	-12
-45	10	BCD Make Before Break	0-9			●	●								-45
-46	10	BCD Make Before Break with Diode Provisions	0-9			●	●								-46
-32	10	BCD with black case and white wheel	0-9	●	●	●	●	●			●	●	●	●	-32
-22	10	BCD with decimal point on case	0-9	●	●	●	●	●			●	●	●	●	-22
-25	10	BCD with separate C to not true bits with decimal point on case	0-9												-25
-52	10	BCD with Diode Provisions	0-9			●	●	●			●	●		●	-52
-15	10	BCD with separate C to not true bits	0-9												-15
-73	10	Berkley Code	0-9												-73
-74	10	Berkley Code with Diode Provisions	0-9												-74
-90	10	Complement of 7 segment indicator	0-9			●	●								-90
-75	10	Complement of 9's Complement	0-9												-75
-72	10	Complement of 9's Complement with Diode Provisions	0-9												-72
-01	10	Decimal	0-9	●	●	●	●	●			●	●		●	-01
-11	10	Decimal—Double Pole	0-9			●	●								-11
-69	10	Decimal Make Before Break	0-9			●	●								-69
-31	10	Decimal with black case and white wheel	0-9	●	●	●	●	●			●	●		●	-31
-21	10	Decimal with decimal point on case	0-9	●	●	●	●	●			●	●		●	-21
-78	10	Decimal with Common in Middle	0-9												-78
-79	10	Decimal with Common in Middle with Diode Provisions	0-9												-79
-51	10	Decimal with Diode Provisions	0-9			●	●					●		●	-51
-49	10	Excess 3 Grey Code Negative	0-9			●	●								-49
-50	10	Excess 3 Grey Code Positive	0-9			●	●								-50
-84	10	Repeating—Double Pole	−,+												-84
-85	10	Repeating—Double Pole	0-1												-85
-86	10	Repeating—Double Pole	0-5												-86
-92	10	Repeating—Double Pole	0-1			●	●								-92
-93	10	Repeating—Double Pole	0-5			●	●								-98
-97	10	Repeating—Double Pole	+,−			●	●								-97
-80	10	Repeating—Single Pole	+,−	●	●	●	●	●			●	●		●	-80
-94	10	Repeating—Single Pole	−,+	●	●	●	●	●			●	●		●	-94
-95	10	Repeating—Single Pole	0-1	●	●	●	●	●			●	●		●	-95
-96	10	Repeating—Single Pole	0-5	●	●	●	●	●			●	●		●	-96
-81	10	Repeating—Single Pole with extended PCB	+,−			●	●					●			-81
-82	10	Repeating—Single Pole with extended PCB	0-1			●	●					●			-82
-83	10	Repeating—Single Pole with extended PCB	0-5			●	●					●			-83
-68	10	2 out of 5 Code	0-9			●	●								-68
-62	10	9's Complement of BCD	0-9												-62
-91	10	9's Complement of BCD with Diode Provisions	0-9												-91
-14	10	9's Complement of BCD + Complement	0-9												-14
-20	12	1 of 12 Code	0-11			●	●								-20
-61	12	1 of 12 Code	0-9 A-B			●	●								-61
-99	12	1 of 12 Code Make Before Break	0-11												-99
-60	12	4 Bit Binary	0-11			●	●					●‡			-60
-76	12	4 Bit Binary + Odd Parity	0-11												-76
-64	16	Grey Code	0-15			●	●								-64
-03	16	Hexidecimal (HEX)	0-15			●	●	●			●	●			-03
-13	16	Hexidecimal (HEX)	0-9 A-F			●	●	●			●	●			-13
-08	16	HEX + Complement, 1 Common	0-15			●	●								-08
-88	16	HEX + Complement, 1 Common	0-9 A-F			●	●								-88
-28	16	HEX + Complement, 1 Common with decimal point on case	0-15			●	●								-28
-29	16	HEX + Complement, 2 Commons with decimal point on case	0-15												-29
-09	16	HEX + Complement with separate Commons	0-15												-09
-89	16	HEX + Complement with separate Commons	0-9 A-F												-89
-23	16	HEX with decimal point on case	0-15			●	●	●			●	●			-23
-53	16	HEX with Diode Provisions	0-15			●	●					●			-53
-63	16	HEX with Diode Provisions	0-9 A-F			●	●					●			-63
-16	16	HEX with separate C to not true bits	0-15												-16
-18	16	HEX with separate C to not true bits	0-9 A-F												-18
-98	16	1 of 16 Code Make Before Break	0-15												-98

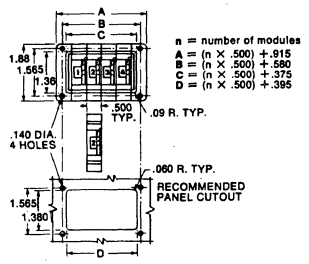
CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Thumbwheel, Leverwheel, Pushwheel

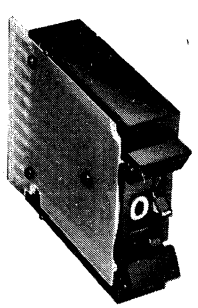
MECHANICAL CHARACTERISTICS		INDUSTRIAL				STANDARD					MINIATURE		
		T10	L10	T11	L11	T64	T65	T71	T72	T75	T20	L20	T24
ACTION	Thumbwheel	●		●		●	●	●	●	●	●		●
	Leverwheel		●		●							●	
	Pushwheel												
NUMBER OF POSITIONS	8	●‡	●‡	●‡	●‡	●	●	●	●	●	●	●‡	●‡
	10	●	●	●	●	●	●	●	●	●	●	●	●
	12	●‡		●‡		●	●		●	●	●‡	●	
	16	●		●		●	●		●	●	●	●	
	Stops Available	●	●	●	●	●	●	●	●	●	●	●	●
APPROXIMATE HEIGHT	1.88	●	●	●	●								
	1.20					●	●	●	●	●			
	1.15										●	●	●
	.945												
	.590												
MOUNTING TYPE	Front/Screw			●	●								
	Front/Snap In						●		●	●			
	Front/Integral Bezel							●					
	Front/Attached to Cust. PCB					●							
	Rear/Screw	●	●								●	●	●
	Rear/Attached to Cust. PCB												
FINISH	(A) Gloss	●	●	●	●	●	●	●	●	●	●	●	●
	(M) Matte	●	●	●	●	●	●	●	●	●	●	●	●
TERMINATION	F Pin Termination*	⊖	⊖	●	●	●	●	●	●	●	●	●	●
	J Pin Termination*	●	●	●	●	●	●	●	●	●	●	●	●
MISCELLANEOUS	Dustproof												●
	Lighted									⊖	⊖		
	Wide Window	●							●		●		

*Not Available In All Codes. Consult Factory ‡With Stops

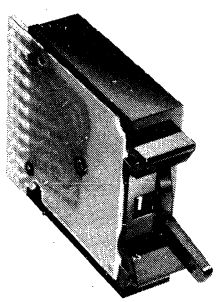
SERIES T10 & L10 — BACK MOUNT



T10 Thumbwheel available in 8, 10, 12 and 16 positions. L10 Leverwheel available in 8 and 10 positions. Both offered in a wide variety of output codes. T10 Thumbwheel can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory to control dial rotation.

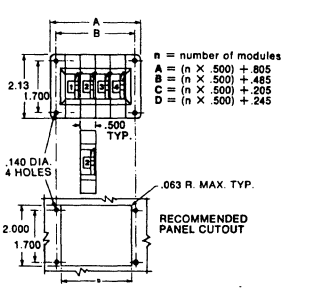


T10 THUMBWHEEL

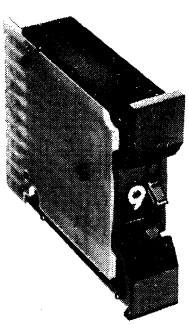


L10 LEVERWHEEL

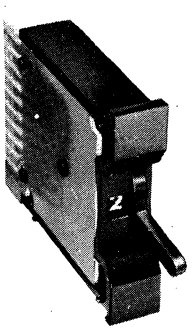
SERIES T11 & L11 — FRONT MOUNT



T11 Thumbwheel available in 8, 10, 12 and 16 positions. L11 Leverwheel available in 8 and 10 positions. Both offered in a wide variety of output codes. T11 Thumbwheel can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory to control dial rotation.



T11 THUMBWHEEL



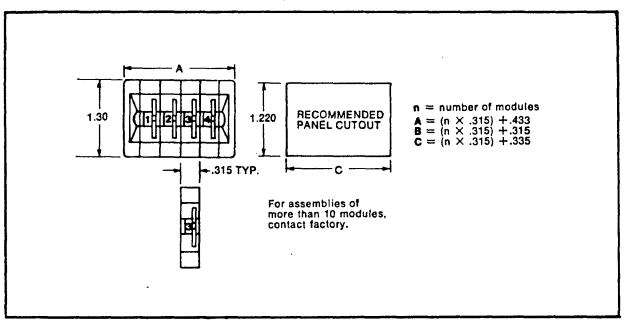
L11 LEVERWHEEL

CHERRY Thumbwheel, Leverwheel, Pushwheel

MECHANICAL CHARACTERISTICS		MINIATURE				SUBMINIATURE						SUB-SUBMINIATURE	
		T35	T38	T62	T63	T50	T51	T52	T54	T56	T57	T55	SUFFIX NO.
ACTION	Thumbwheel	●	●	●	●	●	●	●	●				
	Leverwheel												
	Pushwheel									●	●	●	
NUMBER OF POSITIONS	8	●‡	●‡	●	●	●‡			●‡	●‡		●‡	
	10	●	●	●	●	●	●	●	●	●	●	●	
	12			●	●					●			
	16			●	●	●			●	●			
	Stops Available	●	●	●	●	●			●	●		●	
APPROXIMATE HEIGHT	1.88												
	1.20												
	1.15	●	●	●	●								
	.945					●	●	●	●	●	●		
	.590											●	
MOUNTING TYPE	Front/Screw												
	Front/Snap In									●		●	
	Front/Integral Bezel												
	Front/Attached to Cust. PCB												
	Rear/Screw	●	●		●	●	●	●			●		
	Rear/Attached to Cust. PCB			●					●				
FINISH	(A) Gloss	●	●										
	(M) Matte	●	●	●	●	●	●	●	●	●	●	●	
TERMINATION	F Pin Termination*	●	●	●	●	●	●	●	●	●	●	●	
	J Pin Termination*	●	●	●	●	●	●	●	●	●	●	●	
MISCELLANEOUS	Dustproof		●										
	Lighted									●	●	●	
	Wide Window												

*Not Available In All Codes. Consult Factory ‡With Stops

SERIES T65 — FRONT, SNAP-IN MOUNT

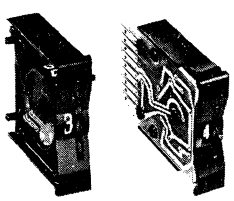


Available in 8, 10, 12 and 16 positions and a wide variety of output codes. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory or in the field to control dial rotation.

SERIES T64

Also available as Circuit Board Mount

Wheel and detent spring are mounted in case so as to elevate the contact wiper set. This permits direct mounting on PC board without modifying the board to recess into switch housing. Typically, the circuit board plugs into a chassis and the thumbwheel switch is mounted to permit presetting to circuit functions. Available in 8, 10, 12 and 16 positions. Dimensions are the same as Series T65.



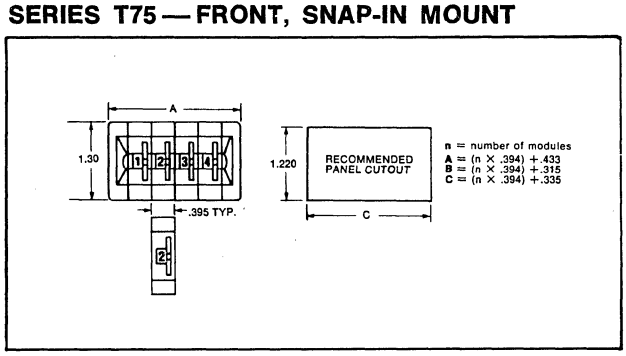
SWITCH CHARACTERISTICS:

Dielectric Strength ..... 500 VAC

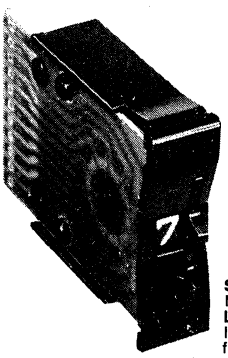
Temperature ..... −40°C to +70°C

Note: Applies to all thumbwheel switches

SERIES T75 — FRONT, SNAP-IN MOUNT



Available in 8, 10, 12 and 16 positions and a wide variety of output codes. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory in the field to control dial rotation.

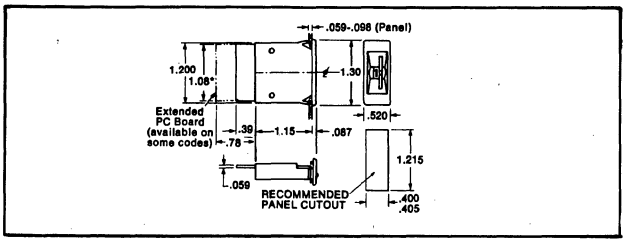


Series T75 — Front Snap-In Mount is also available as Lighted Thumbwheel. Indicated by third digit of suffix. For example T75-01 "L".

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Thumbwheel, Leverwheel, Pushwheel

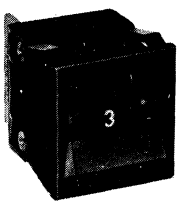
SERIES T71 — INTEGRAL BEZEL, FRONT, SNAP-IN MOUNT

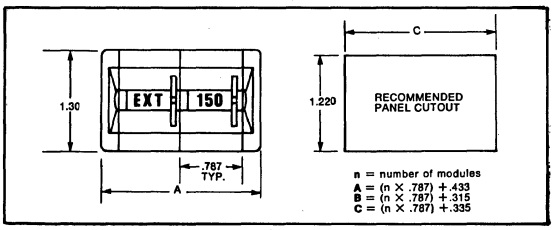


Standard code is 10 positions decimal. Also available on special order in T65 and T75 standard codes except for 12 and 16 position.

SWITCH CHARACTERISTICS:
Dielectric Strength ..... 500 VAC
Temperature ..... −40°C to +70°C
Note: Applies to all thumbwheel switches

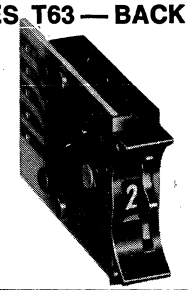
SERIES T72 — WIDE WINDOW FUNCTION SWITCH, FRONT, SNAP-IN MOUNT





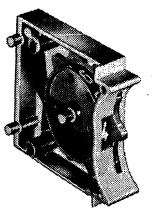
A unique variation of the Series T75, modified to provide a legend area more than three times wider than normal. Offered in a wide variety of standard legends at no extra charge. Non standard legends also available. May be used as a single unit or ganged together with any number of Series T65, T72 or T75 modules.

SERIES T63 — BACK MOUNT



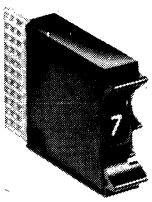
Available in 8, 10, 12 and 16 positions with a wide variety of output codes. Stops may be inserted at factory or in the field to control dial rotation.

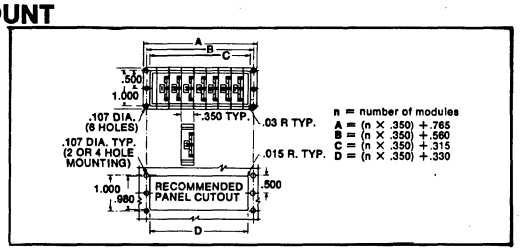
SERIES T62 — CIRCUIT BOARD MOUNT



Wheel and detent spring are mounted in case so as to elevate the contact wiper set. This permits direct mounting on PC board without modifying the board to recess into switch housing. Typically, the circut board plugs into a chassis and the thumbwheel switch is mounted to permit presetting to circuit functions. Available in 8, 10, 12 and 16 positions. Dimensions are the same as Series T63.

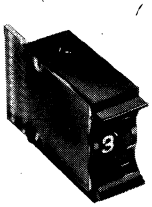
SERIES T35 & T38 — BACK MOUNT

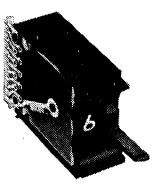


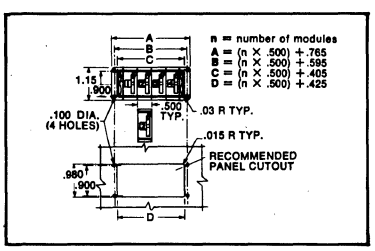


Available in 8 and 10 positions in many output codes. Stops may be inserted at factory or in the field to control dial rotation.

SERIES T20 & L20 — BACK MOUNT

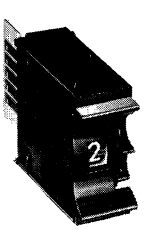


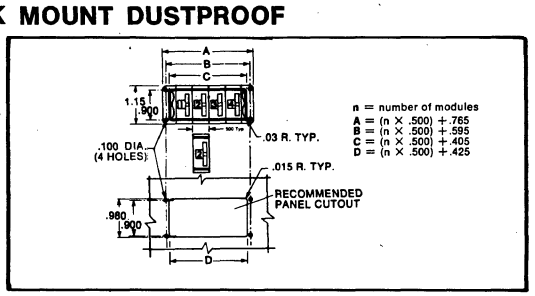




T20 Thumbwheel and L20 Leverwheel available in 8, 10, 12 and 16 positions with widest range of output codes. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory or in the field to control dial rotation.

SERIES T24 — BACK MOUNT DUSTPROOF





A dustproof version of the Series T20 Thumbwheel shown on the preceding page. Clear plastic window covers dial character opening for resistance to dust and moisture. Available in 8 and 10 positions. Stops may be inserted at factory or in the field to control dial rotation.

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY

Thumbwheel, Leverwheel, Pushwheel

THUMBWHEEL CONNECTORS

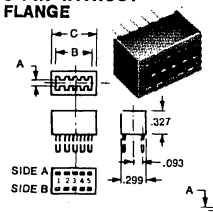
SPECIFICATIONS

Pin spacing on connectors is either .079″ or .100″, in a choice of 9 or 11 pin configuration. Available with or without mounting flanges. Flanges have elongated mounting holes (.122″ x .178″) to accept No. 4-40 or No. 4-48 machine screws.

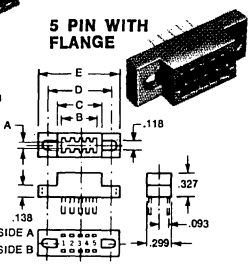
Body material: Molded Noryl

Pins: Gold flashed beryllium copper

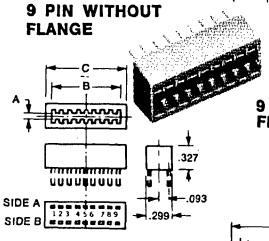
5 PIN WITHOUT FLANGE



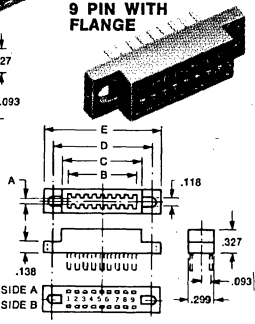
5 PIN WITH FLANGE



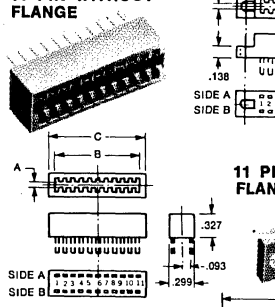
9 PIN WITHOUT FLANGE



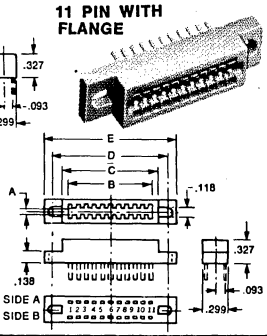
9 PIN WITH FLANGE



11 PIN WITHOUT FLANGE



11 PIN WITH FLANGE



COLOR	With and Without Flange: SWITCH SERIES	NO. OF PINS	A	B	C	With Flange Only: D	E	With and Without Flange: PC BOARD THICKNESS
RED	T56 T56	9 11	.051 .051	.886 .886	.945 .945	1.181 1.181	1.417 1.417	.039 .039
BEIGE	T50 T50	9 11	.051 .051	.965 .965	1.024 1.024	1.260 1.260	1.496 1.496	.039 .039
GREEN	T20, 65, 75 L20	11	.071	1.146	1.205	1.441	1.677	.059
BLACK	T55	5	.051	.563	.630	.866	1.102	.039

SERIES T50 (Beige) 9 pins on .100″ centers, 11 pins on .079″ centers

TERMINATION: Solder Pins: Without Flange	Solder Pins: With Flange	Solder Lugs: Without Flange	Solder Lugs: With Flange	Number of Pins	For Use With Switch Numbers:
C2BO—P101	C2BF—P103	C2BO—N101	C2BF—N103	Side A, 9 Pins	T50-02, 03, 04, 94, 95, 96
C2BO—P802	C2BF—P804	C2BO—N802	C2BF—N804	Side A, 11 Pins	T50-01
—	C2BF—P105	—	—	Side A, 9 Pins; Side B, 9 Pins.	
—	C2BF—P806	—	—	Side A, 11 Pins; Side B, 11 Pins.	

NOTE: No connector is available to fit the T51-02.

SERIES T55 (Black) All pins on .100″ centers, 5 pins per row

TERMINATION: Solder Pins: Without Flange	Solder Pins: With Flange	Solder Lugs: Without Flange	Solder Lugs: With Flange	Number of Pins	For Use With Switch Numbers:
C2KO—P107	C2KF—P109	C2KO—N107	C2KF—1N09	Side A, 5 Pins	See Note
C2KF—P108	C2KF—P110	—	—	Side A, 5 Pins; Side B, 5 Pins.	See Note

NOTE: T55 connectors fit all codes except decimal.

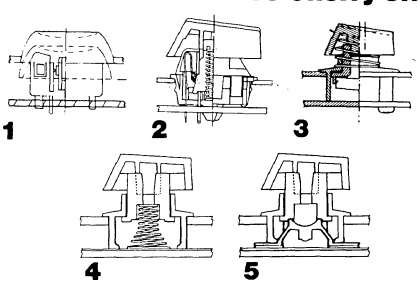
SERIES T56 (Red) 9 pins on .100″ centers, 11 pins on .079″ centers

TERMINATION: Solder Pins: Without Flange	Solder Pins: With Flange	Solder Lugs: Without Flange	Solder Lugs: With Flange	Number of Pins	For Use With Switch Numbers:
C2RO—P111	C2RF—P116	—	C2RF—N116	Side A, Pins 1, 3, 5, 7, 9.	T56-02, 03
C2RO—P112	C2RF—P117	—	—	Side A, Pins 1, 3, 4, 5, 6, 7, 9.	T56 02L, 03L, 12
C2RO—P113	C2RF—P118	C2RO—N113	C2RF—N118	Side A, 9 Pins	T56-02, 02L, 03, 03L, 04, 12
C2RO—P814	C2RF—P819	C2RO—N814	C2RF—N819	Side A, 11 Pins	T56-01
C2RO—P815	C2RF—P820	—	—	Side A, 11 Pins; Side B, Pins 5, 7.	T56-01L
—	C2RF—P121	—	—	Side A, 9 Pins; Side B, 9 Pins.	T56-02
—	C2RF—P822	—	—	Side A, 11 Pins; Side B, 11 Pins.	T56-01

SERIES T20, L20, T65, T75 (Green) All pins on .100″ centers, 11 pins per row maximum

TERMINATION: Solder Pins: Without Flange	Solder Pins: With Flange	Solder Lugs: Without Flange	Solder Lugs: With Flange	Number of Pins	For Use With Switch Numbers:
C2GO—P123	C2GF—P126	—	—	Side A, Pins 4, 5, 6, 7, 8.	T20C-02 L20C-02 T65C-02 T75C-02
C2GO—P124	C2GF—P127	C2GO—N124	C2GF—N127	Side A, 11 Pins	T65C-01 T75C-01
C2GO—P125	C2GF—P128	—	—	Side A, 11 Pins; Side B, 11 Pins.	

KEYBOARDS—Since Cherry offers the five best technologies...one is right for your product.



1 Mini-Travel Hard Contact
Series M8. Mini, .100″ travel versions of our gold crossbar contact configuration. Same low profile. Even lower cost. Super low rest height: .426″.

2 Full Travel Hard Contact
Series MX. Gold crossbar contact configuration relied on in millions of applications. Worldwide. Travel: .160″. Rest height: .703″.

3 Full Travel Capacitive
Series MF. Pad capacitive in a uniquely simple design requiring only five parts and a snap-in pad. Travel: .150″. Rest height: .703″.

4 Full Travel Linear Feel Sealed Contact
Conical steel spring action plus the quality and reliability of sealed silver contacts for long life, low cost. Top mount ergonomic sculptured keyshape. Travel: .150″. Rest height: .665″.

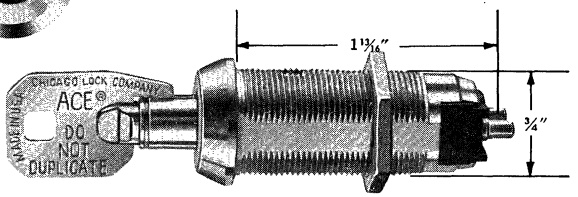
5 Full Travel Tactile Feel Sealed Contact
Elastomeric action combined with sealed silver contacts for long life, low cost. Top mount ergonomic sculptured keyshape. Travel: .150″. Rest height: .703″.

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

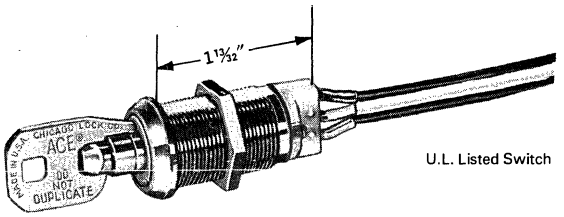
Maximum Security Switch Locks for every application!

Write or call for Switch Lock brochure.

Switch Locks

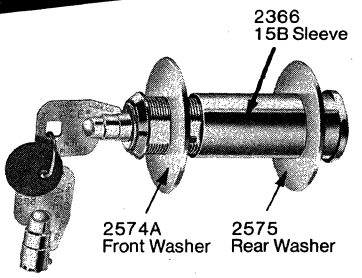


No. 4073—Maintaining contact switch. Key removable "off," "on" or "off-on". Also available as 4073-70 with momentary contact switch. All brass construction. Also offered with die cast outer barrel. No. 2274-80 same as 4073 except with double bitted lock.

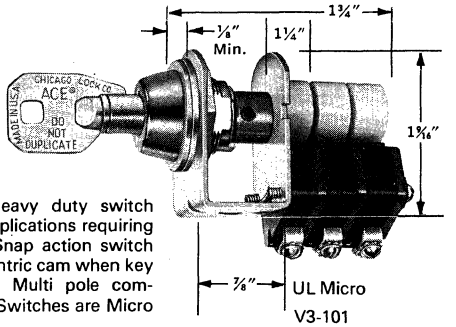


U.L. Listed Switch

No. 4235 — Easy to mount, UL Listed switch SPDT, available with silver plated contacts and 10" wire leads. Offered without 10" leads at reduced cost. Furnished with micro-switch 1SX1-H58.



No. 3039 - SPST switch with adjustable sleeve and washers; dependable wiping contacts. Solder terminals. Lock all brass construction, polished chrome finish. Key removable "off," "on" or "off-on." Also available in die cast outer barrel.

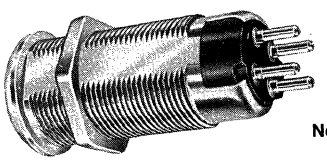


U.L. Listed Switch

UL Micro V3-101

No. EXA-112-3—Heavy duty switch lock designed for applications requiring UL Listed switch. Snap action switch actuated by an eccentric cam when key turned 90 degrees. Multi pole combinations available. Switches are Micro No. V3-101.

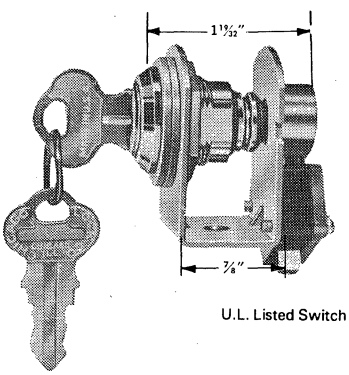
SPECIAL APPLICATION — TWO SEPARATE SPST CIRCUITS



No. 4074

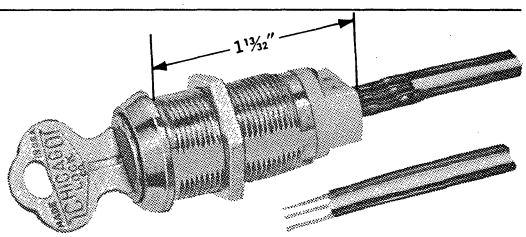
7 Pin Tumbler ACE II™ Mechanism. Same as 4073 lock except with two circuits.

Chicago double bitted switch locks



U.L. Listed Switch

No. EXD-98
Same as EXA-112, except with double bitted cylinder. Designed for high current applications. Multiple pole combinations available. Furnished with micro-switch V3-101.



No. 3535 — UL Listed switch, SPDT. Furnished with silver plated contacts and 10" wire leads. Same as 4235 except has double bitted cylinder. Available without 10" leads at reduced cost. Furnished with micro-switch 1SX1-H58.

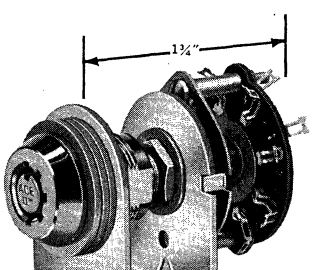
Current Ratings	Lock Numbers
*125-250VAC, 5 AMP; 30 VDC, 3 AMP	3535, 4235
*125-250VAC, 7 AMP; 28 VDC, 7 AMP	2174, 2174-70,
110-120VAC, 10 AMP; 10 VDC, 10 AMP	3039, 4073, 4073-70
125 VDC, ½ AMP	EXD-98, EXA-112†
125-250 VAC, 10 AMP	EXD-98-25
125-250 VAC — Over 10 AMP	EXD-112-25

†When ordering, specify if for appliances requiring T.V. approved switches. Only available on EXD-98 or EXA-112 series.

CURRENT RATINGS for 4188 and 2242	Voltage	AC amps Resistive	DC amps Resistive
	6V	5.5	5.5
	12V	3.5	3.5
	24V	1.75	1.55
	48V	.8	.65
	115V	.23	.21

***Silver plated contacts.** **Also suited for low energy circuits.**

Switch locks with wafer type switches



No. 4188 — Key operated with bracket mounting and Ace cylinder. Switch designed for low voltage applications. Multiple poles and various throw arrangements available with stacked wafers. Available with double bitted lock No. 2242.

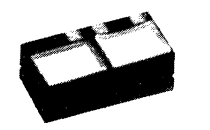
CHICAGO LOCK CO.

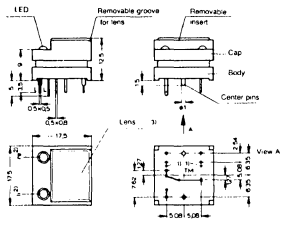
4311 West Belmont Ave., Chicago, Illinois 60641
Phone 1-312-282-7177

COBA/Widmaier SWITCHES/KEYBOARDS

MIDGET SWITCHES FOR DIGITAL ELECTRONICS

MINI-TAST 1100



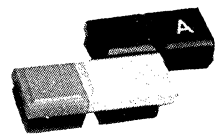


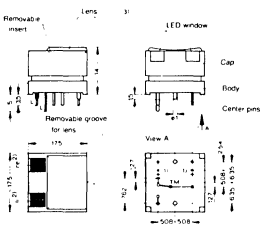
MECHANICAL DATA
Contact type:
1 Form C (snap action)
Travel: ~ 1.5 mm
Force: 120 gr
Application: per DIN 40040 −25°C/+85°C

ELECTRICAL DATA
Switching voltage:
Max 60V ac/dc
Max current: 100mA
Max switching power:
6W, resistive
Electrical life:
1×10^6 operations
Bounce: <2ms
Contact resistance:
<30mOhm
Dielectric strength:
500V~

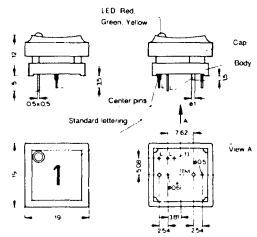
MATERIALS
Contact material:
Silver plated 10 micron, gold flashed 3 micron available
Body and cap:
Polycarbonate

MINI-TAST 1110





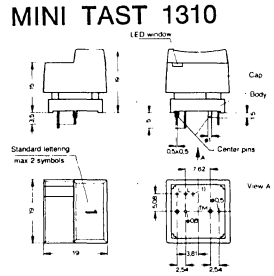
MINI-TAST 1300



MECHANICAL DATA
1 Make contact (form A)
Travel: ~ 1.5mm
Operating force: ~ 1N
Application: in accordance with DIN 40040 −25°C/+85°C

ELECTRICAL DATA
Switching voltage:
60V~
Switching current:
50mA
Switching power: 3W
Values are resistive.
Electrical life: 10×10^6 operations
Bounce: 2ms
Contact resistance:
50 mOhm
Dielectric strength:
50 VAC

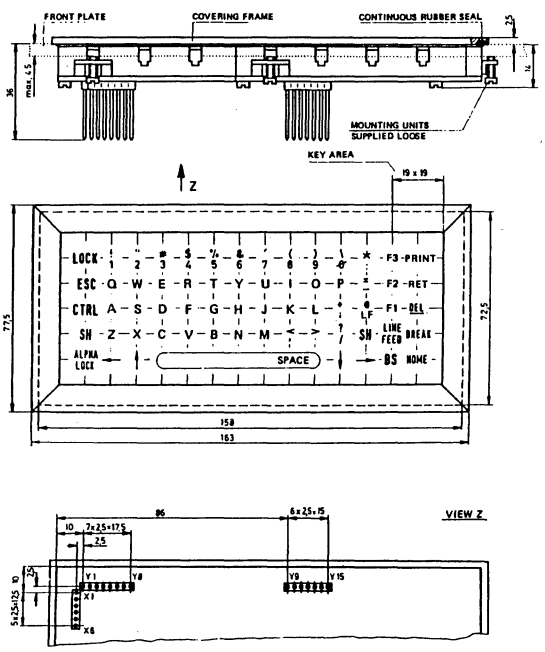
MINI TAST 1310

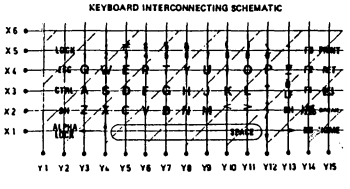


MATERIALS
Contact material:
Silver plated 10 micron, gold flashed 3 micron available
Body and cap:
polycarbonate

MTS Micro-Tast-System

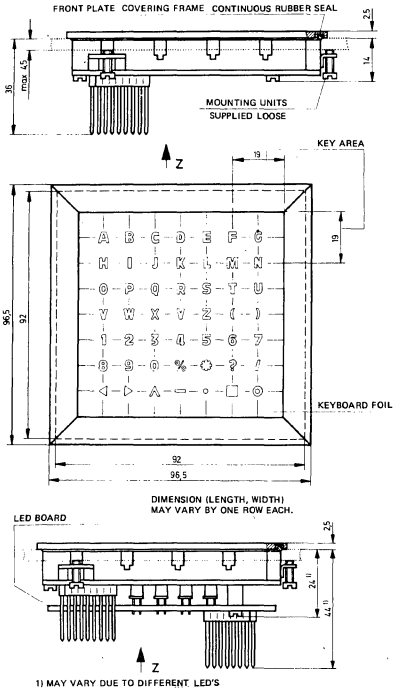
STANDARD KEYBOARD





CHARACTERISTICS
49 Keys
Coded per ASC II (DIN 66003)
5 Levels
Serial Output: Current loop 20mA potential free (active/passive) V24/RS 232
Parallel Output: 7 Bit (and/or 8 Bit optional)
Microprocessor electronic coding
Customer specified coding available (upon request)

STANDARD KEYBOARD WITH LED BOARD



Auto repeat
Operating Voltage: +5 VDC; +12 VDC; −12 VDC

TECHNICAL DATA
EXECUTION:
Keyboard: 48 MTS −
Keys arranged 7 X 7
Connections: 25 Pole D-plug HDP 20 (Amp)
Plug in P.C. Board containing electronics and keys
Mounting: Screw-on Clamps

CHARACTERISTICS
70 KEYS
CODED PER ASCII (DIN 66003)
5 LEVELS
SERIAL OUTPUT: CURRENT LOOP 20mA POTENTIAL FREE (ACTIVE/PASSIVE) V24/RS 232
PARALLEL OUTPUT: 7 BIT (AND/OR 8 BIT OPTIONAL)
MICROPROCESSOR ELECTRONIC CODING
CUSTOMER SPECIFIED CODING AVAILABLE (UPON REQUEST)
AUTO REPEAT

OPERATING VOLTAGE +5 VDC; +12 VDC; −12 VDC
TECHNICAL DATA
EXECUTION:
KEYBOARD: 70 MTS − KEYS ARRANGED 5 X 14
CONNECTIONS: 25 POLE D-PLUG HDP 20 (AMP)
PLUG IN P.C. BOARD CONTAINING ELECTRONICS AND KEYS
MOUNTING: SCREW-ON CLAMPS
CODING:
POWER SUPPLY: +5V ±5% 500 mA MAX. +12V±5% 30 mA MAX. −12V ±10% 15 mA MAX.
BLOCKING: LINE REVERSAL TECHNIQUE (2-KEY ROLLOVER)
DATA OUTPUT: A) SERIAL-, 1 START-, 2 STOP BITS (7 AND/OR 8 BIT)
OUTPUT LEVEL: CURRENT LOOP 20 mA ACTIVE, CHANGEABLE TO PASSIVE, POTENTIAL FREE, V24 INTERFACE
BAUD RATE: 50 . . . .9600 BAUD, STRAP SELECTABLE
PARITY: STRAIGHT (CHANGEABLE)
B) PARALLEL OUTPUT 7 AND/OR 8 BIT PARALLEL, TTL LEVEL FAN-OUT 10
OPERATING TEMPERATURE: 0°C, +65°C
STORAGE TEMPERATURE: −40°C, +70°C
MECHANICAL DATA
CONTACT TYPE: TWO MAKE CONTACTS (A) PER KEY
OPERATING TRAVEL: −1.2mm
OPERATING FORCE: ±5N SNAP ACTION
SPECIFICATION: DIN 40 050 − 1P64
MATERIALS
CONTACTS: GOLD PLATED, 2 MICRON
CONTACT PILLAR: ELECTRICALLY CONDUCTIVE SILICON RUBBER
MOLDED PARTS: POLYCARBONATE
COVERING FRAME: ZINC −DIE CAST ENAMELLED BLACK
KEYBOARD FOIL: RESISTANT AGAINST OILS AND GREASES; PERSPIRATION, BACTERIA AND MILDEW PROOF.
LETTERING ON REVERSE SIDE OF KEYBOARD FOIL; ANY COLOR OR SYMBOL AVAILABLE.

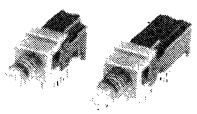
COBA
14920B 28th Avenue North
Plymouth, MN 55441 • (612) 559-3772 TWX 910-576-1152

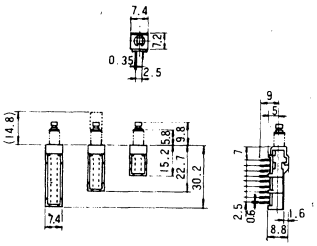
In addition to products shown on these pages, we also offer a wide variety of slide, rotary, pushbutton and key switches. Contact factory for complete information.

COBA/ IWATSU® SWITCHES

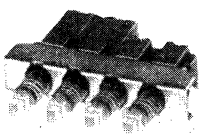
KSE PUSH SWITCHES (STROKE 2 mm)

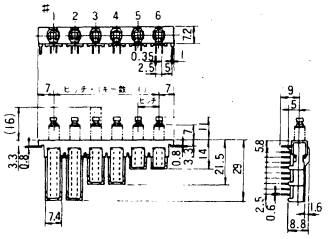
TYPE "M"
(SINGLE KEY ONLY)



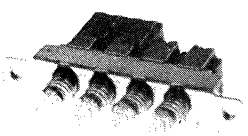


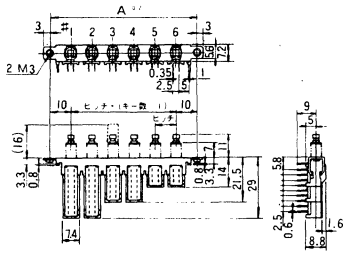
TYPE "P"





TYPE "B"





TYPE "M"

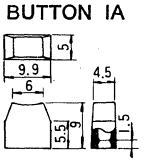
Key pitch
Single key only
Number of pole
2, 4, 6, per key
Operation mode
Lock lock (self lock)
Non lock (momentary)
Switching timing
Non-shorting
Shorting

Rating	DC30V 100mA
Contact resistance	20mΩ max.
Dielectric withstanding	AC500V for 1 min.
Insulation resistance	100MΩ min. (DC500V)
Operation life	10,000 cycles min.
Operation force	170~300gf
Operation temp.	−10°~60°C

TYPE "P" AND TYPE "B"

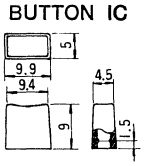
Key pitch
7.5, 10, 15, 20 mm
Number of key
2~7, 9, 11, 13 (at 7.5mm)
2~12 (at 10 mm)
2~7 (at 15 mm)
2~6 (at 20 mm)
Operation mode
Inter lock (lock release)
Lock lock (self lock)
Non lock (momentary)
Switching timing
Non-shorting
Shorting

BUTTON IA



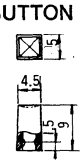
No.	Color
1D101	Red
1D201	Ivory
1D401	Blue
1D911	Black
1D951	Grey

BUTTON IC



No.	Color
1C101	Red
1C201	Ivory
1C401	Blue
1C911	Black
1C951	Grey

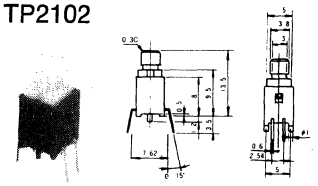
BUTTON ID



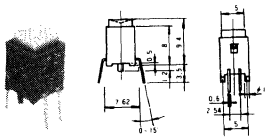
No.	Color
1D101	Red
1D201	Ivory
1D401	Blue
1D911	Black
1D951	Grey

TP2000 TACTILE PUSH SWITCHES

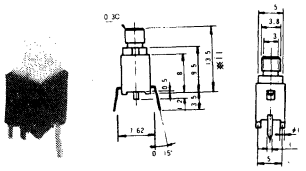
TP2102



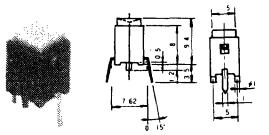
TP2201



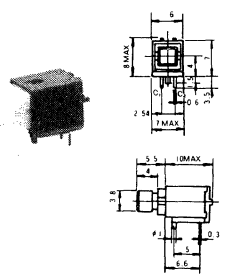
TP2301/TP2302



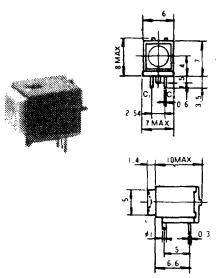
TP2401



TP2891

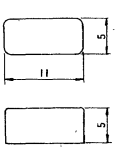


TP2901



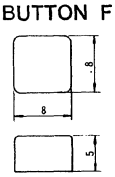
Rating	DC12V 20mA
Contact resistance	1 KΩ max.
Dielectric withstanding	AC150V for 1 min.
Insulation resistance	100MΩ in. (DC100V)
Operation life	100,000 operations
Traveling distance	1 ±0.3mm (at 120gf)
Operating force	90 ±30gf

BUTTON E



Code	Color
E101	Red
E201	Ivory
E401	Blue
E951	Grey
E911	Black
E991	White

BUTTON F



Code	Color
F101	Red
F201	Ivory
F401	Blue
F951	Grey
F911	Black
F991	White

COBA
14920B 28th Avenue North
Plymouth, MN 55441 • (612) 559-3772 TWX 910-576-1152

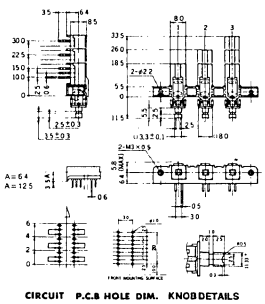
In addition to products shown on these pages, we also offer a wide variety of slide, rotary, pushbutton and key switches. Contact factory for complete information.

COBA/ T.M.S SWITCHES

MULTI PUSH SWITCHES

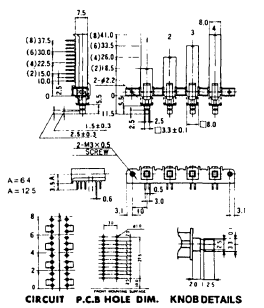
PSK SERIES

SELECTION GUIDE
Poles: 0, 2, 4, 6 poles
Keys: 1 to 10 keys
Key pitch: 10, 12.5, 15, 17.5 20 mm
Contact timing: Non-shorting, Shorting
Actuation: Push-Push, Nonlock, Interlock
MUTING FUNCTION AVAILABLE
Lock stroke: 2.5 mm
Full stroke: 3.5 mm



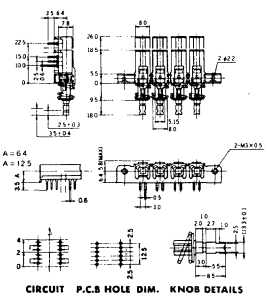
PSE SERIES

SELECTION GUIDE
Poles: 0, 2, 4, 6, 8 poles
Keys: 1 to 10 keys
Key pitch: 10, 12.5, 15, 17.5 20 mm
Contact timing: Non-shorting, Shorting
Actuation: Push-Push, Nonlock, Interlock RESET
Lock stroke: 1.5 mm
Full stroke: 2.5 mm



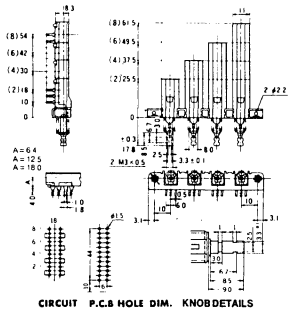
PSF SERIES

SELECTION GUIDE
Poles: 0, 2, 4 poles
Keys: 1 to 10 keys
Key pitch: 10, 12.5, 15, 17.5 20 mm
Contact timing: Non-shorting, Shorting
Actuation: Push-Push, Nonlock, Interlock
Lock stroke: 2.5 mm
Full stroke: 3.5 mm



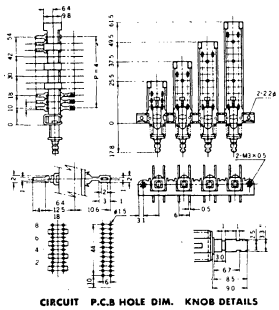
PSC SERIES

SELECTION GUIDE
Poles: 0, 2, 4, 6, 8 poles
Keys: 1 to 10 keys
Key pitch: 12.5, 15, 17.5, 20 mm
Contact timing: Non-shorting, Shorting
Actuation: Push-Push, Nonlock, Interlock Interlock
MUTING FUNCTION AVAILABLE
Lock stroke: 2.5 mm
Full stroke 3.5 mm



PSA SERIES

Lock stroke: 3.2 mm
Full stroke: 4.7 mm



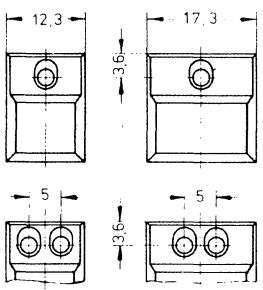
PSS SERIES

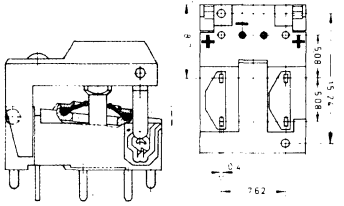
Lock stroke: 2.5 mm
Full stroke 3.5 mm
SELECTION GUIDE
Poles: 0, 2, 4, 6, 8 poles
Keys: 1 to 10 keys
Key pitch: 12.5, 15, 17.5 20 mm
Contact timing: Non-shorting, Shorting
Actuation: Push-Push, Nonlock, Interlock
SPECIFICATIONS
Rating: 0.3A—30VAC 0.1A—30VDC
Rating (special): 1A 15VAC
Insulation Resistance: 50VDC, 100MΩ Min.
Contact Resistance: 30mΩ Max.
Dielectric Strength: 500VDC 1 minute
50VAC 1 minute

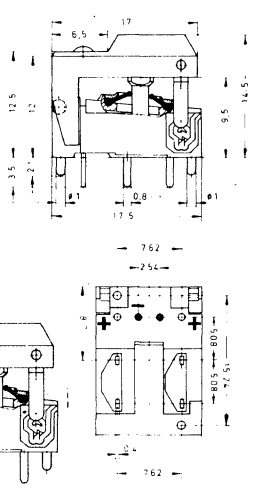
COBA/ SIGMATAST SWITCHES

MINIATURE SWITCHES

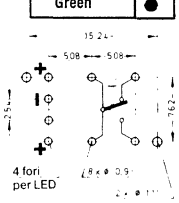
With standoffs for PCB Mount
Water-tight version available
Sealed terminals standard
Gold contacts standard
Micro-switch type coil spring over center contact system
Short travel 2 mm (.079)
5 million operations momentary action







Black	●
White	●
Red	●
Orange	●
Green	●
Blue	●
Grey	●
Red	●
Green	●



MECHANICAL DATA

housing/cap material:	PC-ABS
operating stroke:	(.079") 2 mm
overtravel:	(.039") 1 mm
function:	momentary/alternate action
contact bounce:	≦ 2 ms
mounting:	P.C.B. for flow solder
material:	Polycarbonate
contacts:	ms gal./Ag/Au
operation contact:	ms gal./Ag/Au
duration of life:	5 x 10⁶ mom 5 x 10⁶ alt act
operating of power:	≦ 2 N
classification of applications:	HSF DIN 40040/IP 67 DIN 40050
solder specification:	265°C (409°F) for 5 sec.

ELECTRICAL DATA

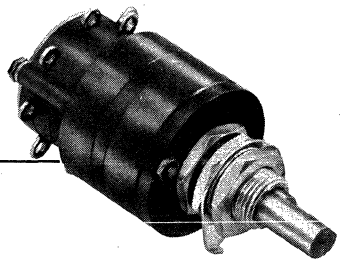
voltage rating:	24V
test voltage cont-cont:	150V
current rating:	12mA
continuous current:	120mA
power rating:	240mW
insulation resistance:	> 10¹⁰Ω
contact resistance:	≦ 20mΩ
capacitance cont-cont:	≦ 1pF
contact configuration:	SPDT

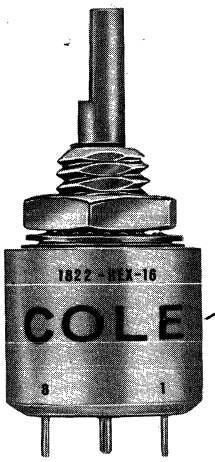
COBA
COBA
14920B 28th Avenue North
Plymouth, MN 55441 • (612) 559-3772 TWX 910-576-1152

In addition to products shown on these pages, we also offer a wide variety of slide, rotary, pushbutton and key switches. Contact factory for complete information.

ROTARY SWITCHES: THIS YEAR'S CLASS

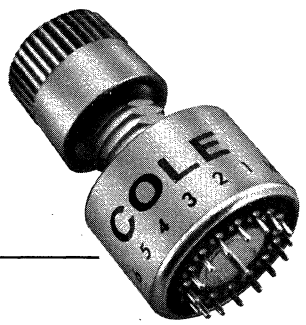
3600 Series Simply, the finest enclosed one inch rotary switch available. MIL-3786 (QPL), it's for aircraft, military and the most demanding commercial applications. 100,000 cycles, min. mechanical life. 30, 36, 45, 60 and 90 degree indexing; 1 to 6 poles per deck. Many options.

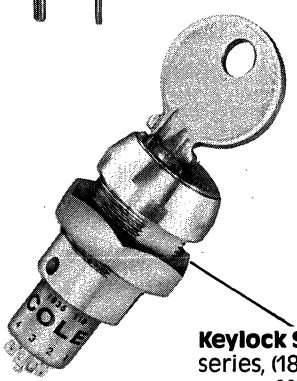




Coded Switch Series Based on our MIL quality 1800 Series, half inch switches, these new data entry devices interface directly with digital logic levels. Gold contacts for micro-current "dry circuit" switching. Hex code standard; BCD, Octal and Reflected Gray codes available. Also, user custom encoding.

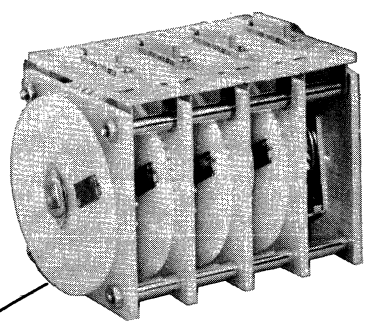
1800 Series The ultimate half inch enclosed rotary selector, also MIL-3786. For critical miniature ordnance and aerospace applications. 1 pole, 2 to 10, and 2 pole, 2 to 5 positions. Solder lug or PC terminals. Can be had with unique COLE internal seal, impervious to moisture, solvents.





Keylock Switches Two series, (1800 and 3600), based on our MIL inch and half inch switch mechanisms are offered, each in a standard and military version. Military versions are often used in ordnance firing applications, and secure communications. Standards used for computer, data and other machine security.

Instrument Series Rugged, precise open frame rotary switches in 1.5 to 2.75 in.^{2} packages. MIL-3786, carry 10 amps. at 28 VDC. 0.0005 ohms max., initial contact resistance. Up to 8 poles per deck, wide variety of detent spacings, available positions, shorting and non-shorting. Pre-wired to terminal boards or connectors.



COLE's application engineers are ready to customize any standard products to your requirement. For complete product lines and specifications, and information on some of the hundreds of special switches we manufacture, ask for our newest product catalog.

COLE
INSTRUMENT CORP.

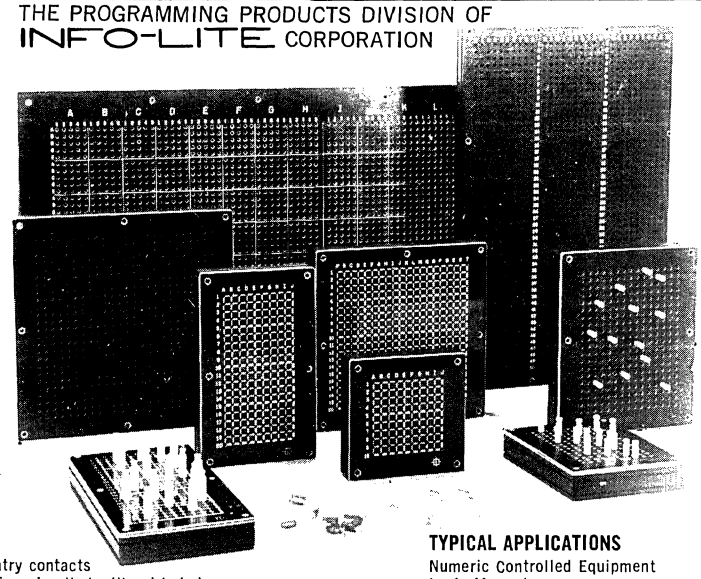
2650 SOUTH CRODDY WAY, SANTA ANA, CA 92704 (714) 556-3100

CROSSPOINT

THE PROGRAMMING PRODUCTS DIVISION OF
INFO-LITE CORPORATION

PROGRAMMING PRODUCTS

MATRIX PINBOARDS



INFO-LITE has developed a most convenient, compact and economical system for reliable programming and switching • The Matrix Program Board allows a wide variety of switching/programming functions to be performed by simply inserting programming pins (shorting or diode type) into a 2 to 10 deck contact matrix • No accessorise such as "read" "write" equipment are required • Matrix Board features have lead them to be favored over such devices at patchboards, card readers, toggle and thumbwheel switches, mag/punched tape and electronic memories • The two basic uses for Matrix Program Boards are: (1) Cordless patching (input-output switching), using shorting pins; (2) Programmable diode matrices (logic memories), using diode pins • Units with up to 100 x 100 crosspoints can be supplied to meet your requirements, whether for prototype or production quantities.

See Data Sheet MB3 for detailed specifications.

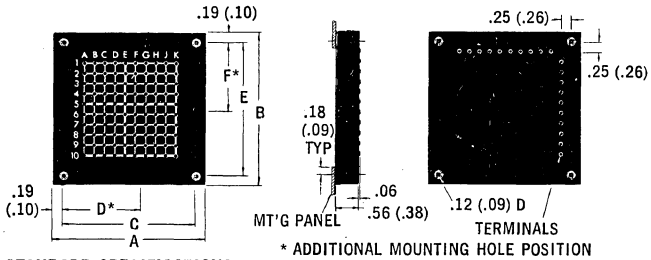
FEATURES

- Reliable closed entry contacts
- Rugged programming pins that will not beind
- Rapid and convenient method of programming/switching
- Permits insertion of components into network without soldering
- Replaces costly complex switching hardware
- Attractive and compact package
- Low capacitance for high frequency applications
- Ease of visual program checking

TYPICAL APPLICATIONS

Numeric Controlled Equipment
Logic Memories
Power Distributors
Circuit/Component Test Programmers
Lighting Systems
Code Generators
Programmable Diode Matrices
Communications Distributors
Status Indicators
Data Logging
Vending Machine Control
Thermo-Couple Selectors
Batching Programmers
Function Generators
Sequence Programmers
Pulse Code Programmers

STANDARD SPECIFICATIONS & STOCK MATRICES FOR 1000 & 2000 SERIES



* ADDITIONAL MOUNTING HOLE POSITION

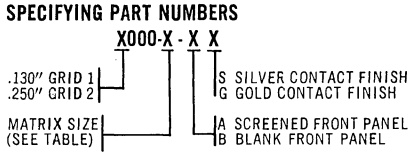
Matrix Size	Dash #	2000 Series — .250" Grid						1000 Series — .130" Grid					
		A	B	C	D	E	F	A	B	C	D	E	F
10 x 10	—1	3.63	3.63	3.25	—	3.25	—	2.02	2.02	1.82	—	1.82	—
10 x 15	—2	3.63	4.93	3.25	—	4.50	—	2.02	2.67	1.82	—	2.47	—
10 x 20	—3	3.63	6.12	3.25	—	5.75	2.75	2.02	3.32	1.82	—	3.12	—
10 x 25	—4	3.63	7.38	3.25	—	7.00	3.50	2.02	3.97	1.82	—	3.77	1.82
10 x 50	—5	3.63	13.62	3.25	—	13.25	4.50	2.02	7.22	1.82	—	7.02	3.51
20 x 20	—8	6.12	6.12	5.75	2.75	5.75	2.75	3.32	3.32	3.12	—	3.12	—
25 x 25	—9	7.38	7.38	7.00	3.50	7.00	3.50	3.97	3.97	3.77	1.82	3.77	1.82
50 x 50	—10	14.4	14.1	14.0	7.00	13.75	7.00	(Currently not available)					

STANDARD SPECIFICATIONS

1 — Contact Type: Closed Entry
2 — Contact Material: Be-Cu, Alloy 25
3 — Contact Finish: a - .0002" Ag over Cu Flash
b - .00002" Min. Au over Ni Flash
4 — Contact Support Material: Silicone Rubber
5 — Contact Resistance: .040 Ohm, typ.
6 — Contact Capacitance: 1 uuf [2 uuf]/in. at 1 MHz, typ.
7 — Bussing: 1st (top) Deck Vertical; 2nd Deck Horizontal
8 — Breakdown Voltage: 1000 VRMS
9 — Current Rating: 5 [2] Amps standard; 10 [4] Amps available
10 — Terminals: Combination Taper Pin Socket/Solder Cup [Solder Cup]
11 — Panel Material: Black XX Grade Phenolic
12 — Panel Marking: Alpha-Numeric/Grid, White Epoxy Ink Screened

NOTE: Values in brackets [ ] are for 1000 Series if two values are given.

SPECIFYING PART NUMBERS

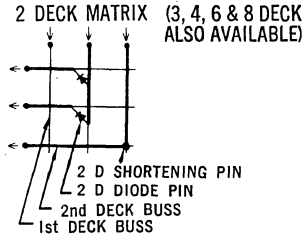


EXAMPLE: A 20 x 20, .250" grid matrix with silver contacts and blank front panel would have Part Number 2000-8-BS. U.S. Patent No. 3,631-374

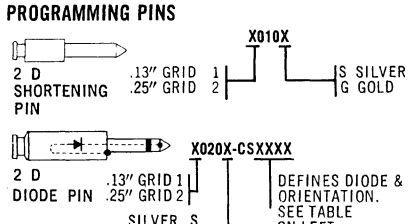
Programming Pins Diode Pins 1000 Series (.13" Grid)	Specifications Diode	Anode To†
1020S-CS0001/-CS0002	1N4151	Tip/Sleeve
1020G-CS0003/-CS0004	1N4151	Tip/Sleeve
2000 Series (.25" Grid)	† On Std. Matrices Tip makes W/2nd Deck.	
2020S-CS0006/CS0007	1N270	Tip/Sleeve
2020S-CS0010/CS0011	1N4151	Tip/Sleeve
2020G-CS0012/CS0025	1N4151	Sleeve/Tip
2020S-CS0014/CS0024	1N4004	Sleeve/Tip
Shorting Pins 1010G & 2010G		

† Sold in multiples of 25 pieces.

SCHEMATIC



PROGRAMMING PINS



* Diode orientation shown: Anode to Sleeve (1st Deck)

PROGRAM BOARD KITS IDEAL FOR BREADBOARD, PROTOTYPE AND EVALUATION

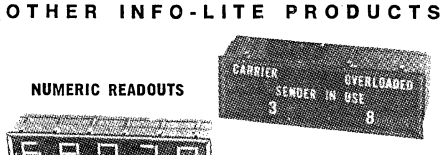
2000 SERIES KITS CT-1 Includes one 10 X 10 Matrix Board (2000-1-AS), Ten Shorting Pins (2010S) and Ten Diode Pins with 1N4151 diodes installed (2020S-CS0010).

CT-2 Same as CT-1 but without diodes.

1000 SERIES KITS CT-3 Includes one 10 X 10 Matrix Board (1000-1-AS), Ten Shorting Pins (1010S) and Ten Diode Pins with 1N4151 diodes installed (1020S-CS0001).

OTHER INFO-LITE PRODUCTS

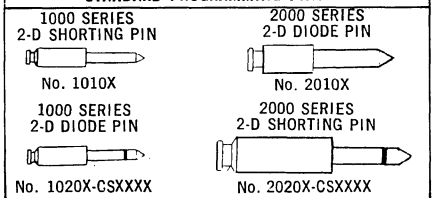
NUMERIC READOUTS



LIGHTED INDICATORS

SEE EEM SECTION 2450

STANDARD PROGRAMMING PINS



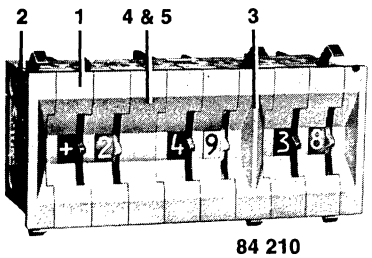
CROSSPOINT• Div. of INFO-LITE• 422 Cliff Street • Fairview, NJ 07022• (201) 941-4455•"LINKS BETWEEN MAN AND MACHINE"

EEM PRODUCT SELECTION GUIDES

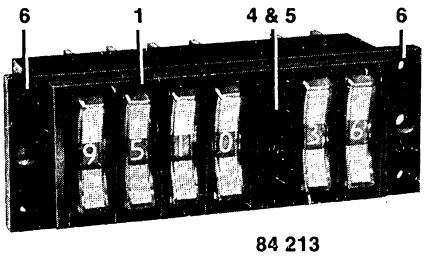
Use the EEM Product Selection Guides. There are 34 Guides in this edition of EEM. See page 2 (A•2, B•2, C•2, D•2) of each volume to locate the Product Selection Guides that pertain to your needs.

Digital Switches - LED Readouts

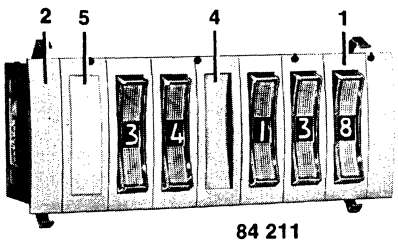
Rocker & Thumbwheel



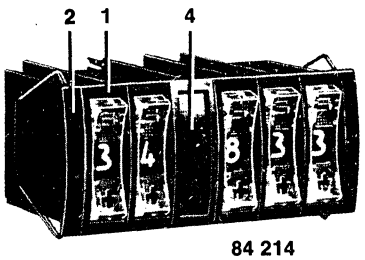
84 210
Thumbwheel Series
Panel Mount



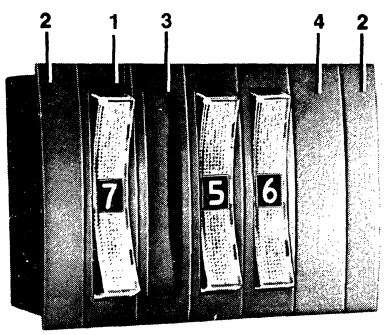
84 213
Rocker Series
Rear Mount



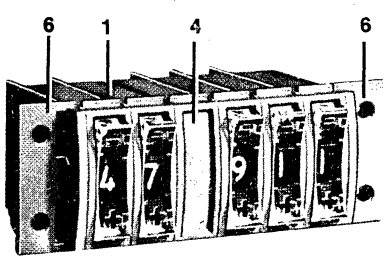
84 211
Rocker Series
Panel Mount



84 214
Rocker Series
Miniature Panel Mount



84 212
Rocker Series
Large Size Panel Mount



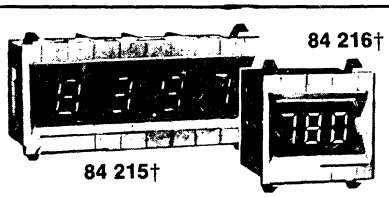
84 218
Rocker Series
Miniature Rear Mount

A Fully Modular System

1. **Basic Module:** Enables data input in coded form.
2. **End Caps:** Snap into place to complete module assembly. Complete with 4 panel clips.
3. **Separator:** Used to fit 2 switch assemblies into one unit. They come with 2 clips.
4. **Spacer:** Blank module used to replace a module assembly.
5. **Encoded "Dummy" Module:** Enables a simultaneous switching to two circuits from one digital switch. It is driven by the adjacent module via a coupling shaft.
6. **End Caps:** For rear mounting of module assembly. They come in pairs.

LED Readouts

- Compatible with Crouzet Rocker* and Thumbwheel† switches
- Easy to assemble snap-on modules
- With or without decoding/memory
- Two sizes available



84 216†

84 215†

84 217*

Crouzet Controls, Inc.
1083 State Parkway, Schaumburg, IL 60195
Tel: 312/843-2200 - Telex: Crouzet 206 297

CTS® CORPORATION*

PASO ROBLES DIVISION

CTS SERIES 207 AUTO-DIP™ SWITCH

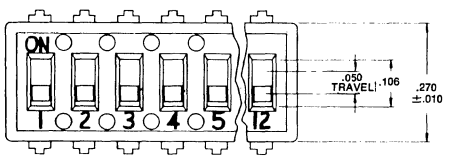
AUTOMATICALLY INSERTABLE, WAVE SOLDERABLE, BOARD WASHABLE DIP SWITCH

FEATURES

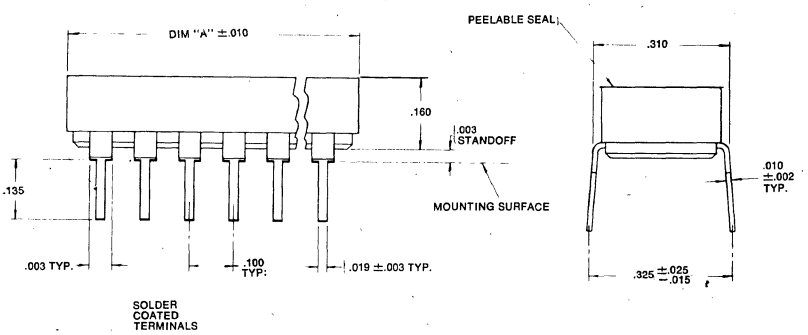
Optimized Contact System
- Redundant, wiping contacts
- Contactor does not rub on plastic or deflect during actuation

Optimized Mechanical Features
- Fully sealed to withstand insertion shock, wave solder temperatures, board washing
- Positive detent separate from contactor
- Closed windows prevent particle contamination
- .050″ actuator travel
- Molded .300″ integrated circuit package outline

Premium Materials
- Inlaid gold contacts, solder coated terminals
- Beryllium copper contactor
- 260°C housing heat deflection temperature assures contact and seal integrity after wave soldering
- All plastics rated UL 94 V-0
- Permanent laser marking

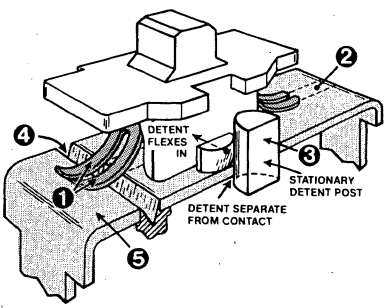


"A" Overall Dim.	No. of Switch Sections	Part No.
.258	2	207-2LPST
.358	3	207-3LPST
.458	4	207-4LPST
.558	5	207-5LPST
.658	6	207-6LPST
.758	7	207-7LPST
.858	8	207-8LPST
.958	9	207-9LPST
1.058	10	207-10LPST
1.158	11	207-11LPST
1.258	12	207-12LPST



GENERAL TOLERANCES:
Decimal dimensions ±.005″

Switch reliability that is the best ever!



1. Redundant gold inlaid contacts dramatically enhance contact reliability.
2. Positive wiping contacts assure low and consistent contact resistance. (.050″ travel)
3. Detent function separated from contacts to optimize both designs.
4. Gold contacts never abraded or contaminated by sliding over polymer surfaces. Contacts never touch a nongold surface.
5. No contactor deflection for the life of the switch. Constant contact force eliminates overstressing of contacts for greater reliability.

ELECTRICAL AND MECHANICAL SPECIFICATIONS

Contact Resistance
25 milliohms maximum initial
50 milliohms maximum at end of life

Actuation Life
2000 cycles switching
50 mA @ 6 VDC or 2 mA @ 50 mVDC

Nonswitching Rating
100 mA or 50 VDC

Insulation Resistance
1 x $10^9\Omega$ minimum between insulated terminals

Dielectric Strength
200 VAC minimum

Switch Capacitance
5 pF maximum between adjacent closed switches

Temperature Range
0 to 70°C operating
−40 to 70°C storage

Allowable Wave Solder Time
Up to 4 seconds with 260°C solder

Shock
No mechanical damage or changes of switch settings with 25 G applied for 6 milliseconds

Vibration
No mechanical damage or changes of switch settings during or after testing, when tested in 3 mutually perpendicular planes at 10-50 Hz sweep or at 60 Hz constant vibration. Amplitude .06″

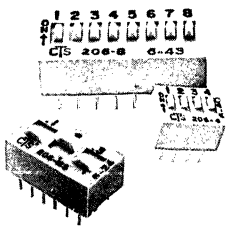
PASO ROBLES DIVISION • 3230 Riverside Avenue • Paso Robles, California 93446 • (805) 238-0350
* In Calif., dba CTS Electronics Corporation

CTS® CORPORATION*

PASO ROBLES DIVISION

CTS SERIES 206

CTS DIP PROGRAMMABLE SWITCHES



FEATURES

- Contact wiping on make and break
- Suitable for flow soldering on PC board or mounting with standard DIP sockets
- Long term contact corrosion resistance provided by gold plated contact arms
- All U.L 94V-O plastic used
- Integral terminal and contact locked into plastic base rails
- Crisp, positive slide actuators
- Types 206-02 through -10 approved to MIL-S-83504/4 upon request
- Available with flush (low profile) actuators — SPST styles

Description

From 2 thru 12 SPST; 1 thru 6 SPDT; 1 thru 6 DPST; 1, 2 or 3 DPDT and 1, 2 or 3 4PST slide switches per switch package on .100″ x .300″ DIP centers

Initial Contact Resistance

50 miliohms

Maximum Contact Resistance

100 milliohms after 10,000 cycles switching 50 mA @ 24 VDC

Maximum Non-Switching Rating

100 mA or 50 VDC

Insulation Resistance

Across open switch and between adjacent closed switches: 1 x 10^9 ohms

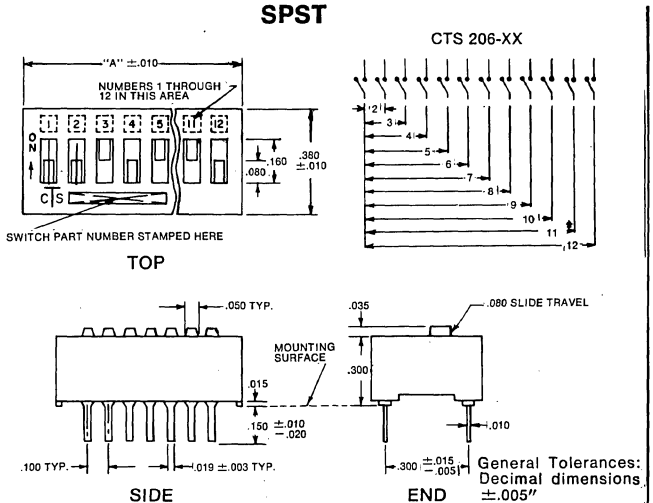
Dielectric Breakdown

Between adjacent switches minimum: 500 VDC

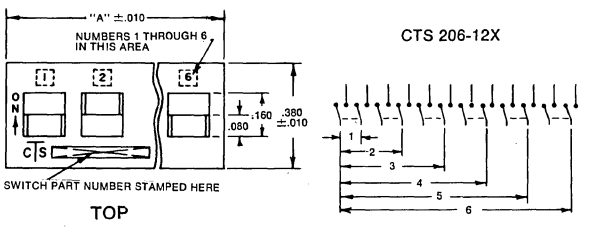
Switch Capacitance

Between adjacent switches maximum: 5.0 pF

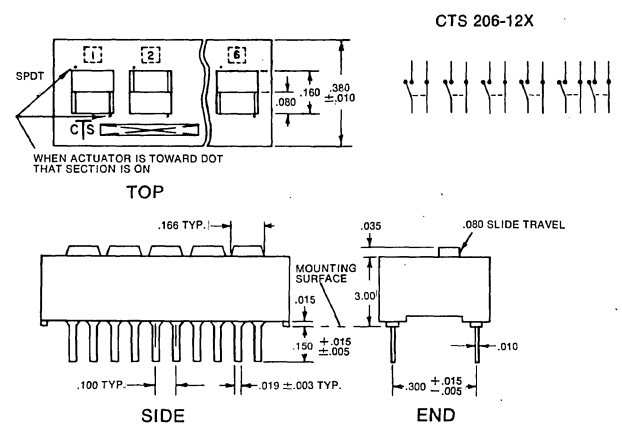
SPST



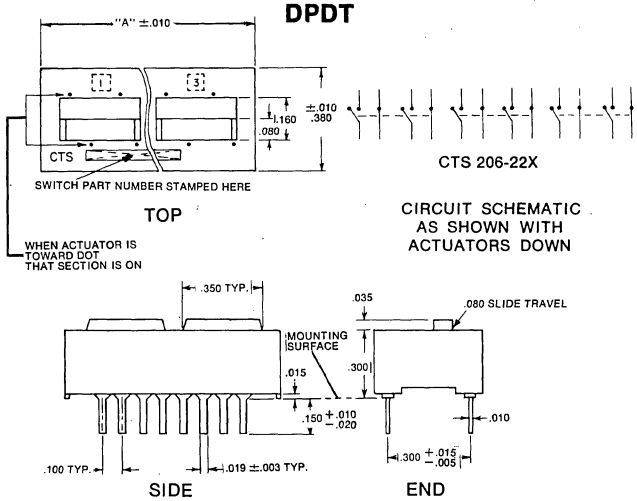
DPST



SPDT



DPDT



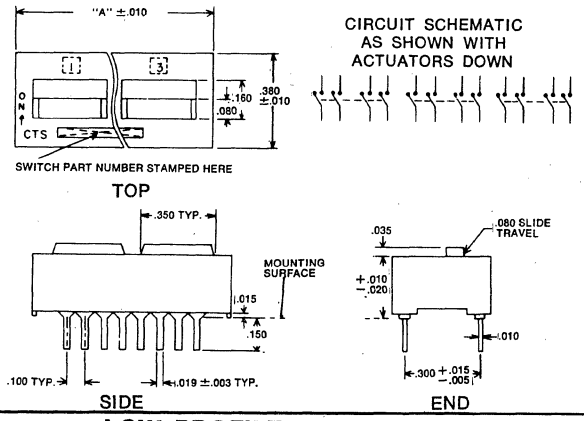
PASO ROBLES DIVISION • 3230 Riverside Avenue • Paso Robles, California 93446 • (805) 238-0350
* In Calif., dba CTS Electronics Corporation

CTS® CORPORATION*
PASO ROBLES DIVISION

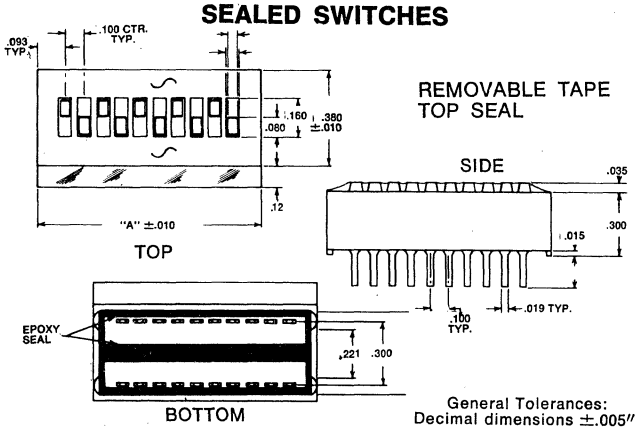
CTS DIP PROGRAMMABLE SWITCHES

4PST

CTS 206-41X

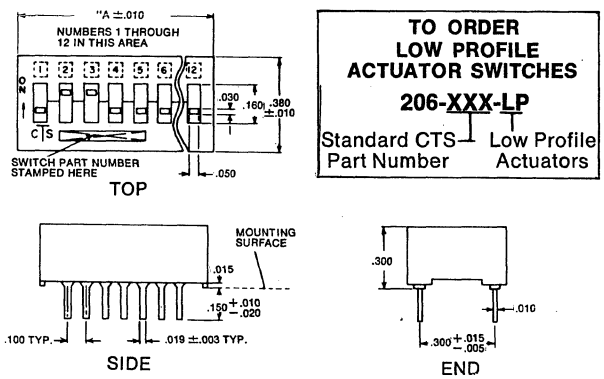


SEALED SWITCHES



General Tolerances: Decimal dimensions ±.005″

LOW PROFILE ACTUATORS

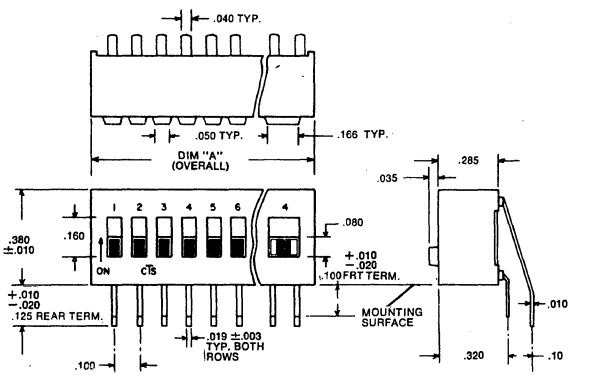


TO ORDER LOW PROFILE ACTUATOR SWITCHES

206-XXX-LP

Standard CTS Part Number — Low Profile Actuators

RIGHT ANGLE PANEL MOUNT — 206RA



General Tolerances: Decimal dimensions ±.005″

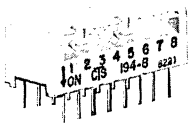
STANDARD "OFF THE SHELF" PART NUMBERS

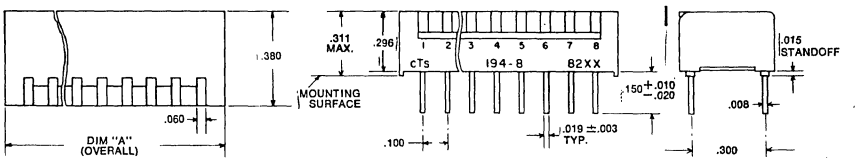
"A" Overall Dimension	Number of Switch Sections	Actuation	Part Number	Low Profile Bottom & Top Sealed	Both Bottom & Top Sealed	Right Angle Mount Sealed Bottom & Top
.286	2	SPST	206-2	206-2LPST	206-2ST	206-2RAST
.386	3	SPST	206-3	206-3LPST	206-3ST	206-3RAST
.486	4	SPST	206-4	206-4LPST	206-4ST	206-4RAST
.586	5	SPST	206-5	206-5LPST	206-5ST	206-5RAST
.686	6	SPST	206-6	206-6LPST	206-6ST	206-6RAST
.786	7	SPST	206-7	206-7LPST	206-7ST	206-7RAST
.886	8	SPST	206-8	206-8LPST	206-8ST	206-8RAST
.986	9	SPST	206-9	206-9LPST	206-9ST	206-9RAST
1.086	10	SPST	206-10	206-10LPST	206-10ST	206-10RAST
1.286	12	SPST	206-12	206-12LPST	206-12ST	206-12RAST
.286	1	SPDT	206-121		206-121ST	206-121RAST
.486	2	SPDT	206-122		206-122ST	206-122RAST
.686	3	SPDT	206-123		206-123ST	206-123RAST
.886	4	SPDT	206-124		206-124ST	206-124RAST
1.086	5	SPDT	206-125		206-125ST	206-125RAST
1.286	6	SPDT	206-126		206-126ST	206-126RAST
.286	1	DPST	206-211		206-211ST	206-211RAST
.486	2	DPST	206-212		206-212ST	206-212RAST
.686	3	DPST	206-213		206-213ST	206-213RAST
.886	4	DPST	206-214		206-214ST	206-214RAST
1.086	5	DPST	206-215		206-215ST	206-215RAST
1.286	6	DPST	206-216		206-216ST	206-216RAST
.486	1	DPDT	206-221		206-221ST	206-221RAST
.886	2	DPDT	206-222		206-222ST	206-222RAST
1.286	3	DPDT	206-223		206-223ST	206-223RAST
.486	1	4PST	206-411		206-411ST	206-411RAST
.886	2	4PST	206-412		206-412ST	206-412RAST
1.286	3	4PST	206-413		206-413ST	206-413RAST

PASO ROBLES DIVISION • 3230 Riverside Avenue • Paso Robles, California 93446 • (805) 238-0350
* In Calif., dba CTS Electronics Corporation

CTS® CORPORATION*
PASO ROBLES DIVISION

CTS SERIES 194
CTS DIP SWITCHES





General Tolerances: Decimal dimensions ±.005″

FEATURES
- Electrical switching occurs at 50% of actuator rotation angle
- Contact wiping on make and break
- Enclosed actuators shield contacts from foreign particles throughout life of switch
- The gold plated, over-center design provides positive detent action
- Reliable tape top seal optional/ bottom epoxy seal standard
- Insert molded base halves of thermoset material ensure mechanical integrity of contacts and terminals through soldering operations
- All U.L. 94 V-O plastics used

STANDARD "OFF THE SHELF" PART NUMBERS

"A" Overall Dimension	Number of Switch Sections	Part Number (Bottom Epoxy Seal Only)	Part Number (Bottom Epoxy Seal and Tape Top Seal)
.486	4	194-4S	194-4ST
.886	8	194-8S	194-8ST
1.086	10	194-10S	194-10ST

Description
Side actuated 4, 8 or 10 section SPST switching functions per package on .100″ x .300″ DIP centers

Initial Contact Resistance
50 milliohms maximum

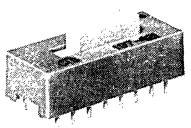
Maximum Contact Resistance
100 milliohms after 7000 cycles switching 50 mA @ 24 VDC

Insulation Resistance
Across open switch and between adjacent closed switches: 1 x 10^9 ohms minimum

Dielectric Breakdown
Between adjacent switches minimum 500 VDC

Switch Capacitance
Between adjacent switches maximum: 5.0 pF

CTS SERIES 197



FEATURES
- Designed for automatic insertion
- Integral terminal and contact locked into thermoset base rails
- Contact wiping on make and break
- Break before make contacts
- Useful in "service/operate" applications, low level signal routing, digital circuit programming, etc.
- Long term contact corrosion provided by gold plated/inlaid contacts
- All U.L. 94 V-O plastics used

Description
4PDT slide actuated switch package on .100″ x .300″ DIP centers

Initial Contact Resistance
50 miliohms maximum

Maximum Contact Resistance
100 milliohms after 2000 cycles switching 50 mA @ 24 VDC

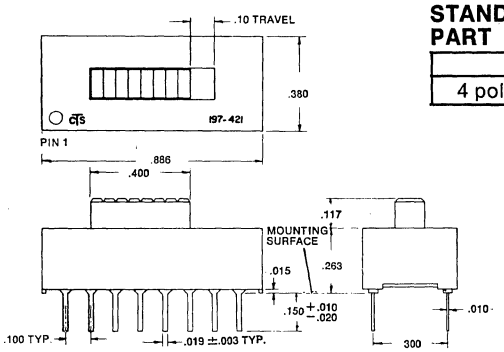
Insulation Resistance
Across open switch and between adjacent closed switches: 1 x 10^9 ohms minimum

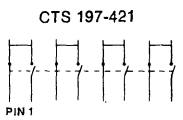
Dielectric Breakdown
Between adjacent switches minimum: 500 VDC

Switch Capacitance
Between adjacent switches maximum: 5.0 pF

STANDARD "OFF THE SHELF" PART NUMBERS

Function	Part Number
4 pole double throw	197-421

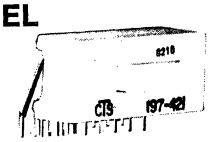


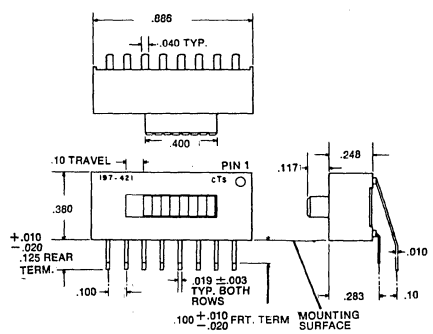


TOP VIEW

General Tolerances: Decimal dimensions ±.005″

OPTIONAL RIGHT ANGLE PANEL MOUNT STYLE 197RA





SCHEMATIC

TOP VIEW
(ACTUATOR TO RIGHT)

STANDARD "OFF THE SHELF" PART NUMBER

Function	Part Number	Seal
4 pole double throw	197-421RAS	bottom

General Tolerances: Decimal dimensions ±.005″

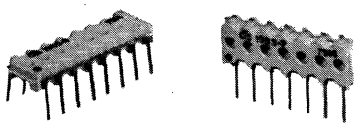
PASO ROBLES DIVISION • 3230 Riverside Avenue • Paso Robles, California 93446 • (805) 238-0350
* In Calif., dba CTS Electronics Corporation

CTS® CORPORATION*

PASO ROBLES DIVISION

CTS SERIES 198

CTS PROGRAMMABLE DIP/SIP SHUNT NETWORKS



Description
Low cost matrix programming. DIPs offered in 4-24 terminal configurations; SIP's in 2-12 terminal packages

Current Rating
1.0 amp maximum

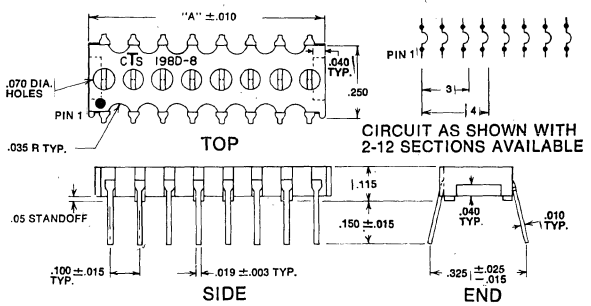
Insulation Resistance
1 x 10^{11} ohms minimum between any 2 electrically isolated terminals

Dielectric Breakdown Voltage
500 VDC minimum between any 2 electrically isolated terminals

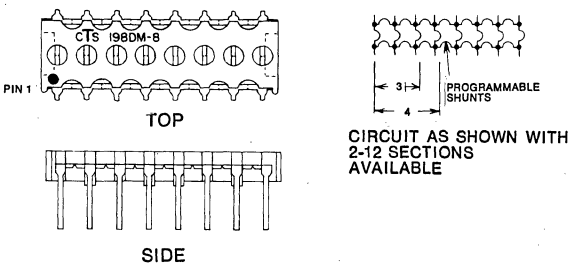
Insulation
UL recognized 94 V-O rated high temperature thermoplastic

Metal Parts
Solder plated copper alloy. (Gold plated terminals optional)

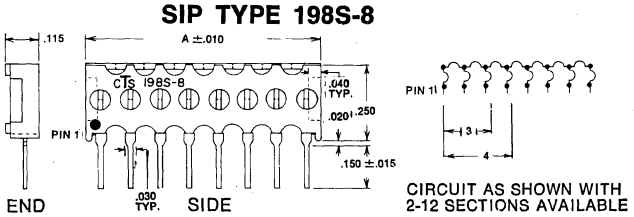
DIP TYPE 198D-8



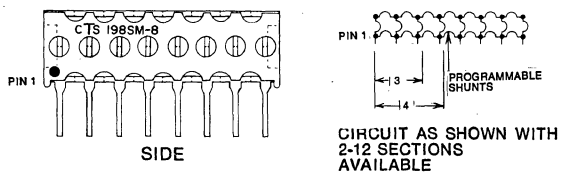
DIP TYPE 198DM-8



SIP TYPE 198S-8



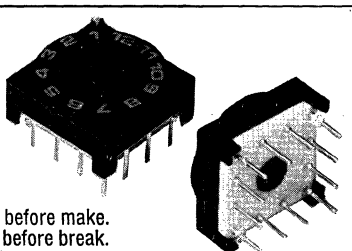
SIP TYPE 198SM-8



No. of Sections	2	3	4	5	6	7	8	9	10	11	12
"A" DIM.	.200	.300	.400	.500	.600	.700	.800	.900	1.000	1.100	1.200

PASO ROBLES DIVISION • 3230 Riverside Avenue • Paso Robles, California 93446 • (805) 238-0350
* In Calif., dba CTS Electronics Corporation

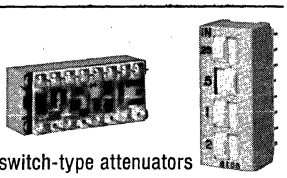
SERIES 235
Enclosed Miniature .500" Square Rotary Switches



Switch Functions:
1. Single pole, 11 positions, break before make.
2. Single pole, 11 positions, make before break.
3. Binary up to hexadecimal (0-15).
4. Other functions and combinations are available with special tooling.

Electrical and Mechanical Specifications:
1. Contact resistance varies with switch style: Typical values for 11 positions break before make. 0.1 ohm initial contact resistance, 0.15 ohm after 1000 cycles of 360° rotation.
2. Standard operating temperature range: −55°C to +85°C.
3. Rotational life: 1000 cycles of 360° rotation.
4. Wiping action on contact.
5. 360° rotation.
6. Small size: .5" x .5" square.
7. 250" profile from mounting plane to top of package.
8. Enclosed construction excludes dust and foreign material.
9. Terminal pull strength: 5 lbs. minimum.

SERIES 196
Switchable DIP Attenuator



- Reliable replacement for thumbwheel switch-type attenuators (at substantial savings)
- 75 ohm and 600 ohm unbalanced PI or T configuration networks
- .100" x .300" DIP packages
- Standard thick film ceramic modules; custom thin film modules available upon request
- Sealed bottom or top/bottom versions optional; assures contaminate-free switch operation after flow soldering and cleaning
- Standard values from .1 dB to 16 dB in increments of .1 dB to 2 dB

Electrical and Environmental Specifications
(all are absolute maximum ratings)

Electrical:

Impedance Tolerance	±2%
Power Rating (maximum input signal)	20 dBm
Insertion Loss	.02 dB

Environmental:

Storage Temperature	−40°C to +85°C
Operating Ambient Temperature	0°C to +70°C
Lead Temperature (soldering 10 seconds)	300°C maximum

MICROELECTRONICS DIVISION, 1201 Cumberland Avenue, West Lafayette, Indiana 47906
Post Office Box 1278, Lafayette, Indiana 47902 • Phone: (317) 463-2565, TWX: 810-342-1882

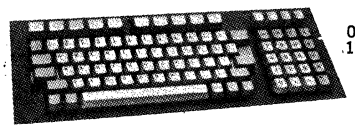
TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

HIGH QUALITY SWITCHES by DSA

KEYBOARD SWITCH



Overall Height 17.5mm

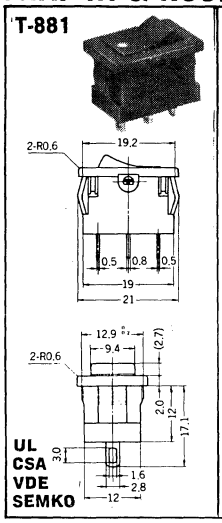
Fundamental Functions	Standard Type (Overall height 35mm)	Thin Type (Overall height 17.5mm)
Operation Force	60gr	
Full Stroke	4.0 ±0.2mm	
Operation Stroke	ON 3.0mm — OFF 2.5mm	
Electrical Rating	DC 5V 2mA	
Contact Resistance	less than 300Ω	
Bounce	less than ON 5msec — OFF 10msec.	
Withstand Voltage	AC 250V 1 min.	
Insulation Resistance	more than 50MΩ (DC 250V)	
Durability	more than 10,000,000 actions	
Operation Touch	snap-action	

Conductive Silicon rubber contacts and durable switches for more than 10 million actions. High speed typing. Two color molding and curved letters.

Also available Keyboard switch for Telephone units.

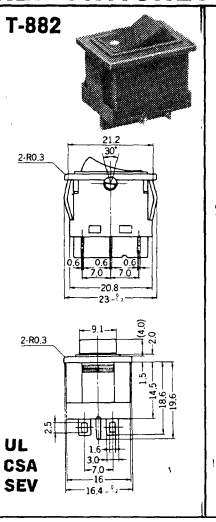
SNAP-IN & ROCKER SWITCHES

T-881



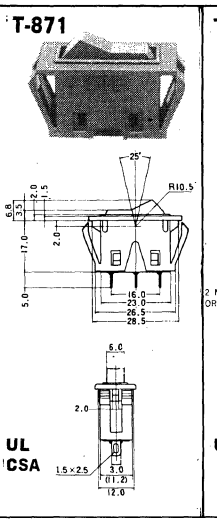
UL
CSA
VDE
SEMKO

T-882



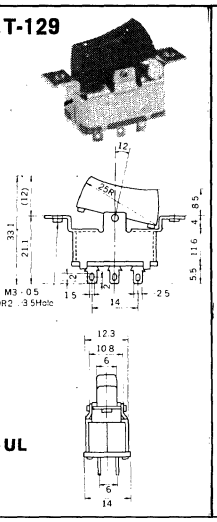
UL
CSA
SEV

T-871



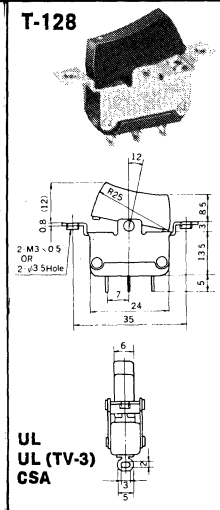
UL
CSA

T-129



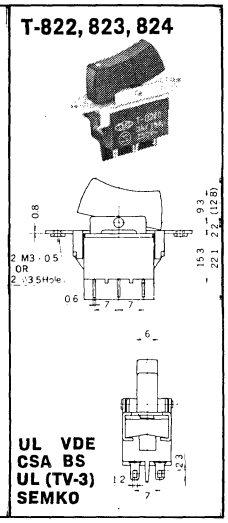
UL

T-128



UL
UL (TV-3)
CSA

T-822, 823, 824

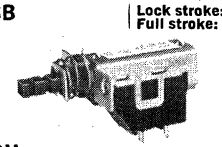


UL VDE
CSA BS
UL (TV-3)
SEMKO

Model	T-881	T-882	T-871 (Rocker Lever)	T-129	T-127, T-128	T-822, 823, 824
Circuit		SPST SPDT		DPDT	SPST	DPST DPDT
Rating for UL, CSA	15A 125 3A 250	5A 125 5A 250	10A 125VAC 5A 250VAC	0.1A 30VDC		3A 125VAC 1.5A 250VAC
Insulation Resistance	500VDC — 100MΩ					
Contact Resistance	20MΩ Max					
Voltage Breakdown	1000VAC 1 Minute				1500VAC 1 Minute	1000VAC 1 Minute

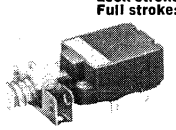
POWER PUSH SWITCH

PSB Lock stroke: 2.5mm Full stroke: 3.5mm



UL
CSA

PSU Lock stroke: 2.5mm Full stroke: 3.5mm



UL

MULTI PUSH SWITCH

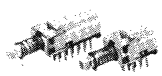
PSE Series

Lock stroke: 1.5mm
Full stroke: 2.5mm

PSA Series

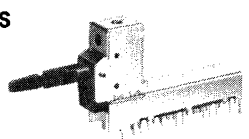
Lock stroke: 3.2 mm
Full stroke: 4.7mm

PV, Series



LEVER SWITCH

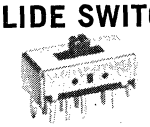
LS



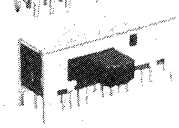
SLK Series

SLIDE SWITCH

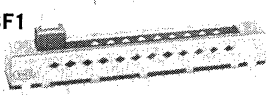
SLV



SB



SSF1

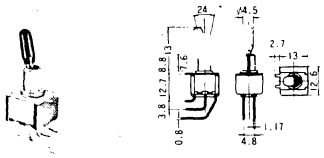


Model	PSB	PSU	Push Switch	Lever Switch	Slide Switch
Circuit	SPST	DPST	Push-Push, Nonlock, Interlock Reset	Locking & Momentary	SPDT, DPDT,DP3T, SP3T to SP12T, 3P3T, 4PDT, 6PDT, 4P3T
Rating	15A 125VAC 10A 125VAC 5A 250VAC	10A 125VAC 5A 250VAC	1A 15VAC 0.3A 30VAC 0.1A 30VAC	0.3A 30VAC 0.1A 30VAC 15VAC — 2A	0.1A 30VDC 0.3A 30VDC
Insulation Resistance	500VDC 100mΩ Min.				
Contact Resistance	20mΩ Max		30mΩ Max	20mΩ Max	20MΩ Max — 30MΩ Max
Voltage Breakdown (1 Minute)	1500VAC	1000VAC	500VAC	250VAC	250VAC
Poles			0, 2, 4, 6, 8	2, 4, 6, 8	2 to 12
			Keys 1 to 10	Position 2, 3, (4)	2 to 5
			Key Pitch 10-20 Shorting & Nonshorting	Shorting & Non-shorting	
			Height 6.4 to 18mm		

DSA-DAI-ICHI SHOJI OF AMERICA, INC.
150 Fifth Avenue, Suite 516, New York, NY 10011, (212) 691-9050

MIYAMA SWITCHES by DSA

M-SERIES HIGH QUALITY GOLD FLASH MINIATURE SERIES



Circuit	Switching Function
3P(SPDT)	ON-ON ON-(ON) ON-OFF-ON ON-OFF-(ON) (ON)-OFF-(ON)
6P(DPDT)	

DRAWING: MS-331-F

M-SERIES GENERAL RATINGS

Resistance Load	6A 125VAC (3A 250VAC) 6A 30VDC
Inductive Load	6A 125VAC (Power Factor 0.8) (3A 250VAC (P.F.0.8))
Mechanical Life	Over 30,000 Operations
Electrical Life	Over 10,000 Operations
Insulation Resistance	Over 100MΩ (By DC 500V Tester)
Voltage Breakdown	AC 1000V/1 Min (Between Contact & Case)
Contact Resistance	20mΩ Maximum
Ambient Temperature	−10°C ~ +55°C
Ambient Humidity	85%RH Maximum

Terminals: Models available with either solder, printed circuit, right angle or vertical terminals (right angle and vertical terminals are available by special order only).

Also available in our economy line of silver plated contacts.

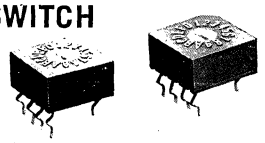
MS-820 SERIES DIP SLIDE SWITCH

- The contact has a self-cleaning mechanism and double contact formation is employed to ensure stable contact.
- The actuator is designed to fit in the case to be sealed with tape for flux cleaning (for water-proof type only).
- Designed to make body 35mm in height and 6.6mm in width compared to conventional DIP switch.

SPECIFICATIONS

Rating	DC50V, 100mA non-switching DC24V, 25mA switching
Initial Contact Resistance	50mΩ (AC0.1mV, 1mA)
Dielectric Strength	500VAC 1Min
Insulation Resistance	100VDC 1000MΩ or more
Electrical Life	5000
Operating Force	100~300gf
Operating Temperature Range	−20~+75°C
Soldering Heat Resistance	260°C±5°C 10Min when installed on printed circuit board

MS-830 SERIES DIP ROTARY CODED SWITCH

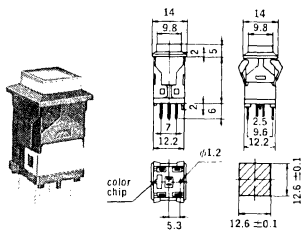


- Size 10mm x 10mm x 5.8mm
- Completely sealing ultrasonic wave with O ring seal
- Gold plated contact

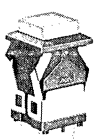
SPECIFICATIONS

Rating	DC50V, 100mA non-switching DC5V, 100mA switching
Initial Contact Resistance	100mΩ (AC0.1mV, 1mA)
Dielectric Strength	250VAC 1Min
Insulation Resistance	100VDC 1000MΩ or more
Electrical Life	10,000
Operating Temperature Range	−20~+70°C
Soldering Heat Resistance	260°C±5°C 10Min when installed on printed circuit board

MIDGET ILLUMINATED PUSHBUTTON SWITCH (FOR P.C. MOUNT AND SOLDER TERMINAL)

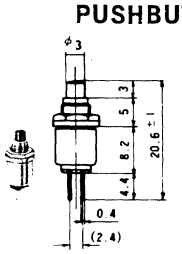


MS-800
(WITHOUT SNAP-IN PLATE)

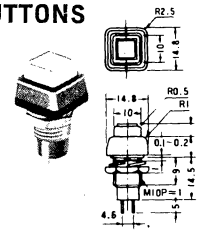


MS-810
(WITH SNAP-IN PLATE)

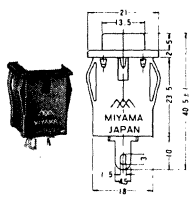
PUSHBUTTONS



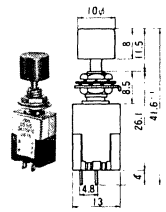
TINY PUSH-ON
MS-402



DS-456,457
(ALTERNATE)
DS-469,470
(MOMENTARY)

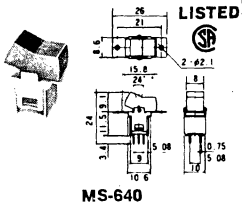


MS-078
MS-080
(WITH 6.3 VOLT LAMP)

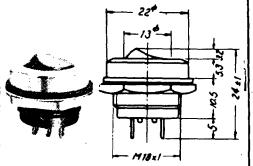


DS-195 2P
D-S-249 2P

ROCKERS UL LISTED



MS-640

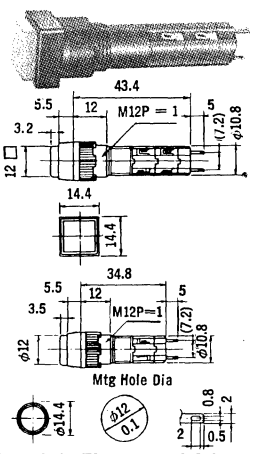


DS-062 (BLACK FRAME)
DS-063 (GOLD FRAME)

DS-850 SERIES

PUSHBUTTONS LED ILLUMINATED

DS-700 (ALTERNATING)
DS-710 (MOMENTARY)



BOTH MODELS ARE AVAILABLE WITH SQUARE OR ROUND SWITCH FACE.

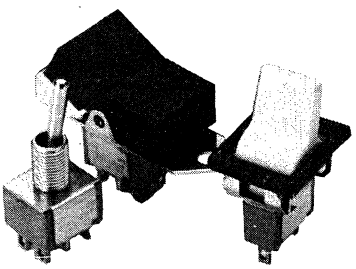
Part No.	MS-800	MS-810	MS-402	MS-078	MS-080	MS-640	DS-195	DS-456	DS-062	DS-850	DS-700	DS-710
Model Type	Push-button Illuminated	Push-button Non-Illuminated	Push-button	Push-button with 6.3V Lamp	Push-button with 6.3V Lamp	Rocker	Push-button	Push-button	Rocker	Rocker w/LED and w/o LED	Push-button with LED	Push-button with LED
Rating	0.1A 30VDC	0.3A 30VDC	0.5A 125VAC	1A 125VAC	1A 125VAC	0.3A 125VAC for P.C.	3A 125VAC	1A 250VAC	3A 750VAC	3A 250VAC	1A 250VAC	3A 125VAC
Circuit	A DPST OFF-ON B DPST OFF-(ON) C DPST ON-OFF D DPST ON-(OFF) E SPDT ON-ON F SPDT ON-(ON)		2P(SPST)	2P(SPST)	2P(SPST)	2P(SPST) 3P(SPDT) 6P(DPDT)	2P(SPST)	2P(SPST)	2P(SPST) 3P(SPDT) 4P(DPST) 6P(DPDT)	2P(SPST)	(SPDT) (DPDT)	(SPDT) (DPDT)
Switching Function			(Push ON) Momentary	(Push ON) Momentary	(Push OFF) Momentary	ON-OFF ON-ON	ON-OFF	ON-OFF	ON-OFF ON-OFF	ON-OFF	ON-ON Alternate	ON-(ON) Momentary
Contact Resistance	2.5VDC 10mA 500mΩ (Max)		2.5VDC 1A 20mΩ or less	2.5VDC 1A 10mΩ or less		2.5VDC 1A 20mΩ or less		2.5VDC 100mA 20mΩ or less	2.5VDC 1A 20mΩ or less		2.5VDC 10mΩ or less	
Insulation Resistance	500VDC 500mΩ (Min)					500VDC 100mΩ or less		500VDC 100mΩ or less			2.5VDC 10mΩ or less	
Voltage Breakdown	500VAC 1 Minute			1000VAC 1 Minute		100VAC 1 Minute	1000VAC 1 Minute	1500VAC 1 Minute	1500VAC 1 Minute	1000VAC 1 Minute	1500VAC 1 Minute	1500VAC 1 Minute
Mounting Hole Dia. mm	12.6x12.6		5.2	18.5x18.5	18.5x18.5	10	6	10	18	19x13	12	12

DSA offers a complete line of **MIYAMA** toggle switches, rocker switches, sub-miniature switches, pushbutton switches, lever switches and illuminated switches. **MIYAMA** . . . reliability and quality for over 50 years. For complete information on our wide range of products please contact:

DSA-DAI-ICHI SHOJI OF AMERICA, INC.
150 Fifth Avenue, Suite 516, New York, NY 10011, (212) 691-9050

DIALIGHT SWITCHES MEET YOUR NEEDS.

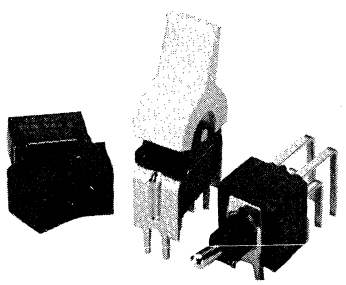
MINIATURE ROCKER/ TOGGLE SWITCHES



Available in over one million combinations, our miniature rocker, toggle and lever switches (Series 570) offer maximum design flexibility. Choose from low-level, 5-ampere and combination ratings; up to four poles; nine switching functions; nine colors and numerous mounting and terminal styles to meet your unique parameters. Miniature size saves valuable space, particularly where PC boards are utilized. Ideal for telecommunications, industrial control, computer peripherals and many other applications where high reliability, easy visual identification of switch functions, and low cost are prime objectives. U.L. listed and CSA certified.

Specifications
Electrical Ratings
Standard, Low-level and Combination up to 5 amps resistive at 120 VAC or 28 VCD; 2 amps resistive at 250 VAC.
Electrical Life
Up to 100,000 operations.
Materials
Gold and/or silver contacts and terminals, stainless steel housing, chrome plated brass toggle and nylon rockers and levers.

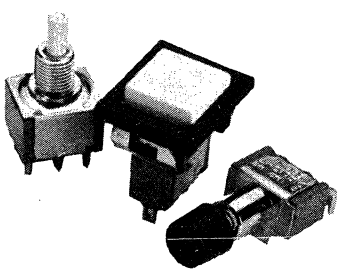
SEALED ROCKER/ TOGGLE SWITCHES



Three-way sealing process utilizing epoxy, rubber o-rings and ultrasonics allows our rocker, toggle and lever switches (Series 578) to be wave soldered and cleaned without contamination. They install easily into PC boards along with other components, reducing labor costs. And they can be used as direct replacements for unsealed switches, eliminating the need for redesign. They also come in a wide variety of styles, colors, contact ratings, functions and mounting configurations.

Specifications
Electrical Ratings
Standard, Low-level and Combination up to 7.5 amps resistive at 120 VAC or 28 VDC; 3 amps resistive at 250 VAC.
Electrical Life
40,000 operations.
Materials
Gold and/or silver contacts and terminals, high temperature U.L. approved plastic case, chrome plated brass toggle and nylon rockers and levers.

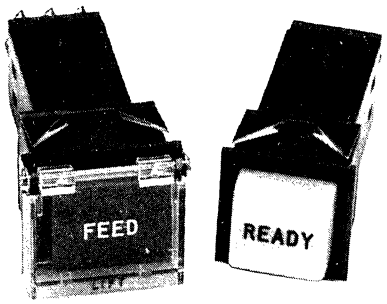
MINIATURE SNAP-ACTION PUSHBUTTON SWITCHES



The extremely short pre-travel of our miniature pushbutton switches (Series 580) offers near-instant response. While their snap-action mechanism provides positive user feedback. Small in size, they have a minimum rear projection, too. Available with numerous mounting options, including rear-panel and front snap-in. Can be used with or without four attractive snap-on caps available in a choice of 9 colors. All switches also come with epoxy-sealed terminals to prevent flux entry from the rear of the switch during soldering. U.L. listed.

Specifications
Electrical Ratings
Combination and Low-level up to 1 amp resistive at 120 VAC or 28 VDC.
Electrical Life
60,000 operations minimum.
Travel
.025″ typical.
Materials
Gold or gold over silver contacts and terminals, stainless steel housing and glass filled polyester plunger.

COMPUTER GRADE ILLUMINATED PUSHBUTTON SWITCHES



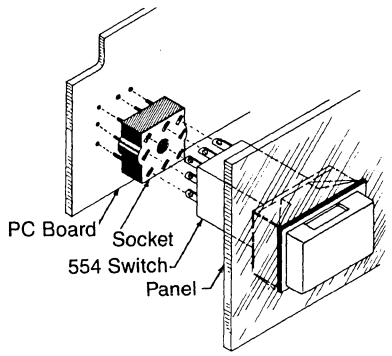
Ideal for all types of equipment, in addition to computers, our computer grade illuminated pushbutton switches (Series 554) offer long life, independent incandescent or LED illumination and outstanding design flexibility. Bright cap illumination provides quick identification of switch status, while independent lamp circuitry can be used to denote required operator action. Fingertip grips on caps also simplify lamp replacement in the field. Available in a wide variety of combinations. Choose from four contact ratings (including Solid State Hall Effect), ten cap styles (including LED illumination and split screen), momentary or alternate action mechanisms, matching indicators and two mounting styles. Optional wave-solderable and washable sockets are available for PC board applications. Optional side barriers and Kap-Guard™ device minimize the chance of accidental actuation. U.L. listed. CSA certified.

Specifications

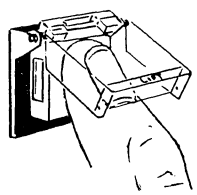
Electrical Ratings
Snap-action silver, snap-action gold, wiping-action gold and solid state up to 7 amps at 125 VAC or 30 VDC; 2 amps at 250 VAC.

Operating Life
750,000 operations (momentary), 250,000 (alternate action) and 1,000,000 operations minimum (solid state).

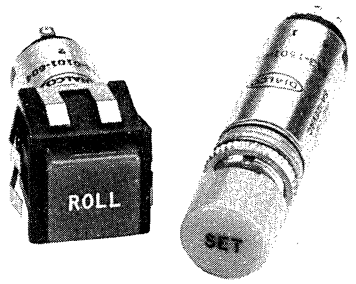
Materials
Gold plate and/or silver contacts, high temperature U.L. approved plastic housing and high impact plastic caps.



Protective Kap-Guard™



COMMERICAL GRADE ILLUMINATED PUSHBUTTON SWITCHES



Highly dependable contact mechanisms and rugged metal bodies make our commercial grade lighted pushbutton switches (Series 513) ideal for applications requiring more rigid switch construction. Bright cap illumination provides quick identification of switch status, while independent incandescent, LED or neon illumination can be used to denote required operator action. Fingertip grips on caps also simplify lamp replacement in the field. Choose from thousands of combinations, including momentary, snap or non-snap, alternate action; two contact ratings; over 100 cap styles; ten cap colors; engraving, hot stamping or replaceable film legends; and snap-in or rear-panel mounting. U.L. listed.

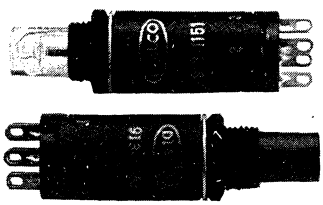
Specifications

Electrical Ratings
Standard and Low-level up to 5 amps resistive at 125 VAC or 30 VDC.

Operating Life
Up to 100,000 operations.

Materials
Gold plated coined silver contacts, anodized aluminum housing and high-impact plastic caps with a nickel plated brass shank.

LED AND NEON ILLUMINATED PUSHBUTTON SWITCHES



Our led and neon illuminated pushbutton switches (Series 913) feature a high brightness LED with current-limiting resistor for 5 VCD operation, or neon lamp for 125 VAC operation. Their integral cap prevents unintentional removal. While their highly reliable momentary switching mechanism has a typical life of one million actuations. Specifically designed for attractive rear-panel mounting, these switches require no subpanels and a minimum of hardware, reducing both material and labor costs.

Specifications

Electrical Ratings
0.1 amp resistive at 125 VAC or 30 VDC.

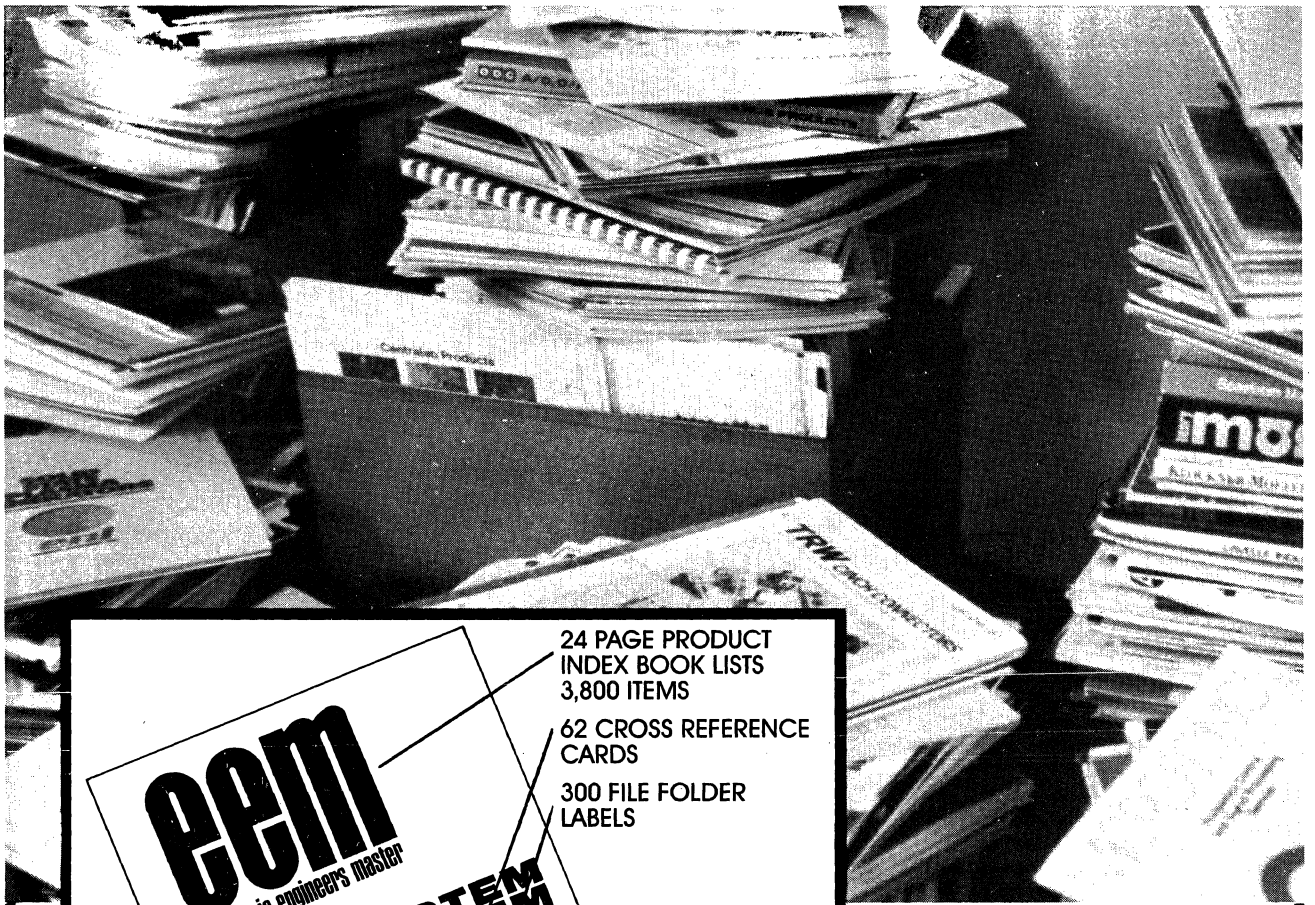
Operating Life
1,000,000 operations.

Materials
Gold plated contacts and black anodized aluminum housing.

For complete specifications, mounting diagrams, ordering information, etc., send for our free switch product catalogs. Contact Dialight, 203 Harrison Place, Brooklyn, NY 11237-1587. (718) 497-7600

DIALIGHT SWITCHES

A North American Philips Company



ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

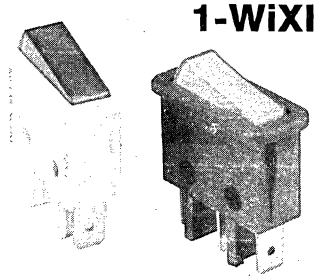
Dreefs ROCKER SWITCHES

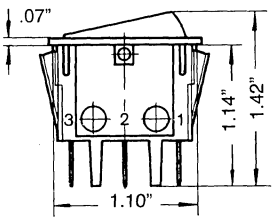
STANDARD FEATURES:

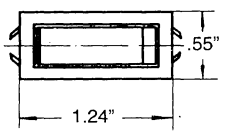
- All rocker switches rated at 16 amps @ 125/250VAC
- Includes dry circuit or high-inrush
- Maintained or momentary action
- Welded solid silver contacts
- Wide range of colors available
- VDE and other international approvals
- Body material: Nylon Type 6/6.(rated at 105°C)
- 2500V RMS Dielectric strength (Minimum)
- Greater than 3mm gap between contacts
- Greater than 4mm over-surface clearance
- Snap-in installation
- Single or Double Pole; single or double throw
- Molded or printed legends
- Illuminated or non-illuminated (Neon or incandescent)
- High-brightness, long-life neon
- Matching panel indicator styles
- Spade, solder lug or screw type terminals

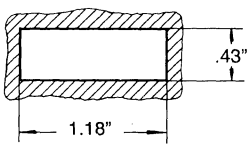
When Dreefs says "standard", that's exactly what we mean. Standard features like switch ratings which give you an enormous degree of freedom when designing your product--and for not a penny more! Like a range of North American and European approvals unmatched by any other American switch manufacturer. Because we know that in your business, the ability of products to travel without hassle is important. And we know that one size--or color--or style does not fit all. When it comes to quality, reliability and performance, you'll find more choices at **Dreefs Switch** than anywhere else--because your special requirements are our standards.

1-WiXII



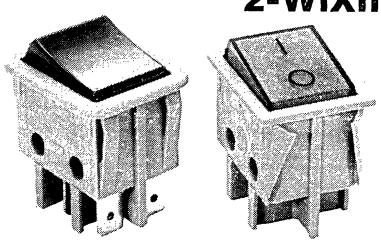


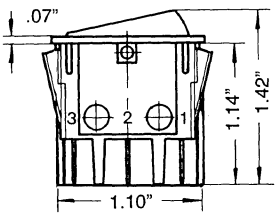


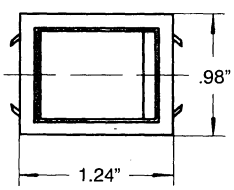


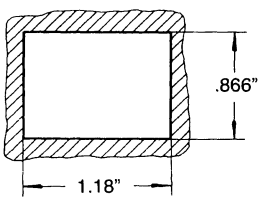
SABS

2-WiXII



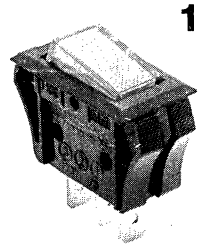


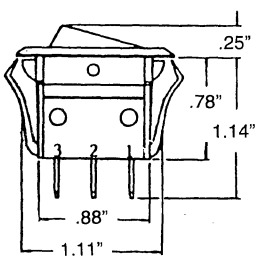


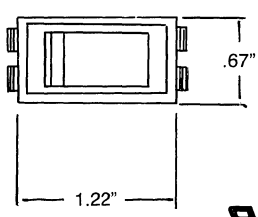


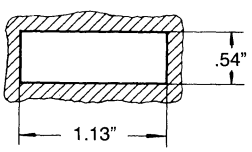
SABS

1-WiXIX

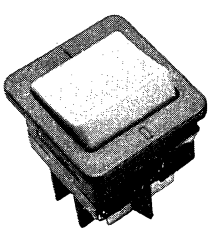


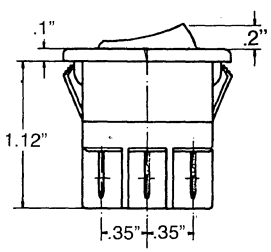


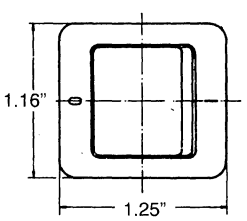


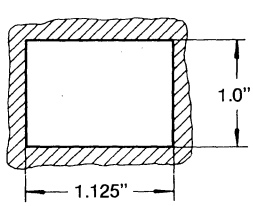


Wi26





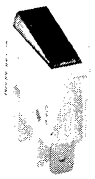




The Wi26 series is fully compatible with the standard 1.0" X 1.125" panel cutout. Highly legible "I" and "0" numerals are molded directly into the bezel.

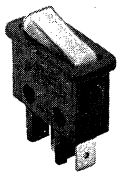
Dreefs **SWITCH INCORPORATED**
3782 Hawthorn Court Waukegan, IL 60087
Phone: **312-662-7667** or: **800/323-9605**

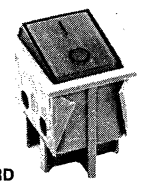
SERIES WiXII ROCKER SWITCHES
STANDARD SWITCH STYLES


1-WiXII STANDARD

The Dreefs Series WiXII rocker switches are available in several different mounting, bezel, and rocker styles, as follows:

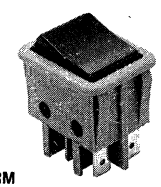
Standard. The Standard housing is characterized by a square-cornered bezel design and positive-grip mounting ears for snap-in mounting. These mounting ears provide a snug, wiggle-free installation in a wide range of panel thicknesses. Proper fit is assured by specifying panel thickness when ordering from the factory. Matching indicator housings and lenses are available in all colors. Paddle and splashguard version (not shown) are also available.


1-WiXII SOFTFORM

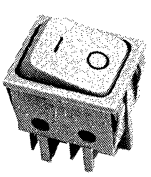

2-WiXII STANDARD

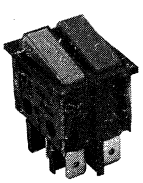
Softform.® The Softform housing features bezel contours which are slightly rounded on the top edge and at the corners. Serrated clips provide snap-in mounting and minimize lateral movement in the panel cutout. This bezel design gives a "softer" appearance to the mounted switch; while the serrated clip type of snap-in mounting provides easier switch removal from the panel when it is desired to gain access to the switch terminals. Matching indicator housings and lenses are available in all colors.

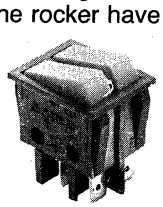
2-WiXII SERRATED CLIP


2-WiXII SOFTFORM

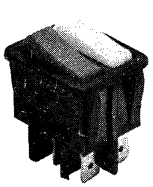
Hi-Tek. The new Hi-Tek housing incorporates variations of the features of the Standard and Softform versions, while displaying unique design characteristics of its own. The outside contours of the bezel are not so square as the Standard, nor as rounded as the Softform, however, the **inside** corners of the bezel have been rounded, to accomodate the rounded corners of the rocker design. Also, all edges of the rocker have been slightly rounded, to provide a clean, instrument-type appearance to the mounted switch. Serrated clips on each side of the switch body provide snap-in mounting and easy removal.


2-WiXII HI-TEK


2-WiXII STD DUAL


2-WiXII DUAL W/CLIPS

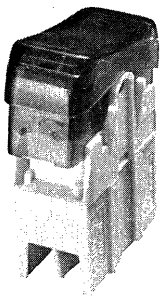
Dual. The Dual housing features a compartmentalized body which is designed to accomodate either: two individual switches, two individual indicators, or a combination switch and indicator. This housing is available in either the Standard or Softform design.

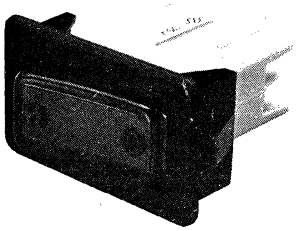

2-WiXII SOFTFORM DUAL

STANDARD FEATURES:

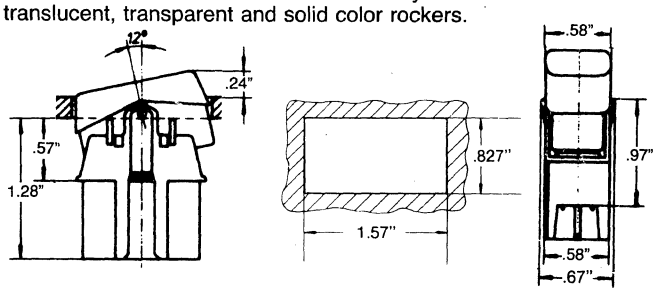
- All rocker switches rated at 16 Amps @ 125/250VAC
- Includes dry circuit or high-inrush • Maintained or momentary action • Welded solid silver contacts • Wide range of colors available • VDE and other international approvals
- Body material: Nylon Type 6/6.(rated at 105°C) • 2500V RMS Dielectric strength (Minimum) • Greater than 3mm gap between contacts • Greater than 4mm over-surface clearance. • Snap-in installation • Single or Double Pole; Single or Double Throw
- Molded or printed legends • Illuminated or non-illuminated (Neon or incandescent) • High-brightness, long-life neon
- Matching panel indicator styles • Spade, solder lug or screw type terminals

Wi23

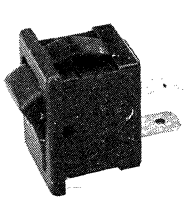


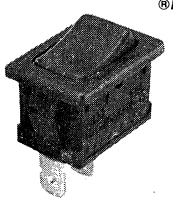


These splashproof rocker switches offer a unique capability for contiguous mounting in a single panel cutout, so design freedom is built-in while fluids are sealed out. And you can select from translucent, transparent and solid color rockers.

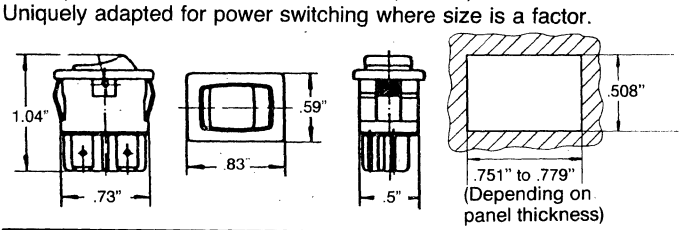


Wi32





Subminiature rocker switch rated at 16 amps @ 125VAC or 10 amps @ 250VAC. Available in SPST, SPDT, and DPST. Uniquely adapted for power switching where size is a factor.



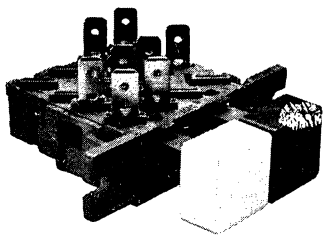
Dreefs
SWITCH INCORPORATED
3782 Hawthorn Court Waukegan, IL 60087
Phone: **312-662-7667** or: **800/323-9605**

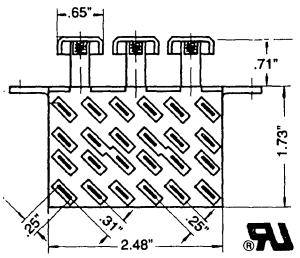
DPS PUSHBUTTONS

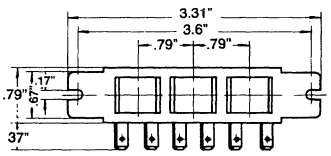
The unique terminal arrangement and building block technique used in the design of this pushbutton allows great versatility in combining switching functions along a single shaft. For instance, power control as well as logic level switching are easily accomodated within one switch housing. The standard heavy-duty, heat resistant thermoplastic housing material allows this switch to be used in adverse temperature environments. Applications include computerized equipment, industrial controls, appliances, office machines and instrumentation.

STANDARD FEATURES: DPS PUSHBUTTONS

- 1 to 8 pushbutton stations
- Rated at 16 Amp @ 125/250VAC
- Momentary or push-push action
- Wide variety of pushbutton styles
- Dry switching types available
- VDE and other International approvals
- Welded solid silver contacts
- Spade terminals
- Standard legends







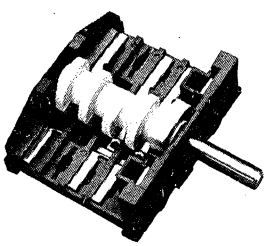
FRONT VIEW

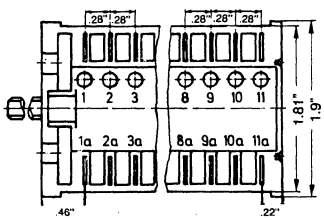
CH ROTARY SWITCH

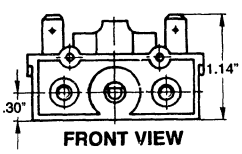
Featuring the capability of stacking up to 23 poles, rated at 16 amp @ 125/250VAC, the elegantly simple design and rugged construction of this switch make it the designer's choice for long life and trouble-free operation. The standard solid silver contacts add a further dimension of reliability for thousands of power switching operations. The cam-action switching mechanism imparts a crisp, tactile feedback for positive detent.

STANDARD FEATURES: CH ROTARY

- 1 to 23 poles; 1 to 12 positions
- Flat or back-to-back construction
- Rated at 16 Amp @ 125/250VAC
- Variable shaft lengths and diameters
- Housing rated to withstand 85 C or 125 C
- VDE and other International approvals
- Available with matching thermostat attached
- Straight, angular or spur gear drive.
- Spade or solder lug terminals.







FRONT VIEW

RTXI THERMOSTAT

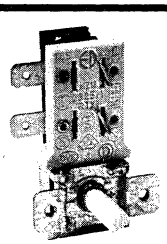
Designed to provide maximum reliability, repeatability and long life using time-proven materials and techniques, this thermostat utilizes a combination of a bi-metallic regulator with a snap-action switch mechanism, mounted on a ceramic base. Precise construction specifications permit factory adjustment within close tolerences, repeatable over at least 100,000 cyles. Various shaft lengths and diameters are standard. Spade or screw terminals in various configurations are available.

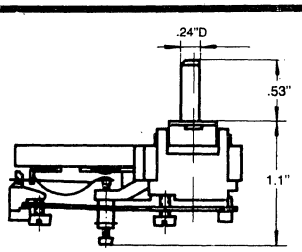
STANDARD FEATURES

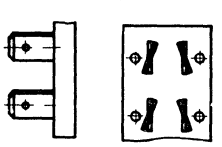
- Rated at 16 amp @ 380VAC
- Available in either the 30° Series or the 50° Series, as follows:
- Temperature Differential: 1.0° C to 3° C (1.8° F to 5.4° F) within each temperature range.

SERIES	TEMPERATURE RANGE	
30° C (54° F)	5° C to 35° C	(41° F to 95° F)
	10° C to 40° C	(50° F to 104° F)
	15° C to 45° C	(59° F to 113° F)
	20° C to 50° C	(68° F to 122° F)

SERIES	TEMPERATURE RANGE	
50° C (90° F)	0° C to 50° C	(32° F to 122° F)
	5° C to 55° C	(41° F to 122° F)
	10° C to 60° C	(50° F to 140° F)
	15° C to 65° C	(59° F to 149° F)







Dreefs **SWITCH INCORPORATED**
3782 Hawthorn Court Waukegan, IL 60087 Phone: **312-662-7667** or: **800/323-9605**

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C
CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J
JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K
kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L
LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P
PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

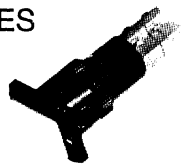
Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

EAO SWITCHES

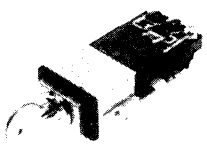
The World's Finest Switching Products

SERIES 01



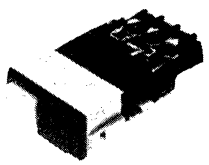
- Round, Square, and Rectangular bezel-front panel mount
- All types mount in a round hole
- 1-4 poles
- Momentary or maintained action
- Maintained action is position indicating
- 2 piece lens cap. Can be separated for insertion of film
- 3 Switching elements—Snap, Low Level, Electronic
- 9 Lens colors
- Front panel replacement of lamps
- Lamps do not travel when the switch is actuated

SERIES 02



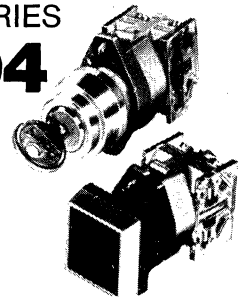
- Double pole, Double throw Momentary or Maintained action on both 380 Volt 10 Amp contacts
- Rectangular lens cap—9 colors
- Key Lock available

SERIES 03



- Full or split display—2 lamp
- Double pole, single or 2 button action
- Momentary, Maintained or combination
- Independent or Interlocked
- Key Switches available

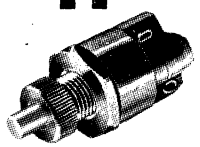
SERIES 04



OILTIGHT SWITCHES

- Round or Square panel front
- Snap together modular design
- Up to 8 pole switching
- Lighted and unlighted pushbuttons
- Mounts in 890" round hole
- Lever, Key-Lock, Emergency Stop actuators

SERIES 11

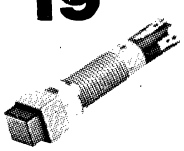


- Round lens cap—6 colors
- Mount from rear of panel
- 1-3 pole switching elements
- Momentary or maintained action
- Lamps replaceable from front
- LED available

SERIES 14

- Combines the rugged design of the 04 oiltight panel seal and the choice of switching elements
  5 Amps 250 volt
  Low level or electronic elements
- Specifically designed for machine tool applications where low level or computer switching is required.
- High-Security Key Lock available

SERIES 19

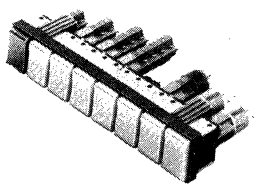


- Miniature lighted pushbuttons & indicators
- 9 mm (.354") centers.
- Round or square bezel
- Low level switching:
  μV up to 60V;
  μA up to 100 mA
- Momentary or maintained action (position indicating)

SERIES 21

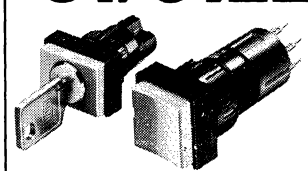
- Non illuminated version of the Series 11 with 6 differeht colored actuator button.
- Switching Elements
  5 Amp 240 volt 1 to 3 poles
  Low level switch
  Electronic switch Hall effect
- Momentary and maintained (position indicating) action

SERIES 30



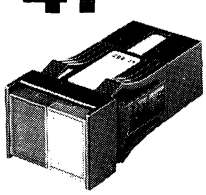
- Mechanical Interlock Switch
- 2—12 Switch units
- 5 different interlock combinations
- Slide Mechanism—All metal construction
- 3 Switching elements—Snap, Low Level, Electronic

SERIES 31/31LL



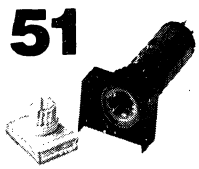
- Square or Rectangular bezel
- Flat or Concave lens
- 1-4 pole snap acting switch, Low Level or Electronic
- Lamp T-1 ¾ groove base
- Key Lock—round, square, rectangular with 3 levels of security: Low-Cost, Standard and High-Security

SERIES 41



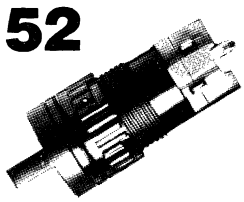
- 2 lamp switch
- Full or split screen
- Same panel dimensions as 31 Series
- Soft mount—from front of panel
- Switching elements same as 31 Series

SERIES 51



- Combines style of Series 31 with oil and water tight features of Series 14.
- Integral 'O' ring seal; one-piece actuator; conforms to IP65 requirements
- 1-4 pole, snap-acting contacts, low level or electronic switching.
- Round, square and rectangular panel fronts; choice of 8 lens colors.

SERIES 52



- Oil/Watertight seal; built to IP65 requirements
- 2-Position rotary switch
- Illuminated lever
- Integral "O" ring seal
- 3 Switching elements-Snap, Low Level, Electronic
- ⅝" Round hole mounting

SERIES 98

- Oil/Watertight seal; built to IP67 standards
- 3 sizes; non-illuminated or illuminated (1 or 2 LED)
- Momentary or maintained action, SPDT, (Form C)
- Rated at 50 VAC/72 VDC
- Gold plated contacts; over 5 million operations

SERIES 99

LIGHTED KEYBOARD SWITCH

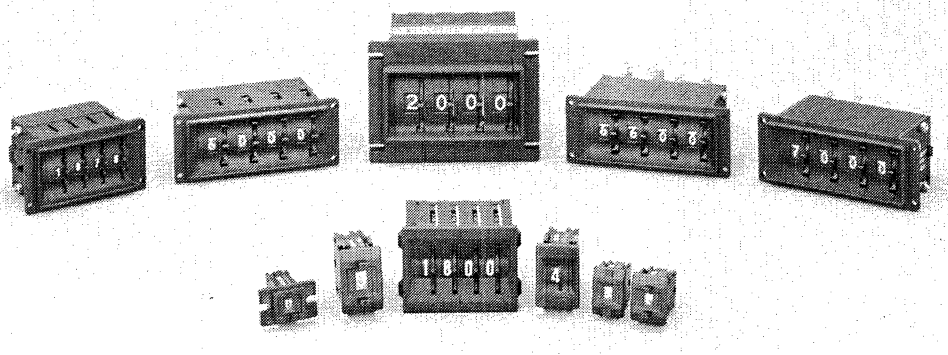
- Momentary and maintained action
- Gold contacts
- Long Life—5 million operation minimum
- Low level switching —dry circuit
- Low constance resistance— 15 milli-ohms
- Low contact bounce, < 100μ sec

EAO Switch. You can feel the difference.

EAO SWITCH CORPORATION

P.O. Box 552, Milford, CT., 06460 • 203/877-4577 • TLX: EAO SWITCH MFRD 964347

EECO® THUMBWHEEL SWITCHES



1000 Series Thumbwheel or Pushwheel Switch

The .236 wide 1000 Series switch provides reliability and compact size for applications where space is limited. Available in standard thumbwheel adjust, Push-Set and Pen-Set.

Number of Positions 10
Life . . . . . 300,000 Detents
Electrical Rating
Non-Switching Load . . . . . 0.500 Amps
Switching Load . . . . . 0.100 Amps
Contact Resistance . . . . . 0.200 Ohms
Dielectric Withstanding V. . . . . 500 VDC
Seal . . . . . Dust
Panel Mount . . . . . Rear
Dimensions, Module
Height 0.551 (14.0)
Width 0.236 (5.99)
Depth, Behind Panel 0.865 (21.97)
Actuation Method
Thumbwheel/Push/Pen-Set . . . . . Std.

1100 Series Thumbwheel or Pushwheel Switch

With the same narrow .236 width design as the 1000 Series switch, but with front mount configuration, the 1100 Series switch offers space saving dimensions in an attractive black matte finish.

Number of Positions 10
Life . . . . . 300,000 Detents
Electrical Rating
Non-Switching Load . . . . . 0.500 Amps
Switching Load . . . . . 0.100 Amps
Contact Resistance . . . . . 0.200 Ohms
Dielectric Withstanding V. . . . . 500 VDC
Seal . . . . . Dust
Panel Mount . . . . . Front
Dimensions, Module
Height 0.708 (17.98)
Width 0.236 (5.99)
Depth, Behind Panel 0.905 (22.99)
Actuation Method
Thumbwheel/Push/Pen/Lock-Set . . . Std.

1200 Series Pushwheel Switch

This .300 wide single pole decimal or binary coded switch offers long life and reliability in a snap-together Push-Set panel switch. With small size and easily read characters, the 1200 Series switch provides 10 positions.

Number of Positions 10
Life . . . . . 300,000 Detents
Electrical Rating
Non-Switching Load . . . . . 0.500 Amps
Switching Load . . . . . 0.100 Amps
Contact Resistance . . . . . 0.200 Ohms
Dielectric Withstanding V. . . . . 500 VDC
Seal . . . . . Dust
Panel Mount . . . . . Front
Dimensions, Module
Height 0.708 (17.98)
Width 0.300 (7.62)
Length 0.905 (22.99)
Actuation Method . . . . . Push-Set

1300 Series Pushwheel Switch

With .300 width, snap-together assembly, front snap-in mounting and large characters, this 10- or 16-position switch is the perfect choice for users that require high reliability and compactness.

Number of Positions . . . . . 10 and 16
Life . . . . . 1,000,000 Detents
Electrical Rating
Non-Switching Load . . . . 1.000 Amps
Switching Load . . . . . 0.100 Amps
Contact Resistance . . . . . 0.200 Ohms
Dielectric Withstanding V. . . 500 VDC
Seal . . . . . Dust
Panel Mount . . . . . Front
Dimensions, Module
Height 0.945 (24.00)
Width 0.300 (7.62)
Depth, Behind Panel . . 1.338 (33.99)
Actuation Method . . . . . Push-Set

1400 Series Thumbwheel or Pushwheel Switch

Thumbwheel, Push-Set or Lock-Set, the 1400 Series switch with its high reliability, easy snap-together assembly and variety of binary or decimal codes gives design flexibility to the user.

Number of Positions . . . . . 10 and 16
Life . . . . . 1,000,000 Detents
Electrical Rating
Non-Switching Load . . . . 1.000 Amps
Switching Load . . . . . 0.100 Amps
Contact Resistance . . . . . 0.200 Ohms
Dielectric Withstanding V. . . 500 VDC
Seal . . . . . Dust
Panel Mount . . . . . Front
Dimensions, Module
Height 0.945 (24.00)
Width 0.315 (8.00)
Depth, Behind Panel . . 1.338 (33.99)
Actuation Method
Thumbwheel/Push/Lock-Set . . . . Std.

1776/1976 Series Thumbwheel Switch

Revolutionary in design, the 1776 Series .500 wide thumbwheel switch, and the slimmer (.350) 1976 Series switch, offer optional notched terminals for mounting directly to motherboards.

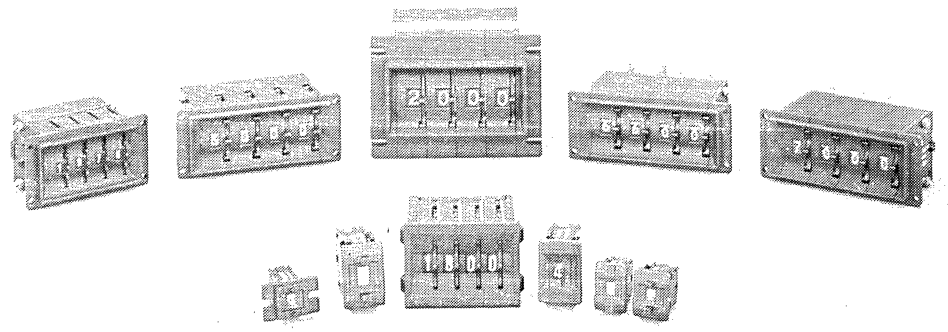
Number of Positions . . 8, 10, 12, and 16
Life . . . . . 1,000,000 Detents
Electrical Rating
Non-Switching Load . . . . . 3.000 Amps
Switching Load . . . . . 0.125 Amps
Contact Resistance . . . . . 0.100 Ohms
Dielectric Withstanding V. . . . 1000 V rms
Seal . . . . . Dust
Panel Mount . . . . . Rear
Dimensions, Module
Height 1.200 (30.48)
Width . . . . . 0.500 (12.70),0.350 (8.89)
Depth, Behind Panel 1.508 (38.30)
Actuation Method . . . . . Thumbwheel

Dimensions in inches (mm)

EECO®

EECO Incorporated • 1601 E. Chestnut Ave. • P.O. Box 659 • Santa Ana, CA 92702-0659 • Phone: (714) 835-6000 • TWX 910-595-1550 • Telex 67-8420
EECO Membrane Switch Operations • 2949 N. 31st Ave., Phoenix, AZ 85017 • Phone: (602) 272-5645 • TWX 910-950-0196
EECO LIMITED, Trafalgar Way, Bar Hill, Cambridge CB3 8SQ, England, Phone: Crafts Hill (0) 954-80257, Telex 817303

EECO® THUMBWHEEL SWITCHES



1800 Series Thumbwheel Switch

A reliable, low cost snap-in mount switch available in gray, beige or black in gloss or molded matte finish. The 1800 Series switch has PCB termination and is a slim .315 wide.

Number of Positions 10
Life . . . . . 500,000 Detents
Electrical Rating
Non-Switching Load . . . . . 1.000 Amps
Switching Load . . . . . 0.100 Amps
Contact Resistance . . . . . 0.100 Ohms
Dielectric Withstanding V. . . . . 1000 V rms
Seal . . . . . None
Panel Mount . . . . . Front
Dimensions, Module
Height 1.300 (33.02)
Width 0.315 (8.00)
Depth, Behind Panel 1.417 (35.99)
Actuation Method . . . . . Thumbwheel

2000 Series Thumbwheel Switch

A general purpose, large industrial-type switch, the 2000 Series offers over 50 codes in 8-, 10-, 12-, and 16-positions. Available with a sealed option, plus extra large legend.

Number of Positions . . 8, 10, 12, and 16
Life . . . . . 1,000,000 Detents
Electrical Rating
Non-Switching Load . . . . . 3.000 Amps
Switching Load . . . . . 0.125 Amps
Contact Resistance . . . . . 0.100 Ohms
Dielectric Withstanding V. . . 1,000 V rms
Seal . . . . . Optional
Panel Mount . . . . . Rear
Dimensions, Module
Height 2.100 (53.34)
Width 0.500 (12.70)
Depth, Behind Panel 2.030 (51.56)
Actuation Method . . . . . Thumbwheel

6000 Series Thumbwheel Switch

The commercial version of the 7000, the 6000 Series features a fully sealed switch chamber and rugged construction. Available with PC Board, cable or wire loop termination.

Number of Positions . . . . . 8, 10, and 12
Life . . . . . 1,000,000 Detents
Electrical Rating
Non-Switching Load . . . . . 3.000 Amps
Switching Load . . . . . 0.125 Amps
Contact Resistance . . . . . 0.100 Ohms
Dielectric Withstanding V. . . 1,000 V rms
Seal . . . . . Environmental
Panel Mount . . . . . Rear
Dimensions, Module
Height 1.150 (29.21)
Width 0.500 (12.70)
Depth, Behind Panel 1.560 (39.62)
Actuation Method . . . . . Thumbwheel

7000 Series Military Thumbwheel Switch

Qualified to the rigid standards of MIL-S-22710/15, this Military-grade switch offers a completely sealed contact area, impervious to dust, high humidity and salt spray. Can be used safely in explosive environments.

Number of Positions 8, 10
Life . . . . . 1,000,000 Detents
Electrical Rating
Non-Switching Load . . . . . 3.000 Amps
Switching Load . . . . . 0.125 Amps
Contact Resistance . . . . . 0.100 Ohms
Dielectric Withstanding V. . . 1,000 V rms
Seal . . . . . Environmental
Panel Mount . . . . . Rear
Dimensions, Module
Height 1.150 (29.21)
Width 0.500 (12.70)
Depth, Behind Panel 1.570 (39.88)
Actuation Method . . . . . Thumbwheel

Thumbpot™ Digital Voltage Divider

This unit is available in .500 or .350 wide models and electrically divides the input voltage into precise, incremental voltage output values. The major feature of the unit is exacting repeatability.

Number of Positions 10
Life . . . . . 1,000,000 Detents
Electrical Rating
Std. Res. Range . . . . . 100-100K Ohms
Std. Res. Tolerance . . . . . ±1%
Dielectric Withstanding V. . . . . 500 V rms
Ins. Res. (@ 500 VDC) . . 1,000 Megohms
Seal . . . . . Dust
Panel Mount . . . . . Rear
Dimensions, Module
Height 1.200 (30.48)
Width 0.500 (12.70), 0.350 (8.89)
Depth, Behind Panel 1.250 (31.75)
Actuation Method . . . . . Thumbwheel

6600 Series Digital Voltage Divider

This unit features make-before-break switch contacts and military grade construction. Based on the Kelvin-Varley circuit, the 6600 uses laser trimmed resistor networks offering exact repeatability.

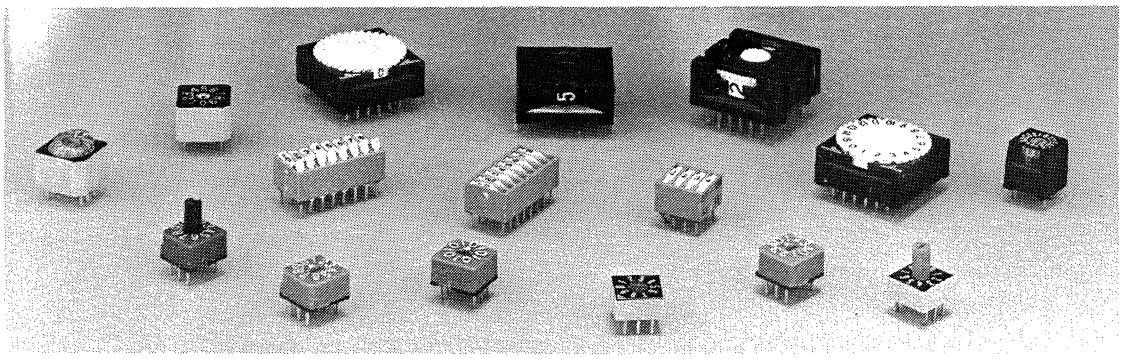
Number of Positions 10
Life . . . . . 1,000,000 Detents
Electrical Rating
Std. Res. Range . . . . . 1K-100K Ohms
Std. Res. Tolerance . . . . . ±1%
Output change with temperature 50 PPM
Dielectric Withstanding V . . . . 500 V rms
Ins. Res. (@ 500 VDC) . 1,000 Megohms
Seal . . . . . Environmental
Panel Mount . . . . . Rear
Dimensions, Module
Height 1.200 (30.48)
Width 0.500 (12.70)
Depth, Behind Panel 2.465 (62.61)
Actuation Method . . . . . Thumbwheel

Dimensions in inches (mm)

EECO®

EECO Incorporated • 1601 E. Chestnut Ave. • P.O. Box 659 • Santa Ana, CA 92702-0659 • Phone: (714) 835-6000 • TWX 910-595-1550 • Telex 67-8420
EECO Membrane Switch Operations • 2949 N. 31st Ave., Phoenix, AZ 85017 • Phone: (602) 272-5645 • TWX 910-950-0196
EECO LIMITED, Trafalgar Way, Bar Hill, Cambridge CB3 8SQ, England, Phone: Crafts Hill (0) 954-80257, Telex 817303

EECO® PCB SWITCHES



2300 Series MICRO-DIP®

Advanced in concept, the 2300 Series switch is a space-saving yet economical method of equipment programming. Ideal for address encoding or presetting of PROM's and data entry devices.

Number of Positions	10 and 16
Life	10,000 Detents
Electrical Rating	
Non-Switching Load	1.000 Amps
Switching Load	0.100 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	250 V rms
Dimensions	
Height	0.239 - 0.394 (6.07 - 10.01)
Width	0.376 - 0.450 (9.55 - 11.43)
Length	0.396 - 0.450 (10.06 - 11.43)
Actuation Method	
Screwdriver	Standard
Shaft	Available
Binary Coded Output	Standard

3300 Series MICRO-DIP®

A low-profile, fully-sealed version of the original 2300 Series MICRO-DIP switch, this switch has all of its features, plus full sealing to withstand automated soldering and cleaning processes.

Number of Positions	10 and 16
Life	10,000 Detents
Electrical Rating	
Non-Switching Load	1.000 Amps
Switching Load	0.100 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	250 V rms
Full Environmental Seal	Standard
Dimensions	
Height	0.190 (4.83)
Width	0.380 (9.65)
Length	0.380 (9.65)
Actuation Method	
Screwdriver	Standard
Shaft	Available
Binary Coded Output	Standard

2400 Series MINI-DIP®

With exclusive gold-on-gold cleaning/ wiping action contacts, this series of switches assures low contact resistance while the unique locking rod design prevents accidental actuation.

Number of Positions	2 to 10
Life	2,000 Detents
Electrical Rating	
Non-Switching Load	1.000 Amps
Switching Load	0.125 Amps
Contact Resistance	0.050 Ohms
Dielectric Withstanding V.	500 V rms
Full Environmental Seal	Optional
Dimensions	
Height	0.375 (9.52)
Width	0.385 (9.78)
Length	0.200 - 1.000 (5.08 - 25.4)
Actuation Method	Rocker
Standard Options	
Special Marking	Yes
Seal	Yes

2100 Series STRIPSWITCH®

The most economical method of handsetting coded values. Requires a minimum of space, no mounting hardware, and can be "ganged" up to four stations in a strip. Two legend locations provide readability.

Number of Positions	10 and 16
Life	250,000 Detents
Electrical Rating	
Non-Switching Load	3.000 Amps
Switching Load	0.125 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	500 V rms
Dimensions	
Height	0.430 (10.92)
Width	0.775 (19.68)
Length	0.800 (20.32)
Actuation Method	
Thumbwheel	Standard
Screwdriver	Standard
Shaft	Available
Binary Coded Output	Standard

2200 Series STRIPSWITCH®

This switch offers all of the features of the proven 2100 Series STRIPSWITCH in a low-profile, fully-sealed unit. The easy-to-read thumbwheel has a built-in screwdriver slot.

Number of Positions	10 and 16
Life	100,000 Detents
Electrical Rating	
Non-Switching Load	3.000 Amps
Switching Load	0.125 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	500 V rms
Full Environmental Seal	Standard
Dimensions	
Height	0.360 (9.14)
Width	0.790 (20.07)
Length	0.790 (20.07)
Actuation Method	
Thumbwheel	Standard
Screwdriver	Standard
Binary Coded Output	Standard

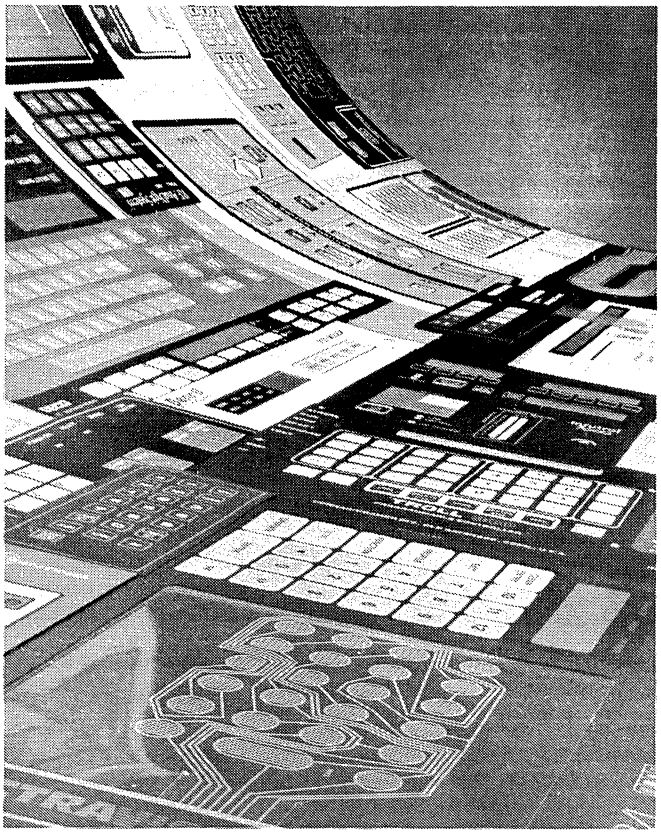
Dimensions in inches (mm)

EECO®

EECO Incorporated • 1601 E. Chestnut Ave. • P.O. Box 659 • Santa Ana, CA 92702-0659 • Phone: (714) 835-6000 • TWX 910-595-1550 • Telex 67-8420
EECO Membrane Switch Operations • 2949 N. 31st Ave., Phoenix, AZ 85017 • Phone: (602) 272-5645 • TWX 910-950-0196
EECO LIMITED, Trafalgar Way, Bar Hill, Cambridge CB3 8SQ, England, Phone: Crafts Hill (0) 954-80257, Telex 817303

EECO®
MEMBRANE SWITCHES

A UNION OF GRAPHICS EXCELLENCE AND ELECTROMECHANICAL EXPERTISE.



The Membrane Switch Operations of EECO Incorporated provides high quality switches to customers requiring absolute reliability combined with faultless graphics.

EECO membrane switches integrate SPST, momentary, normally open switches into control panels which include exceptional graphic features. Circuitry is screen-printed on polyester substrates and conductors carry low voltage DC logic signals. Construction methods provide totally-sealed panels capable of withstanding harsh environmental conditions. Mechanical designs minimize the effect of normal handling during the assembly process and use of the finest available materials ensures quality.

Typical applications include:
- Medical products and instrumentation.
- Depth-finders and radar systems for marine use.
- Heat and humidity intensive products such as handheld military radios.
- Office products.
- Point-of-Sale terminals.

Vertical Integration
EECO ensures quality and efficiency by exercising careful control over processes and materials. EECO in-house capabilities include:
- Computer Assisted Design to ensure documentation quality.
- Design engineering and art layout.
- Photographic reproduction.
- One of the finest technical graphics capabilities in the country.
- Circuit printing and a comprehensive testing program for the electronic component portion of all EECO membrane switches.
- A graphic ink laboratory for production and matching of high quality inks.
- Fabrication of steel rule dies.
- Production of stainless steel and polyester mesh screens in humidity-controlled environment.
- Die cutting.
- Assembly.

Features
- Embossed graphics provide tactile location and enhance the user interface.
- Selective texturing adds chemical resistance and allows a transparent readout area in a matte background without a die-cut opening.
- Connectors are installed and tested to met specific circuit configurations.
- Standard aluminum or plastic support panels can be provided with mounting hardware.
- PCB's with components and connectors are available for integration of LED backlighting.
- Graphic interchangeability permits cosmetic changes to control panels for private labeling.
- Backlit switch functions are available.
- "Deadfront" legends allow selective display of instructions.
- Lenses for LED, Vacuum Fluorescent, Liquid Crystal, and CRT displays are available.
- Polyester or stainless steel domes provide tactile feedback which adds mechanical resistance and travel.
- ESD/EMI shielding provided with aluminum or copper foils, or a variety of cost-effective printed conductive materials.

Quality & Reliability
The EECO quality system is organized to provide reliable membrane switch products that you can count on—every time!
- All aspects of a proposed design are reviewed prior to production.
- Training programs for the entire manufacturing force assure quality at every phase of production.
- All component materials are selected, qualified and inspected with quality standards prior to release to manufacturing.
- Die cutting, color matching, printing and assemblies are all first-article inspected before continued manufacture.
- Continuous monitoring of operations assures adherence to strict quality standards.
- Circuits and connectors are fully electrically inspected before final assembly.
- Conductors are fully tested for electrical conformance, proper substrate adhesion, hardness and proper curing.
- Each switch function is thoroughly tested for design compliance, continuity and electrical specifications.
- Final inspection is 100%, plus a simulated customers' incoming inspection program sampling.
- A thoroughly documented Quality Assurance Program assures that only top quality products are shipped.

EECO®

EECO Incorporated • 1601 E. Chestnut Ave. • P.O. Box 659 • Santa Ana, CA 92702-0659 • Phone: (714) 835-6000 • TWX 910-595-1550 • Telex 67-8420
EECO Membrane Switch Operations • 2949 N. 31st Ave., Phoenix, AZ 85017 • Phone: (602) 272-5645 • TWX 910-950-0196
EECO LIMITED, Trafalgar Way, Bar Hill, Cambridge CB3 8SQ, England, Phone: Crafts Hill (0) 954-80257, Telex 817303

electro-mech
LIGHTED PUSH-BUTTON SWITCHES

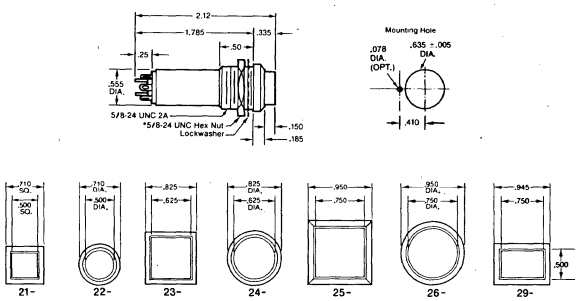
DISPLAY ASSEMBLIES/ INTERLOCK SWITCH ASSEMBLIES/ INDICATORS

ELECTRO-MECH provides a perfect blend of quality standard products with in-depth experience in answering unique requirements. Proven engineering designs are illustrated by the excellent performance characteristics of each ELECTRO-MECH lighted push-button switch, indicator, and display assembly. Low-bounce, long-life contacts, new innovations in legends, displays, field-service, packaging– all standard features. Whatever your applications, ELECTRO-MECH is prepared to answer your specific needs. Choose from any of the most popular models.

Technical specifications apply to all ELECTRO-MECH Switch models unless otherwise specified:

- **Ratings: 30 Volts DC or 115 Volts AC; 2 amps resistive, 1 amp inductive**
- **Weight: 0.8 oz. (approx.)**
- **Operating Pressure: 2 lbs. + 1 lb.**
- **Plunger Travel: 3/16" (approx.)**
- **Actuations: 100,000**
- **Accommodates all "switchlines" standard lenses. Uses one T1-3/4, AN3140-327, 328, 330 bulb or neon lamp, 3 actuation modes standard**
- **Lenses: Available in ½" to 1" round and square, plus various rectangular sizes.**

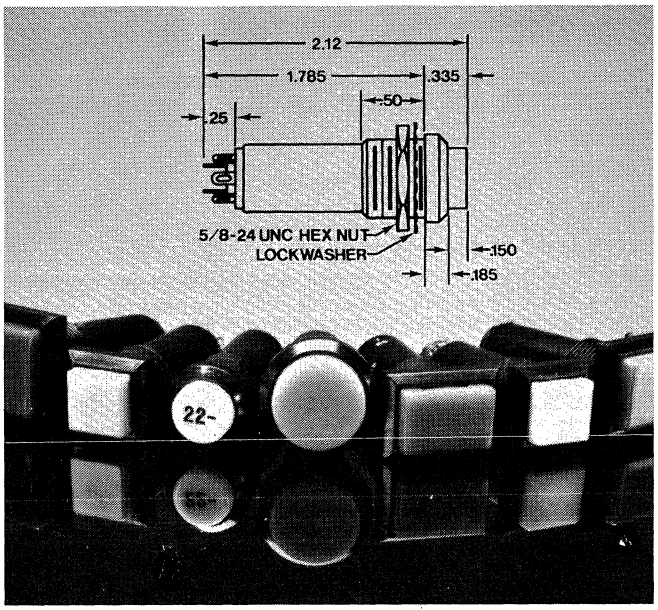
MOUNTING SPECIFICATIONS



SWITCH FUNCTIONS	SPST N.O.	SPST N.C.	DPST N.O.	DPST N.C.	DPST 1 N.O., 1 N.C.	SPDT	DPDT
MOMENTARY	2*-128	2*-129	2*-130	2*-131	2*-132	2*-149	2*-150
PUSH-ON PUSH-OFF	2*-228	2*-229	2*-230	2*-231	2*-232	2*-249	2*-250
PUSH-ON REMAIN-IN PUSH-OFF	2*-828	2*-829	2*-830	2*-831	2*-832	2*-849	2*-850
N.O. POS	2-5		1-2, 4-5		1-2	1-2	1-2, 4-5
N.C. POS		2-5		2-3, 5-6	5-6	2-3	2-3, 5-6
COMMON POS			2, 5	2, 5		2	2, 5

*—Indicate style of switch (21- through 26, and 29)

SERIES 20
A NEW CONCEPT OF FAST EASY SWITCH INSTALLATION AND DISPLAY DESIGN VERSATILITY



FEATURES:

- **Momentary or alternate action**
- **Mounts in a ⅝" dia. round hole**
- **High density mounting ability—less than ¾" centers**
- **Low profile appearance in one unitized housing**

ELECTRO-MECH's Series 20 Switches are provided in display configurations.

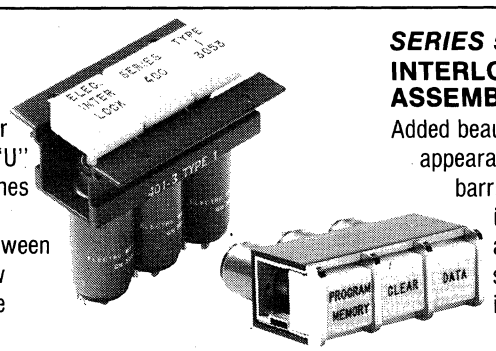
These low profile units are available in any switching mode with independent circuitry from SPST to DPDT including a separate indicator circuit. The all plastic, unitized housing assures ease in handling (no adapters, clamps or brackets). Just drop in round hole and secure with a nut from behind panel.

Series 20 Switches have the same internal parts as the all metal 6100 Series Switches including positive action, reliable circuitry and proven low bounce characteristics made possible by our unique design concept of silver slide bar action.

Available options include gold plating for dry circuit applications. Round slotted nuts for mounting switches on close centers.

SERIES 400
MULTI-STATION SUB-PANEL ASSEMBLIES

Multi-station switch assemblies designed for sub-panel mounting by means of a flanged "U" channel. All standard ELECTRO-MECH switches can be incorporated with several types of mechanical interlocking/lockout actions between stations. Up to 12 stations in one or two row configurations. The standard center distance between switches is ⅝", ¾", ⅞" and 1".



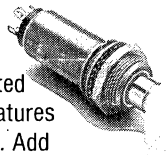
SERIES 500
INTERLOCKING SWITCH ASSEMBLIES

Added beauty and long-lasting appearance with handsome chrome barriers between each switch or indicator. Independent or interlocking action. Ten types of tracking action and switching sequences. Up to 12 switches in single or dual row, ⅞" or 1" centers.

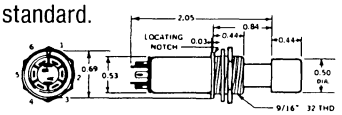
electro-mech
LIGHTED PUSH-BUTTON SWITCHES

COMMUNICATIONS/INDUSTRIAL CONTROLS/DISPLAYS
COMPUTER PERIPHERALS/INSTRUMENTATION

SERIES 2100



This version of our standard illuminated Pushbutton Switch features silver slide bar action. Add BR after part number for mounting on ⅝" centers. Utilizes AN3140-T 1¾"or Neon bulb. All other specifications same as standard.

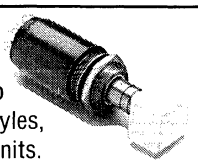


	1 PST		2 PST		1 N.O.		
	N.O.	N.C.	2 N.O.	2 N.C.	1 N.C.	1 PDT	2 PDT
Momentary Push-on/ Push-off	2128	2129	2130	2131	2132	2149	2150
	2228	2229	2230	2231	2232	2249	2250

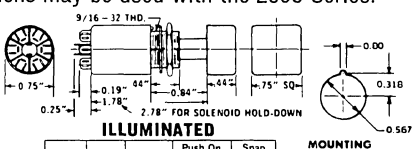
SERIES 4000 10 AMP

Low profile matches standard industry models. Momentary or Alternate Action design takes any standard lens size. 30 VDC or 115 VAC, 10 A Resistive, 5 A Inductive.

SERIES 2600



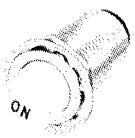
Standard models are available from 2PST to 6PDT in 116 different styles, including non-lighted units. Virtually any standard ELECTRO-MECH lens may be used with the 2600 Series.



ILLUMINATED

	Mom.	Push On Push Off	Push On Remain In Push Off	Snap Feel Mom.
2 PDT	2650	2750	2850	2550
3 PDT	2651	2751	2851	2551
4 PDT	2652	2752	2852	2552
5 PDT	2653	2753	2853	2553
6 PDT	2654	2754	2854	2554

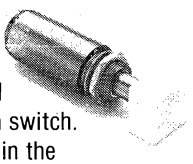
SERIES 5000



An exceptionally short momentary switch available in circuit configurations up to 2 PDT.

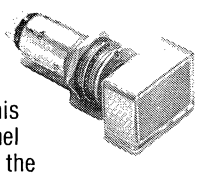
	1 PST		2 PST				
	N.O.	N.C.	2 N.O.	2 N.C.	1 N.O. 1 N.C.	1 PDT	2 PDT
MOMENTARY	5128	5129	5130	5131	5132	5149	5150

SERIES 3000

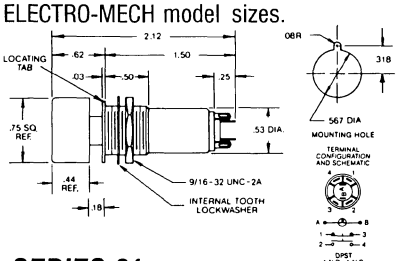


Illuminated Pushbutton switches with an integral hold-down coil which is activated with switch. Holds the push-button in the depressed position until coil is de-energized returning it to relaxed position. Available in all circuit configurations up to 6 PDT. Same specifications as standard model.

SERIES 6100



High-density packaging requirements are answered with this shorter, front panel mount, providing the same quality design as standard ELECTRO-MECH model sizes.



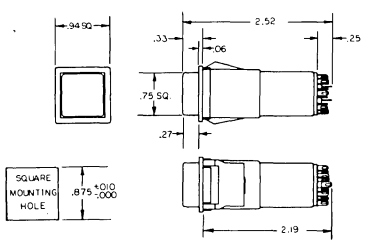
Designer Group Switches

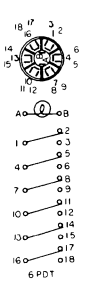
¾" sq., ¾" x 1½", ¾" x ⅞", ½" sq.

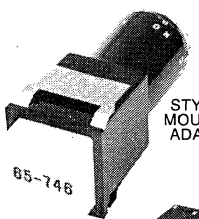
These ELECTRO-MECH Standards feature typical switch functions and mounting options for design flexibility. A choice of dual/quad display units are also available.

All Designer Group units feature:

- **1PST TO 6PDT**
- **Momentary: Alternate action; push-on remain-in; push-on, push-off and momentary snap-feel.**



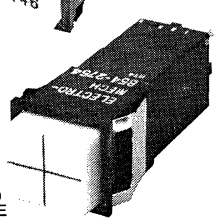


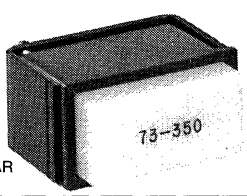


MODEL 65
NO BARRIER

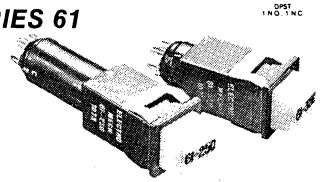
MODEL 68
SINGLE BARRIER (L OR R)

MODEL 67
DOUBLE BARRIER





SERIES 61



ELECTRO-MECH's Series 61 switches are provided in ½-inch square, snap-in or hardmount configurations. Each low-profile unit is available in any function from SPST to 2PDT, each controlled with an independent circuit. The all plastic, unitized housing, helps insulate switch from other surrounding components. The 61 Series is also available in a standard PC Board mounting configuration.

SERIES 60
MOMENTARY SWITCH

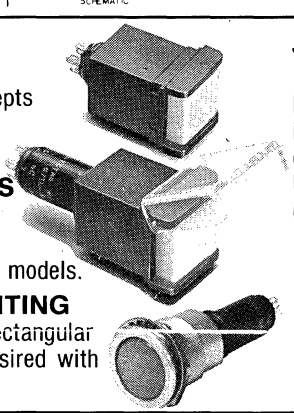
Rear mounted "U" bracket accepts switch installation from front of panel.

LG SERIES SAFETY LENS

Available on all 67-single-station, double-barrier lighted push-button bezel switch models.

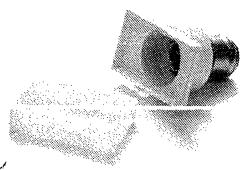
EL SERIES FLUSH MOUNTING

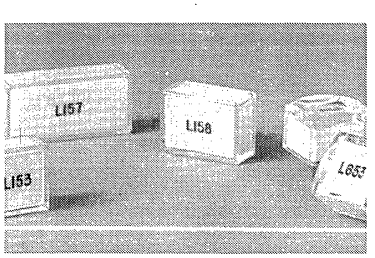
Available in round, square or rectangular styles. Specify switch model desired with "EL" suffix (i.e. 73 EL-2654).



SERIES 150
INTERCHANGABLE LENSES/FILTERS

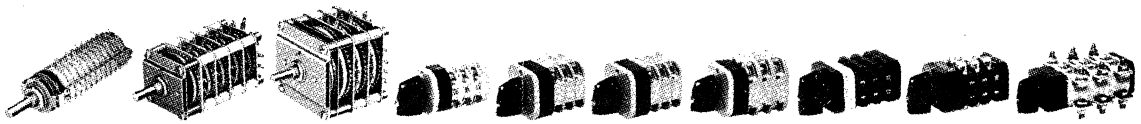
Displays may be changed or buttons replaced. Non-wearing, clear-acrylic lens and filter buttons. Available in standard, Opaque or Contour.





ELECTRO-MECH COMPONENTS, INC. • 1826 NORTH FLORADALE AVE. • SO. EL MONTE, CALIF. 91733 • (818) 442-7180

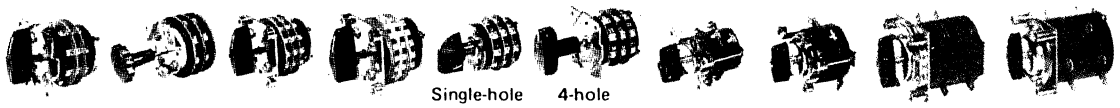
ELECTROSWITCH selector guide rotary switches



	LOW CURRENT SWITCHES			CAM-ACTIVATED SWITCHES						
CHARACTERISTICS	**SERIES 1**	**SERIES 2**	**SERIES 4**	**PR 10**	**PR 16**	**PR 20**	**PR 25**	**CC 32**	**CC 63**	**CC 125**
SECTIONS	1-24	1-15	1-10	1-12	1-12	1-12	1-12	1-12	1-12	1-6
POLES	1-24	1-24	1-24	1-24	1-24	1-24	1-24	1-24	1-24	1-12
POSITIONS	2-12	2-32	2-48	2-12	2-12	2-12	2-12	2-12	2-12	2-12
DETENTING ANGLE	30,60,90,180°	11¼,15,22½,30°	7½,15°	30,45,60,90°	30,45,60,90°	30,45,60,90°	30,45,60,90°	30,45,60,90°	30,45,60,90°	30,45,60,90°
ELECTRICAL RATINGS										
Continuous Rating	10A-115V	10A-115V	10A-115V	12A-600V	20A-600V	24A-600V	34A-600V	40A-600V	80A-600V	160A-600V
Interrupting Current										
120 VAC	0.35A(115VAC)	2A	1A	10A	16A	20A	25A	32A	63A	125A
240 VAC				10A	16A	20A	25A	32A	63A	125A
600 VAC				10A	16A	20A	25A	32A	63A	125A
24 VDC	1A(28VDC)	2A(30VDC)	2A(30VDC)	10A	16A	20A	25A	32A	63A	125A
125 VDC				3A	2½A	2½A	2½A	5A	3A	3.5A
250 VDC		0.1A								
Max. Breaking Ability				42A	65A	75A	125A	107A	215A	267A
Max. Making Ability				64A	100A	120A	170A	160A	320A	400A
Momentary Current										
1 second				300A	400A	420A	1100A	1200A	1500A	2400A
3 seconds								350A		
30 seconds								155A		
60 seconds								120A		
Overload Current										
(50 operations)										
120 VAC				60A		120A		360A		
240 VAC				55A	96A			360A		
600 VAC					66A	102A	132A	270A		
24 VDC								45A		
125 VDC								15A		
250 VDC								2A		
Dielectric Strength	1000 VRMS	1500 VRMS	1500 VRMS	2200 VRMS	2200 VRMS	2200 VRMS	2200 VRMS	2200 VRMS	2200 VRMS	2200 VRMS
Insulation Resistance	10^4 megohms	10^6 megohms	10^6 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms
Contact Resistance	2.5 milliohms	2.0 milliohms	2.0 milliohms	30 milliohms	30 milliohms	30 milliohms	30 milliohms	10 milliohms	10 milliohms	6 milliohms
HORSEPOWER RATINGS										
3-phase ratings — reduce by ½ for 1-phase										
110/120 VAC				1 hp	2 hp	3 hp	3 hp	5 hp	10 hp	
220/240 VAC				3 hp	5 hp	5 hp	7½ hp	9 hp	20 hp	
440/480 VAC				5 hp	7½ hp	10 hp	15 hp	15 hp	27 hp	
550/600 VAC				7½ hp	10 hp	15 hp	20 hp			
MOUNTINGS										
Single-Hole	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
2-Hole		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4-Hole										
Base-mount				Yes	Yes	Yes	Yes	Yes	Yes	Yes
Water proof-mount	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Door-mount				Yes	Yes	Yes	Yes	Yes	Yes	Yes
LOCKING FEATURES										
Key-interlock				Yes	Yes	Yes	Yes	Yes	Yes	Yes
Push-to-turn										
Solenoid-lock										
SPECIAL DRIVES										
Key-operated				Yes	Yes	Yes	Yes			
Solenoid-operated										
Ganged gear-operated				Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spring return	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	
APPROVALS										
U/L				Recognized	Recognized	Recognized	Recognized	Recognized	Recognized	
CSA Certified				Yes	Yes	Yes	Yes	Yes	Yes	

ELECTRO SWITCH CORP. • Weymouth, Massachusetts 02188 • Telephone: 617/335/5200 • TWX: 710/388/0377

FOR GENERAL INDUSTRIAL CONTROL



DETENT SWITCHES						SNAP-ACTION SWITCHES				
SERIES 21	SERIES 24	SERIES 25	SERIES 28	SERIES 31	SERIES 31	SERIES 101	SERIES 103	SERIES 105	SERIES 107	CHARACTERISTICS
1-30	1-10	1-25	1-15	1-10	1-10	1-12	1-12	1-8	1-8	SECTIONS
1-60	1-20	1-75	1-30	1-20	1-20	1-12	1-12	1-8	1-8	POLES
2-8	2-8	2-12	2-16	2-8	2-8	2-4	2-4	2-4	2-4	POSITIONS
45°	45°	30°	22½°	45°	45°	90°	90°	90°	90°	DETENTING ANGLE
										ELECTRICAL RATINGS
15A-600V	30A-600V	10A-600V	5A-600V	15A-600V	15A-600V	20A-600V	45A-600V	75A-600V	200A-600V	Continuous Rating
										Interrupting Current
15A	20A	10A	5A	10A	10A	15A	40A	60A	200A	120 VAC
7½A	15A	5A	3A	5A	5A	10A	40A	60A	200A	240 VAC
4A	6A	3A	2A	3A	3A	5A	30A	60A	200A	600 VAC
10A		7½A	5A	5A	5A	15A	30A	60A	200A	24 VDC
2A	3A			1A	1A	10A	30A	60A	on request	125 VDC
						5A	30A	60A	on request	250 VDC
30A		75A	15A	60A	60A	90A	180A	360A	600A	Max. Breaking Ability
30A		75A	15A	60A	60A	90A	180A	360A	600A	Max. Making Ability
										Momentary Current
										1 second
140A	200A	75A		90A	90A	140A	300A	300A		3 seconds
45A	75A	30A		35A	35A	45A	125A	250A		30 seconds
35A	60A	25A		25A	25A	35A	100A	175A		60 seconds
										Overload Current
										(50 operations)
30A	95A	75A	15A	60A	60A	90A	180A	360A	600A	120 VAC
	65A	20A		45A	45A					240 VAC
	35A			20A	20A					600 VAC
				30A	30A					24 VDC
				15A	15A					125 VDC
										250 VDC
1200 VRMS	2200 VRMS	1200 VRMS	1200 VRMS	2000 VRMS	2000 VRMS	2200 VRMS	2500 VRMS	2500 VRMS	2500 VRMS	Dielectric Strength
100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	Insulation Resistance
30 milliohms	10 milliohms	10 milliohms	10 milliohms	10 milliohms	10 milliohms	30 milliohms	10 milliohms	6 milliohms	1.5 milliohms	Contact Resistance
										HORSEPOWER RATINGS
										3-phase ratings — reduce by ½ for 1-phase
						½ hp				110/120 VAC
						½ hp	2 hp			220/240 VAC
							2 hp			440/480 VAC
										550/600 VAC
										MOUNTINGS
				Yes		Yes				Single-Hole
	3-hole									2-Hole
Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	4-Hole
						Yes	Yes	Yes	Yes	Base-mount
Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Water proof-mount
										Door-mount
										LOCKING FEATURES
Yes	Yes	Yes	Yes							Key-interlock
Yes	Yes	Yes	Yes							Push-to-turn
Yes	Yes	Yes	Yes							Solenoid-lock
										SPECIAL DRIVES
	Yes			Yes						Key-operated
	Yes				Yes					Solenoid-operated
Yes	Yes	Yes	Yes							Ganged gear-operated
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Spring return
										APPROVALS
listed	Yes	listed	listed	listed	listed	listed	listed			U/L
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			CSA Certified

ELECTRO SWITCH CORP. • Weymouth, Massachusetts 02188 • Telephone: 617/335/5200 • TWX: 710/388/0377

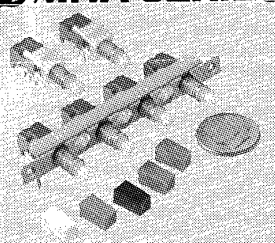
Want an unique Front Panel Design?
Then "SWITCH" for a variety of reasons!

PC BOARD MOUNTS | **COLORFUL SELECTIONS** | **DISTINCTIVE ARRANGEMENTS** | **ESTHETICALLY PLEASING**

VARIETY OF APPLICATIONS | **SUPERIOR QUALITY HIGH INTEGRITY** | **EXTREMELY COMPETITIVE PRICES** | **QUICK DELIVERY FROM "OFF THE SHELF"**

Our switches are being used in a variety of applications in a great number of industries...Instrumentation, Test Equipment, Telecommunications, Audio Visual, Computers, Business Machines, Automotive and a multitude of other fields. Call or write for a catalog, samples and price information for these and our other switch products.

Soft Touch Miniature /MTA SERIES



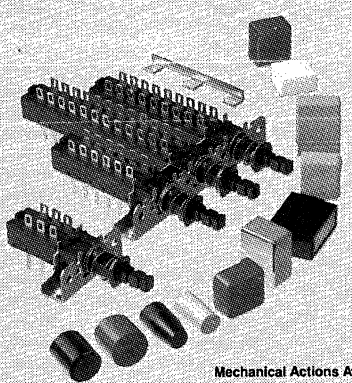
Compact in design yet maintains the miniature modular switch concept for all types of electronic apparatus

- Single as well as multiple position assemblies available
- Short 2mm soft touch stroke
- Double sided sliding system for highly reliable contact
- Momentary interlocked or alternate action
- Caps are available in red, ivory, blue, black and grey
- .100" terminal spacing

"Your reason to switch"

ELECTRONIC COMPONENTS GROUPE

"Old Reliable" /TA SERIES

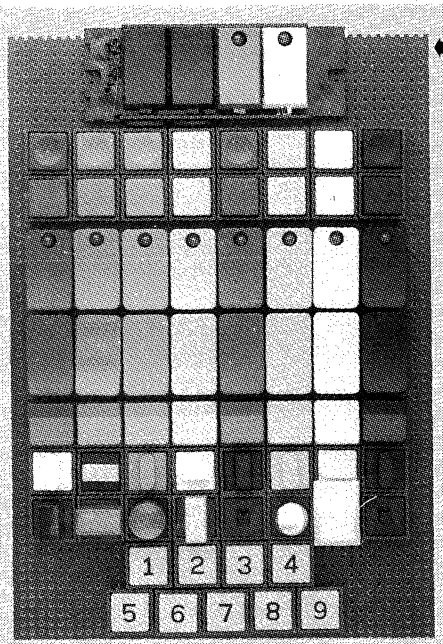


Modular Electro-mechanical Switch ...the most widely used style because of its flexibility.

- .157" Terminal spacing
- DPDT/SPDT
- Modular Construction Hand wiring and Flo-Soldering Connections are standard
- Solder lugs on top for handwiring
- PC Spikes at bottom for flo-soldering
- Individual Coil Spring Loaded Moving Contacts
- Long term low contact resistance
- Ease of maintenance...switch plunger with sliding contacts is removable from the front without disturbing electrical connections
- Enclosed housing protects inner contact area from dust and foreign intrusions.

Mechanical Actions Available:

- **GR** = Interlocking.
- **GR$_1$GR$_2$** = Two independent interlocking groups.
- **o.A.** = Momentary.
- **A.o.R.** = momentary release button for interlocking.
- **EE** = Push-push



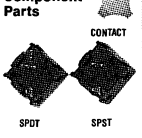
/323M SERIES

- 1 to 12 positions per assembly
- Interlocking/momentary/alternate action
- SPST/SPDT with or without LED
- 8 colors available
- Graphics available

/320M SERIES

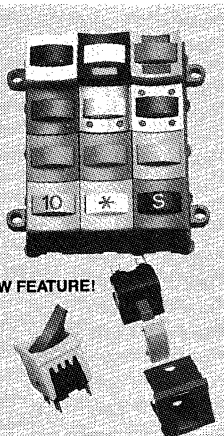
- Momentary contact SPST/SPDT
- Low profile with tactile feel
- PCB mount
- 2 million switching cycles, mechanical and electrical
- Available with or without LED'S
- Graphics available
- Special colors and cap styles can be produced

/320M Component Parts



Terminals staked through body to eliminate wicking problems. Locating pins and standoffs assure perfect PCB alignment.

One of our most dynamic product lines. Series 323M and 320M feature compact, simple, easy to maintain designs with great versatility. The body and contacts are identical and the series features a multitude of cap styles. The simple assembly allows PCB cleaning without the contact and cap in place.



NEW FEATURE!

Toggle switch makes modular system more versatile

/UNIMEC MODULAR SWITCH SYSTEM

PCB/Panel Mount

- 5 contact functions determined by circuit board layout
- Compact and symmetric, 12.5 mm square
- Momentary or alternate action
- Tactile feel
- 1 position through 10x10 matrix support available for custom keyboard designs
- 10 standard colors available, mix or match
- Up to 4 LED indications per switch
- Graphics available

Subsidiary of Stein Industries Inc.

ELECTRONIC COMPONENTS GROUPE

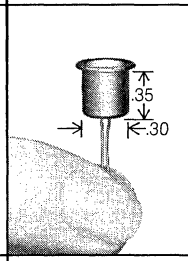
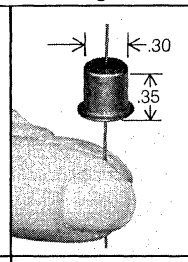
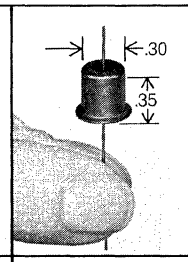
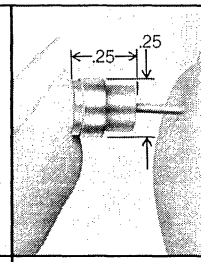
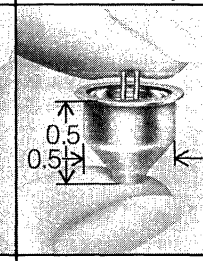
14143 21st Avenue North, Minneapolis, MN 55441

612/559-0720 • TWX 910-576-1725

FIFTH DIMENSION, INC.

Tilt Switches

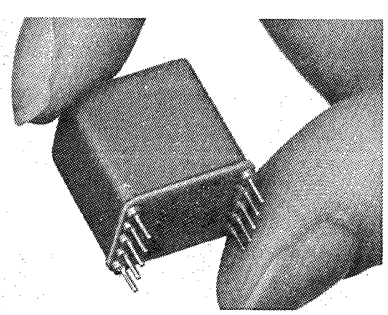
Fifth Dimension tilt switches are small, precision-made, omni-directional devices which trigger at a predetermined angle. The operating mechanism in each of these reliable switches is a free mass of mercury enclosed in a rugged welded steel, hermetically sealed case containing an oxygen-free atmosphere. Jitter switches are actuated by vibration, acceleration or movement.

	Normally Closed	Normally Open	Jitter	Low-Cost Jitter	Normally Closed
	Mounting Position: Glass Seal Down				Glass Seal Up
90° L 0°					
	TS7B	TS7W10	TS7K	TS66	TS411
Nominal Operating Angle	45°	70°	70°	horizontal operation	45°
Operating Angle Tolerance	±25°	±15°	±15°		±15°
Relative Amount Contact Jitter	M	M	S	S	L
*Relative Speed of Response	M	M	F	F	F
Load Current @ 115 VAC Amperes	0.5	0.5	0.5	0.01	0.5
Load Current @ 12 VDC	1.0	1.0	1.0	0.1	2.0
Contact Resistance @ 100mA ohms	1.0	0.5	2.0	10.0	0.05
Contact Resistance @ 1mA ohms	1.0	0.5	10.0	200.0	0.05
Operational Lower Temperature Degrees C	−20	−20	−20	−38	−38
Operational Upper Temperature Degrees C	+105	+105	+105	+105	+85

L–Little M–Moderate S–Substantial SL–Slow F–Fast

*Viscosity of damping fluids changes with temperature. Switch is slower at cold extreme and faster at higher temperature.

Custom-Designed Tilt Switches and Tilt-Switch Packages



Tell us about your application and we'll develop a special tilt switch or tilt-switch package that will enhance your product's performance or marketability. We can design tilt switches that will trigger at specified angles, that will detect the direction of an impulse, the direction and amplitude of acceleration or of tilt; switches that will respond to shock, vibration and, in fact, to virtually any kind of motion.

Then, if you require, we will incorporate the switch into a pc board, add other components, provide a special connector, encapsulate the assembly in a potting material...all with the objective of ensuring that the package will meet the special precision, configuration, reliability and repeatability specifications of your industrial, commercial or military application.

FIFTH DIMENSION, INC.

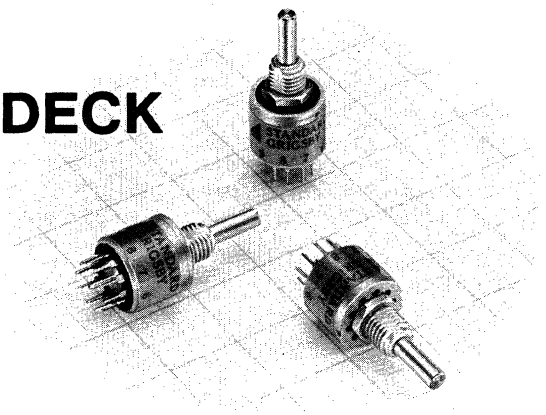
801 New York Avenue, Trenton, NJ 08638 • Tel: 609-393-8350 • TWX: 510-681-8412

STANDARD GRIGSBY

SG SERIES – SD

A GORDOS INTERNATIONAL Company

S.G. SERIES – SD
1/2" ROTARY – SINGLE DECK



- .500" approximate size.
- P.C. or solder lug available.
- 30°, 36° indexing angles.
- 25,000 cycles.
- Adjustable stops.

ELECTRICAL CHARACTERISTICS

Current and Voltage Ratings — 200 MA. at 28 VDC resistive; 150 MA. at 115 VAC resistive.
Current Carrying Capacity — 6 amps.
Dielectric Strength — 600 VAC min.
Insulation Resistance — 50,000 megohms.

MECHANICAL SPECIFICATIONS

Life — 25,000 cycles.
Rotational Torque — 8 to 24 oz./in. at ambient conditions.
Stops — Adjustable stops supplied.

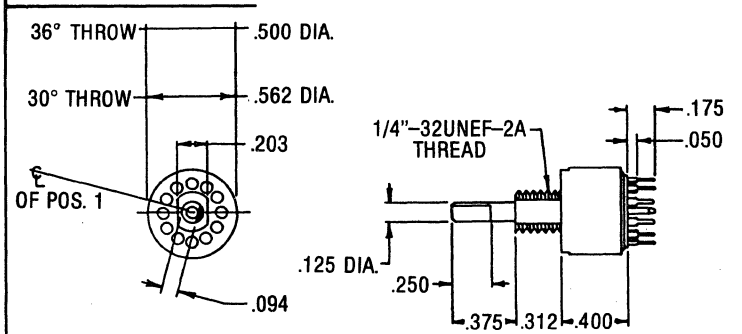
MATERIAL AND FINISHES

Switch Base — Diallyl Phthalate, MIL-M-14.
Shaft — Stainless steel passivated.
Index Housing — Zamak with chromate finish.
Rotor Contacts — Coin silver alloy.
Common Ring — Gold plate.
Terminals — Gold plate.
Mounting Hardware — Mounting nut and lockwasher supplied unassembled.

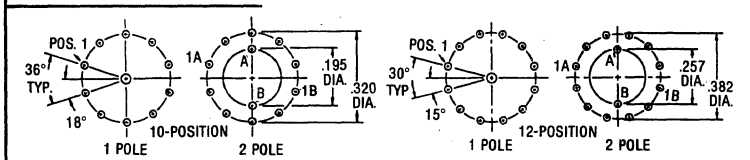
SG SERIES – SD DISTRIBUTOR NUMBERS

30° Index – 12 Positions:	
Part No.	Description
D501-SGS-12-P	1 pole, non-shorting, PC pins
D502-SGS-12-S	1 pole, non-shorting, solder lugs
D503-SGS-12-P	2 poles, non-shorting, PC pins
D504-SGS-12-S	2 poles, non-shorting, solder lugs
D509-SGS-12-P	1 pole, shorting, PC pins
D510-SGS-12-S	1 pole, shorting, solder lugs
D511-SGS-12-P	2 poles, shorting, PC pins
D512-SGS-12-S	2 poles, shorting, solder lugs
36° Index – 10 Positions:	
Part No.	Description
D517-SGS-10-P	1 pole, non-shorting, PC pins
D518-SGS-10-S	1 pole, non-shorting, solder lugs
D519-SGS-10-P	2 poles, non-shorting, PC pins
D520-SGS-10-S	2 poles, non-shorting, solder lugs
D521-SGS-10-P	1 pole, shorting, PC pins
D522-SGS-10-S	1 pole, shorting, solder lugs
D523-SGS-10-P	2 poles, shorting, PC pins
D524-SGS-10-S	2 poles, shorting, solder lugs

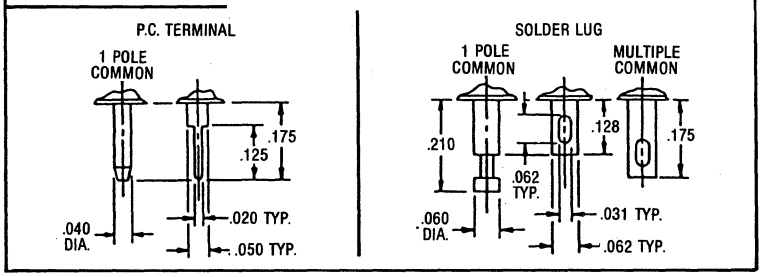
OUTLINE DIMENSIONS

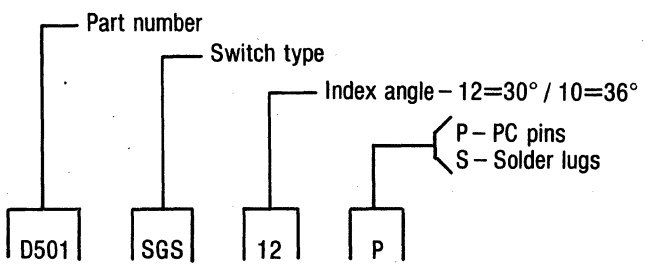


VIEW FROM KNOB END



TERMINAL DETAILS





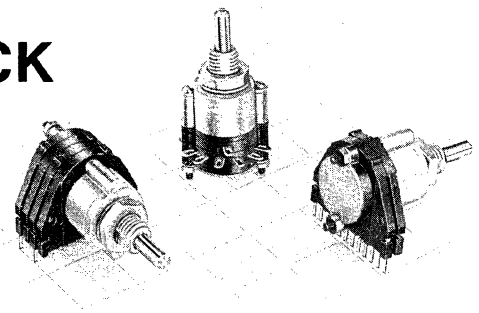
STANDARD GRIGSBY
920 RATHBONE AVE., P.O. BOX 1528, AURORA, IL 60507-9990 USA / TELEPHONE (312) 844-4300 / TWX 910-232-3138

STANDARD GRIGSBY

SG SERIES – MD

A GORDOS INTERNATIONAL Company

S.G. SERIES – MD
1/2" ROTARY – MULTI DECK



- .500" approximate size.
- P.C. or solder lug available.
- 30° indexing angle.
- 25,000 cycles.
- Adjustable stops.

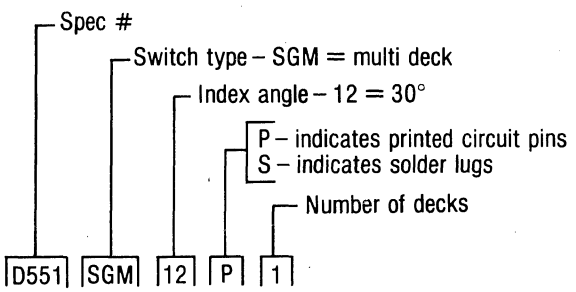
ELECTRICAL CHARACTERISTICS
Current and Voltage Rating — 150 MA. at 28 VDC resistive: 100 MA. at 115 VAC resistive.
Current Carrying Capacity — 3 amps.
Dielectric Strength — 600 VAC min.
Insulation Resistance — 50,000 megohms.

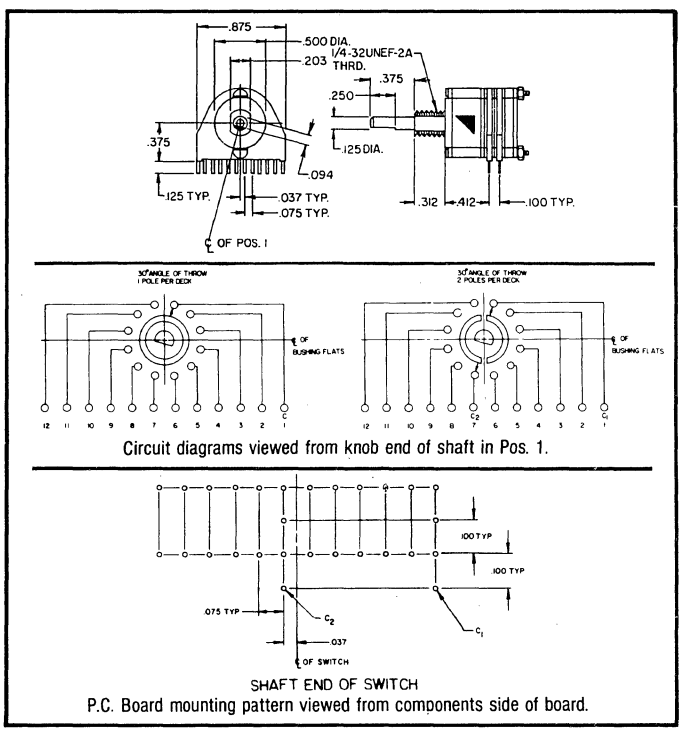
MECHANICAL SPECIFICATIONS
Life — 25,000 cycles.
Rotational Torque — 6 to 32 oz./in. depending on number of poles.
Stops — Adjustable stops supplied.

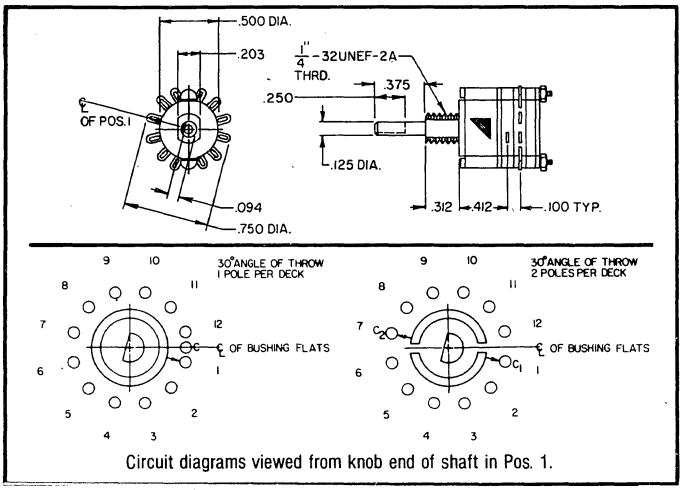
MATERIAL AND FINISHES
Decks — Per MIL-M-14G.
Shaft — Stainless steel passivated.
Index Housing — Zamak with chromate finish.
Rotor Contacts — Gold plate.
Stationary Contacts — Silver clad.
Terminals — Silver clad.
Mounting Hardware — Mounting nut and lockwasher supplied unassembled.

SG SERIES — MD DISTRIBUTOR NUMBERS

30° Index – 12 Positions	
Part No.	Description
D551-SGM-12-P-1	1 deck, 1 pole, non-shorting, PC pins
D552-SGM-12-S-1	1 deck, 1 pole, non-shorting, solder lugs
D553-SGM-12-P-1	1 deck, 2 poles, non-shorting, PC pins
D554-SGM-12-S-1	1 deck, 2 poles, non-shorting, solder lugs
D559-SGM-12-P-2	2 decks, 1 pole, non-shorting, PC pins
D560-SGM-12-S-2	2 decks, 1 pole, non-shorting, solder lugs
D561-SGM-12-P-2	2 decks, 2 poles, non-shorting, PC pins
D562-SGM-12-S-2	2 decks, 2 poles, non-shorting, solder lugs







STANDARD GRIGSBY
920 RATHBONE AVE., P.O. BOX 1528, AURORA, IL 60507-9990 USA/TELEPHONE (312)844-4300/TWX 910-232-3138

STANDARD GRIGSBY

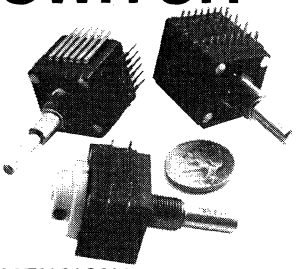
MICROMINIATURE P/REL

A GORDOS INTERNATIONAL Company

MICROMINIATURE P/REL PROGRAMMABLE ROTARY ENCODED LOGIC SWITCH

DUAL FLEX™ DETENT

The Dual Flex detent has a dual ball starwheel drive to provide positive indexing and longer life, tactile feedback and resistance to teasing.



ELECTRICAL RATINGS

Switching Loads — 1.5 mA at 115 VAC, 150 mA at 14 VDC
Current Carrying Capacity — 250 milliamps at 28 VDC resistive load
Contact Resistance — 75 milliohms max. over lifetime
Codes — Hexidecimal, B.C.D., and others
Dielectric Strength — 500 volts min.
Contacts — Make before break

MECHANICAL SPECIFICATIONS

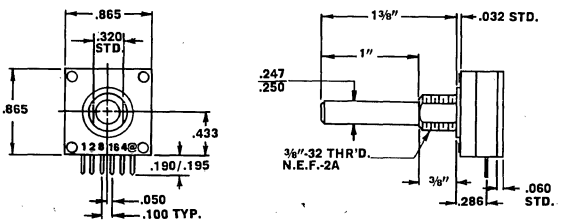
Life — 50,000 cycles at rated load
Operating Temperature Range — −55°C to +85°C
Shafts and Hardware — Shafts and hardware are steel, cadmium plated and chromate treated
Contacts — Gold plated
Anti-Rotation Device — Flatted mounting bushing. .375" dia. x .320", double "D"

Part Number	Description
D101-08-BH	8 position Binary parallel shaft mounting
D103-08-BV	8 position Binary perpendicular shaft mounting
D105-10-BH	10 position Binary parallel shaft mounting
D107-10-BV	10 position Binary perpendicular shaft mounting
D109-12-BH	12 position Binary parallel shaft mounting
D111-12-BV	12 position Binary perpendicular shaft mounting
D113-16-BH	16 position Binary parallel shaft mounting
D114-16-CH	16 position Binary complement parallel shaft mounting
D115-16-BV	16 position Binary perpendicular shaft mounting
D116-16-CV	16 position Binary complement perpendicular shaft mounting
D117-18-BH	18 position Binary parallel shaft mounting
D119-18-BV	18 position Binary perpendicular shaft mounting
D121-20-BH	20 position Binary parallel shaft mounting
D123-20-BV	20 position Binary perpendicular shaft mounting
D125-24-BH	24 position Binary parallel shaft mounting
D127-24-BV	24 position Binary perpendicular shaft mounting
D129-28-BH	28 position Binary parallel shaft mounting
D131-28-BV	28 position Binary perpendicular shaft mounting

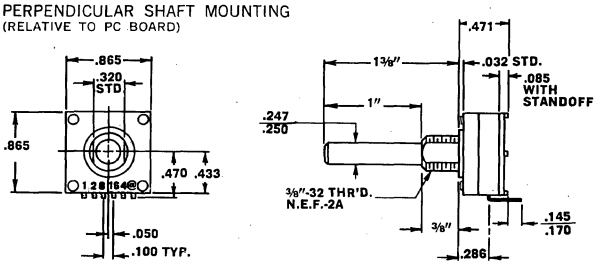
Note: All switches are continuous rotation.

OUTLINE DIMENSIONS

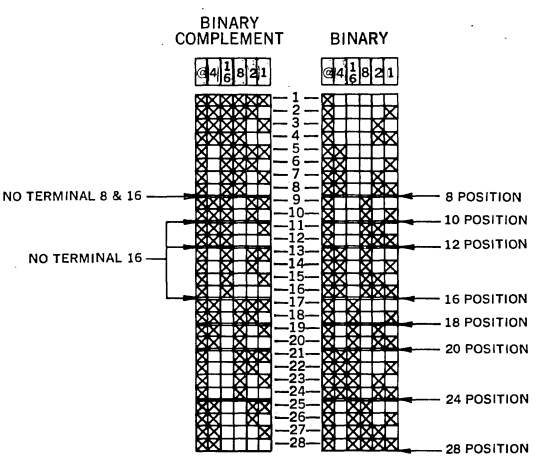
PARALLEL SHAFT MOUNTING
(RELATIVE TO PC BOARD)



PERPENDICULAR SHAFT MOUNTING
(RELATIVE TO PC BOARD)



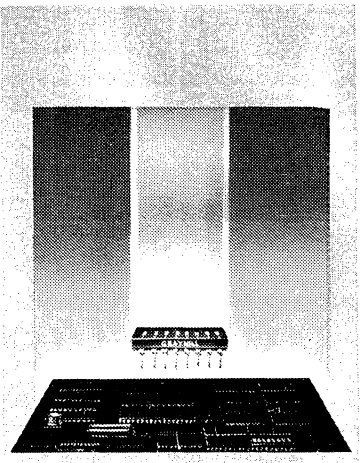
TRUTH TABLES



D101 - 08 - B H
Part number
Positions
H = Parallel shaft mounting
V = Perpendicular shaft mounting
B = Binary
C = Binary complement

Grayhill INC

DIP Switches

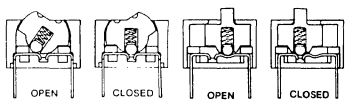


The Latest Addition to the Grayhill DIP Switch Family: Machine Insertable MIDIP® Switch

New MIDIP® switch is designed especially for machine insertion equipment such as Amistar, Dynapert and Universal with 0.010" thick terminals that won't bend during insertion. Choose from a selection of 2 through 10 and 12 stations. Its low profile allows closer board stacking and space savings.

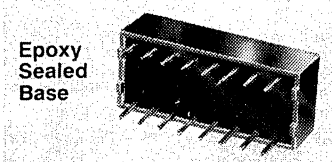
High Performance Features for All Grayhill Switches

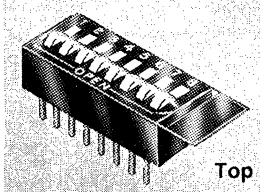
- Reliable, long term operation with exclusive spring and ball contact system. This unique system provides high contact pressure, reliable switching, Positive positioning and immunity to shock and vibration.



Unique Contact System

- Sealed bases help keep switches contamination-free at no extra charge! Standard sealed or molded (MIDIP®) bases make the underside of switch impenetrable to cleaning solutions and impurities.
- Our QC reduces yours—100% electrical inspection, 100% pin straightening.
- Military qualified to MIL-S-83504/01 and MIL-S-83504/02 (SPST rocker DIP switches)


Epoxy Sealed Base


Top Seal

Optional Features

Top seal your DIP switches for complete protection during vapor, spray and immersion cleaning.

- Factory applied tape seal—available on all but toggle style DIP switches
- Do-it-yourself tape seal—sold separately to apply to switches after incoming inspection
- Rigid, clear plastic snap-on cover helps prevent accidental switch actuation and keep dust out.
- Special printing for part numbers or wording on switch body.
- Position location marking on recessed rocker switches and MIDIP® switches

Specifications—Series 76, 78, 78SS, 90 & Military

(For Series 74 and 79 Specifications, see Rotary BCD and Linear Action DIP switch pages.)

Ratings

	Series 76	Series 78	Series 78SS	Series 90
Mechanical Life: (Operations/Position)				
	50,000	35,000	10,000	5000
Make & Break Current Rating (Operations)				
At 10 mA, 50 mVdc	—	—	—	2000
At 50 mA, 30 Vdc	35,000	25,000	7,500	—
At 100 mA, 30 Vdc	—	—	—	5000
At 125 mA, 30 Vdc	25,000	15,000	—	—
Current Carry Rating: Max. temp rise 20°C				
	5A	4A	4A	3A

Contact Resistance: (Measured at 10 mA,DC and 50 mV—open circuit) 100 milliohms max. after life; 30 milliohms initially.

Insulation Resistance:* (at 100 Vdc) 1000 megohms min. after life; 5000 megohms initially.

Dielectric Strength:* 500 Vac after life; 750 Vac initially.

Capacitance:* (at 1 MHz) 5.0 pF max. except Series 90 rated at 2.0 pF max.

* Across open switch pole or between adjacent (closed) switch poles.

Machine Soldering

Fluxing: Per EIA RS-448-2 with flux touching switch body.

Soldering: Per MIL-S-83504 (Both resistance to solder heat and solderability)

Cleaning: Per EIA, RS-448-2 immersion using freon (TF or TE) or water/detergent. Consult factory for other solutions.

Materials and Finishes

Shorting Bar (Ball): Brass, Gold plated 10 microinches minimum over Nickel plate (except Series 78SS—Brass, silver plated over nickel).

Base Contacts: Copper Alloy, gold plated 10 microinches minimum over 50 microinches min. Nickel barrier.

Terminals: Copper Alloy, solder (90/10) plated 100 microinches minimum over Nickel plate.

Switch Cover, Rocker and Base: Polyester UL94 VO type.

Potting Material: Epoxy. (Not applicable to Series 90).

Protective Cover: Polycarbonate. (Not applicable to Series 90).

Top Seal: Polyester film. (Except Series 90—Thermoplastic passes 6PS1 20 second gross leak test.)*

Optional Contact Plating: Gold thicknesses of 30 microinches and 100 microinches are also available. Contact GRAYHILL.

Environmental

Vibration: 10 to 2000 Hz, 15g or 0.06 in. D.A.—no mechanical damage, no contact openings greater than 10 microseconds (Series 76, 78) 1 microsecond (Series 90).

Shock: 50g, 11mS half sine—no opening greater than 10 microseconds (Series 78, 76), 1 microsecond (Series 90). Series 90 only—100g, 6mS half sine, no contact openings greater than 1 microsecond.

Moisture Resistance: 240 hours with temperature cycling and polarization; pass insulation resistance and dielectric strength.

Thermal Shock: No failures for 5 cycles (1 cycle: −55°C, +25°C, +85°C, +25°C) Per MIL-S-83504.

Thermal Aging: 1000 hours at 85°C, no failures. (No rating for Series 90).

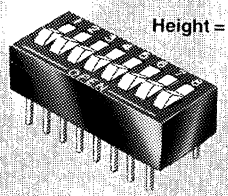
Terminal Strength: 1 lb. pull, 1/2 lb. push, no damage—per MIL-S-83504.

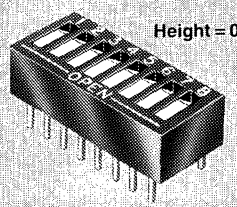
Operating Temperature: −55°C to +85°C.

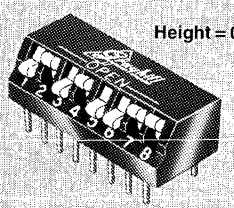
Available Locally Through Your Grayhill Distributor

Grayhill INC.

Single Pole/Single Throw DIP Switches







Raised and Recessed Rocker Style—Series 76

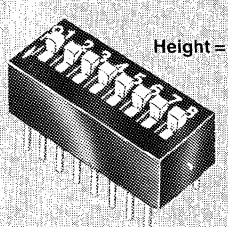
Standard **Military Qualified**

No. of Stations	Length	Part No. Raised	Part No. Recessed	Unit Price	Military Raised	Grayhill Number	Military No. Recessed	Grayhill Number	Unit Price
2	0.280	76SB02	76RSB02	$2.90	M83504/01-022	76MSB02	M83504/02-022	76MRSB02	$3.20
3	0.380	76SB03	76RSB03	3.00	M83504/01-023	76MSB03	M83504/02-023	76MRSB03	3.30
4	0.480	76SB04	76RSB04	3.10	M83504/01-024	76MSB04	M83504/02-024	76MRSB04	3.40
5	0.580	76SB05	76RSB05	3.20	M83504/01-025	76MSB05	M83504/02-025	76MRSB05	3.50
6	0.680	76SB06	76RSB06	3.30	M83504/01-026	76MSB06	M83504/02-026	76MRSB06	3.60
7	0.780	76SB07	76RSB07	3.35	M83504/01-027	76MSB07	M83504/02-027	76MRSB07	3.65
8	0.880	76SB08	76RSB08	3.45	M83504/01-028	76MSB08	M83504/02-028	76MRSB08	3.75
9	0.980	76SB09	76RSB09	3.55	M83504/01-029	76MSB09	M83504/02-029	76MRSB09	3.85
10	1.080	76SB10	76RSB10	3.60	M83504/01-030	76MSB10	M83504/02-030	76MRSB10	3.90
12	1.280	76SB12	76RSB12	3.80	M83504/01-032	76MSB12	M83504/02-032	76MRSB12	4.10

PIANO-DIP® Toggle Style—Series 76

No. of Stations	Length	Part No.	Unit Price
4	0.480	76PSB04	$3.65
5	0.580	76PSB05	3.70
6	0.680	76PSB06	3.80
7	0.780	76PSB07	3.90
8	0.880	76PSB08	3.95
9	0.980	76PSB09	4.10
10	1.080	76PSB10	4.25

To oder a top sealed version switch, add suffix "S" to Grayhill part number or "T" to military part number. Add $0.20 to Unit Price and discount accordingly. Contact Grayhill for information and prices on switches with the following Military Numbers: M83504/01-002 through M83504/01-010 and M83504/02-002 through M83504/02-010.



Slide Actuated Style—Series 78

Standard Switches

No. of Stations	Length	Part No. Raised	Part No. Recessed	Unit Price
2	0.280	78B02	78RB02	$2.61
3	0.380	78B03	78RB03	2.70
4	0.480	78B04	78RB04	2.79
5	0.580	78B05	78RB05	2.88
6	0.680	78B06	78RB06	2.97
7	0.780	78B07	78RB07	3.02
8	0.880	78B08	78RB08	3.11
9	0.980	78B09	78RB09	3.20
10	1.080	78B10	78RB10	3.24

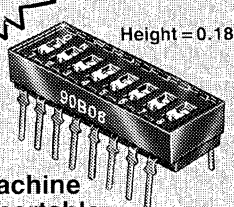
Silver Contact Slide Switches

No. of Stations	Description	Ordering Information	
4	SPST only;	78SS04	$2.35
8	Raised Slides	78SS08	2.65
5, 6, 7, 9 or 10	Special order in minimum lots of 50,000 per part number. Contact GRAYHILL.		

To order top sealed switch, add suffix "S" to Grayhill part number; add $0.18 to unit price, and discount accordingly.

Machine Insertable—Series 90 MIDIP® Switch

NEW MIDIP®



Machine Insertable DIP Switch

No. of Stations	Length	Part No. Recessed	Unit Price
2	0.270	90B02	$2.90
3	0.370	90B03	3.00
4	0.470	90B04	3.10
5	0.570	90B05	3.20
6	0.670	90B06	3.30
7	0.770	90B07	3.35
8	0.870	90B08	3.45
9	0.970	90B09	3.55
10	1.070	90B10	3.60
12	1.270	90B12	3.80

To order Magic Membrane® top seal, add suffix "S" to Grayhill part number. Add $0.20 to Unit Price and discount accordingly.

MIDIP® terminals are designed to compress to fit standard .300 dimension holes. The switch body width is .280.

Dimensions

Switch length is indicated in chart, maximum height above board is shown with pictures and switch body width is 0.380 (except MIDIP® which is 0.280" wide).

Prices and Discounts subject to change without notice.

Discount Schedule

Qty.	76PSB	Others
1-9	Unit Price	Unit Price
10-24	Less 8%	Less 8%
25-49	Less 16%	Less 21%
50-99	Less 21%	Less 40%
100-499	Less 30%	Less 50%
500-999	Less 40%	Less 57%
1000 Up	Contact Your Local Distributor or Grayhill	

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

Multiple Pole and Multiple Throw DIP Switches

Two, Three, and Four Pole/Single Throw

Slide Actuated

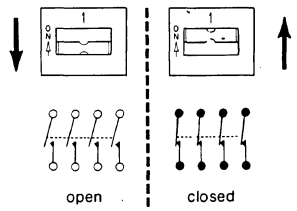
Last 2 digits in part number indicate number of stations in switch.

DPST		3PST		4 PST		
Part No.	Unit Price	Part No.	Unit Price	Part No.	Unit Price	Length
78F01	$3.56	–	–	–	–	0.280
–	–	78G01	3.74	–	–	0.380
78F02	3.78	–	–	78H01	3.78	0.480
78F03	3.96	78G02	3.96	–	–	0.680
78F04	4.19	–	–	78H02	4.19	0.880
–	–	78G03	4.23	–	–	0.980
78F05	4.37	–	–	–	–	1.080

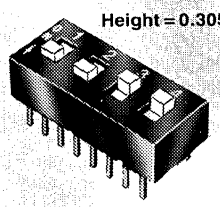
For top seal versions, add the suffix "S" to part number; add $0.20 to unit price and discount accordingly.

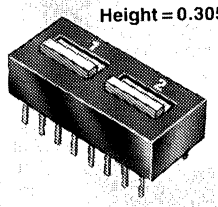
Typical Circuit Diagram

● indicates closed contact
○ indicates open contact



Circuitry diagrams shown are for 4PST. Circuitry is achieved in a similar fashion for 2PST and 3PST switches.





Single Pole/Double Throw

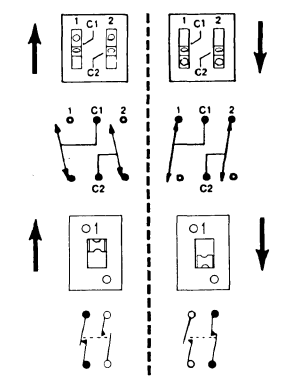
Rockers and Toggles

		DIP-C®		TOGGLE-DIP™	
No. of Stations	Length	Raised Part No.	Recessed Part No.	Toggle Part No.	Unit Price
2	0.380	76SC02	76RSC02	76STC02	$3.70
3	0.580	76SC03	76RSC03	76STC03	3.95
4	0.780	76SC04	76RSC04	76STC04	4.20

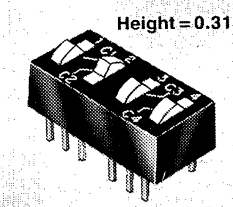
Slide Actuated Switches

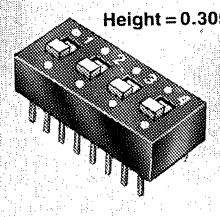
No. of Stations	Length	Part No.	Price
1	0.280	78J01	$4.41
2	0.480	78J02	4.59
3	0.680	78J03	4.82
4	0.880	78J04	5.04
5	1.080	78J05	6.30

To order top seal versions add suffix "S" to part number (not available on TOGGLE-DIP), add $0.20 to unit price, and discount accordingly.



See Double Throw Note.





Double Pole/Double Throw

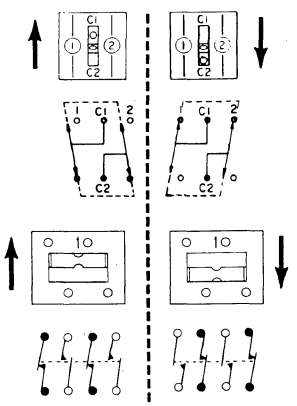
Rockers and Toggles

DOUBLE DIP™				TOGGLE-DIP™	
No. of Stations	Length	Raised Part No.	Recessed Part No.	Part No.	Unit Price
1	0.380	76SD01	76RSD01	76STD01	$3.80
2	0.780	76SD02	76RSD02	76STD02	4.30

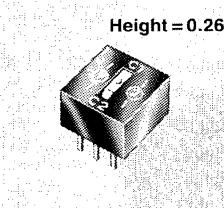
Slide Actuated Switches

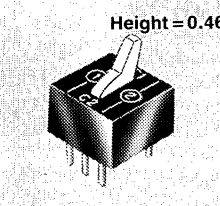
No. of Stations	Length	Part No.	Price
1	0.480	78K01	$6.48
2	0.880	78K02	7.02

To order top seal versions, add suffix "S" to part number (not available on TOGGLE-DIP), add $0.20 to unit price, and discount accordingly.



See Double Throw Note.





Dimensions

Switch length is indicated in chart; width is 0.380 inches; maximum height above board is shown with picture.

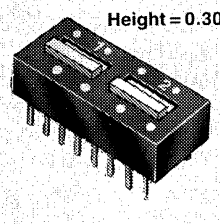
Discount Schedule

	Series 76	Series 78
1-9	Unit Price	Unit Price
10-24	Less 8%	Less 8%
25-49	Less 16%	Less 21%
50-99	Less 21%	Less 40%
100-499	Less 30%	Less 50%
500-999	Less 35%	Less 57%
1000 Up	Contact Grayhill	

Prices and Discounts Subject to Change Without Notice.

Double Throw Circuitry

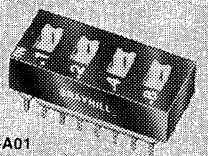
All Series 78 double throw switches have alternately opposed circuits which are actually 2 completely separate circuit paths. A single slide actuates both circuits thus providing double throw. True double-throw circuitry is achieved by tying selected terminals on the PC board for a common. The "on" position of each circuit is indicated by a dot on the cover.



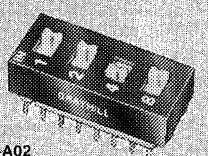
Available Locally Through Your Grayhill Distributor

Grayhill INC.

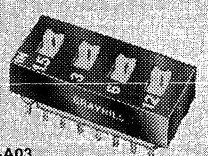
Attenuator DIP and Rotary BCD Switch



78J04-A01



78J04-A02



78J04-A03

Adjustable Input Signal Attenuation With Attenuator DIP Switch

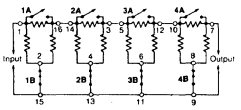
Three Ranges

- 0.1 To 1.5 dB In 0.1 dB Steps
- 1.0 To 15 dB In 1.0 dB Steps
- 1.5 To 22.5 dB In 1.5 dB Steps

Dimensions

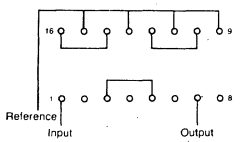
Switch length is 0.880″ and width is 0.380″. Maximum height above board is 0.395″.

Equivalent Schematic Of Attenuator DIP Switch Plus External Connections



Switches 1 thru 4 are ganged such that when 'A' is open, 'B' is closed and vice versa. Switches selectively insert or remove PI sections of the attenuator to determine the total number of sections between input and output.

PC Board Pattern Requirements



Specifications

See introductory DIP switch page for more Series 78 specifications.

Ratings

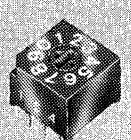
Power Rating: 20 dB Maximum.
Impedance: 600 OHM ± 2%, Unbalanced.
Insertion Loss: 0.02 dB.
Loss In dB: ± 0.015 dB Cumulative.

Materials and Finishes

Network Encapsulation: Polymer Plastic.
Frequency Response: DC to 1000 Kilohertz Minimum.

Attenuator Range	Part No. Without Tape Seal	Price	Part No. With Tape Seal	Price
0.1 to 1.5 DB	78J04-A01	$14.50	78J04S-A01	$14.70
1.0 to 15 DB	78J04-A02	14.50	78J04S-A02	14.70
1.5 to 22.5 DB	78J04-A03	14.50	78J04S-A03	14.70

Prices Subject to Change Without Notice
For Discount Schedule, See Facing Page.



ACTUAL SIZE

Binary Coded Rotary DIP Switch Provides Direct BCD Logic With Single Setting Accuracy.

Dimensions

Switch is 0.380″ square. Maximum height above board is 0.295.

Truth Table

SWITCH POSITION	1	2	4	8
0				
1	●			
2		●		
3	●	●		
4			●	
5	●		●	
6		●	●	
7	●	●	●	
8				●
9	●			●

Terminals that contact common shown by dot. Common terminals are internally connected—PC board connection is not required.

Specifications

Ratings

Mechanical Life: 4000 cycles of operation minimum. Note: one cycle is a 360° rotation and a return through all switch positions to the starting point. 4000 cycles of operation is equivalent to 72,000 position actuations.

Make And Break Current Rating: 2000 cycles of operation for the following voltages and currents; 10 mA at 50 mVdc; 125 mA at 30 Vdc.

Contact Resistance: 100 milliohms maximum after life measured at 10 mA DC and an open circuit voltage of 50 mV. 50 milliohms maximum initially.

Insulation Resistance (At 100 Vdc): 1000 megohms minimum after life. 5000 megohms initially.

Dielectric Strength: 500 Vac between current carrying members.

Current Carry Rating: 2 Amps with a maximum contact temperature rise of 20°C.

Materials and Finishes

Cover and Base: Polyester, 94 VO rating.

Base and Rotating Contacts: Copper Alloy, Gold plated 10 microinches minimum over Nickel plate.

Terminals; Copper Alloy, Solder (90/10) plated 100 microinches minimum over Nickel plate.

Rotor: Thermoplastic.

Potting Material: Epoxy.

Top Seal: Polyester film.

Cleaning Solutions

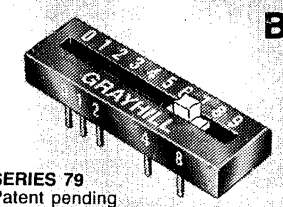
Acceptable Solvents: 1-1-1 Trichlorethane, Freon (TF, TE or TMS), Isopropyl Alcohol, detergent (140°F max.).

Not Recommended: Acetone, Methylene Chloride, Freon TMC.

Description	Part No.	Price
BCD Switch	74B10	$4.68
BCD Switch With Tape Seal	74B10S	4.88

For discount schedule, see facing page.
Prices subject to change without notice.

Linear Action DIP Switches



SERIES 79
Patent pending

79B10

- Tap Switches And Coded Outputs
- Positive Detent
- Reliable Switching
- 2,000 Cycle Life—60,000 Detent Operations

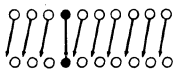
Dimensions

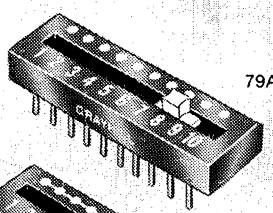
Height above board is 0.265″ width is 0.380″; length of 10 position switch is 1.180″; length of 16 position switch is 1.780″.

Circuit Selector In 10 And 16 Circuits

1-of-10 circuits ..... Part No. 79A10
1-of-16 circuits ..... Part No. 79A16

● indicates closed circuit
○ indicates open circuit

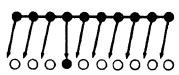


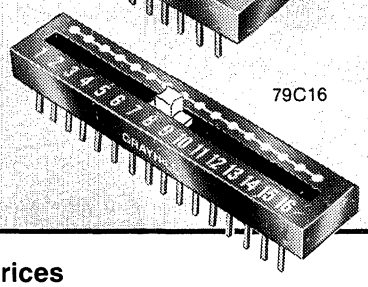


79A10

SP/10 Position Tap Switch SP/16 Position Tap Switch

SP/10 Position ..... Part No. 79C10
SP/16 Position ..... Part No. 79C16

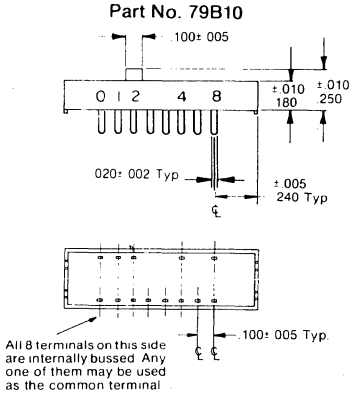




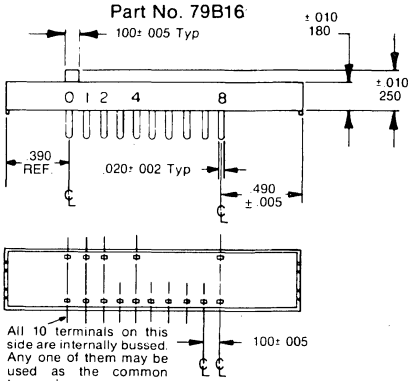
79C16

Binary Code Decimal And Hexadecimal Outputs

10 Position
Part No. 79B10



16 Position
Part No. 79B16



Prices

Part No. Standard	Price	Part No. With Tape Seal	Price
79A10	$4.00	79A10S	$4.30
79A16	4.65	79A16S	4.95
79B10	4.00	79B10S	4.30
79B16	4.65	79B16S	4.95
79C10	4.00	79C10S	4.30
79C16	4.65	79C16S	4.95

Discount Schedule

Qty.	Series 74	Series 78	Series 79
1-9	Unit	Unit Price	Unit Price
10-24	Less 8%	Less 8%	Less 8%
25-49	Less 16%	Less 21%	Less 16%
50-99	Less 21%	Less 40%	Less 21%
100-499	Less 30%	Less 50%	Less 30%
500-999	Less 40%	Less 57%	Less 35%
1000 Up	Contact Grayhill		

Specifications

Ratings

Mechanical Life: 4,000 cycles minimum. Note: A cycle is one complete operation, back and forth thru all switch positions.

Make and Break Current Rating: 2,000 cycles at 10 mA,30 mV dc; 2,000 cycles at 125 mA,6 Vdc; 2,000 cycles at 50 mA, 30 Vdc.

Contact Resistance: 100 milliohms maximum after life, measured at 10 mA dc and 50 mV (open circuit). Initial values are 60 milliohms maximum for coded switches, and 50 milliohms for other Linear Action Switches.

Insulation Resistance (At 100 Vdc): Between adjacent isolated contacts—1,000 Megohms minimum after life; (5,000 Megohms initially). Across open contacts 1,000 Megohms minimum after life. (5,000 Megohms initially).

Dielectric Strength: Between adjacent isolated contacts: 500 Vac after life, (750 Vac initially). Across open contacts: 500 Vac after life, (750 Vac initially).

Current Carry Rating: 2 Amps with a maximum contact temperature rise of 20°C.

Environmental Refer to MIL-STD-202F Per MIL-S-83504.

Vibration: 10 to 2,000 Hz at 15g (or 0.060″ double amplitude); no damage and no contact openings exceeding 10 microseconds. (Method 204, Test Condition B)

Shock: 50g, 11 mS half sine; no damage and no openings exceeding 10 microseconds. (Method 213, Test Condition A).

Materials and Finishes

Switch Cover, Slide, Base: Polyester, UL94 VO rating.

Shorting Arm: Phosphor Bronze, Gold plated .00001 minimum over Nickel plate .00002 minimum.

Base Contacts: Copper Alloy, Gold plated .00001 minimum over Nickel plate .00002 minimum.

Terminals: Copper Alloy, Tin plated .00005 minimum over Nickel plated .00002 minimum.

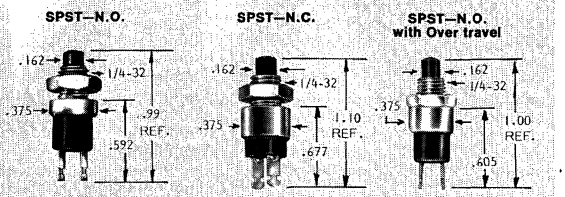
Potting Material: Epoxy.

Tape Seal: Polyester film.

Available Locally Through Your Grayhill Distributor

Grayhill INC.

Pushbutton Switches



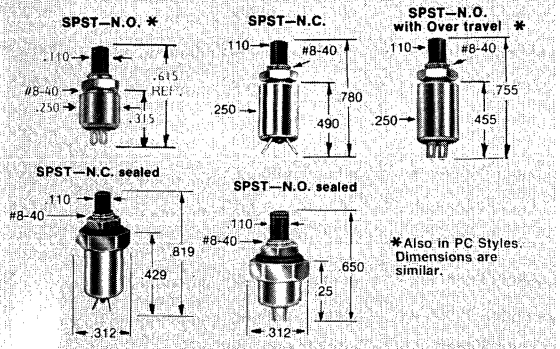
SPST—N.O.-Sealed
SPST—N.C.-Sealed
Dimensions approximately same as above.

1 Amp Butt Contact Pushbutton Switches

Life Expectancy — 1 Million Operations,
UL Listed Types Available

RATING CRITERIA
Make and break 1 Amp

Part No.	Description	Circuitry	Operations at Rated Load	Part No.	Description		Operations at Rated Load
30-1	Momentary	SPST-N.O.	1,000,000	30-251	Sealed, SPST-N.O.		1,000,000
30-3				30-352	Sealed, SPST-N.C.		
30-2		SPST-N.C.	1,000,000	30-1UL	UL Listed	SPST-N.O.	6,000 at 5 Amp 115 VAC
30-6				30-3UL			
30-15	.020" Overtravel	SPST-N.O.	500,000	30-2UL		SPST-N.C.	
30-37				30-6UL			



*Also in PC Styles. Dimensions are similar.

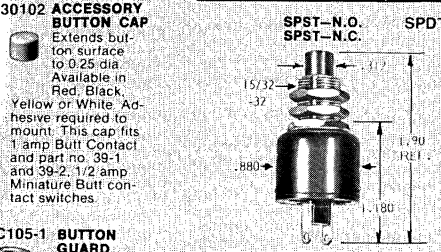
¼ Amp and ½ Amp Miniature Butt Contact Pushbutton Switches

Minimum of Space, Flux Cleaning Protection

Part Number	Circuitry Momentary	Description	Operations at Rated Load	Rated Load
39-1	SPST—N.O.	Red Button	1,000,000	1/2 Amp, 115 VAC
39-3		Black Button		
39-601		Silver Contacts		150 mA, 5 VDC (20 mA, 20 VDC)
39-401		PC Mount		150 mA, 28 VDC
39-405		PC, No Nut		
39-351		Sealed	100,000	1/2 Amp, 115 VAC
39-12	SPST—N.O. .130" Overtravel	Red Button	100,000	1/2 Amp, 115 VAC
39-24		Black Button		
39-424		PC Mount	100,000	150 mA, 28 VDC
39-2	SPST—N.C.	Black Button	250,000	1/4 Amp, 115 VAC
39-352		Sealed	100,000	

See also Accessory Button Cap.

30102 ACCESSORY BUTTON CAP
Extends button surface to 0.25 dia. Available in Red, Black, Yellow or White. Adhesive required to mount. This cap fits 1 amp Butt Contact and part no. 39-1 and 39-2, 1/2 amp Miniature Butt contact switches.



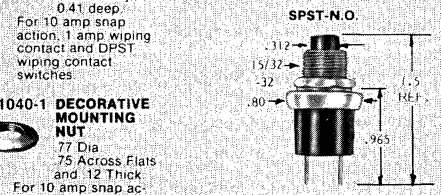
10 Amp Snap Action Pushbutton Switches

Extremely Fast Make And Break, Audible Click
Life Expectancy—25,000 Operations

Make and break 10 Amp Part No.	Circuitry Momentary Contact	Operations at Rated Load	Make and break 10 Amp Part No.	Circuitry Momentary Contact	Operations at Rated Load
2201	SPST-N.O.	25,000	7-8	SPST-N.C.	25,000
7-7			2202		
Common terminal of SPDT switch (not shown) extends overall length to 1.966.			7-26 RED	SPDT	25,000
			7-26 BLK		

10C105-1 BUTTON GUARD
Prevents Accidental Actuation 0.29 dia. by 0.41 deep. For 10 amp snap action, 1 amp wiping contact and DPST wiping contact switches.

7C1040-1 DECORATIVE MOUNTING NUT
.77 Dia
.75 Across Flats
and .12 Thick.
For 10 amp snap action, 1 amp wiping contact and DPST wiping contact switches.



1 Amp Wiping Contact Pushbutton Switches

Life Expectancy — 100,000 Operations,
UL Listed Types Available

Make and break 1 Amp
UNDERWRITERS LABORATORY LISTED
Make and break 3 Amp

Part No.	Action	Circuitry	Operations at Rated Load	Part No.	Action	Circuitry	Operations at Rated Load
4001	Momentary	SPST-N.O.	100,000	4001UL	Momentary	SPST-N.O.	6,000
10-9				10-9UL			

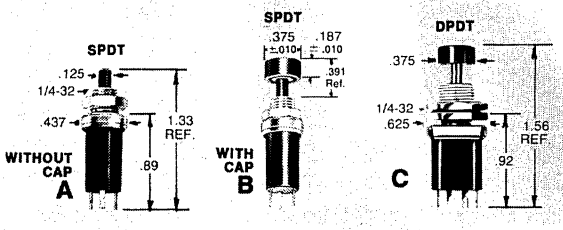
ORDERING INFORMATION

Part No.	Button Color	Unit Price	Part No.	Button Color	Unit Price	Part No.	Button Color	Unit Price	Part No.	Button Color	Unit Price	Part No.	Button Color	Unit Price
7-7	Blk	$6.67	30-1UL	Red	$1.53	30-251 RED	Red	$4.16	39-3	Blk	$2.32	39-405 RED	Red	$1.94
7-8	Red	7.12	30-2	Blk	1.72	30-251 BLK	Blk	4.16	39-12	Red	2.87	39-405 BLK	Blk	1.94
7-26 RED	Red	8.11	30-2UL	Blk	1.72	30-252 RED	Red	4.89	39-24	Blk	2.87	39-424 RED	Red	2.57
7-26	Blk	8.11	30-3	Blk	1.53	30-252 BLK	Blk	4.89	39-351 RED	Red	4.52	39-424 BLK	Blk	2.57
7C1040-1	—	.34	30-3UL	Blk	1.53	30B1012-5	Red	.23	39-351 BLK	Blk	4.52	39-601 RED	Red	1.68
10-9	Blk	2.30	30-6	Red	1.72	30B1012-8	Wht	.23	39-352 RED	Red	5.20	39-601 BLK	Blk	1.68
10-9UL	Blk	2.30	30-6UL	Red	1.72	30B1012-9	Blk	.23	39-352 BLK	Blk	5.20	2201	Red	6.67
10C1015-1	—	.50	30-15	Red	1.90	39-1	Red	2.32	39-401 RED	Red	2.00	2202	Blk	7.12
30-1	Red	1.53	30-37	Blk	1.90	39-2	Blk	3.41	39-401 BLK	Blk	2.00	4001	Red	2.30
												4001UL	Red	$2.30

For Discounts See Next Page.

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

Pushbutton Switches



All Switches on this page and page at left have these qualifications . . .

- **RATING CRITERIA:** See individual charts. 115 VAC resistive load.
- **CONTACT RESISTANCE:** 25 milliohms maximum on a new switch.
- **VOLTAGE BREAKDOWN:** 1,000 VAC between mutually insulated parts.
- **INSULATION RESISTANCE:** 1,000 megohms minimum.

¼ Amp Wiping Contact Pushbutton Switches

Long Wipe Assures High Reliability With Life Expectancy To 250,000 Operations

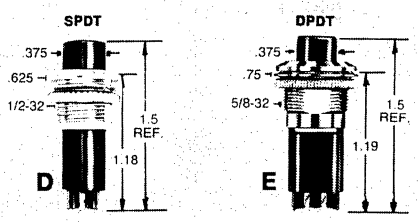
Make and break ¼ Amp

Part No.	Fig.	Momentary Circuitry	Operations at Rated Load
46-101 RED	A	SPDT	250,000
46-101 BLK			
46-102 RED(CAP)	B	SPDT	
46-102 BLK (CAP)			
46-200 RED	C	DPDT	250,000
46-200 BLK			

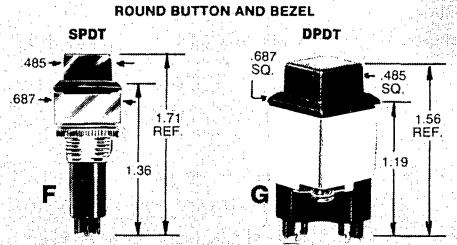
DECORATIVE Make and break ¼ Amp

Part No.	Fig.	Momentary Circuitry	Operations at Rated Load
46-05-05-502-0303	D	SPDT	250,000
46-05-05-502-0707			
46-05-08-502-0303	E	DPDT	
46-05-08-502-0707			
46-01-05-500-0303	F	SPDT	
46-01-05-500-0707			
46-01-08-500-0303	G	DPDT	
46-01-08-500-0707			

DECORATIVE MOUNTING



ROUND BUTTON AND BEZEL



SQUARE BUTTON AND BEZEL

¼ Amp Wiping Contact Pushbutton Switches

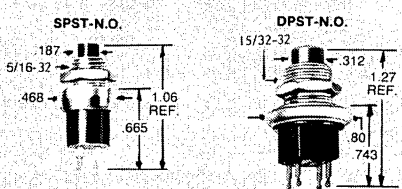
Momentary Contact With Life Expectancy To 100,000 Operations

Make and break ¼ Amp

Part No.	Circuitry	Operations at Rated Load
23-1	SPST-N.O.	100,000
23-4		

Make and break ½ Amp

Part No.	Circuitry	Operations at Rated Load
35-1	DPST-N.O.	100,000
35-3		

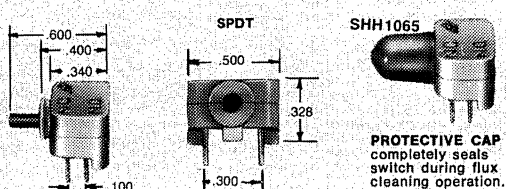


PC Mount, ¼ Amp Butt Contact Switches

Side Actuated, PC Mounted, Sealed—500,000 Operations

Make and Break ¼ Amp

Part No.	Circuitry	Button
Switch With Protective Cap Assembled		
39-250 RED	SPDT (2 Circuits)	Small
39-250 BLK		
39-260 RED		.187 Dia.
39-260 BLK		Flat
Switch Without Protective Cap		
39-251 RED	SPDT (2 Circuits)	Small
39-251 BLK		
39-261 RED		.187 Dia.
39-261 BLK		Flat



PROTECTIVE CAP completely seals switch during flux cleaning operation.

Also available with .187 Diameter Flat Button.

ORDERING INFORMATION

Part No.	Button Color	Unit Price
23-1	Red	$2.10
23-4	Blk	2.10
35-1	Red	3.07
35-3	Blk	3.07

Protective Cap Only		
SHH1065	Red	0.10

Part No.	Button	Unit Price
39-250 RED	Small	$1.80
39-250 BLK		1.80
39-251 RED	Small	1.49
39-251 BLK		1.49
39-260 RED	Flat	1.80
39-260 BLK		1.80
39-261 RED	Flat	1.49
39-261 BLK		1.49

Part No.	Button Color	Unit Price
46-101 RED	Red	$2.24
46-101-BLK	Blk	2.24
46-102 RED(CAP)	Red	2.35
46-102 BLK (CAP)	Blk	2.35
46-200 RED	Red	4.75
46-200 BLK	Blk	4.75

Part No.	Button Color	Unit Price
46-05-05-502-0303	Red	$4.48
46-05-05-502-0707	Blk	4.48
46-05-08-502-0303	Red	5.94
46-05-08-502-0707	Blk	5.94
46-01-05-500-0303	Red	5.39
46-01-05-500-0707	Blk	5.39
46-01-08-500-0303	Red	6.79
46-01-08-500-0707	Blk	6.79

Discount Schedule

1-49	Unit Price
50-99	Less 15%
100-499	Less 25%
500-999	Less 36%
1000 UP	Contact GRAYHILL

Prices and Discounts Subject to Change Without Notice.

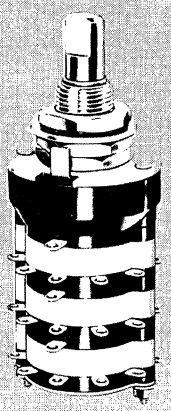
Available Locally Through Your Grayhill Distributor

Grayhill INC.

1 Inch, 1 Amp, Rotary Switch

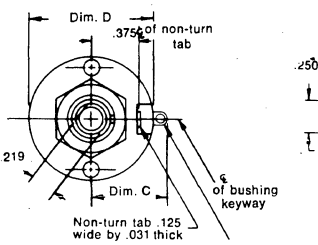
Our Most Popular Rotary Switch Family

- Available in standard and military styles
- Single or concentric shafts
- P.C. Mounting
- Add-a-pots
- Shaft and panel seals

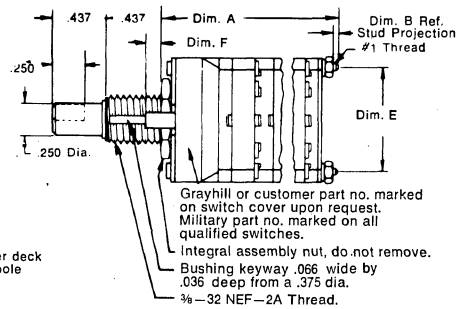


Standard Or Military

DIMENSIONS

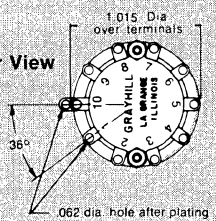


Common locations for a single pole per deck switch. For common location on multipole switches see circuit diagram.

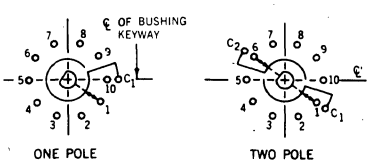


Series 42
36° Angle of Throw

Rear View



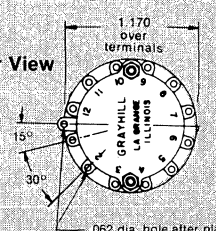
CIRCUIT DIAGRAMS

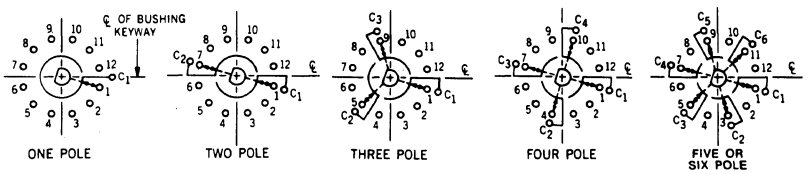


Dimensions	C	D	E	F
SERIES 42	.562	1,000	.830	.093
SERIES 44	.642	1,162	1.000	.121

Series 44
30° Angle of Throw

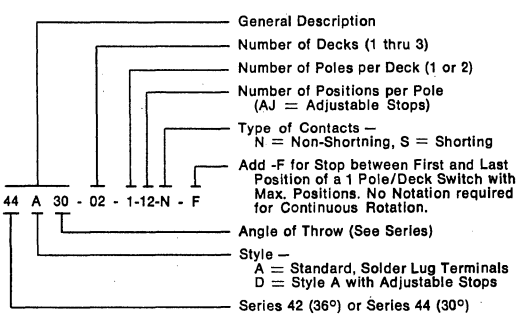
Rear View





ORDERING INFORMATION:

How to determine part number—Sample part number for a standard style, fixed stop, 2 deck, 1 pole per deck 12 positions per pole, 30° angle of throw rotary switch with non-shorting contacts.



Discount Schedule

1-9	....Unit Price
10-24	....Less 8%
25-49	....Less 16%
50-99	....Less 37%
100-499	....Less 50%
500-UP	.... Contact your local distributor or Grayhill

Prices and Discounts subject to change without notice.

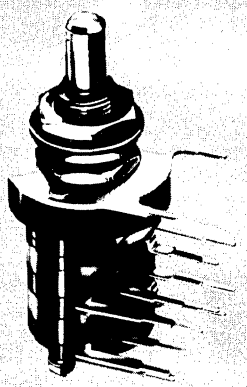
For other angles of throw; 3 to 6 poles per deck; 4 thru 12 decks; military, sealed, UL listed, or PC mountable styles, contact factory.

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

1 Inch, 1 Amp, Rotary Switch

With A Wide Range Of Variations And Options

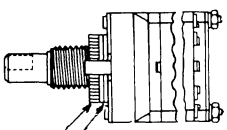
- 30°, 36°, 45°, or 90° angle of throw
- 1 thru 6 poles/deck
- 1 thru 12 decks
- Non-shorting or shorting contacts
- Adjustable stops (see below)



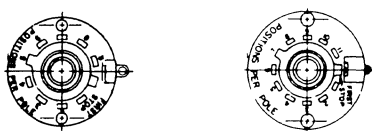
P.C. Mounting

ADJUSTABLE STOPS

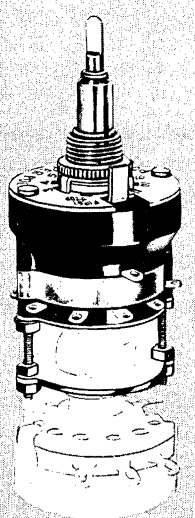
Adjustable stop switches permit the user to externally set the switch stops which limit its rotation. Adjustment is accomplished by removing the stop washers and relocating them. The knurled nut or the panel can be used to hold-in the stop washers. All other dimensions are the same as the standard style.



Adjustable stop washers.
Use of knurled nut is optional.



Series 44 is available with adjustable stops in 30° angle of throw only.



Add-A-Pot

SPECIFICATIONS

Rated: To make and break the following loads with 30° or 36° angle of throw: 1 amp., 115 VAC resistive; 1 amp., 6 to 28 VDC resistive; 0.25 amp., 115 VAC inductive; 0.02 amp., 115 VDC inductive; 0.10 amp., 6 to 28 VDC inductive; 0.10 amp., 115 VDC resistive. To carry 10 amps. continuously.

Contact Resistance: After 25,000 cycles of operation .020 ohms maximum.

Insulation Resistance: 50,000 megohms minimum (initially).

Voltage Breakdown: 1,000 VAC initially (500 VAC or better after most enviornmental tests).

Life Expectancy: 100,000 mechanical cycles of operation; details in catalog.

Stop Strength: 15 pound-inches standard, 12 pound-inches adjustable minimum.

Rotational Torque: 8-115 ounce-inches, depending on the number of poles per deck and the number of decks.

Contacts: Shorting or non-shorting wiping contacts with over 150 grams contact force.

Shaft Flat Orientation: Flat opposite contacting position of pole number one. (See circuit diagram.)

Specifications and circuit values for military styles along with additional characteristics available—contact Grayhill for complete engineering catalog.

PRICES

One Pole Per Deck — Fixed Stops

No. of Decks	SERIES 42A 36 AND 44A 30 (FIXED STOPS) Number of Positions 2	3	4	5	6	7	8	9	10	SERIES 44A 30 11	12
1	$18.72	$19.13	$19.53	$19.93	$20.34	$20.75	$21.15	$21.56	$21.97	$22.37	$22.76
2	22.13	22.94	23.76	24.56	25.38	26.19	27.00	27.80	28.62	29.42	30.24
3	25.55	26.76	27.98	29.19	30.41	31.63	32.84	34.05	35.27	36.50	37.71

Two Poles Per Deck — Fixed Stops

No. of Decks	SERIES 42A 36 AND 44A 30 (FIXED STOPS) Number of Positions 2	3	4	5	SERIES 44A 30 6
1	$20.48	$21.29	$22.09	$22.91	$23.72
2	25.65	27.28	28.90	30.51	32.14
3	30.83	33.26	35.69	38.13	40.55

Series 42 D 36 — Adjustable Stop

No. of Decks	No. of Positions 2-12 1 Pole	2-5 2 Pole
1	$21.97	$22.91
2	28.62	30.51
3	35.27	38.13

Series 44 D 30 — Adjustable Stop

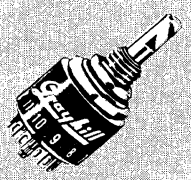
No. of Decks	No. of Positions 2-10 1 Pole	2-6 2 Pole
1	$22.76	$23.72
2	30.24	32.14
3	37.71	40.55

Available Locally Through Your Grayhill Distributor

Grayhill INC.

½ Inch Diameter Single Deck

Outstanding Circuit Versatility And A Wide Range Of Options

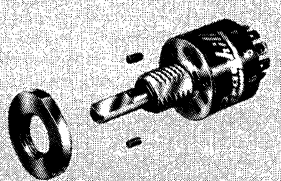


The most popular Series 50 and 51 rotary switches are fixed stop, with or without panel seals, solder lug or PC terminals. The drawing below (Figures 1 thru 4) show these combinations. The chart below lists the switch style that describes the combination and the appropriate drawing that illustrates the combination. The Series 50 is 36° angle of throw and 0.500″ diameter. The Series 51 is 22½° or 30° angle of throw and 0.562″ diameter. Many other options are available as described below.

STANDARD FEATURES OR OPTIONS

—Screwdriver Slotted Shafts
—Coded Versions
—Spring Return (Momentary Positions)
—Push-To-Turn or Pull-To-Turn†
—Keylock (Key Operated)
—RFI Grounding†
—Electrostatic or Electromagnetic Shielding†
—Intermix of Shorting and Non-Shorting Contacts†

†Indicates not available through distributors



ADJUSTABLE STOPS

Military Style Rotary Switches

The Series 50 and 51 Rotary Switches are also available with military type switch materials. Many types of the Series 50 are fully qualified to MIL-S-3786/20. Many types of the Series 51 are fully qualified to MIL-S-3786/35. These documents as well as the QPL (Qualified Products List) should be consulted for complete specification and ordering information. Contact GRAYHILL for additional assistance in specifying military styles Series 50 and 51 Rotary Switches.

45°, 60° or 90° Angles of Throw

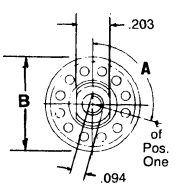
The Series 50 Rotary Switch is also available with 45° (8 position), 60° (6 position) or 90° (4 position) angles of throw. These angles of throw are available with 1 or 2 poles per deck, solder lug or PC mount terminals, with or without shaft and panel seal, fixed or adjustable stops and in standard or military types.

Adjustable Stops

Adjustable stop versions of the Series 50 and 51 Rotary Switches are readily available from local distributor stock. The adjustable stop versions are form, fit and function equivalents to their fixed stop counterparts. Adjustable stop Series 50 and 51 Rotary Switches can be provided in all angles of throw and with or without shaft and panel seal. Contact your local distributor or GRAYHILL for cross reference information between fixed and adjustable stop switches.

UNSEALED — FIXED STOPS

Shown on these two pages are the standard unsealed and sealed fixed stop version with solder lug or PC terminals.



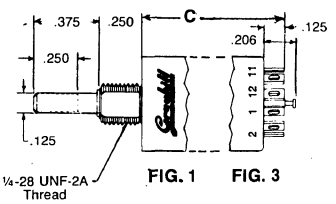


FIG. 1 FIG. 3

SEALED — FIXED STOPS

Seal does not alter dimensions when mounted

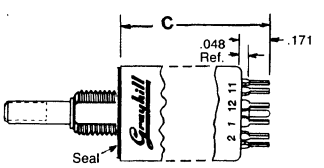


FIG. 2 FIG. 4

Type	Terminal	Switch Style	Applicable Figures	Dimension C
Unsealed	Solder Lug	A	1,3	.617
Fixed Stop	PC Terminal	P	1,4	.667
Sealed	Solder Lug	S	2,3	.617
Fixed Stop	PC Terminal	SP	2,4	.667

Series	51	51	50
Angle of Throw	22½°	30°	36°
Angle A	101°15″	105°	108°
Dimension B	.562	.562	.500

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

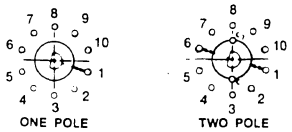
Rotary Switches

Circuit Diagrams

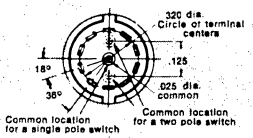
Switches are viewed from shaft end and shown in position 1.

Common location for a single pole switch. Two pole commons are located as shown in circuit diagram on a .156 dia. Circle of centers; four pole commons are located as shown in circuit diagram on a .175 dia. circle of centers.

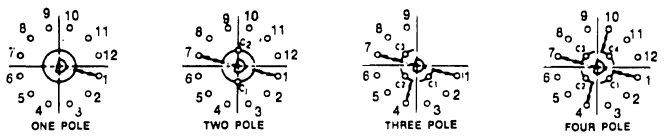
SERIES 50



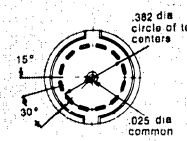
36° ANGLE OF THROW



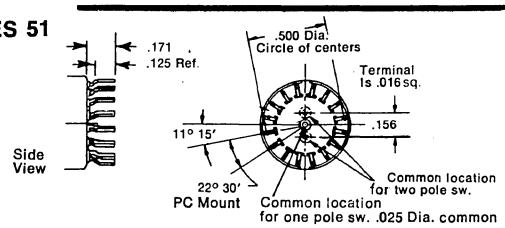
SERIES 51



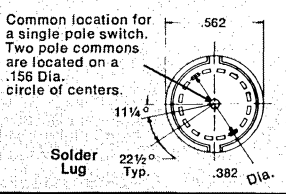
30° ANGLE OF THROW



SERIES 51



22½° ANGLE OF THROW



SPECIFICATIONS

RATING:
Rated to make and break 200MA for 10,000 cycles of operation or 50MA for 25,000 cycles of operation, resistive load, 115VAC or 30VDC. For 22½° switch, rating is lower. For complete load life information, see GRAYHILL Rotary Switch catalog.

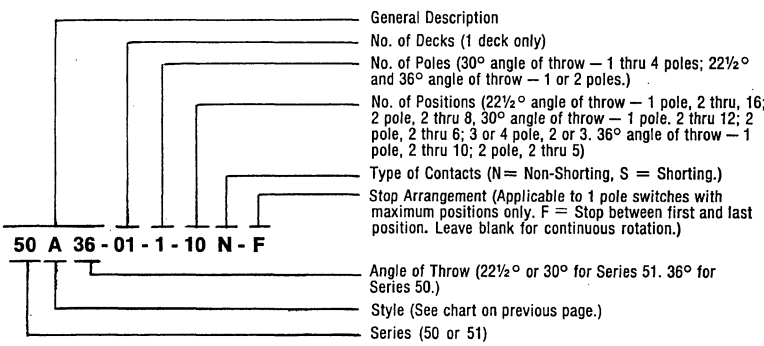
CONTACT RESISTANCE:
50 milliohms maximum (10 milliohms initially).

INSULATION RESISTANCE:
10,000 megohms minimum between mutually insulated parts (50,000 megohms initially).

VOLTAGE BREAKDOWN:
600VAC between mutually insulated parts; 400VAC for 22½° switch.

CARRY CURRENT:
6 amperes with a maximum contact temperature rise of 20°C.

HOW TO ORDER



Style A (for Style P, add $.50)

No. of Poles	Non-Shorting			Shorting		
	Series 50 36°	Series 51 22½°	Series 51 30°	Series 50 36°	Series 51 22½°*	Series 51 30°
1	$11.00	$15.55	$11.85	$12.20	$16.70	$13.05
2	13.60	17.30	14.35	15.20	18.80	15.90
3	...	...	16.45	...	...	18.50
4	...	...	18.80	...	...	21.15

Style S (for Style SP, add $.50)

No. of Poles	Non-Shorting			Shorting		
	Series 50 36°	Series 51 22½°	Series 51 30°	Series 50 36°	Series 51 22½°*	Series 51 30°
1	$12.00	$16.78	$12.89	$13.22	$17.94	$14.11
2	14.78	18.67	15.57	16.42	20.20	17.15
3	...	...	17.77	...	...	19.88
4	...	...	20.24	...	...	22.67

Discount Schedule

1-9	.....Unit Price
10-24	.....LESS 8%
25-49	.....LESS 16%
50-99	.....LESS 37%
100-499	.....LESS 50%
500 UP	. . Contact your local distributor or Grayhill

Prices and Discounts Subject to Change Without Notice.

Available Locally Through Your Grayhill Distributor

Grayhill INC

1/2" Diameter Single Deck

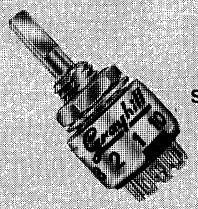
Grayhill Quality For As Little As $3.25*

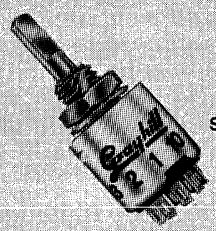
Great Variety Of Styles And Features:

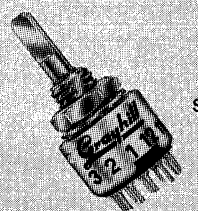
Shaft and Panel Seal
Screwdriver Actuation
PC Termination

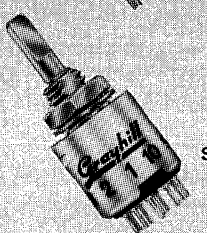
Adjustable Stops
Extra Short Depth
30⁰ or 36⁰, 1 or 2 Poles

*Standard Style, 1 Pole, 10 Position, Non-Shorting Switch in lots of 1000.



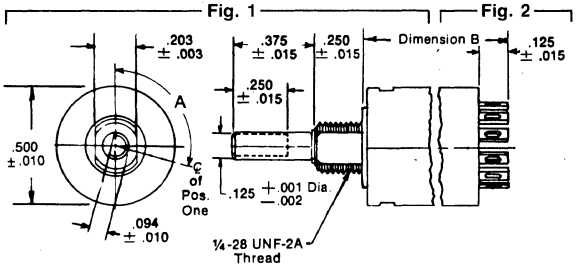






Dimensions See Choices and Limitations for applicable Figures.

Fig. 1 — Fig. 2



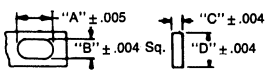
Stop pin holes can be seen in Fig. 3.

Angle Of Throw	30°	36°
Angle 'A'	105°	108°

Series	55	56
Dimension 'B'	.635 ±.020	.480 ±.020

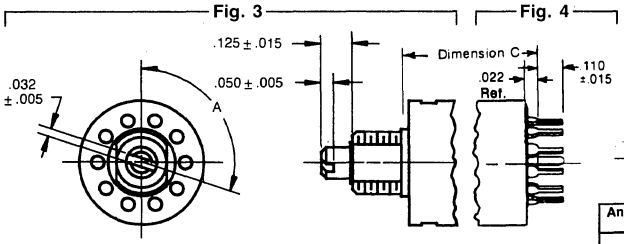
Rear Views Shown With Circuit Diagrams

SOLDER LUG TERMINAL DETAIL



Angle	30°			36°		
		Common			Common	
Dim.	Term.	1 Pole	2 or 4	Term.	1 Pole	2 Pole
"A"	.063	WIRE WRAP STYLE	.068	0.68	WIRE WRAP STYLE	.068
"B"	.020		.036	.036		.036
"C"	.016	.062 DIA. ±.001	.020	.020	.062 DIA. ±.001	.020
"D"	.046		.062	.062		.062

Fig. 3 — Fig. 4



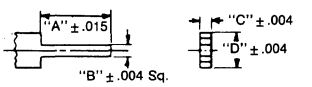
For additional dimensions, See Figure 1.

Angle Of Throw	30°	36°
Angle 'A'	105°	108°

Series	55	56
Dimension 'C'	.532 ±.020	.377 ±.020

Rear Views Shown With Circuit Diagrams

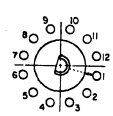
PC TERMINAL DETAIL

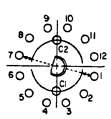


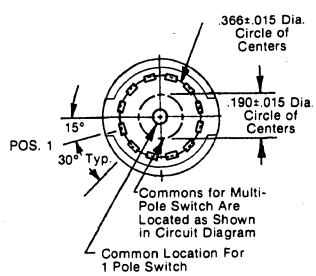
Angle	30°			36°		
		Common			Common	
Dim.	Term.	1 Pole	2 or 4	Term.	1 Pole	2 Pole
"A"	.110	RND.	.110	.110	RND.	.110
"B"	.016	PIN	.020	.020	PIN	.020
"C"	.016	.025 DIA. ±.002	.020	.020	.025 DIA. ±.002	.020
"D"	.046		.062	.062		.062

CIRCUIT DIAGRAMS

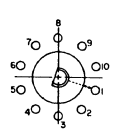
30⁰ ANGLE OF THROW

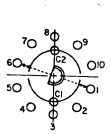


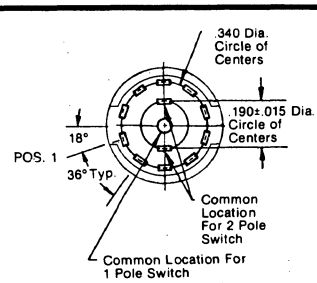




36⁰ ANGLE OF THROW







Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

Rotary Switches

Specifications

RATING:
Rated to make and break 200 mA for 10,000 cycles of operation or 50 mA for 25,000 cycles of operation, resistive load, 115 VAC or 30 VDC. For complete load life information, see GRAYHILL Catalog Number One.

CONTACT RESISTANCE:
100 milliohms maximum (15 milliohms initially).

INSULATION RESISTANCE:
10,000 megohms minimum between mutually insulated parts (50,000 megohms initially).

VOLTAGE BREAKDOWN:
600VAC between mutually insulated parts.

CARRY CURRENT:
6 amperes with a maximum contact temperature rise of 20°C.

SHAFT AND PANEL SEAL
Panel is sealed by an "O" ring at the base of bushing. Shaft is sealed by an "O" ring inside the bushing. After the switch is mounted, seals do not alter the dimensions of the unsealed style.

ADJUSTABLE STOPS
Set and Reset Stops to Limit Rotation Form, Fit and Function Equivalent to Fixed Stop Counterparts

Adjustable Stop Switches: Two stop pins and an adhesive backed sticker or seal washer are provided. Stop pins can be located or reset as desired. Sticker or seal washer maintains stop pins in place. Sticker or seal washer can be removed to change stop pin location.

Choices And Limitations

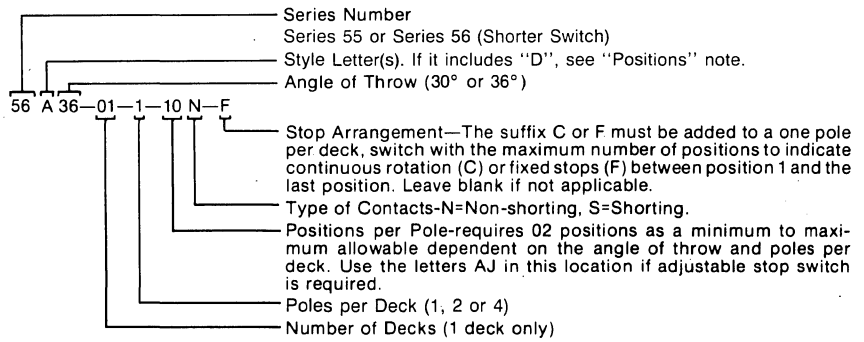
Style, Description & Applicable Drawing Figures	Angle Of Throw	Stops	Terminals	Number of Poles		Number Of Positions/Pole
				Shorting	Non-Shorting	
A = Standard 1, 2 **S** = Standard, Shaft/Panel Seal 1, 2 **B** = Screwdriver Slotted 3, 2 **BS** = Slotted, Shaft/Panel Seal 3, 2	30°	Fixed	Solder Lug	1 2 4	1 2 4	2 thru 12 2 thru 6 2 or 3
	36°			1 2	1 2	2 thru 10 2 thru 5
P = PC Mount 1, 4 **SP** = PC Mount, Shaft/Panel Seal 1, 4 **BP** = Screwdriver Slotted, PC Mount 3, 4 **BSP** = Slotted, Sealed, PC Mount 3, 4	30°	Fixed	Printed Circuit	1 2 4	1 2 4	2 thru 12 2 thru 6 2 or 3
	36°			1 2	1 2	2 thru 10 2 thru 5
D = Adjustable Stops 1, 2 **SD** = Adj. Stops, Shaft/Panel Seal 1, 2 **BD** = Adj. Stops, Screwdriver Slotted 3, 2 **BSD** = Slotted, Sealed, Adjustable 3, 2	30°	Adjustable	Solder lug	1 2 4	1 2 4	Adjustable (2 thru 12) Adjustable (2 thru 6) 2 or 3
	36°			1 2	1 2	Adjustable (2 thru 10) Adjustable (2 thru 5)
DP = Adj. Stops, PC Mount 1, 4 **SDP** = Adjustable, PC Mount, Sealed 1, 4 **BDP** = Slotted, Adjustable, PC Mount 3, 4 **BSDP** = Slotted, Sealed, Adj., PC 3, 4	30°	Adjustable	Printed Circuit	1 2 4	1 2 4	Adjustable (2 thru 12) Adjustable (2 thru 6) 2 or 3
	36°			1 2	1 2	Adjustable (2 thru 10) Adjustable (2 thru 5)

ADDITIONAL OPTIONS (CONTACT GRAYHILL)

—KEYLOCK
—DIFFERENT SHAFT FLAT
—INTERMIXING OF SHORTING CONTACTS AND NON-SHORTING

HOW TO ORDER

Part number is descriptive and formed in the following manner:



PRICES

All Prices Are Unit Prices

Angles Of Throw	Poles	Shorting Non-Shorting	Switch Style A,B,D,BD	P,BP,DP,BDP	S,BS,SD,BSD	SP,BSP,SDP, BSDP
30°	1	N	$7.75	$8.00	$8.40	$8.65
		S	8.00	8.25	8.65	8.90
	2	N	8.60	8.85	9.25	9.50
		S	9.10	9.35	9.75	10.00
	4	N	10.30	10.55	10.95	11.20
		S	11.30	11.55	11.95	12.20
36°	1	N	7.50	7.75	8.15	8.40
		S	7.75	8.00	8.40	8.65
	2	N	8.35	8.60	9.00	9.25
		S	8.85	9.10	9.50	9.75

Discount Schedule

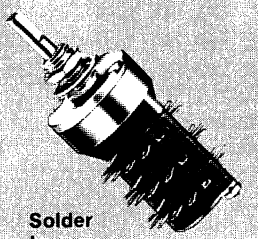
Quantity Range
1-9..... Unit Price
10-24.....Less 8%
25-49.....Less 16%
50-99.....Less 37%
100-499.....Less 50%
500 and up ..... Contact Your Local Sales Office Or GRAYHILL

PRICES AND DISCOUNTS SUBJECT TO CHANGE WITHOUT NOTICE.

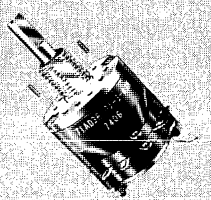
Available Locally Through Your Grayhill Distributor

Grayhill INC.

½ Inch Diameter, ¼ Amp



Solder Lug Terminals



Adjustable Stops

Value Engineered To Compete In Price And Outperform Open-Wafers

- 30° Or 36° Angle Of Throw
- Military Qualification
- 1/8″ or 1/4″ Shaft Diameter
- Solder Lug Or PC Mount
- 1 Thru 12 Decks; 1 To 6 Poles Per Deck

ADDITIONAL FEATURES

ADJUSTABLE STOPS—Stocked By Distributors

Number of positions per pole can be changed by removing and relocating stop pins in holes in the switch front plate. Available in the single shaft versions with either .125″ or .250″ diameter, 30° or 36° angle of throw; and solder lug terminals or PC mount.

Non Adjustable Style	With Adjustable Stops Style Becomes
A	AD
B	BD
AF	ADF
BF	BDF

MILITARY QUALIFIED, MIL-S-3786/39

The Series 71 rotary switch qualification includes the 30° and 36° angles of throw in both shaft diameters, sealed and unsealed styles, in 1 thru 5 decks with solder lug terminals, and in 1 thru 4 operative decks with PC terminals. For more details, see GRAYHILL Engineering Catalog Number One.

Commercial Style	Military Style
A	MA
B	MB
AF	MAF
BF	MBF

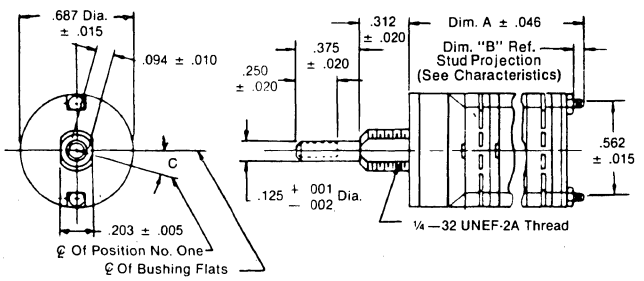
SHAFT AND PANEL SEAL

Shaft is sealed by "O" ring inside bushing. Panel is sealed "O" ring at base of bushing. Seals do not alter dimensions as shown in the drawings when switch is mounted. Panel seal is silicone rubber. Shaft seal is an "O" ring per MIL-P-5516B.

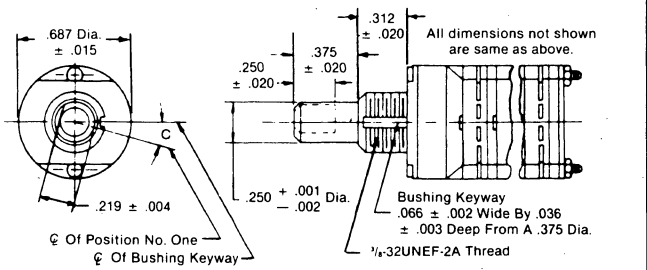
Non Sealed Style	With Seals Style Becomes	Military Style Becomes
A	AS	MAS
B	BS	MBS
AF	ASF	MASF
BF	BSF	MBSF

DIMENSIONS — SOLDER LUG TERMINALS

Style A, 0.125 Dia. Shaft



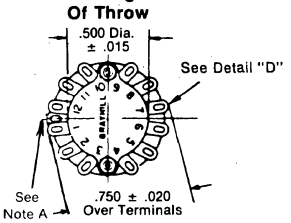
Style B, 0.250″ Dia. Shaft



Rear Views

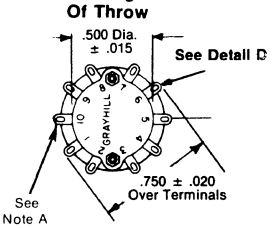
30° and 36° Angle of Throw may be Interposed on Either Shaft Diameter

30° Angle Of Throw



Note A: Common Location for a Single Pole Per Deck Switch. For Common Location on Multipole Switches See Circuit Diagram.

36° Angle Of Throw



Dimensions A & B

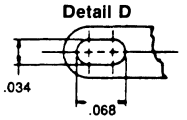
Extended studs are provided on switches of 6 or more decks for recommended double end mounting. See also military note under drawing for PC mountable styles.

No. of Decks	Dimension A: Mil. F Styles	Dimension A: Others	Dim. B
1	.761	.761	.031
2	.979	.979	.031
3	1.415	1.197	.031
4	1.633	1.415	.031
5	—	1.633	.031
6	—	2.131	.312
7	—	2.349	.312
8	—	2.567	.312
9	—	2.785	.312
10	—	3.003	.312
11	—	3.221	.312
12	—	3.439	.312

Dimension C

10 Position Switches	12 Position Switches
36°	15°

Detail D



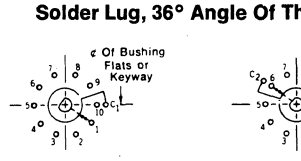
CIRCUIT DIAGRAMS

(Switch is viewed from Shaft End and shown in Position No. 1)

Solder Lug, 30° Angle Of Throw

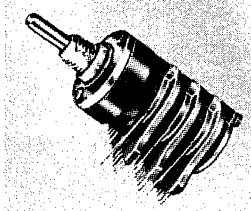
NOTE: All Common Terminals are located above Base Terminals as shown.

Solder Lug, 36° Angle Of Throw



Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

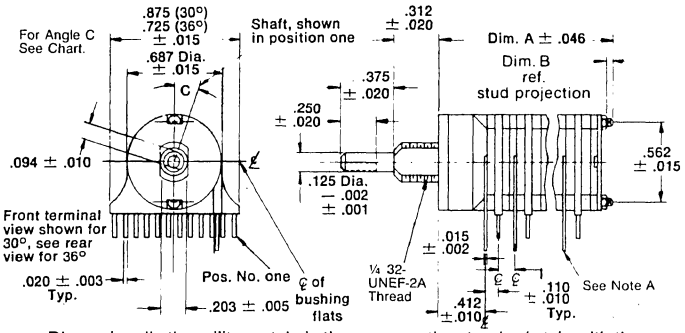
Multideck, Rotary Switches



PC Mountable

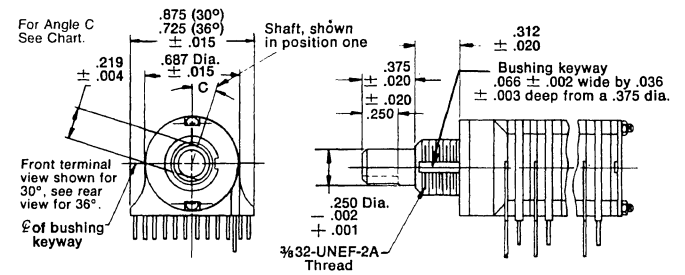
DIMENSIONS—PC BOARD MOUNTABLE

Style AF, 0.125" Dia. Shaft



Dimensionally the military style is the same as the standard style with the exception of the PC version of 3 or 4 decks; a spacer deck between decks 2 and 3 adds another deck length to the switch without increasing the number of operative decks. See chart.

Style BF, 0.250" Dia. Shaft

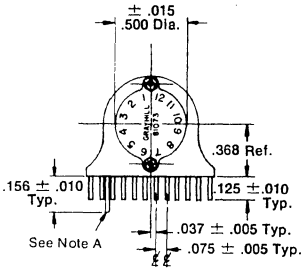


For other dimensions and military styles, see drawing above.

Rear Views

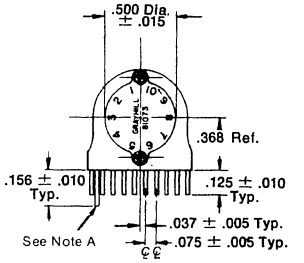
30° and 36° Angle of Throw may be interposed on either Shaft Diameter

30° Angle Of Throw



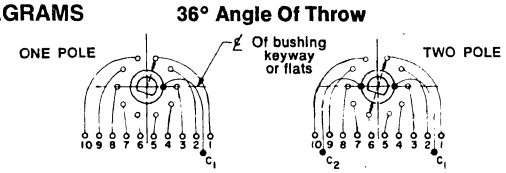
Note A: Common Location for a Single Pole Per Deck Switch. For Common Location on Multipole Switches See Circuit Diagram.

36° Angle Of Throw

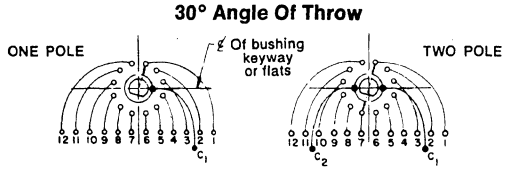


CIRCUIT DIAGRAMS

36° Angle Of Throw



30° Angle Of Throw



SPECIFICATIONS

RATING:
Rated to make and break 400MA for 10,000 cycles of operation or 200MA for 25,000 cycles of operation, resistive load, 115VAC or 30VDC. Rated to make and break 250MA for 10,000 cycles of operation or 100MA for 25,000 cycles of operation, inductive load (250 Millihenries), 30VDC.

For complete load life information, see GRAYHILL Engineering Catalog Number One.

CONTACT RESISTANCE:
50 milliohms maximum (10 milliohms initially).

VOLTAGE BREAKDOWN:
500 VAC minimum between mutually insulated parts.

CARRY CURRENT:
4 amperes with a maximum contact temperature rise of 20°C.

INSULATION RESISTANCE:
10,000 megohms minimum between mutually insulated parts (50,000 megohms initially).

HOW TO ORDER

71 A 30 - 02 - 1 - 12 N - C

- Series 71, Style (as described on these pages), Angle of Throw (30° or 36°)
- No. of Decks (12 decks max., also see poles per deck limitation in price table.)
- No. of Poles per Deck (See circuit diagram for style and angle of throw limitations. Also limited to a maximum of 16 total poles per switch.
- No. of Positions (30° angle of throw solder lug—1 pole, 2 thru 12; 2 pole, 2 thru 6; 3 pole, 2 thru 4; 4 pole, 2 or 3; 5 or 6 pole, 2 only. 30° angle of throw PC mount—1 pole, 2 thru 12; 2 pole, 2 thru 6. 36° angle of throw—1 pole, 2 thru 10; 2 pole, 2 thru 5.)
- Type of Contacts (N=Non-Shorting. S=Shorting)
- Stop Arrangement (Applicable to 1 pole switches with maximum positions only. C=Continuous, F=Stop between first and last position.)

Prices on following page.

Available Locally Through Your Grayhill Distributor

Grayhill 16, 20, and 24 Position Rotary Switches (1/2 Amp)

PRICES SERIES 71 (cont'd)

71A30 71B30 71A36 71B36 Poles/Deck and Positions/Pole

Poles / Decks	1 (2-12)	2 (2-6)	3 (2-4)	4 (2-3)	5 (2)	6 (2)
1	$11.89	$12.37	$12.87	$13.37	$13.86	$14.37
2	15.60	16.60	17.59	18.57	19.58	20.57
3	19.34	20.82	22.31	23.79	25.29	N.A.
4	23.05	25.04	27.03	29.00	N.A.	N.A.
5	26.78	29.26	31.74	N.A.	N.A.	N.A.
6	30.51	33.48	N.A.	N.A.	N.A.	N.A.
7	34.23	37.71	N.A.	N.A.	N.A.	N.A.
8	37.95	41.93	N.A.	N.A.	N.A.	N.A.
9	41.69	N.A.	N.A.	N.A.	N.A.	N.A.
10	45.40	N.A.	N.A.	N.A.	N.A.	N.A.
11	49.13	N.A.	N.A.	N.A.	N.A.	N.A.
12	52.86	N.A.	N.A.	N.A.	N.A.	N.A.

71AF30 71BF30 71AF36 71BF36 Poles/Deck and Positions/Pole

Poles / Decks	1 (2-12)	2 (2-6)
1	$13.06	$13.57
2	18.14	19.14
3	23.24	24.74
4	28.34	30.31
5	33.42	35.92
6	38.51	41.49
7	43.61	47.08
8	48.69	52.66
9	53.78	N.A.
10	58.87	N.A.
11	63.97	N.A.
12	69.06	N.A.

71MA30, 71MB30, 71MA36, 71MB36 Poles/Deck and Positions/Pole

Poles / Decks	1 (2-12)	2 (2-6)	3 (2-4)	4 (2-3)	6 (2)
1	$12.56	$13.05	$13.56	$14.04	$15.05
2	16.51	17.49	18.49	19.48	21.48
3	20.46	21.95	23.44	24.92	27.92
4	24.40	26.40	28.38	30.36	N.A.
5	28.36	30.85	33.32	N.A.	N.A.

71MAF30 71MAF36 71MBF30 71MBF36

Number of Decks	1 (2-12)	2 (2-6)
1	$13.73	$14.23
2	19.06	20.04
3	24.37	25.86
4	29.68	31.67

NOTE: Number of Positions does not affect price.

Shaft and Panel Seal, Style AS, ASF, BS, BSF, MAS, MASF, MBS, or MBSF—Add $1.23 to the price of a similar Style A, AF, B, BF, MA, MAF, MB or MBF switch.

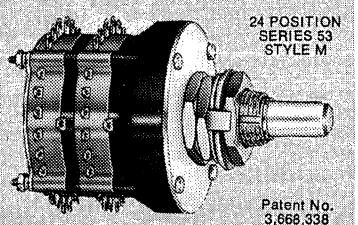
Adjustable Stops, Style AD, ADF, BD or BDF—Add $0.62 to the cost of a similar Style A, AF, B, or BF rotary switch.

Discount Schedule

1-9	. . . UNIT PRICE
10-24	. . . . LESS 8%
25-49	. . . . LESS 16%
50-99	. . . . LESS 37%
100-499	. . . . LESS 50%
500 UP	. . . Contact your local distributor or Grayhill

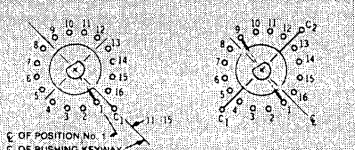
PRICES AND DISCOUNTS SUBJECT TO CHANGE WITHOUT NOTICE.

More Circuits In Less Space.

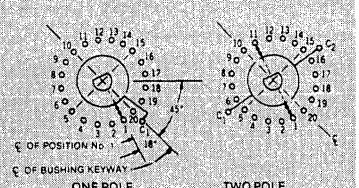


Patent No. 3,668,338

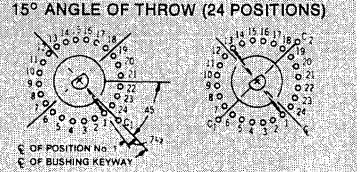
SERIES 57 —
22½° ANGLE OF THROW (16 POSITIONS)



SERIES 59 —
18° ANGLE OF THROW (20 POSITIONS)

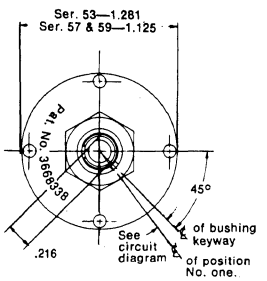


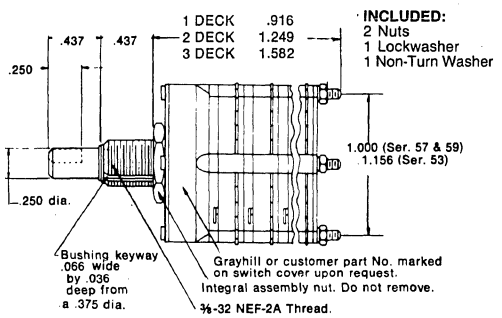
CIRCUIT DIAGRAMS
SERIES 53 —
15° ANGLE OF THROW (24 POSITIONS)



Provides Logic Level To ½ Amp Switching Capability

DIMENSIONS





INCLUDED:
2 Nuts
1 Lockwasher
1 Non-Turn Washer

SPECIFICATIONS

Voltage: 115 VAC or 30 VDC, resistive load; 30 VDC inductive load.

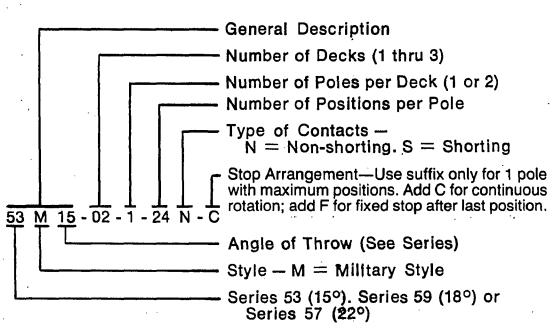
Contact Resistance: 50 milliohms maximum (15 milliohms initially).

Insulation Resistance: 10,000 megohms minimum between mutually insulated parts. (50,000 megohms initially.)

Voltage Breakdown: 500 VAC minimum between mutually insulated parts. These switches will carry 4 amperes with a maximum contact temperature rise of 20°C.

Life: 10,000 cycles at 500 mA; 30,000 cycles at 200 mA (resistive loads). Cycle is 360° in one direction and a 360° return. Life measured at sea level, 25°C and 68% relative humidity.

ORDERING INFORMATION



For 3 to 12 poles per deck; 4 thru 12 decks; military qualified, sealed styles, contact factory.

Poles/Deck and Positions/Pole

Series No.	1 Pole	2 Pole
53	2-24	2-12
59	2-20	2-10
57	2-16	2-8

For 3-12 poles, 4-12 decks, sealed, or military styles, contact GRAYHILL.

Prices

Number Of Decks	1 Pole	2 Pole
1	$29.42	$30.83
2	39.82	42.63
3	50.20	54.44

Use Discounts Above.

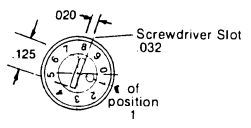
Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

0.3" Diameter Rotary Switches

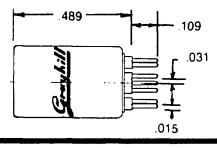
Designed As The World's Smallest Rotary Switch

- 10 Position, 1 or 2 Poles
- Rated to make and break logic loads for a minimum of 15,000 cycles of operation
- Non-Shorting Wiping Contacts

Style AP Screwdriver Actuated

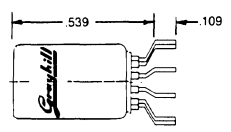


Body diameter is .298



Style AF

All Dimensions Not Shown and Front View Same as Style AP

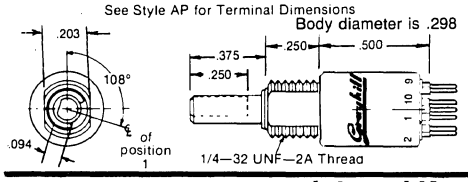


ACTUAL SIZE

Style BP Shaft Actuated

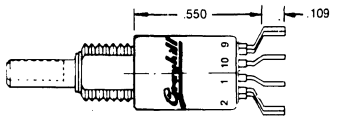
See Style AP for Terminal Dimensions

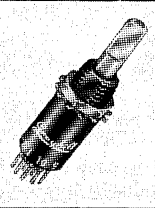
Body diameter is .298



Style BF

All Dimensions Not Shown and Front View Same as Style BP

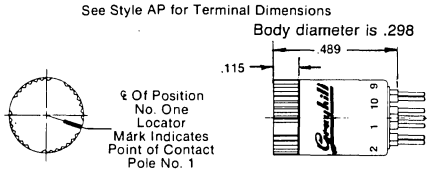




Style CP Integral Knob Actuated

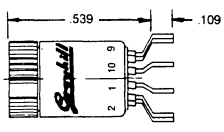
See Style AP for Terminal Dimensions

Body diameter is .298



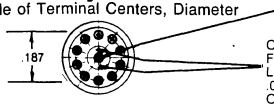
Style CF

All Dimensions Not Shown and Front View Same as Style CP

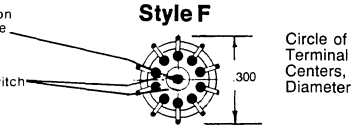


Style P

Circle of Terminal Centers, Diameter



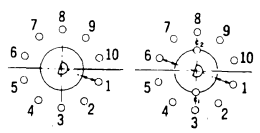
Style F



REAR VIEWS

CIRCUIT DIAGRAM

(Switch is viewed from shaft end and shown in position 1.)



ONE POLE TWO POLE

SPECIFICATIONS

Voltage: 115 VAC or 30 VDC, resistive load.

Contact Resistance: 50 milliohms maximum. (15 milliohms initially).

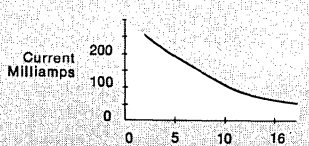
Insulation Resistance: 10,000 megohms minimum between mutually insulated parts. (50,000 megohms initially.)

Voltage Breakdown: 500 VAC minimum between mutually insulated parts.

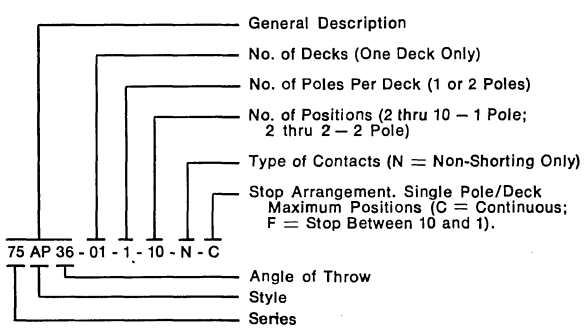
Chart shown for non-shorting contacts (break before make).

One cycle is 360° rotation and a return through all switch positions to the starting position. The data for the curve was measured at sea level, 25°C. and 68% relative humidity with the above life limiting criteria.

RATING:
Life Expectancy:



ORDERING INFORMATION



PRICES

Style	Unit Price 1 Pole/Deck	Unit Price 2 Pole/Deck
AF or CF	$13.14	$16.29
AP or CP	12.74	15.23
BF	14.96	18.09
BP	14.54	17.03

Discount Schedule

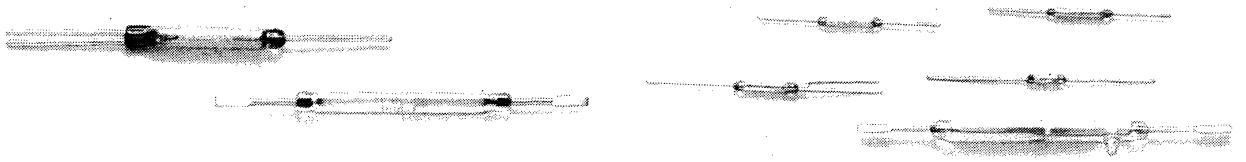
1-9	Unit Price
10-24	Less 8%
25-49	Less 16%
50-99	Less 37%
100-499	Less 50%
500-UP	Contact your local distributor or Grayhill

PRICES AND DISCOUNTS SUBJECT TO CHANGE WITHOUT NOTICE.

Available Locally Through Your Grayhill Distributor

HAMLIN INC
LAKE and GROVE STREETS · LAKE MILLS, WISCONSIN 53551
PHONE: SALES 414/648-2361 · TWX 910-260-3740

MAGNETIC REED SWITCHES

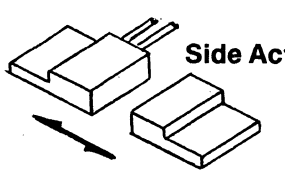


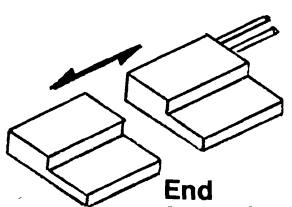
Micro-miniature • Tiny • Sub-miniature • Compact • Mercury-wetted
High voltage • High current

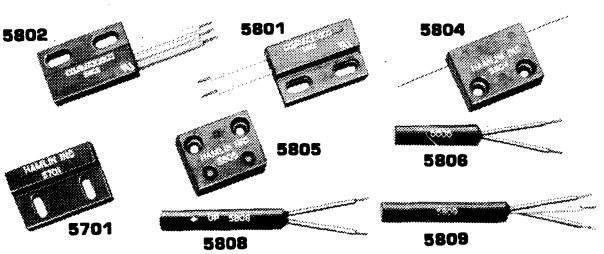
Switch Model No.	Form	Max. DC Contact Rating	Max. Amps	Max. DC Volts	Ampere Turn Pull-In Range	Overall Length Nominal Inches	Glass Length Max. Inches	Glass Diameter Max. Inches	Magnet	Special Features
MORR-DT-175	C	3W	.240	28	20-35	2.076	.562	.105	H-33	3W Low Profile Form C
MRG-DT-175	C	3W	.250	28	20-35	2.125	.610	.130	H-33	Mod. Current & Voltage
DDR-DTH-445	C	10W	.500	250	65-80	3.375	1.562	.218	H-34	High Breakdown Form C
DRT-DTH-445	C	20W	1.500	500	65-80	3.375	1.562	.218	H-34	Inductive Loads
MINI-2S-115	A	3W	.110	28	12.5-27.5	1.235	.500	.070	H-31	The Mini-Reed
MDRR-4-185	A	10W	.500	100	22.5-37.5	1.235	.600	.105	H-ee	Low Profile Form A
MDSR-4-185	A	10W	.500	100	22.5-37.5	1.590	.600	.090	H-33	.090 Dia. Low Profile
MARR-2-185	A	10W	.500	100	22.5-37.5	2.230	.800	.105	H-33	.105 Dia. High Reliability
MARR-5-196	A	10W	.500	500	22.5-42.5	1.775	.800	.105	H-33	Breakdown Voltage to 1000 VDC
DRR-1-425	A	15W	1.000	400	62.5-77.5	3.250	2.000	.207	H-34	Mod. Current & Voltage
DRR-5-425	A	25W	1.000	1000	62.5-77.5	3.250	2.000	.207	H-34	Breakdown Voltage to 1500 VDC
DRT-5-425	A	50W	3.000	1000	62.5-77.5	3.250	2.000	.207	H-34	Inductive Load Type Contact
MCD-1-387	A	50W	2.000	500	40-80	2.250	.610	.130	H-33	Tiny Size, Mercury Wetted
MDC-DT-420	C	28W	.500	200	40-70	1.600	.625	.132	H-32	Form C, Mercury, Wetted
DRR-129-425	A	100W	3.000	250	62.5-77.5	3.250	2.000	.207	H-34	Ideal High Current Loads

MAGNETICALLY ACTUATED REED PROXIMITY SENSORS

High Reliability and Long Life
Hermetically Sealed.







RATING INFORMATION

Sensor Number	Contact Form	Contact Ratings Watts	VDC	VAC	AMPS	Minimum Breakdown Voltage (VDC)
5801	A	10	200	240	.5	400
5802	C	3	28	120	.25	200
5804	A	10	100	120	.5	200
5806	A	10	100	120	.5	200
5807	A	10	100	120	.5	200
5808	A	50	500	240	2.0	1000
5809	C	3	28	120	.25	200
5811	A	50	100	120	1.0	225
5812	A	10	200	240	.5	400
5901	A	1.5	——	240	1.5	400

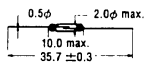
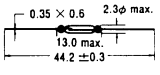
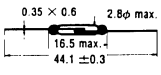
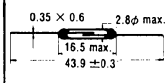
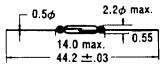
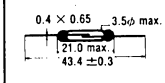
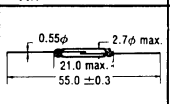
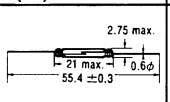
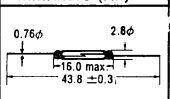
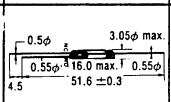
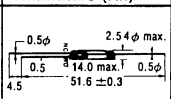
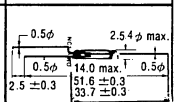
ACTUATION DISTANCES OF MAGNETIC ACTUATION

ACTUATOR	USE WITH SENSOR	SIDE OPERATING MODE ON	SIDE OPERATING MODE OFF	END OPERATING MODE ON	END OPERATING MODE OFF
5701	5801	.400	1.00	——	——
	5802	.250	1.00	——	——
	5806	.400	1.00	.200	.750
	5807	.450	1.10	.200	.750
	5808	.150	.750	1.00	.500
	5809	.250	.900	.150	.750
	5811	.250	.750	——	——
	5901	.400	1.00	——	——
5805	5804	.400	1.00	——	——
	5806	.350	1.00	.200	.750
	5807	.350	1.10	.200	.750
	5808	.050	.750	.050	.500
	5809	.150	.900	.100	.750
5810	5806	.350	1.00	.150	.750
	5807	.400	1.10	.150	.750
	5808	.100	.750	.050	.500
	5809	.200	.900	.100	.750
	5811	.250	.750	——	——

HASCO COMPONENTS INC. / REED SWITCHES

OKI electric industry company, ltd.

Specifications

							
		ORD-211	**ORD-221**	**ORD-225**	**ORD-226**	**ORD-228**	**ORD-234**
Electrical Characteristics	Contact	1A	1A (offset)	1A	1A RLS/OP >0.8	1A	1A
	Contact resist. (Initial) [mΩ]	150 max.	150 max.	150 max.	150 max.	150 max.	150 max.
	Breakdown voltage [DCV]	150 min.	200 min.	250 min.	150 min.	200 min.	300 min.
	Insulation resistance [Ω]	10^9 min.	10^9 min.	10^{10} min.	10^9 min.	10^9 min.	10^{10} min.
	Electrostatic cap. [PF]	0.2 max.	0.3 max.	0.3 max.	0.3 max.	0.3 max.	0.5 max.
	Contact capacity [VA]	1.0	10	10	10	10	10
	Max. conductive curr. [A]	0.3	1.0	1.0	0.5	1.0	2.0
	Max. voltage [V]	24	100	100	100	100	200
Oper. Characteristics	Operate time [ms]	0.3 max.	0.3 max.	0.4 max.	0.3 max.	0.3 max.	0.5 max.
	Bounce time [ms]	0.3 max.	0.3 max.	0.4 max.	1.0 max.	0.3 max.	0.5 max.
	Release time [ms]	0.05 max.	0.05 max.	0.05 max.	0.1 max.	0.05 max.	0.05 max.
	Resonant frequency [Hz]	8600 ±500	2750 ±250	3700 ±300	4200 ±200	5300 ±300	2200 ±300
	Max operating freq. [Hz]	500	500	500	500	500	500
Standard Coil	Coil resistance [Ω]	600	450	450	450	450	500
	No. of turns [T]	5000	5000	5000	5000	5000	5000
	Dimensions [mm]	2.0 x 10	2.9 x 15	2.9 x 15	2.9 x 15	2.9 x 15	3.6 x 20
	Type No.	8	6	6	6	6	3
Features (Contact material)		Ultra-miniature Rh	Miniature offset (Rh)	General purpose miniature (Rh)	Drop-out >0.8 (Rh) Pull-in	General purpose miniature (Rh)	Long life (Rh)
							
		ORD-229	**ORD-2210**	**ORD-2211**	**ORT-233**	**ORT-551**	**ORT-551-1**
Electrical Characteristics	Contact	1A	1A	1A	1C	1C	1C
	Contact resist. (Initial) [mΩ]	150 max.	150 max.	100 max.	150 max.	150 max.	150 max.
	Breakdown voltage [DCV]	700 min.	300 min.	200 min.	200 min.	200 min.	200 min.
	Insulation resistance [Ω]	10^{10} min.	10^{10} min.	10^9	10^9 min.	10^9 min.	10^9 min.
	Electrostatic cap. [PF]	0.2 max.	0.5 max.	0.3 max.	1.5 max.		
	Contact capacity [VA]	20	70	30W max.	3	3	3
	Max. conductive curr. [A]	2.0	2.5	0.5; in-rush 3	0.5	0.5	0.5
	Max. voltage [V]	250	100	100	30	30	30
Operating Characteristics	Operate time [ms]	0.5 max.	0.5 max.	0.6 max.	1.0 max.	1.0 max.	1.0 max.
	Bounce time [ms]	0.5 max.	0.5 max.	0.4 max.	(NC) 1.0 max. (NO) 1.5 max.	(NC) 1.5 max. (NO) 1.0 max.	(NC) 1.5 max. (NO) 1.0 max.
	Release time [ms]	0.1 max.	0.1 max.	0.05 max.	0.5 max.	0.5 max.	0.5 max.
	Resonant frequency [Hz]	2200 ±300	2350 ±250	4600 ±500	6000 ±4000		
	Max. operating freq. [Hz]	500	500	500	200		
Standard Coil	Coil resistance [Ω]	500	500	450	570		
	No. of turns [T]	5000	5000	5000	5000		
	Dimensions [mm]	2.8 x 18	3.6 x 20	2.9 x 15	3.6 x 10		
	Type No.	7	3	6	10		
Features (Contact material)		High breakdown voltage (Rh)	High power (Rh)	High inrush	Miniature transfer (Rh)	Ultra Miniature transfer (Rh)	Ultra Miniature transfer (Rh)

For a comprehensive engineering Reed Switch Catalog, contact factory.

High Reliability Supported by Unique Technology

Flux Scanning Method:

In spite of severe control of the sealing process, there is a slight probability that foreign matter such as magnetic particles may enter the glass. After extensive study in the detection of micro impurities, OKI has adopted the highly reliable flux scanning method. In flux scanning, external magnetism is moved so that foreign matter near the reed is forced to jump to the contact part. The contact resistance then measured is used as the standard for the selection of characteristics. We have thus succeeded in remarkably improving the reliability of reed switches by replacing conventional visual checking with the latest flux scanning method.

HASCO COMPONENTS INC. SWITCHES

TOGGLE, PUSH, LEVER and ROCKER HT3T SERIES

SPECIFICATIONS

CONTACT RATING

Solid Silver	Gold Plating
6 AMPS @ 125V AC	0.4 VA max.
3 AMPS @ 250V AC	@ 20 VDC or
3 AMPS @ 30V DC	Peak AC

INITIAL CONTACT RESISTANCE: Below 10 milliohms.

INSULATION RESISTANCE: 1,000 meg-ohms minimum.

DIELECTRIC STRENGTH: 1,000 volts RMS at sea level.

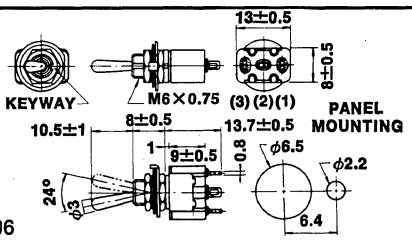
LIFE EXPECTANCY: Mechanical, 100,000 operations. Electrical, 25,000 operations.

CIRCUIT CHARACTERISTICS

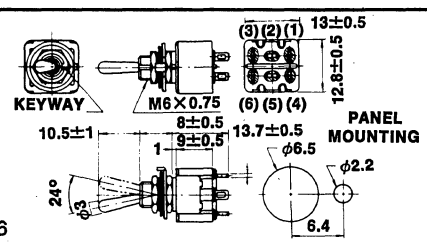
Type	Part Number	Switching Function		
SPDT	HT3T106D	On	—	On
	HT3T106E	On	Off	On
	HT3T106F	On	—	(On)
	HT3T106G	(On)	Off	(On)
	HT3T106H	On	Off	(On)
2PDT	HT3T206N	On	—	On
	HT3T206P	On	Off	On
	HT3T206R	On	—	(On)
	HT3T206S	(On)	Off	(On)
	HT3T206T	On	Off	(On)
	HT3T206PA	On	On	On
3PDT	HT3T306D	On	—	On
	HT3T306E	On	Off	On
	HT3T306F	On	—	(On)
	HT3T306G	(On)	Off	(On)
	HT3T306H	On	Off	(On)
4PDT	HT3T406N	On	—	On
	HT3T406P	On	Off	On
	HT3T406R	On	—	(On)
	HT3T406S	(On)	Off	(On)
	HT3T406T	On	Off	(On)
	HT3T406PA	On	Off	On

(On) indicates momentary position

STANDARD TOGGLE

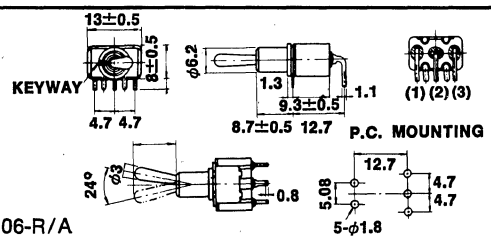


HT3T106

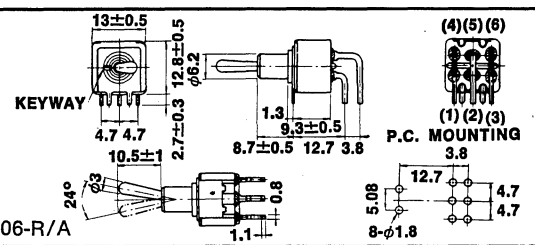


HT3T206

RIGHT ANGLE

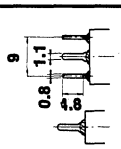
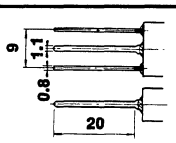


HT3T106-R/A

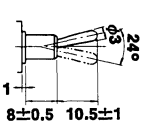
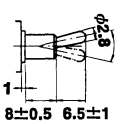
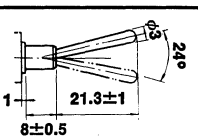
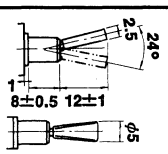
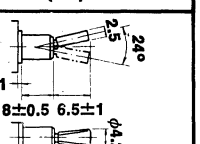


HT3T206-R/A

TERMINATIONS

WIRED	PRINTED CIRCUIT (P/C)	WIRE-WRAP (W/W)
		

ACTUATORS

STANDARD TOGGLE	SHORT TOGGLE (S)	LONG TOGGLE (L)	FLAT TOGGLE (F)	SHORT FLAT TOGGLE (FS)
				

HASCO COMPONENTS INC. SWITCHES

ORDERING INFORMATION

When ordering, please specify the part number to the function requested. Then add the terminal code followed by the actuator requested.

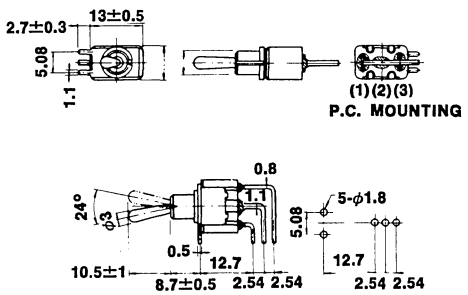
I.E.: A SPDT ON/OFF/ON with printed circuit terminals is called: HT3T106E-P/C-S.

Also available in pushbutton, lever and rocker styles.

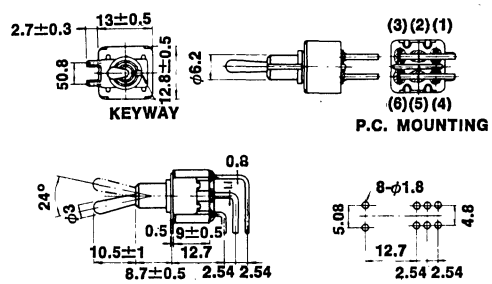
FEATURES

Our Unique Design Features Notched Contacts Eliminating Surface Contamination Buildup, Thus Increasing Reliability.

VERTICAL MOUNTING

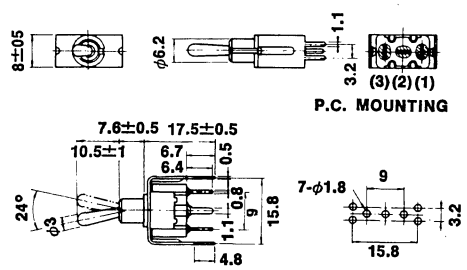


HT3T106-V/M

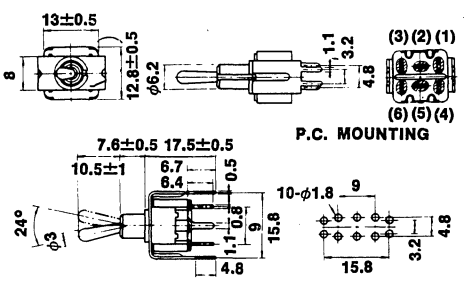


HT3T206-V/M

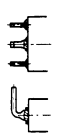
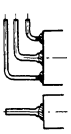
BRACKET MOUNTING

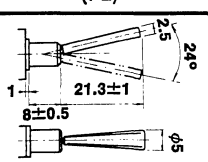
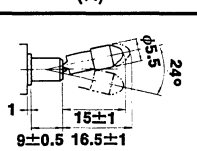
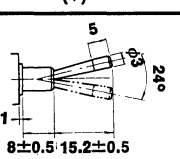
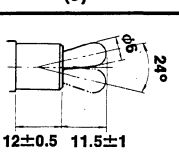
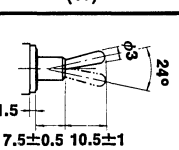


HT3T106-B/M

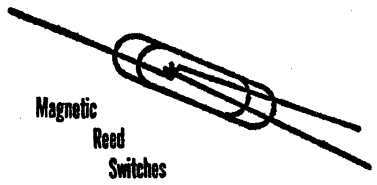


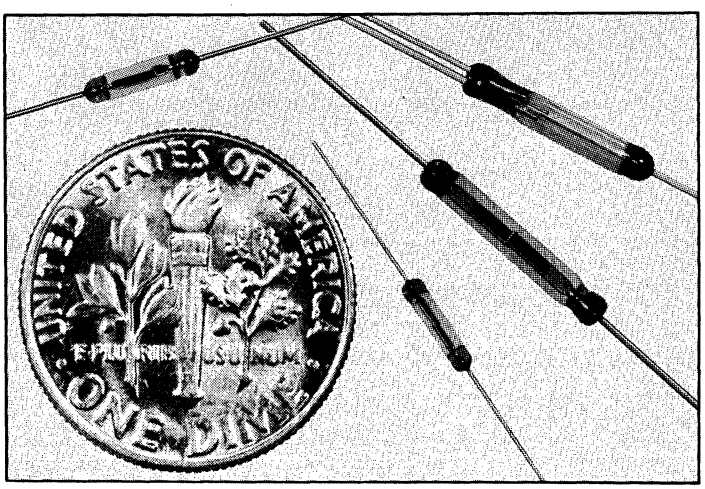
HT3T206-B/M

RIGHT ANGLE (R/A)	VERTICAL MOUNTING (V/M)	BRACKET MOUNTING (B/M)
		

LONG FLAT TOGGLE (FL)	LOCKING TOGGLE (K)	BATON TOGGLE (T)	LARGE TOGGLE (J)	WATER PROOF TOGGLE (W)
				

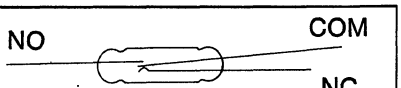
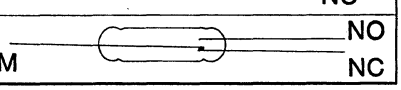
HERMETIC SWITCH





MANUFACTURERS OF

THE WORLD'S SMALLEST REED SWITCHES

Model	Form	Max D C. Watts	Max D C. Amps	Max D C. Volts	Stock Amp-Turn Pull-In Range	Overall Length Inches	Max Glass Diameter Inches	Max Glass Length Inches	Special Features
THE WORLD'S SMALLEST									
HSR-003	A	0.1	.01	10	5-25	1.050	.055	.210	AVAILABLE IN HI-REL AND COMMERCIAL GRADES
HSR-004	A	0.1	.01	10	5-40	1.000	.055	.260	
HSR-067	A	4	.20	30	10-35	1.240	.070	.460	
HSR-370	C	3	.10	28	15-35	1.490	.072	.485	
MINIATURE FORM C									
HSR-301	C	4	.20	100	15-40	1.930	.093	.580	
HSR-3015	C	4	.20	100	15-40	1.930	.103	.580	
HSR-302	C	4	.20	100	15-40	1.930	.120	.580	
HSR-510	C	3	.25	100	15-40	2.000	.105	.590	
HSR-520	C	3	.25	100	15-40	2.000	.125	.600	
HIGH POWER									
HSR-V200	A	200	3.0	7500	50-150	3.230	.210	2.100	SOLID TUNGSTEN CONTACTS
HSR-156	A	100	3.0	28	50-100	3.200	.190	1.700	
HSR-634	C	100	3.0	28	40-80	3.390	.210	1.400	
HIGH VOLTAGE									
HSR-V10K	A	50	3.00	7500	50-150	3.230	.210	2.100	10,000 VDC DIELECTRIC

ASK FOR CATALOG AND SPECIFICATION SHEETS ON COMPLETE REED SWITCH PRODUCT LINE INCLUDING OVER 25 STANDARD MODELS

HERMETIC SWITCH, INC.

P.O. BOX 1325, HIGHWAY 92 SOUTH / CHICKASHA, OKLAHOMA 73018 / TELEPHONE (405) 224-4046
TELEX 796125 HERMETIC CKSA

FOR SURE

if it's an Illinois Lock

Illinois Lock has a full line of switch locks design-engineered to handle the critical security needs of today's sophisticated "high-tech" marketplace. They have the same high quality in performance and reliability that has gained Illinois Lock worldwide recognition for over a half a century.

Our wide variety of switch locks range from high security antistatic locks with up to 20 KVDC protection for computer, medical, scientific applications to space saving switch locks for your tight security applications. Select locks feature single, double, or triple-bitted keying; master keying, grandmaster keying . . . with hundreds to thousands of key changes available. You will find an Illinois Lock to meet your most demanding security needs.

Call today! Our sales and engineering departments are ready to provide expert assistance in design and specification for your positive security needs.

Illinois Lock Company

A Division of the Eastern Co.

301 West Hintz Road • Wheeling, Illinois 60090 • 1-312-537-1800

Illinois Lock Company

A Division of the Eastern Co.

puts the lock on positive protection for you!

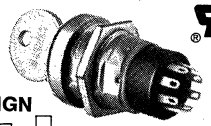
LECTRO-QUIP®

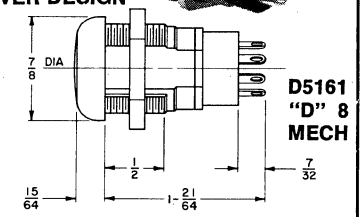
SWITCH LOCKS FOR ADVANCED ELECTRONICS & COMMUNICATIONS

A LQ-9 - D5161

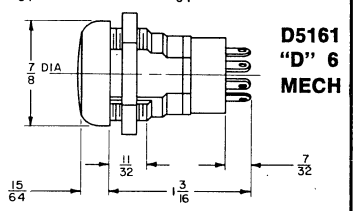
ROTARY SWITCH LOCK

SPACE SAVER DESIGN





D5161 "D" 8 MECH

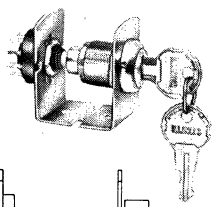


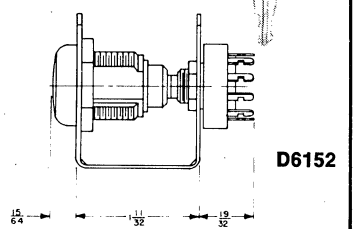
D5161 "D" 6 MECH

UL COMPONENT RECOGNITION

B LQ-3 - D4152

ROTARY SLIDE TYPE SWITCH LOCKS



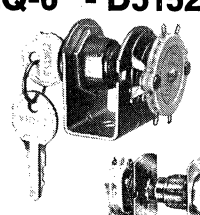


D6152

UL LISTED ROTARY SWITCH

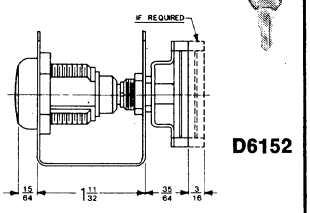
C LQ-10 - D5162
LQ-6 - D5152

ROTARY WAFER TYPE SWITCH LOCKS



D5162

D5152



D6152

UL LISTED WAFER SWITCH

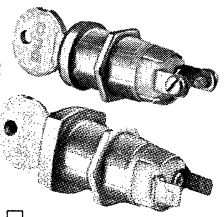
D LQ-1 - D6122*

(Screw)/D6123 (Spade)

LQ-11 - D6223*

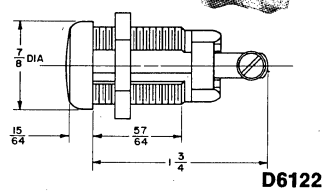
(Spade)/D6222 (Screw)

SWITCH LOCKS

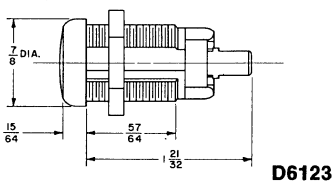


D6122

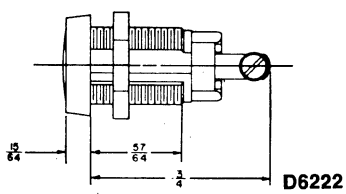
D6223



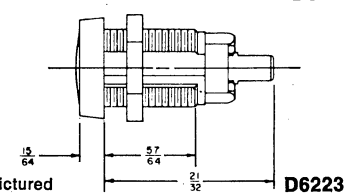
D6122



D6123



D6222

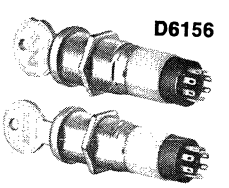


*Pictured D6223

UL COMPONENT RECOGNITION

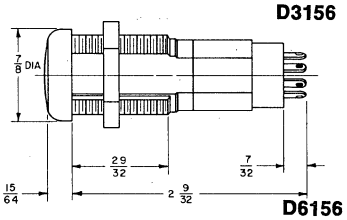
E LQ-5 - D6156
LQ-7 - D3156

ANTI-STATIC ROTARY SWITCH LOCKS



D6156

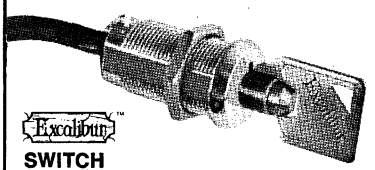
D3156



D6156

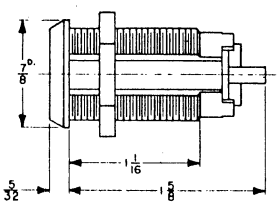
UL COMPONENT RECOGNITION

F LQ-8 - D8163-03



SWITCH LOCK

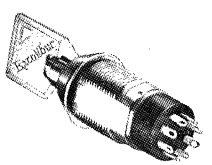
D8163-03

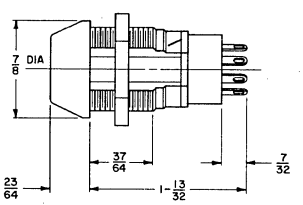


D8164

G LQ-12 - D8161

SPACE SAVER DESIGN ROTARY SWITCH LOCK

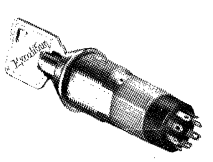


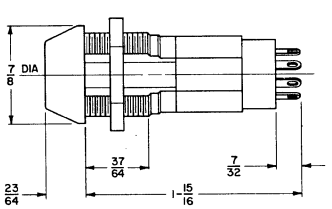


UL LISTED ROTARY SWITCH

H LQ-13 - D8156

ANTI-STATIC SWITCH LOCK





UL LISTED ROTARY SWITCH

301 W. Hintz Road • Wheeling, IL 60090 • 1-312-537-1800

Illinois Lock Company
A Division of the Eastern Co.
puts the lock on positive protection for you!

LECTRO-QUIP®
SWITCH LOCKS FOR ADVANCED ELECTRONICS & COMMUNICATIONS

A LQ-9 "CLICK-SWITCH" ROTARY SWITCH LOCK
Specially Designed For LIMITED SPACE APPLICATIONS

Specifications: Maintaining Contact Style—one or two pole, and up to 5 positions.

Lock and Mechanism Available: Model D5161 Illinois® type "D8-eight positive action tumblers operated by double-bitted key; 500 primary changes, master keying. Type "D6" offers 60 primary changes.

B LQ-3 ROTARY SLIDE-TYPE SWITCH LOCKS
Specifications: Bracket mounted lock and switch, available with 1 or 2 pole and positive mechanical indexing.

Lock and Mechanism Available: D6152 Duo® Type M—14 brass tumblers, triple-bitted key; offers 13,950 primary key changes, can be master and grandmaster keyed, obtain two key pulls at 0°, 180°.

D5151 Illinois®, Type D—8 tumblers, double-bitted key; 250 primary key changes, master keyed, obtain two key pulls at 0°, 180°. Model D4152 Illinois®, Type E—8 tumblers, double-bitted key; design permits multiple key pulls up to 10 positions (36° increments).

C LQ-6/LQ-10 ROTARY WAFER TYPE SWITCH LOCKS
Specifications: Bracket mounted lock and switch. UL listed wafer switch, available with multiple poles and stacked decks. Positive detent at each index position. Spring return feature available.

Lock and Mechanism Available: LQ-10 - D5162-110 Illinois® "D8" eight tumblers, double-bitted key; 250 primary changes; D5162-100 Illinois® "D6"—6 tumblers, double-bitted key, 60 primary changes.

LQ-6 - D6152 Duo®, Type M—14 brass tumblers, triple-bitted key; 13,950 primary changes, master and grandmaster keyed, obtain 4 key pulls at 0°, 90°, 180°, 270°. D5152 Illinois® Type D—8 tumblers, double-bitted key; 250 primary changes, master keyed; obtain 4 key pulls at 0°, 90°, 180°, 270°. D4152 Illinois®, Type E—8 tumblers; double-bitted key; design permits key pulls up to 8 positions (45° increments).

D LQ-1/LQ-11 SWITCH LOCKS
Specifications: Maintaining switch; single pole single throw (SPST), 90° turn to operate. Screw or spade type terminals available.

Lock and Mechanism Available: DUO® "M"—14 brass tumblers, 13,950 key changes available, master and grandmaster keying capability.

ILLINOIS® "D10"—10 tumblers, 930 key changes, master keying.

ILLINOIS® "D8"—8 tumblers, 250 key changes, master keying. Plug and barrel are of "Zamak 3" zinc die cast material. Contacts and terminals are solid brass. Silver or gold plated contacts available for low voltage applications.

FOR SURE
if it's an Illinois Lock

E LQ-5/LQ-7 ANTI-STATIC SWITCH LOCKS
. . . with up to 20 KVDC protection!

Specifications: Anti-static available in two styles: Momentary Contact Style—1 or 2 pole, 2 position, 45° key turn to operate, spring return; Maintaining Contact Style—1 or 2 pole, up to 5 positions. Available shortly with maintaining and momentary contact incorporated within one key switch.

Lock and Mechanism Available: LQ5 HIGH SECURITY—D6157/D6156 DUO® "B"—14 brass tumblers, triple-bitted key; 13,950 primary changes, master and grandmaster keyed. D5157/D5156 in "D10" with 10 tumblers, double bitted key, 950 changes; "D8" has 8 tumblers, double-bitted key, 250 primary changes, master keyed.

LQ7 features D4156/D4157 Illinois® Type "E"—8 tumblers, double bitted key, 250 primary key changes. D3156/D3157 Illinois® Type "G"—5 tumblers, single-bitted key, 659 primary key changes, master keyed.

F LQ-8 Excalibur™
Specifications: Maintaining contact style, single pole two position. Available with standard wire leads: 6" long, 16 gauge or with solder terminals.

Lock and Mechanism Available: D8163/D8164 "Excalibur" Type 7 pin tubular mechanism, in excess of 750,000 primary key changes available. "Zamak 3" zinc die cast barrel. Spindle and pin tumblers are solid brass, keys bright nickel-plated steel. Contacts and terminals are copper. Silver or gold plated contacts available.

G LQ-12 Excalibur™ "CLICK-SWITCH" SPACE SAVER SWITCH LOCK
Specifications: Maintaining Contact Style—1 or 2 pole, up to 5 positions and 5 key pulls.

Lock and Mechanism Available: Model D8161 "Excalibur" Type 7 pin tubular mechanism, offers in excess of 750,000 primary changes. "Zamak 3" zinc die cast barrel. Spindle and pin tumblers are solid brass, keys are bright nickel-plated steel. Switch housing is nylon "Zytel 101" UL rated 94V-2; terminals are solderable faston type, silver-plated copper alloy. Available with gold-plated contacts.

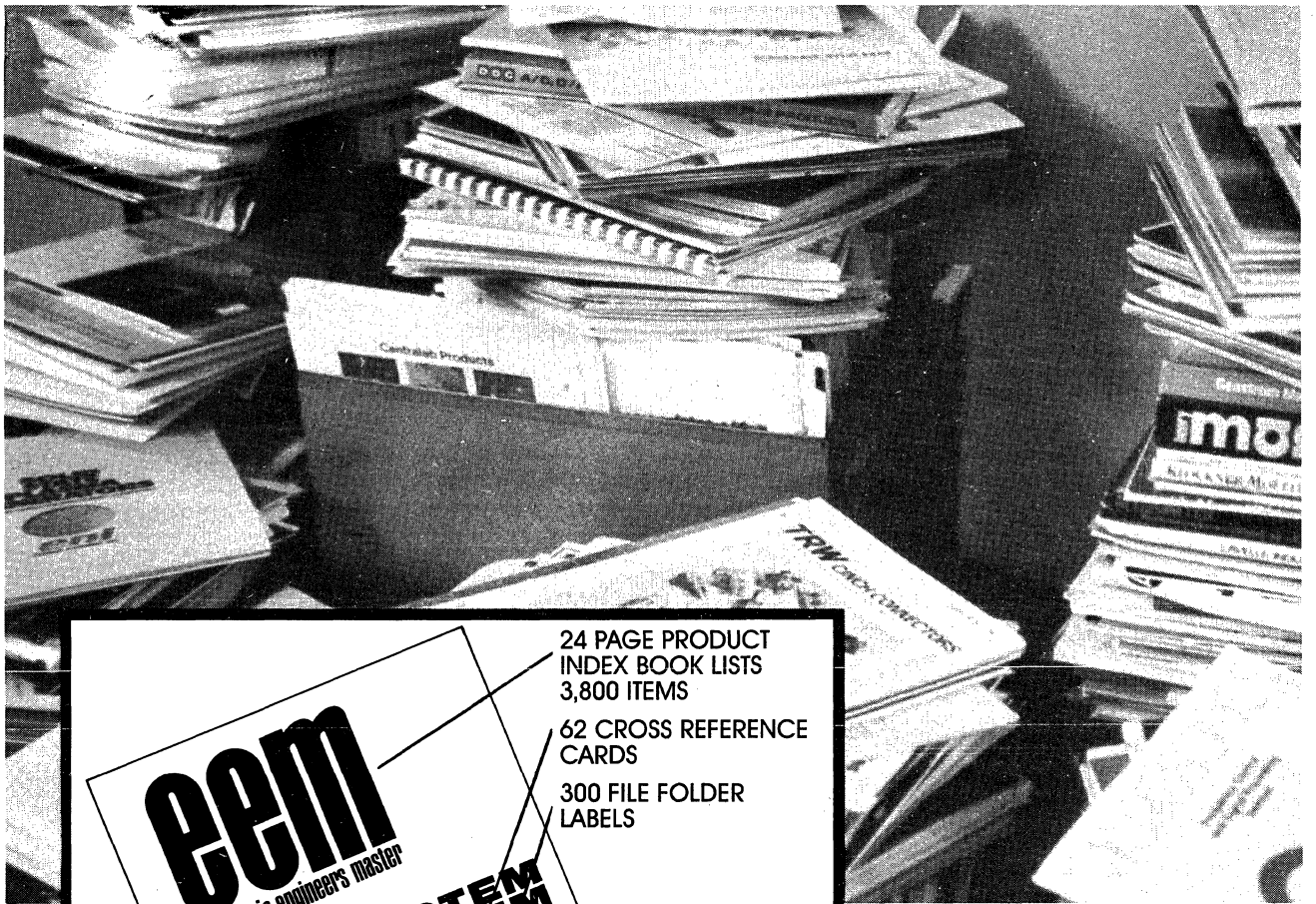
H LQ-13 Excalibur™ ANTI-STATIC SWITCH LOCK
Up to 20 KVDC protection!

Specifications: Anti-static Maintaining Contact Style—1 or 2 pole, up to 5 positions and 5 key pulls.

Lock and Mechanism Available: Model D8156 "Excalibur" Type 7 pin tubular mechanism, offers in excess of 750,000 primary changes.

"Zamak 3" zinc die cast barrel. Spindle and pin tumblers are solid brass, keys are bright nickel-plated steel. Switch housing is nylon "Zytel 101" UL rated 94V-2; terminals are solderable faston type, silver-plated copper alloy. Available with gold-plated contacts.

301 W. Hintz Road • Wheeling, IL 60090 • 1-312-537-1800 **WRITE OR CALL FOR YOUR FULL LINE LECTRO-QUIP® CATALOG NOW!**



ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

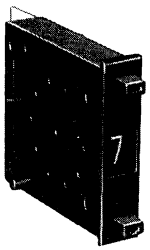
Don't waste any more time. Get organized now!

EEM FILE SYSTEM,

645 stewart ave., garden city, ny 11530

THUMBWHEEL SWITCHES

IMLEC

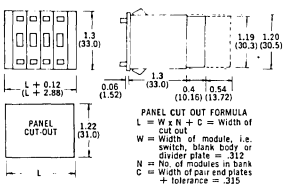


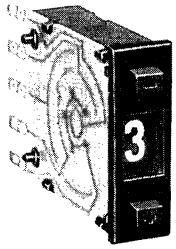
MODEL II IMLEC INDEXER PUSHBUTTON FRONT MOUNT

The Imlec Indexer is a bi-directional push indexing front mount switch, 5/16" in width. Identical in size to our popular MF switches. With snap together banking and snap-in panel mounting. Pushbuttons above and below the legend allow the user to add or subtract from the count.

These 10 or 16-position switches are available in all popular codes.

DIMENSIONS IN INCHES (IN MILLIMETERS)



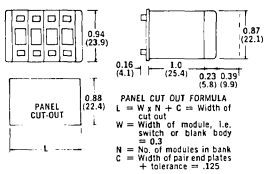


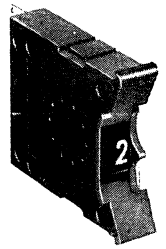
MODEL MI MINI INDEXER PUSHBUTTON FRONT MOUNT

The Mini Indexer is a bi-directional push indexing front mount switch. 0.30" in width. Similar to our Imlec Indexer but smaller in size. Features snap together banking and snap-in panel mounting. Pushbuttons above and below the legend allow the user to add or subtract from the count.

Available in most popular 10-position codes.

DIMENSIONS IN INCHES (IN MILLIMETERS)



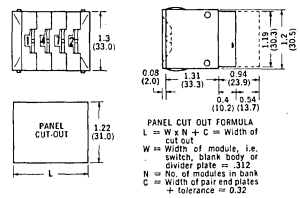


MODEL MF MINIATURE FRONT MOUNT

The MF is our most popular, low cost, 5/16" wide Thumbwheel Switch. Slim, attractive, snap-in panel mounting requires no panel mounting hardware.

Available in all popular 10 and 16-position codes. Matte black finish on high impact moldings, with white legend on black wheel standard.

DIMENSIONS IN INCHES (IN MILLIMETERS)

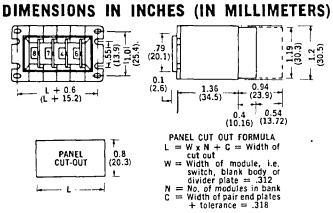


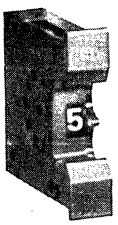
MODEL TR THIN REAR MOUNT

For applications that require a lot of switch in a small space, these 5/16" wide TR switches are ideal. Rear mount counterpart to our popular MF front mount switches.

Available in most 10-position codes including Decimal, BCD, BCD plus Complement and Complement only.

DIMENSIONS IN INCHES (IN MILLIMETERS)



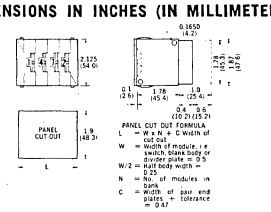


MODEL IF INTERMEDIATE FRONT MOUNT

A rugged front mount switch with large digits, 1/2" wide module. Snap-in front mounting hardware. Available in most popular 10 and 16-position codes.

Matte black finish with white legends on black wheel standard. Gloss fnish, other wheel colors and legends available.

DIMENSIONS IN INCHES (IN MILLIMETERS)

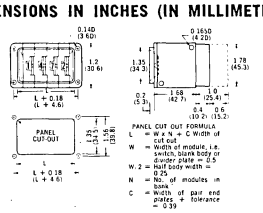


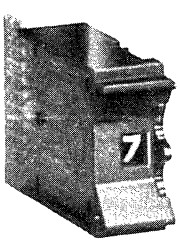
MODEL IR INTERMEDIATE REAR MOUNT

Rugged rear mount counterpart to our IF model, with large readable digits, 1/2" wide module. Available in most popular 10 and 16-position codes.

Matte black finish with white legends on black wheel standard. Gray bodies, gloss finish, other wheel colors and legends available.

DIMENSIONS IN INCHES (IN MILLIMETERS)

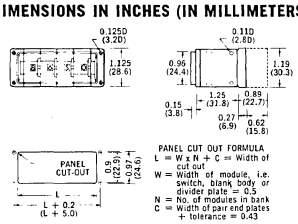




MODEL MR MINIATURE REAR MOUNT

Popular rear mount switch, 1/2" wide module but lower profile than IR model. Available in matte black in most popular 10-position codes including Decimal, BCD, and BCD plus Complements.

DIMENSIONS IN INCHES (IN MILLIMETERS)



Voltage: 200 volts max DC (within power rating) or RMS.

Power: 24 watts max per switch with 12 watts max per energized output.

Insulation Resistance: 1000 megohms between adjacent contacts at 25°C and 20% relative humidity.

Contact Resistance: 0.1 ohms initial and 0.2 ohms after life test at 25°C.

Dielectric Strength: 500 VAC.

Moldings: High impact acetate body in matte black, gloss black or gray finish; wheels are polycarbonate in black with white legends standard, white with black legends for lighted versions, other colors available.

Contact Material: Stator has 0.0001" hard gold over 1 oz. copper on glass fibre as MIL-P-13949GF. Rotor has silver/gold alloy on beryllium copper.

Life: 1,000,000 detents minimum either direction.

Stops: Stops to limit switch to any position.

Panel Thickness: 1/16" to 5/32".

Operating Temperature: −20°C to 70°C. Storage temperature: −40°C to 70°C.

Shock: 100 G's, 6 MS.

Vibration: 15 G's to 70-2000 Hz.

Humidity: 96 HRS, 95% relative.

Options and Accessories Available: Extended Boards for diode suppression; Termination Pins; Stopping; Blank Bodies, Half Bodies; End Plates Divider Plates; Connectors; External LED Lighting; Sealing, etc.

SPECIFICATIONS

ALL MODELS

Contact Current: Contacts rated 2 amps @ 115 VAC or 28 VDC non-switching; 0.5 amps @ 28 VAC or DC switching. Minimum recommended switching current 10 microamps @ 20 millivolts.

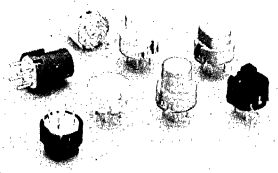
HOW TO ORDER

CODE NO.	DESCRIPTION	II	MI	MF	TR	MR	IF	IR
-12	10 pos. Decimal	II-12	MI-12	MF-12	TR-12	MR-12	IF-12	IR-12
-12A	10 pos. Decimal Ext. Board	II-12A	MI-12A	MF-12A	TR-12A	—	IF-12A	IR-12A
-13	10 pos. Decimal 2 pole	II-13	—	MF-13	TR-13	MR-13	IF-13	IR-13
-18	10 pos. BCD Complement Only	II-18	MI-18	MF-18	TR-18	—	—	—
-18A	10 pos. BCD Complement Only Ext. Board	II-18A	MI-18A	MF-18A	TR-18A	—	—	—
-21	10 pos. BCD	II-21	MI-21	MF-21	TR-21	MR-21	IF-21	IR-21
-21A	10 pos. BCD Ext. Board	II-21A	MI-21A	MF-21A	TR-21A	MR-21A	IF-21A	IR-21A
-22	10 pos. BCD and Complement	II-22	—	MF-22	TR-22	MR-22	IF-22	IR-22
-22A	10 pos. BCD and Complement Ext. Board	II-22A	—	MF-22A	TR-22A	MR-22A	IF-22A	IR-22A
-55	16 pos. Decimal 0-15 or 0-F	II-55	—	MF-55	—	—	IF-55	IR-55
-56	16 pos. BCD 0-15 or 0-F	II-56	—	MF-56	—	—	IF-56	IR-56
-57	16 pos. BCD and Comp. 0-15 or 0-F	II-57	—	MF-57	—	—	IF-57	IR-57
-57A	16 pos. BCD and Comp. 0-15 or 0-F Ext. Board	II-57A	—	MF-57A	—	—	IF-57A	IR-57A
-EP	End Plates, Pair	II-EP	MI-EP	MB-EP	TR-EP	MR-EP	IF-EP	IR-EP
-BB	Blank Body	II-BB	MI-BB	MF-BB	TR-BB	MR-BB	IF-BB	IR-BB
-DP	Divider Plate	—	—	MF-DP	TR-DP	MR-DP	IF-DP	IR-DP
-BBH	Blank Body with Decimal Point	II-BBH	MI-BBH	MF-BBH	TR-BBH	MR-BBH	IF-BBH	IR-BBH
-CN	Connector 10 position only	MCN-10	—	MCN-10	MCN-10	—	ICN-10	ICN-10
-HB	Half Body	—	—	—	—	—	IF-HB	IR-HB
IH	Banking Hardwade (insert no. of modules)	—	—	—	—	IH-( )	IH-( )	IH-( )
MFH	Banking Hardwade (insert no. of modules)	—	—	MFH-( )	MFH-( )	—	—	—

INTER-MARKET INC. Dept. EM. 1946 Lehigh Avenue / Glenview. Illinois 60025 / (312) 729-5330 / TWX-910-651-1997

Keyswitches

Schadow ITT



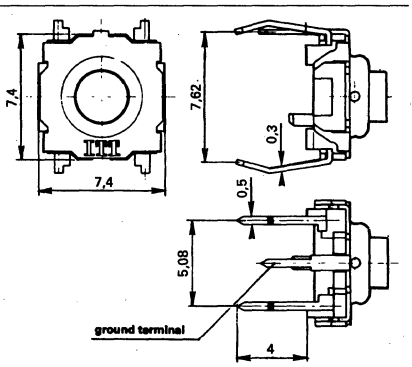
Description
These switches are specially designed for keyboards building. They present a large choice of buttons shapes and colours.

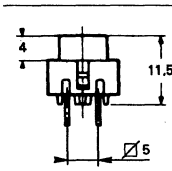
KSA
Short travel (0,3 m/m) miniature fully sealed keyswitch designed for automatic insertion at minimum center to center matrix of 7,62 m/m × 10,16 m/m.

D6
Single pole, momentary action normally open keyswitch. Strapped terminals allows XY coding. Integrated button, good tactile feed back.

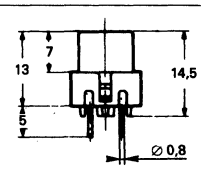
Mechanical Data		
Operating force	1,30 N ± 25%	1,3 N
Nominal travel	–	0,8 m/m
Travel max.	0,3 m/m	0,8 m/m
Electrical data		
Contact type	Single pole single throw NO	Single pole single throw NO
Contact material	Ag	Ag
Max. voltage	50 V DC	35 V DC
Max. switching power	1 W	350 mW
Max. switching current	50 mA	10 mA
Contact resistance	50 mΩ	≤ 20 mΩ max
Insulation resistance	$>10^5$ MΩ	100,000 MΩ
Bounce	≦1 ms	5 ms
Life expectancy (operations)	500,000 cycles	500,000 cycles
Climatic data		
Temperature range	– 20 °C + 75 °C	–20 °C +85 °C
Wave or bath soldering	250 °C ± 5 °C/4sec	
Cleaning	Sealed against immersion in solvents	ABS compatible solvents

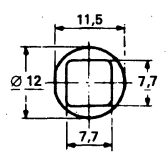
Note: N.O.: normally open



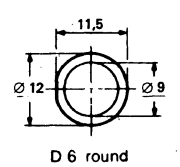


D 6 square button



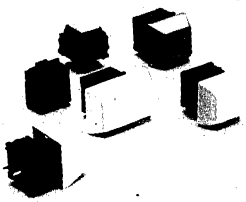


D 6 round button



Keyswitches

Schadow ITT



DISC SERIES
MD is a keyswitch module with momentary effect. It can be fitted with a button, thus becoming a complete keyswitch with short and good tactile feeling: the MDP.

MD	MDP
2,4 N	2,4 N
0,6 m/m	0,3 m/m
0,9 m/m	0,5 m/m

Single pole, single throw NO	
Ag*	Au*
100 V DC	100 V DC
6 W	3 W
100 mA	50 mA
<10 mΩ	<15 mΩ
$>10^5$ MΩ	$>10^5$ MΩ
100 μs	100 μs
10^6	5 x 10^6

–25 °C +70 °C
235 °C 5sec
–

* MD performances, MDP life expectancy 100.000 operations

DIGITAST
Momentary keyswitch with change over contacts, many button shapes including double or triple tabular buttons. In option: 1 or 2 LED buttons.*

1,5 N
1,5 m/m
1,8 m/m

SPDT
Au
24 V
240 mW
10 mA
≦50 mΩ
1.10^3 MΩ
1 ms
5 x 10^5

–25 °C to 85 °C

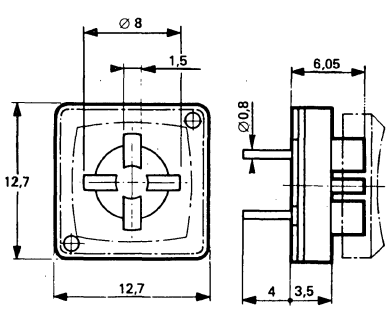
* Note: Push-push version in option

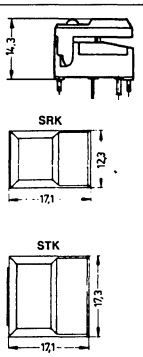
DC 61
Momentary keyswitch for alphanumerical keyboards. Low profil (16,7 m/m). Push-push option and spacebar.

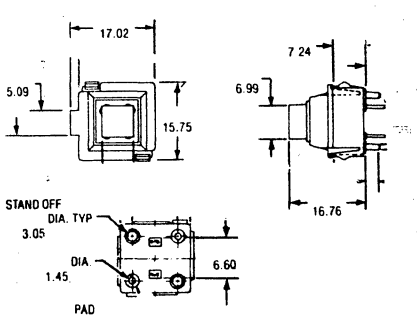
0,7 N
–
3,2 m/m

Single pole single throw NO
Au
30 V DC
1.5 W
50 mA
150 mΩ max
100 mΩ min @ 100 V
<0,5 ms Nom
20 x 10^6

0 °C to 50 °C
2s/235°C

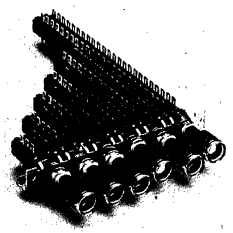


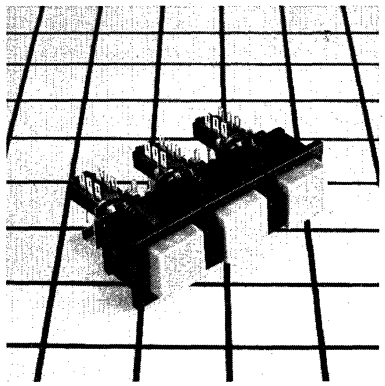




Push button switches

Schadow ITT





Description

ITT push buttons switches family offers the user a wide range of applications by its variety of construction, design and button styles.

F Series

These switches offer wide possibilities:
- up to 10 change overs per module
- frame up to 23 positions with 5 different pitches
- patented mechanical indicator buttons.

ML Series

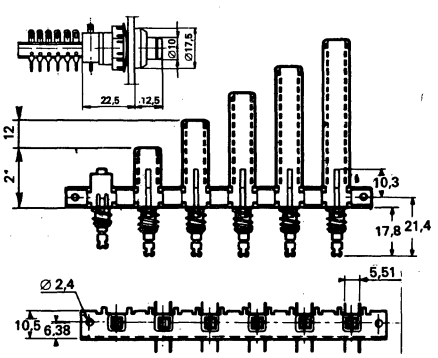
ML Series offers the Design Engineer the latest in High Tech Front panel appearance with a wide variety of switching capabilities. The ML Series buttons can be used with LT, F, F Power and DC50 Series.

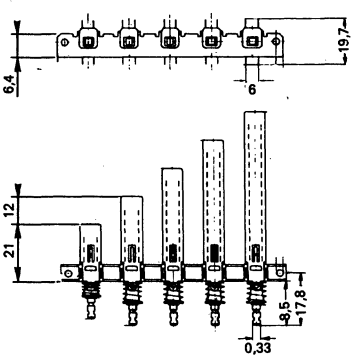
Mechanical Data			**FML**
Modules number	1 to 23		1 to 10
Pitch between modules'	10–12, 5–15–17, 5–20 m/m		17,5 5 – 25 m/m
Travel max.	4,7 m/m		4.7 m/m
Operating force	7 N for 2 C/O, 15 N 10 C/O		3N for 2 C/O, 4N for 4 C/O
Functions – –	Interlocking, interdependant Release key, push-push		

Electrical data			
Number of change overs	2 to 10		2 to 4
Contact materials	Ag	Au	Ag
Switching voltage max.	50 V~	100 V~	125 V AC
Switching current max.	0,5 A	0,04 A	0.45 A
Switching power max.	15 W	300 mW	15 W
Contact resistance	≦10 mΩ	≦20 mΩ	≦ 10 mΩ
Dielectric strenght between contacts and between contacts and metallic parts	1500 V 1500 V		1500 V 1500 V
Insulation resistance	1 x 10^9 Ω min		≧ 10^3 Ω
Life expectancy operations	10^5		105

Climatic data	
Temperature range	–20 °C +70 °C
Wave or bath soldering	270 °C/5sec. max.

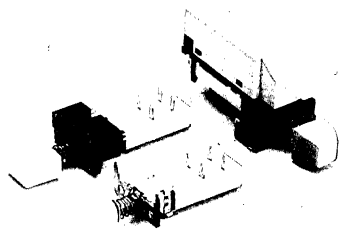
Note: C/O = change over

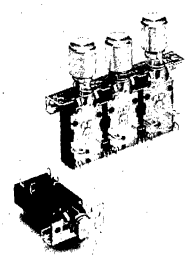




Power Switches

Schadow ITT





Description

ITT mains switches family can be used individually or together with ITT push buttons. All ITT mains switches responds to international specifications.

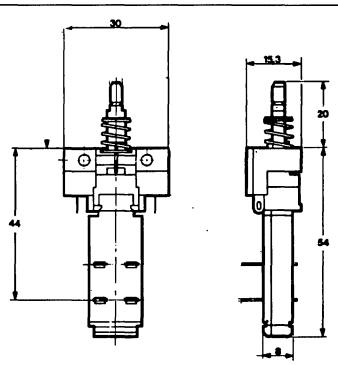
MSA

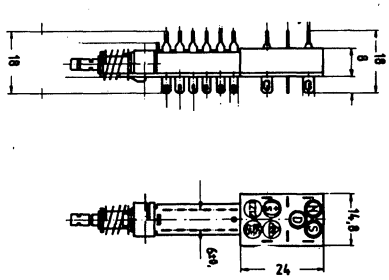
The MSA is a bipolar push button mains switch. It withstands a peak current of 80 A. MSA-ER is the electromagnetic release version. MSA present worldwide approvals.

NE 15

Mains switches compatible with F series ITT push buttons hold several specifications approvals. Double pole double throw or single throw contacts with 2 c/o low currents.

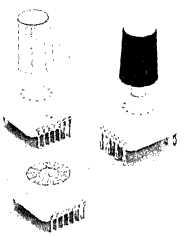
Mechanical data		
Total travel	5,9 m/m	4,7 m/m
Operating force	<10 N	$\leqq 7$ N
Electrical data		
Switching voltage max.	250 V~	250 V~
Switching current max.	4 A	4 A
Switching power max. (resistive)	1000 W	1000 W
Surge current (peak)	80 A	24 A
Dielectric strength between contacts	1500 Vrms	–
and between contacts/ground	3000 Vrms	–
Insulation resistance between contacts	–	$1 \times 10^{12}\ \Omega$
and between contacts/ground	10^3 MΩ	$1 \times 10^{12}\ \Omega$
Auxiliary contact:		
max. voltage	24 V DC	30 V
Switching current max.	100 mA DC	0,5 A
operating life	25.000	10.000
Options		
	Electromagnetic release, auxiliary momentary contacts	Auxiliary contacts
Climatic data		
Operating temperature	−10 °C +70 °C	−20 °C to + 70 °C

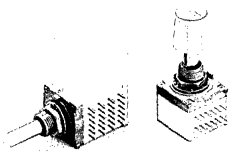




Rotary switches

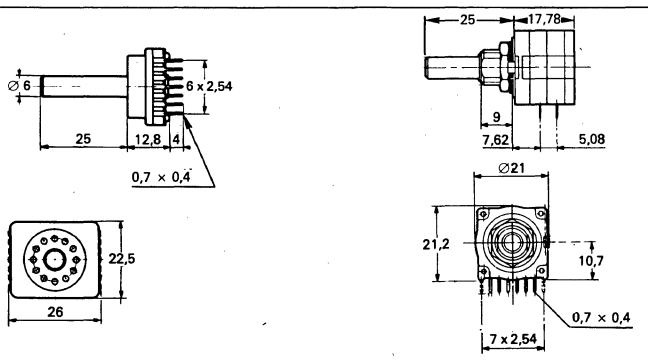
Schadow ITT



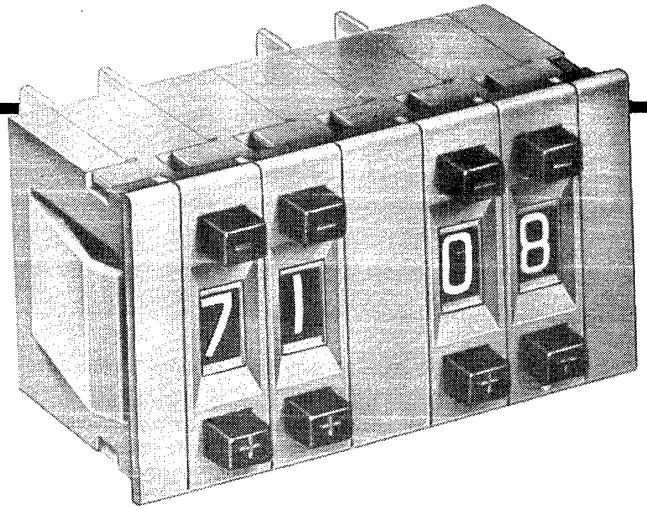


Description	RTA	RTB
ITT rotary switches family is wide, versatile and permanently up dated. ITT is a world leader in these switches category.	Dual in line, flat rotary switch with solder lugs or pins for PCB mounting. RTA can be coded or used conventionally. The contacts are protected against flux ingress. Good performances/cost ratio.	PCB mounting, highly reliable rotary switch with excellent performance/price ratio, the RTB offers large possibilities of coding. The RTB is completely sealed.
Mechanical Data		
Max. number of wafers	1	4
Number of poles per wafers	1 to 4	1 or 2 (consult us)
Number of positions per wafers	2 to 12 and 2 to 10	24–16–12–10
Codes	Binary and complement	Binary-complement-Hexa-Grey
Angle between 2 positions	30° or 36°	12°–22,5°–30°–36°
Shaft diameter	6 m/m	6–6,35 m/m
End stop	With/without or snap in 12–2	With or without
Materials	Thermoplastic	Thermoplastic
Electrical data		
Types of contacts	BBM*	BBM*
Contact materials	Silver plated	Au
Max. switching power	5 VA	0,2 W
Max. switching current	150 mA	20 mA
Max. carrying current	1 A	1 A
Max. voltage at 50 HZ	60 V	25 V
Contact resistance	$<150\ m\Omega$	$<100\ m\Omega$
Dielectric strenght between contacts and between contacts and frame (50 HZ)	500 Vrms	500 Vrms
Insulation resistance between contacts and contacts and frame (500 V continuous)	$>10^3\ M\Omega$	$>10^3\ M\Omega$
Number of operations at max. power	10.000	10.000 to 25.000
Climatic Data		
Climatic category	25/70/21	25/70/21
Storage temperature	−40 °C +85 °C	−40 °C +85 °C
Soldering	260 °C – 5s	iron or flow
Cleaning	Brushing – no immersion	Sealed against immersion in solvents

* BBM: Break before make
MBB: Make before break

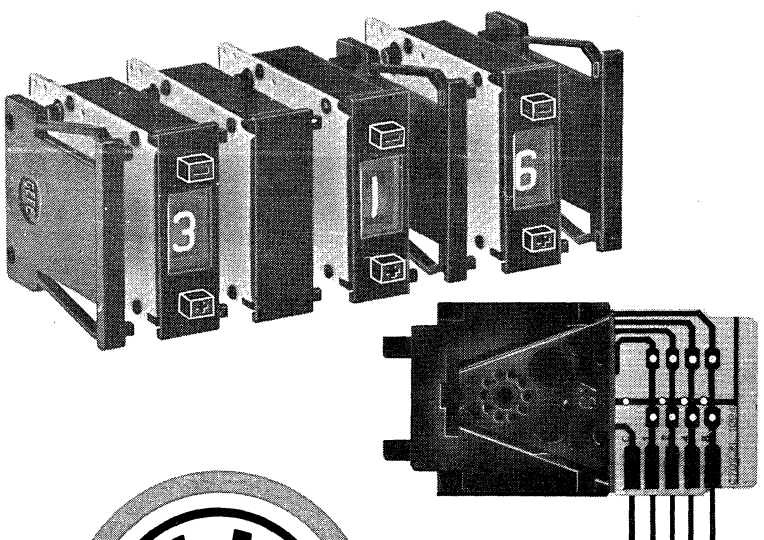


ITT Schadow Inc., 8081 Wallace Road, Eden Prairie, MN 55344 • 612/934-4400



The Alternative to Thumbwheels...

PUSHBUTTONS



- Protects against dirt and dust
- Larger figures
- All standard codes and specials
- 5 different sizes Front or Rear Mounting
- Long or short boards
- Special interlocking mount pins for snap together assembly.
- Directly interchangeable with most thumbwheel switches
- Options, pin termination, push on connectors, LED indicators, stop pins, spacers, blanks, CB with resistor or diodes, lights and colors

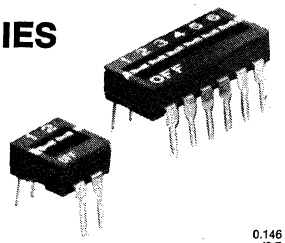
Free Engineering Sample and Specification Catalog

IVO Industries
P.O. Drawer 917
Eatontown, N.J. 07724
Telex 132-414

Call Toll-Free
1-800-932-0489
Ask for Dept. 100

JAE Electronics, Inc.
1901-A EAST CARNEGIE AVE., SANTA ANA, CA 92705 • 714/250-8770 • TELEX: 681-438 (JAE US) • **(800) JAE-PART (523-7278)**

MACHINE INSERTABLE SLIDE-DIP SWITCHES 51D SERIES

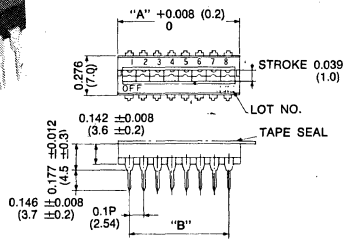


SPECIFICATIONS:

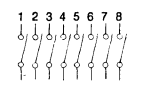
No. of stations: 02 ~ 10 • **Life:** 2000/pole, min. • **Operating force:** 300g (max.) • **Operating temperature range:** −25°C ~ +70°C • **Storage temperature range:** −40°C ~ +85°C • **Max. recommended non-switching load:** 100 mA at 50 VDC • **Max. recommended switching load:** 100 mA at 5 VDC • **Min. recommended switching load:** 10 μA at 5 VDC • **Dielectric withstanding voltage:** 500 VDC for one minute • **Insulation resistance:** 1000 meg ohms at 100 VDC • **Switch circuit resistance:** 50 milli ohm (Initial) • **Materials: Housing:** 15% GF. PBT94V-0; **Contact:** Phosphor bronze, gold over nickel; **Nob (Actuator):** Nylon 94HB • **Resistance to soldering heat:** Solder bath 260°C 10 sec., Hand solder 350°C 3 sec. • **Solderability:** 230°C 2 sec.

STATION	2	3	4	5	6	7	8	9	10
A	0.263 (6.68)	0.363 (9.22)	0.463 (11.76)	0.563 (14.30)	0.663 (16.84)	0.763 (19.38)	0.863 (21.92)	0.963 (24.46)	1.063 (27.00)
B	0.1 (2.54)	0.2 (5.08)	0.3 (7.62)	0.4 (10.16)	0.5 (12.70)	0.6 (15.24)	0.7 (17.78)	0.8 (20.32)	0.9 (22.86)

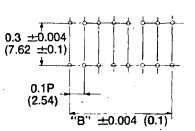
OUTLINE DIMENSIONS INCHES (mm)



CIRCUIT

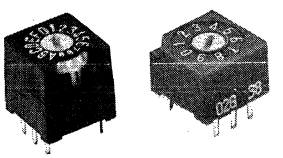


HOLE PATTERN



Tolerance in Inches (mm)
:x ±0.004 (0.1)
.xx±0.0020 (0.05)

ROTARY DIP SWITCHES 41J/42J SERIES



SPECIFICATIONS:

No. of switching positions: 10, 16 positions • **Life:** 10,000 detent operations min. • **Operating force:** 300 g-cm max. at rotor center • **Operating temperature range:** −10°C to +60°C • **Storage temperature range:** −25°C to +75°C • **Max. recommended non-switching load:** 100 mA at 50 VDC • **Max. recommended switching load** • 100 mA at 5 VDC • **Dielectric withstanding voltage:** • 200 Vrms for one minute • **Insulation resistance:** 1000 megohms min. • **Switch circuit resistance:** 100 milliohms max. (10 mA 5 VDC) • **Weight:** 1 gram (Approx.) • **Materials: Housing:** Nylon; **Contact:** Phosphor bronze, gold over nickel; **PC disk:** Glass epoxy, gold over nickel • **Dielectric withstanding voltage:** 250 Vrms for one minute • **Weight:** 0.9 gram (Approx.).

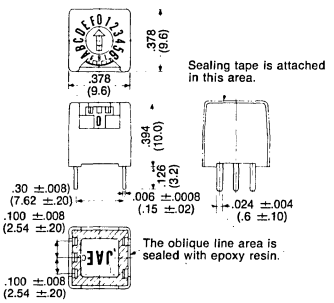
SWITCH MODEL No.:

Model No.	Code Description	Rotor Color	No. of Positions	Truth Table
41J02G	BCD 1-2-4-8	Orange	10	B02
41J12G	BCD 1-2-4-8 Complement	Yellow	10	C12
41J34G	Binary 1-2-4-8, 1 ~ 9, A ~ F Marking	Orange	16	B07
41J41G	Binary 1-2-4-8, 1 ~ 9, A ~ F, Marking Complement	Yellow	16	C16

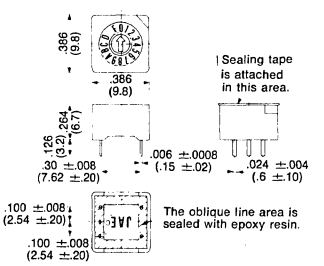
Model No.	Code Description	No. of Positions	Housing Color	Rotor Color	Truth Table
42J02G	BCD 1-2-4-8	10	Blue	Orange	B02
42J12G	Binary 1-2-4-8 Complement	10	Blue	Yellow	C12
42J34G	Binary 1-2-4-8	16	Black	Orange	B07
42J41G	BCD 1-2-4-8 Complement	16	Black	Yellow	C16

OUTLINE DIMENSIONS INCHES (mm)

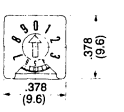
41J — 16 POSITION



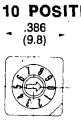
42J — 16 POSITION



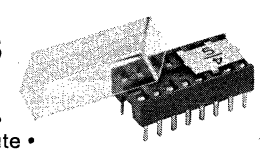
10 POSITION



10 POSITION



SET SWITCHES SR SERIES



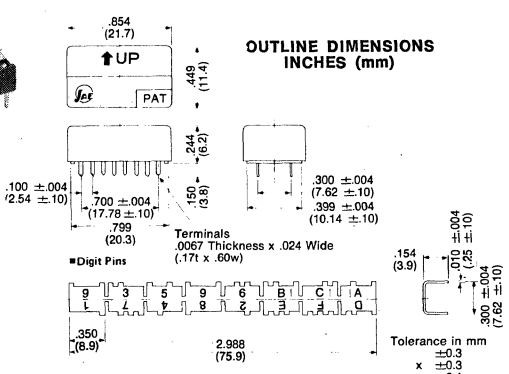
SPECIFICATIONS:

Max recommended switching load: 500 mA at 50 VDC • **Dielectric withstanding voltage:** 500 Vrms for one minute • **Insulation resistance:** 1000 megohms (500 VDC) • **Switch circuit resistance:** 100 milliohms max. (10 mA 5 VDC) • **Operating temperature range:** −30°C to +80°C. **Weight:** 2 grams (Approx.) • **Materials: Base:** Glass-filled polyester; **Dust cover:** Polycarbonate; **Contacts:** Phosphor bronze tin over nickel; **Digit pin:** Phosphor bronze, tin over nickel.

CODE:

Switch Base Code	SR-B16S	16-Pin IC Socket + Dust Cover
Digit Pins Code	SR-D8S	Digit Pins (Pair)

OUTLINE DIMENSIONS INCHES (mm)



Tolerance in mm
±0.3
x ±0.3
xx ±0.1

FOR COMPLETE ORDERING INFORMATION CONSULT FACTORY

JAE
1901-A EAST CARNEGIE AVE., SANTA ANA, CA 92705 • 714/250-8770 • TELEX: 681-438 (JAE US) • **(800) JAE-PART (523-7278)**
JAE Electronics, Inc.

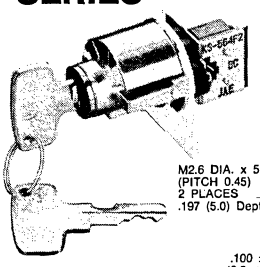
KEY-LOCK SWITCHES KS-X1 SERIES

SPECIFICATIONS:

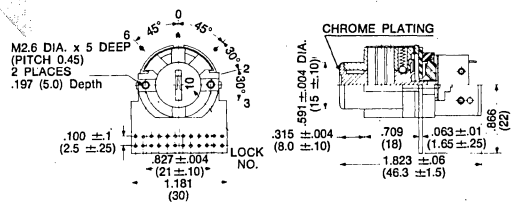
Mechanical life (Switching life): 20,000 operations min. • **Key rotation angle:** 5 kinds (V, W, X, Y, Z) • **Key removal and insertion positions:** Position 6, 0 and 1 • **Key removal and insertion force:** 0.5 kgs max. • **Key stop strength:** 10 kg-cm 15 sec. max. • **Low level switching:** 2 poles, 5 positions (non shorting) • **Rated current:** 0.1A max. at 30 VDC • **Contact resistance:** 0.2 ohm max. at 0.1A • **Dielectric withstanding voltage:** 300 VAC for 1 minute • **Micro Switch (power switching):** SPDT 3A max. at 125 VAC • **Weight:** 50 grams (Approx.).

STANDARD MODEL No.:

KSL-563G2-01AA	2K-01AA-X
2K-01AA-V	2K-01AA-Y
2K-01AA-W	2K-01AA-Z



OUTLINE DIMENSIONS INCHES (mm)



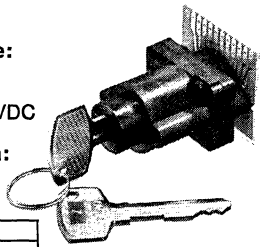
KEY-LOCK SWITCHES KS-X6 SERIES

SPECIFICATIONS:

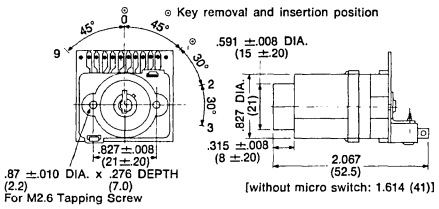
Mechanical life: 20,000 operations min. • **Key rotation angle:** 5 kinds (B0, A3, A2, A0, 00) • **Key removal and insertion positions:** Positions 0 and 1 • **Low level switching:** 2 poles, 5 positions (non shorting) • **Rated current:** 0.1A max. at 30 VDC • **Contact resistance:** 0.2 ohm max. at 0.1A • **Dielectric withstanding voltage:** 500 VDC (for 1 minute) • **Micro switch:** SPDT 3A max. at 125 VAC • **Weight** 20 grams (Approx.).

STANDARD MODEL No.:

KSL-693FA02-60J	2K-60J-A2 (X)
2K-60J-B0 (P)	2K-60J-A0 (Y)
2K-60J-A3 (OP)	2K-60J-00 (OW)



OUTLINE DIMENSIONS INCHES (mm)



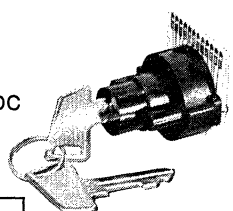
KEY-LOCK SWITCHES KS-X7 SERIES

SPECIFICATIONS:

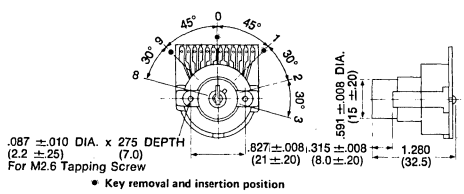
Mechanical life: 20,000 operations min. • **Key rotation angle:** 5 kinds (01, 03, 07, 15, 31) • **Key removal and insertion positions:** Position 0 and 1 • **Low level switching:** 2 poles, 6 positions (non shorting) • **Rated current:** 0.1A max. at 30 VDC • **Contact resistance:** 0.3 ohm max. at 0.1A • **Dielectric withstanding voltage:** 500 VDC for 1 minute • **Micro switch:** SPDT 3A max. at 125 VAC • **Weight: 15 grams** (Approx.).

STANDARD MODEL No.:

KSL-783FA02-71J	2K-71J-07 (X)
2K-71J-31 (REG)	2K-71J-03 (M)
2K-71J-15 (OP)	2K-71J-01 (OW)



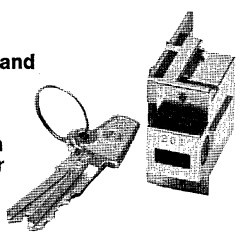
OUTLINE DIMENSIONS INCHES (mm)



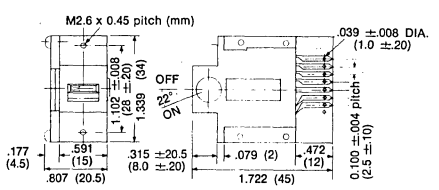
BCD KEY SWITCHES KS-CX1 SERIES

SPECIFICATIONS:

Mechanical life: 20,000 operations min. • **Number of key difference:** 3 max. • **Number of key kinds:** 16 • **Key removal and insertion position:** At switch-off position • **Operating force:** 0.8 ±0.3 kg-cm • **Operating temperature range:** −10°C to +60°C • **Storage temperature range:** −25°C to +70°C • **Max. recommended switching load:** 0.1A at 30 VDC • **Switch circuit resistance:** Max. 0.1 ohm (initial); Max. 0.2 ohm (after condition) • **Dielectric withstanding voltage:** 500 VDC for 1 minute • **Insulation resistance:** Min. 100 megohms • **Output:** 16 binary coded outputs • **Weight:** 40 grams (Approx.).



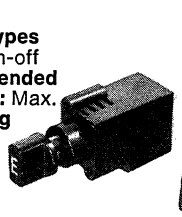
OUTLINE DIMENSIONS INCHES (mm)



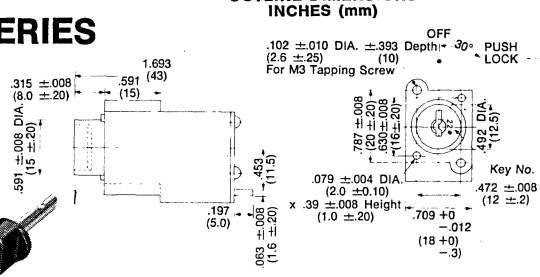
CLERK-KEY SWITCHES KS-CX2 SERIES

SPECIFICATIONS:

Mechanical life: 30,000 operations min. • **Number of key types available:** 4 • **Key removal and insertion position:** At switch-off position • **Operating force:** 500 g-cm max. • **Max. recommended switching load:** 0.1A at 30 VDC • **Switch circuit resistance:** Max. 0.2 ohm • **Output:** ON, OFF output • **Dielectric withstanding voltage:** 500 VDC for 1 minute • **Insulation resistance:** Min. 100 megohms • **Operating temperature range:** −10°C to +60°C • **Storage temperature range:** −25°C to +70°C • **Weight:** 20 grams (Approx.).



OUTLINE DIMENSIONS INCHES (mm)



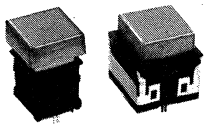
FOR COMPLETE ORDERING INFORMATION CONSULT FACTORY

JAE Electronics, Inc.
1901-A EAST CARNEGIE AVE., SANTA ANA, CA 92705 • 714/250-8770 • TELEX: 681-438 (JAE US) • (800) JAE-PART (523-7278)

LIGHTED PUSH-BUTTON SWITCHES 11/12L SERIES

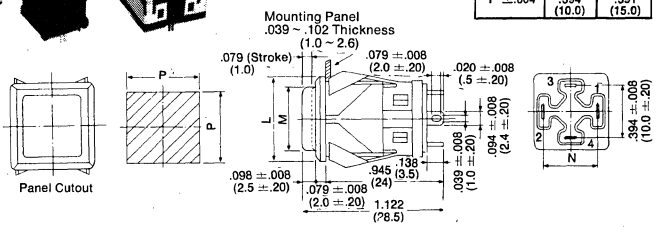
SPECIFICATIONS:

No. of switching positions: 1 SPST • **Life:** 500,000 cycles at rated load • **Electrical Ratings: Rated load:** 1 mA, 5 VDC (resistive load); **Max. switching load:** 1 mA at 20 VDC or 5 mA at 5 VDC • **Switch circuit resistance:** 200 ohms max. (100g force) • **Dielectric withstanding voltage:** 250 Vrms for 1 minute • **Insulation resistance:** 100 megohms min. at 100 VDC • **Operating temperature range:** −10°C to +70°C • **Lamp:** 5V 60 mA (standard) • **Push-button stroke:** 2mm • **Operating force:** 150 ±40g • **Materials: Housing:** Glass-filled nylon; **Top cover:** Polycarbonate; **Lamp:** T1 size; **Contact finish:** Gold; **Lamp terminal finish:** Silver.



Top Size	12	17
A	.610 (15.5)	.807 (20.5)
B	.591 (15.0)	.787 (20.0)
C	.472 (12.0)	.669 (17.0)
D	.559 (14.2)	.756 (19.2)
E	.433 (11.0)	.591 (15.0)
F ±.004	.394 (10.0)	.591 (15.0)

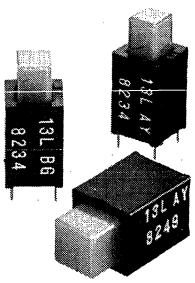
OUTLINE DIMENSIONS INCHES (mm)



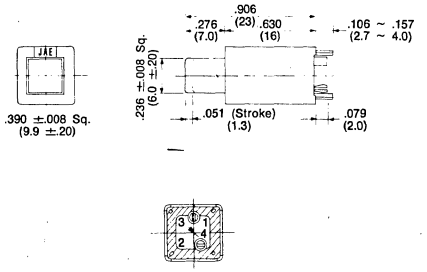
LIGHTED PUSH-BUTTON SWITCHES 13L SERIES

SPECIFICATIONS:

No. of switching positions: 1 SPST • **Life:** 300,000 cycles at rated load • **Electrical ratings: Rated load:** 1 mA, 5 VDC (resistive load); **Max. switching load:** 1 mA at 20 VDC or 5 mA at 5 VDC • **Switch circuit resistance:** 200 ohms max. (100g force) • **Dielectric withstanding voltage:** 250 Vrms for 1 minute • **Insulation resistance:** 100 megohms min. at 100 VDC • **Operating temperature range:** −10°C to +60°C • **Storage temperature range:** −25°C to +70°C • **Push-button stroke:** 1.3 ±0.3mm (0.55 ±0.01) • **Operating force:** 125 ±35g • **Materials: Housing:** Glass-filled nylon; **Top cover:** Polycarbonate; **Contact finish:** Gold; **LED terminal finish:** Tin.



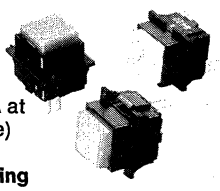
OUTLINE DIMENSIONS INCHES (mm)



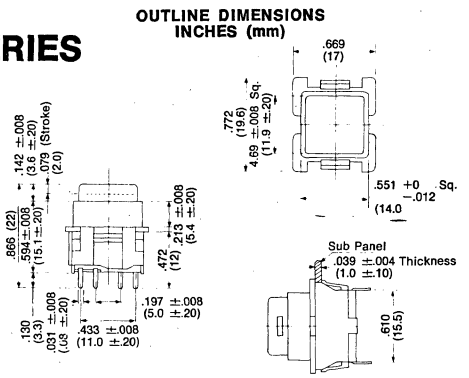
LIGHTED PUSH-BUTTON SWITCHES 15L SERIES

SPECIFICATIONS:

No. of switching positions: 1 SPST • **Life:** 500,000 cycles at rated load • **Electrical ratings: Rated load:** 1 mA, 50 VDC (resistive load); **Max. switching load:** 1 mA at 20 VDC or 5 mA at 5 VDC • **Switch circuit resistance:** 200 ohms max. (200g force) • **Dielectric withstanding voltage:** 250 Vrms for 1 minute • **Insulation resistance:** 100 megohms min. at 100 VDC • **Operating temperature range:** −10°C to +70°C • **Lamp:** 5V 60 mA (standard) • **Stroke:** 2mm (0.08) • **Operating force:** 180 ±50g • **Materials: Housing:** Glass-filled nylon (HB); **Top cover:** Polycarbonate; **Lamp:** T1 size valve; **Contact finish:** Gold; **Lamp terminal finish:** Gold.



OUTLINE DIMENSIONS INCHES (mm)

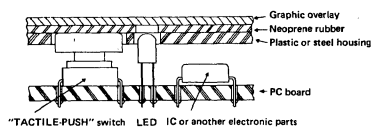


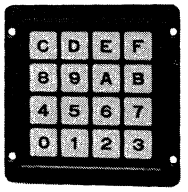
PANEL SWITCHES FP5 SERIES

SPECIFICATIONS:

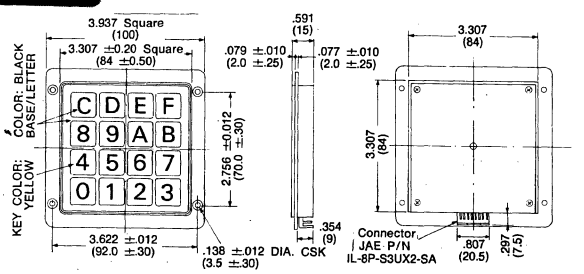
No. of switching positions: 1 SPST • **Life:** 1,000,000 cycles per key • **Contact ratings:** 300 mA, 12 VDC • **Contact resistance:** 1 ohm max. • **Contact bounce:** 4 millisecond max. • **Key travel:** 0.3 to 0.5mm (0.01 to 0.02) • **Key operating force:** 150 ±40g • **Insulation resistance:** 100 megohms min. at 100 VDC • **Dielectric withstanding voltage:** 250 Vrms for 1 minute • **Operating temperature range:** −30°C to +70°C • **Storage temperature range:** −40°C to +80°C.

STRUCTURE:





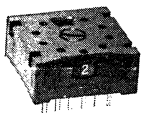
OUTLINE DIMENSIONS INCHES (mm)



FOR COMPLETE ORDERING INFORMATION CONSULT FACTORY

JAE
JAE Electronics, Inc.
1901-A EAST CARNEGIE AVE., SANTA ANA, CA 92705 • 714/250-8770 • TELEX: 681-438 (JAE US) • **(800) JAE-PART (523-7278)**

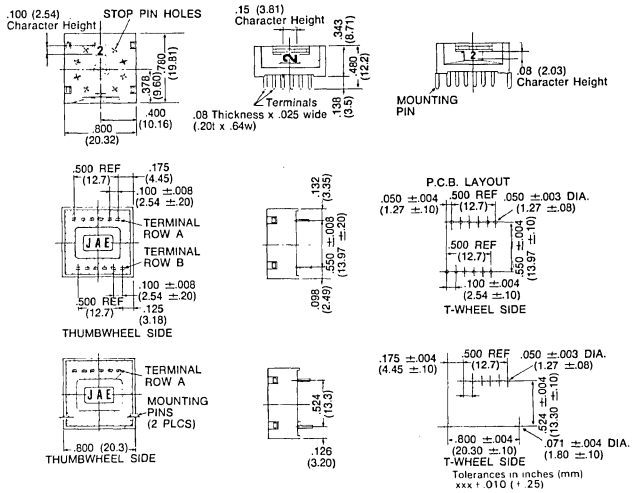
DIGITAL THUMBWHEEL SWITCHES 22J SERIES



SPECIFICATIONS:

No. of switching positions: 10 positions • **Life:** 250,000 detent • **Operating force:** 400g (max.) • **Operating temperature range:** −25°C to +70°C • **Storage temperature range:** −40C° to +100°C • **Dielectric withstanding voltage:** 500 Vrms for one minute • **Insulation resistance:** 1000 megohms (100 VDC) • **Switch circuit resistance:** 0.100 ohms max. initial; 0.200 ohms max. after life test • **Weight:** 3 grams (Approx.) • **Standard color:** Black • **Electrical ratings: Max. recommended non-switching load:** 3A at 28 VDC; **Max. recommended switching load:** 0.125A at 28 VDC; **Min. recommended switching load:** 10 μA at 0.020 VDC • **Materials: Housing:** Black nylon; **Metal contacts:** Phosphor bronze for spring, gold over nickel; **Circuit disk:** Glass, epoxy, gold over nickel; **Dummy pin:** Tin-plated phosphor bronze.

OUTLINE DIMENSIONS INCHES (mm)

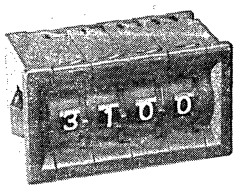


SWITCH MODEL No.:

Model No.	Code Description	Number of Positions
22J**01G	DECIMAL	10
22J**02G	BCD 1-2-4-8	10
22J**12G	BCD 1-2-4-8 Complement Only	10
22J**28G	BCD 1-2-4-8 with Complement	10
22J**56G	BCD 1-2-4-8 with Separate Common To Not True Bits	10
22J**11G	2 Pole Repeating + and −	10

** To complete model number, replace ** with Orientation Number.

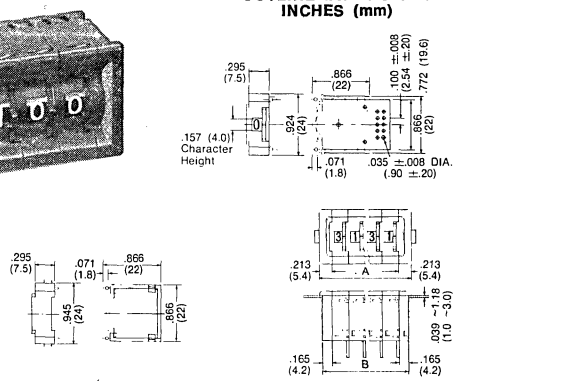
MINI DIGITAL THUMBWHEEL SWITCHES 31J SERIES



SPECIFICATIONS:

No. of switching positions: 10 positions • **Life:** 100,000 detent operations min. • **Dial revolving force:** 400g max. • **Operating temperature range:** −20°C to +60°C • **Storage temperature range:** −40°C to +85°C • **Max. recommended non-switching load:** 1A at 28 VDC • **Max. recommended switching load:** 100 mA at 28 VDC • **Dielectric withstanding voltage:** 500 Vrms for one minute • **Insulation resistance:** 1000 megohms min. at 100 VDC • **Switch circuit resistance:** 150 milliohms max. • **Weight:** 3 grams (Approx.) • **Materials: Housing:** Polyacetal, matte finish; **Contact:** Phosphor bronze, gold over nickel; **PC disk:** Glass epoxy, gold over nickel.

OUTLINE DIMENSIONS INCHES (mm)

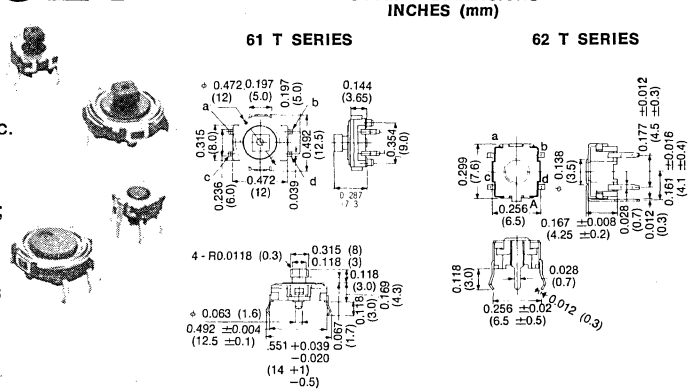


SWITCH MODEL No.:

Model No.	Code Description
31J02M	BCD 1-2-4-8
31J52M	BCD 1-2-4-8 for Mounting Diode
31J11M	1 Pole, Repeating + and −
31J05M	1 Pole, Repeating 0 and 5

TACTILE-PUSH SWITCHES 61/62T SERIES

OUTLINE DIMENSIONS INCHES (mm)



SPECIFICATIONS:

No. of switching positions: 62T Series: SPST Momentary • **Max. recommended switching load: 61T Series:** 30 mA at 12 VDC • **Min. recommended switching load:** 0.1 mA 5 VDC • **Contact bounce: 61T Series:** 4 msec. max.; **62T Series:** 10 msec. max. • **Contact resistance:** 100m ohms max. at 1 mA 5 VDC • **Insulation resistance:** 100 meg ohms min. at 250 VDC • **Dielectric withstanding voltage:** 250 Vrms for one minute • **Operating force/Stroke: 61T Series:** 140 ±30g/0.010 ~ 0.018; **62T Series:** 110 30g/0.010 ±0.004 • **Resistance to solder heat:** Solder bath 260°C 5 sec.; Hand solder 350°C 3 sec. • **Solderability:** Solder bath 230°C 2 sec.; Hand solder 230°C 6 sec. • **Shock: 61T Series:** 20G. 11 ms; **62T Series:** 50G. 11 ms • **Operating temperature range:** −25°C ~ +70°C • **Storage temperature range:** −40°C ~ +80°C • **Life: 61T Series:** 1.000.000; **62T Series:** 300.000 • **Materials: Contact:** Phosphor bronze, silver; **Pusher:** 15% GF PBT; **Housing:** 15% GF PBT.

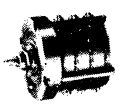
FOR COMPLETE ORDERING INFORMATION CONSULT FACTORY

Series "A" Miniature Rotary Selector Switches

QPL MIL-S-3786

- TOTALLY ENCLOSED
- EXPLOSION PROOF

Series A-15 — 15°

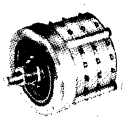


Max. Positions: 24
Body Diameter: 2″

ELECTRICAL RATING:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.

A15-1 Series 1 pole/deck
A15-2 Series 2 pole/deck
A15-3 Series 3 pole/deck
A15-4 Series 4 pole/deck
A15-6 Series 6 pole/deck

Series A-20 — 20°

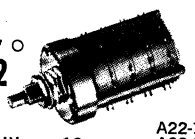


Max. Positions: 18
Body Diameter: 2″

ELECTRICAL RATING:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.

Available only in single pole per deck construction.

Series A-22 — 22½°

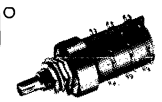


Max. Positions: 16
Body Diameter: 1.5″

ELECTRICAL RATING:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.

A22-1 Series 1 pole/deck
A22-2 Series 2 pole/deck
A22-4 Series 4 pole/deck

Series A-30 — 30°



Max. Positions: 12
Body Diameter: 1.036″

ELECTRICAL RATING:
2 amps 115 v ac Res.
1 amp 28 v dc Res.
0.5 amp 28 v dc Ind.

A30-1 Series 1 pole/deck
A30-2 Series 2 pole/deck
A30-3 Series 3 pole/deck
A30-4 Series 4 pole/deck
A30-6 Series 6 pole/deck

"M" Series
See MIL-S-3786/4

Series A-36 — 36°

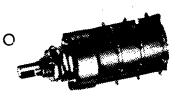
Max. Positions: 10
Body Diameter: 1.036″

ELECTRICAL RATING:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.

A36-1 Series 1 pole/deck
A36-2 Series 2 pole/deck

"M" Series
See MIL-S-3786/4

Series A-45 — 45°



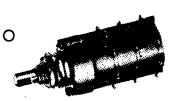
Max. Positions: 8
Body Diameter: 1.036″

ELECTRICAL RATING:
5 amps 115 v ac Res.
5 amps 28 v dc Res.
2.5 amps 28 v dc Ind.

A45-1 Series 1 pole/deck
A45-2 Series 2 pole/deck

"M" Series
See MIL-S-3786/4

Series A-60 — 60°

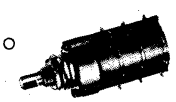


Max. Positions: 6
Body Diameter: 1.036″

ELECTRICAL RATING:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.

Available only in single pole per deck construction.
"M" Series See MIL-S-3786/4

Series A-90 — 90°

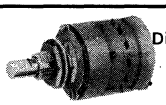


Max. Positions: 4
Body Diameter: 1.036″

ELECTRICAL RATING:
5 amps 115 v ac Res.
5 amps 28 v dc Res.
2.5 amps 28 v dc Ind.

Available only in single pole per deck construction.
"M" Series See MIL-S-3786/4

Series AA30 — 30° / AA36 — 36° / AA45 — 45°



Directly interchangeable with "A" Series above.

ADJUSTABLE STOPS

Max. Positions: AA30-12 AA36-10 AA45-8
Body Dia.: 1.036″ Meets MIL-S-3786

JANCO CORPORATION

Series "B" Micro-Miniature Rotary Selector Switches

QPL MIL-S-3786

- TOTALLY ENCLOSED
- EXPLOSION PROOF
- UNITIZED CONSTRUCTION

All switches offer maximum protection against radio frequency interference.

Body Diameter: .623″

Electrical Rating Continuous:
8 amps at 28 v dc

Switching Rate:
0 to 0.25 amp resistive
0 to 28 v dc
0 to 0.25 amp resistive
0 to 115 v ac
0 to 0.12 amp inductive
0 to 28 v dc

Torque: 5 to 9″ ounces

Contact Resistance:
.005 ohms average

Insulation Resistance:
100,000 megohms minimum at 100 volts
10,000 megohms minimum at 500 volts

Designed and Built to meet the environmental and functional requirements of MIL-S-3786

Series B-30 — 30°

Max. Positions: 12
Body Diameter: .623″

B30-1 Series 1 pole/deck
B30-2 Series 2 pole/deck
B30-3 Series 3 pole/deck

"M" Series
See MIL-S-3786/13

Series B-36 — 36°

Max. Positions: 10
Body Diameter: .623″

B36-1 Series 1 pole/deck
B36-2 Series 2 pole/deck

"M" Series
See MIL-S-3786/13

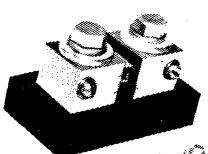
Series B-45 — 45°

Max. Positions: 8
Body Diameter: .623″

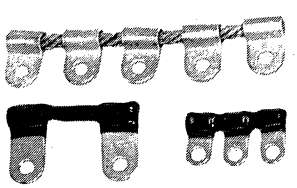
B45-1 Series 1 pole/deck
B45-2 Series 2 pole/deck

"M" Series
See MIL-S-3786/13

ELECTRICAL HARDWARE PRODUCTS FOR AIRCRAFT

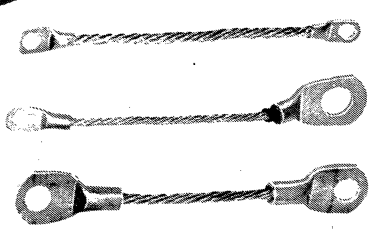


EXTERNAL AMMETER SHUNTS MIL-S-61-B



FLEXIBLE BUS ASSEMBLIES

BUS BARS

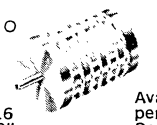


BONDING JUMPERS

JANCO CORPORATION
Box 3038 • 3111 Winona Ave., Burbank, CA 91504 • (818) 846-1800 • TWX 910-498-2701

Series "C" Rotary Selector Switches

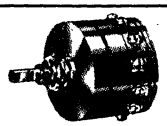
Series C-22 — 22½°



Max. Positions: 16
Body Diameter: 3″

ELECTRICAL RATING:
10 amps 115 v ac Res.
10 amps 28 v dc Res.
6 amps 28 v dc Ind.
Available only in single pole per deck construction.
Screw terminals only.

Series C-30 — 30°



Max. Positions: 11 plus off
Body Diameter: 2.180″

ELECTRICAL RATING:
10 amps 115 v ac Res.
10 amps 28 v dc Res.
5 amps 28 v dc Ind.
C30-1 Series 1 pole/deck
C30-3 Series 3 pole/deck
Screw terminals only.

Series C-36 — 36°

Max. Positions: 9 plus off
Body Diameter: 2.375″

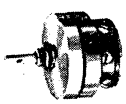
ELECTRICAL RATING:
10 amps 115 v ac Res.
10 amps 28 v dc Res.
5 amps 28 v dc Ind.
Available only in single pole per deck construction.
Screw terminals only.

Series C-45 — 45°

Max. Positions: 7 plus off
Body Diameter: 1.93″

ELECTRICAL RATING:
10 amps 115 v ac Res.
10 amps 28 v dc Res.
5 amps 28 v dc Ind.
C45-1 Series 1 pole/deck
C45-2 Series 2 pole/deck
Screw terminals only.

Series C-90 — 90°



Max. Positions: 4
Body Diameter: 2.12″
Screw terminals only.

ELECTRICAL RATING:
1 pole construction:
15 amps Res. 115 v ac
15 amps Res. 28 v dc
10 amps Ind. 28 v dc
2 pole construction
7.5 amps Res. 115 v ac
7.5 amps Res. 28 v dc
5 amps Ind. 28 v dc
C90-1 Series 1pole/deck
C90-2 Series 2 pole/deck

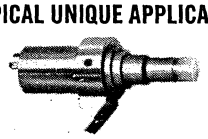
GENERAL SPECIFICATIONS

All switches offer maximum protection against radio frequency interference.
ELECTRICAL RATING:
Carry 10 amps continuous.
Make and Break — see individual switch data.
VOLTAGE DROP:
0.1 volt or less at rated amperage.
Initial Contact Resistance: .003 ohm.
LIFE:
10,000 double cycles make and break rated amperage.
TORQUE:
1 to 3 inch lbs.
SWITCHES DESIGNED AND BUILT IN ACCORDANCE WITH THE FOLLOWING SPECS.:
MIL-S-6807 (rotary switches enclosed)
MIL-S-3786 (rotary switches)
MIL-E-5272 (environmental testing)

ON MOST OF THE SWITCHES LISTED, THE FOLLOWING FEATURES ARE AVAILABLE:

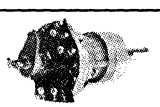
- O-ring Shaft and Panel Seal
- Combination of Decks
- Bridging contacts
- Momentary positions
- Isolated positions
- Adjustable stops
- Solenoid driven
- Keylock
- Gang switches
- Concentric shaft switches

TYPICAL UNIQUE APPLICATIONS OF JANCO ROTARY SWITCHES



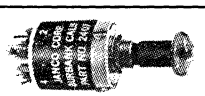
DOUBLE MOMENTARY ACTION
Push button switch designed for grip stick applications. Actuation to first momentary detented position closes first circuit. Second detented position completes second circuit.

FEATURES UNIQUE ON-OFF OPERATION
Actuated by pulling knob out and rotating to "on" positions. While in "on" positions, circuitry cannot be shut off until knob is returned to "off" position and depressed.



MASTER COMMUNICATIONS SWITCH
Provides standard coded outputs and offers unique switching functions by longitudinal shaft movement. Momentary or maintained contact positions actuated by pulling shaft.

JET ENGINE START SWITCH
Knob is depressed and contacts are held in by the solenoid. After jet engine reaches desired RPM, system removes power disengaging solenoid. Lighted knob indicates function.



JANCO CORPORATION — Since 1947

Series "D" Pushbutton Rotary Switches
QPL MIL-S-22710

FEATURES: • Totally enclosed, explosion proof. • Printed-circuit construction. • Black or white numbers on black or white background indicate switch positions (black numbers on white background for lighted switches). • All standard codes available. Available in 8, 10, 12 or 16 positions. • Plastic covered buttons, available in black, red, green, yellow, white or blue.

Series	Indexing	No. of Positions
D45U	45°	8
D36U	36°	10
D30U	30°	12
D22B D22U	22½°	16
D45B	45°	8
D36B	36°	10
D30B	30°	12
DA45U	45°	8
DA36U	36°	10
DA30U	30°	12

MAKE AND BREAK
.125 amp res. at 28 v dc and 115 v ac
.05 amp ind. at 28 vdc

PUSH FORCE:
55 oz. max.

CONTACT RESISTANCE:
Initial .100 ohms
After life .160 ohms

LIFE:
50,000 cycles
Cycle consists of 720° rotation

INSULATION RESISTANCE:
5,000 megohms

ALTITUDE:
70,000 ft.

TEMPERATURE RANGE:
−65°C to +85°C

PLUNGER TRAVEL:
.180 approx.

DIELECTRIC STRENGTH:
750 volts RMS

WEIGHT:
½ oz. approx.

Series "E" Rotary Selector Switches PRINTED CIRCUIT

Series	Indexing	No. of Positions
MINIATURE EA45	45°	8
EA36	36°	10
EA30	30°	12
EA22	22°	16
MICRO-MINIATURE EB45	45°	8
EB36	36°	10
EB30	30°	12
MINIATURE EC45	45°	8
EC36	36°	10
EC30	30°	12
EC22	22°	16
EC18	18°	20
EC15	15°	24

- Totally enclosed, explosion proof.
- Printed circuit construction.
- Make and break:
  .125 amp Res. @ 28 v dc
  .125 amp Res. @ 115 v ac
  .05 amp Ind. @ 28 v dc
- All standard codes available.
- Current carrying capacity, 3 amps continuous.
- Will meet or exceed the environmental requirements of MIL-S-3786 and MIL-S-22710.

JANCO CORPORATION
Box 3038 • 3111 Winona Ave., Burbank, CA 91504 • (818) 846-1800 • TWX 910-498-2701

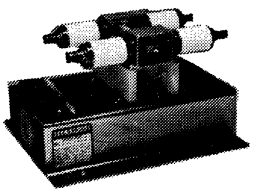
Vacuum Contactors

Vacuum Contactors are used to control large amounts of DC power and RF currents with ratings up to 50 kv and currents up to 600 Amperes continuous. These contactors are recommended wherever high voltage capability, small size, and high speed operation with a long and low maintenance life are important. Applications include primary control of power supplies, industrial motors, and induction heating equipment, RF system tap changing, and fault protection of high power transmitters. The 16 page catalog provides complete specifications with a variety of specific applications for 3-pole, high voltage AC and DC, RF contactors and overcurrent relays actuated by solenoid, air or motor drives.

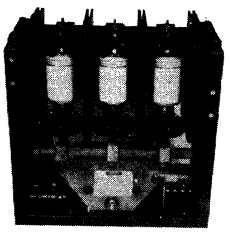
SEND FOR CATALOG C003.

RP101, 103

RP900-901



RT22



RP133, RP173

RP157

GENERAL PURPOSE

Model Number	Operate Voltage (Pk KV)	Continuous Current (Amps)	Max. Interrupt AC Current (Amps RMS)	Capacitor Discharge Decaying to 0 in 200 μS	Contact Arrangement	Actuator Voltage (Volts)	Time to Close (Ms)	Break Time (Ms)	Weight (Lbs.)
RP101F4903D21B20 RP101F4904D21B20	30	200 DC	N/A	N/A	N/O N/C	115 60 Hz	60	50	15
RP101F4304D26B20	30	200 DC	N/A	N/A	N/C	100 DC	55	42	10
RP103F4304D26B20		200 RMS	2000	N/A					
RP103F4903D21B20 RP103F4904W21B20	30	200 RMS	2000	50 K Amps	N/O N/C	115 60 Hz	60 30	50 60	10
RP901K4903D21B30 RP901K4904D21B30	50	400 DC	N/A	100 K Amps	N/O N/C	115 60 Hz	60 30	50 60	20
RP900K4601D26B30 RP900K4602D26B30	50	400 DC	4000	100 K Amps	N/O N/C	100 DC	34 27	11 17	15
RP900K4903D21B30 RP900K4904D21B30	50	400 RMS	4000 at 13 KV RMS	100 K Amps	N/O N/C	115 60 Hz	60 50	50 60	20
RT1G4201C22A10 RT1G4202C21A10	20	100	500	N/A	N/O N/C	230 AC 115 VAC 50/60	60 60	25 30	4
RT5C4202A21A10	15	30	100	N/A	N/C	115 AC	60	30	3

RF

Unit	Pk Operate Voltage 32 MHz	Contact Current 32 MHz RMS	Contact Resistance Ohms Max.	Contact Capacitance pF	Contact Inductance Nh	Contact Arrangement	Open Time	Close Time	Pull-in Current RMS	Hold Current RMS	Hold Power Watts	Actuating Voltage or Air Pressure	Approx. Weight	Life	Auxiliary Contacts Ratings Volt RMS Current RMS
RT224070A31NB (Solenoid Operated)	5*	25	.0005	2.5	n/a	Latching	<300 Ms.	<300 Ms.	.3	n/a	n/a	230 VAC	12 lbs.	2.5×10^5	Form C 230/15
RP233D1585 (Air Operated)	25	35	.0005	2	25	N/O	<200 Ms.	<200 Ms.	n/a	n/a	n/a	40 ±5 psig	13 oz.	1×10^5	n/a

*Higher voltage ratings available at lower frequencies.

3-PHASE

Model Number	Operate Voltage V (RMS)	Continuous Current 60 Hz	Interrupt Current Amps RMS	Mechanical Life (Min.)	Actuator Voltage	Approx. Pull-in Current Amps Max.	Approx. Hold Current Amps Max.	Interrupt Time	Auxiliary Contacts	Approx. Weight
RP151B4541X46R20	600	250	2000	2.5×10^5	26.5 VDC 100 VDC	4.6 1.7	.5 .07	Less than 2 Cycles	DPDT 115/230 VAC	16 lbs.
RP1574549X41TX0 (60 Hz) RP1574549X4KTX0 (50 Hz)	1500	300	3000	1×10^6	115 VAC	15	1.5	Less than 2 Cycles	4 PDT 230 VAC	25 lbs.
RP1574544X44TX0 RP1574544X45TX0 RP1574544X46TX0	1500	300	3000	2.5×10^5	26.5 VDC 48 VDC 100 VDC	24.4 11.3 5.9	.30 .14 .08	Less than 2 Cycles	4 PDT 230 VAC	25 lbs.
RP173-2310-00	7200	450	6000	1×10^6	115 VAC 50/60 110 VDC	3.5	.5	Less than 2 Cycles	3 N/O, 2 N/C	67 lbs.
RP133-2332-00	1500	450	4500	1×10^6	115 VAC* 50/60 110 VDC	3.5	.5	Less than 2 Cylces	3 N/O, 2 N/C	30 lbs.

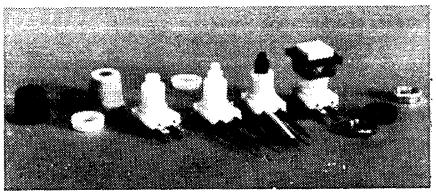
NOTE — * 230 VAC OPERATION AVAILABLE ON SPECIAL ORDER

JENNINGS

970 McLaughlin Avenue • Department EM • San Jose, CA 95122 • (408) 292-4025

JUD·CO MANUFACTURING INC.
P.O. BOX 487-E84 24030 FRAMPTON AVENUE, HARBOR CITY, CALIF. 90710 (213) 534-0959

PUSHBUTTON SWITCHES



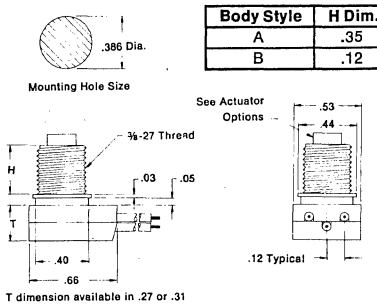
Presenting a varied line of smooth operating and low cost miniature pushbutton switches that will fit most any electrical/electronic applications. Numerous styles and colors of button caps, insulating boots, mounting nuts and related hardware are also available.
Contact materials can also be tailored to meet applications demands.
Consult JUDCO for assistance to meet your specific requirements.

ELECTRICAL RATINGS: 125 VAC 3 Amps Inductive 2A-L, 14 VDC 4 Amps. (UL File No. E70679, Switch Codes 1, 2 & 3 only). Other ratings are also available.
Dielectric Strength: 1000 VRMS

ELECTRICAL LIFE: Tested to suit requirements. **MECHANICAL LIFE:** 250,000 cycles.

SWITCH BODY STYLES

Body Style	H Dim.
A	.35
B	.12



Note: All dimensions in inches.

SWITCH FUNCTIONS

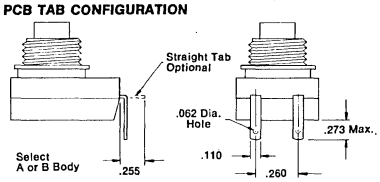
Code	Description
1	On-Off SPST
2	Normally Open
2S	Normally Open (Overtravel)
3	Normally Closed
4	On-On SPDT
5	3 Way (Off-On 1-Off-On 2)
6	Normally Open, Normally Closed
7	4-Way (On 1-On 1 & 2-On 2)

Molded Materials (Body & Actuator)
Acetal, Polyester, Nylon or others. Consult JUDCO.
Standard Colors:
Body: Black/White
Actuator: Black/White/Red
Consult JUDCO for other colors.

TERMINALS & LEADS

- Wire leads. Specify wire size (#22 thru #18 AWG), colors, length and strip.
- PCB solder tabs/quick connects.
- Consult JUDCO for other terminal requirements.

PCB TAB CONFIGURATION



ACTUATOR STYLES

Style	Fig.	Body	D Dia.	L1	L2
P1	1	A	—	.17	—
		B	—	.14	—
P2	1	A	—	.28	—
		B	—	—	—
P3	2	A	.120	—	.30
		B	.120	—	.26
P4	2	A	.183	—	.28
		B	.183	—	.27

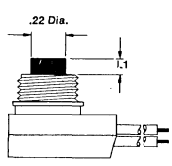


FIG. 1

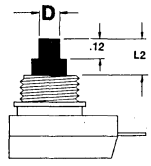
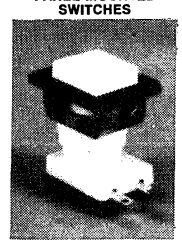
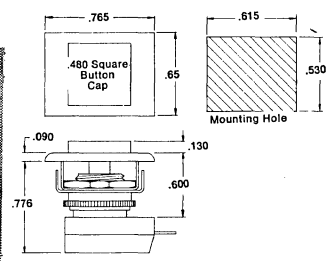


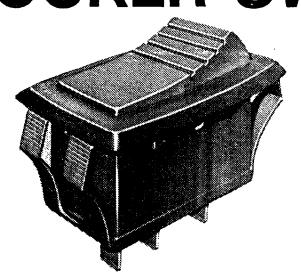
FIG. 2

SNAP-IN PANEL MOUNTED SWITCHES





ROCKER SWITCHES



A line of highly versatile and low cost snap-in mounted rocker switches. Possible applications include automotive, appliances, games & toys, instrumentation, motors, power tools, audio components and other electrical/electronic switching needs. Housing and actuators are molded of UL 94V-2 nylon.

ELECTRICAL RATINGS: Up to 16A at 125VAC, 10A at 250VAC and 8A Tungsten Filament Load at 125VAC. DC and other ratings also available.
Dielectric Withstand Voltage: 1500 VRMS.
Insulation Resistance: 1000 Megohms

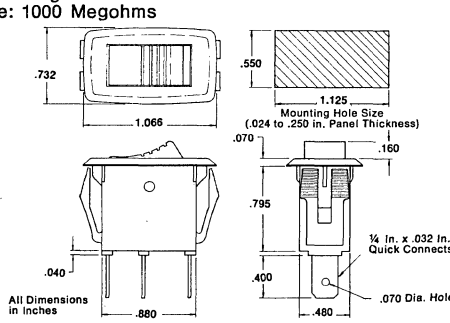
SWITCH FUNCTIONS

NON-LIGHTED SWITCHES

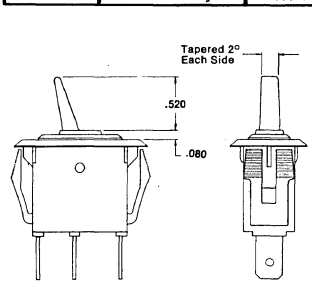
SPST	2 Positions	On	Off
SPDT	2 Positions	On	On
SPDT	3 Positions	On	Off On
SPST	Momentary	Normally On	
SPST	Momentary	Normally Off	

LIGHTED SWITCHES

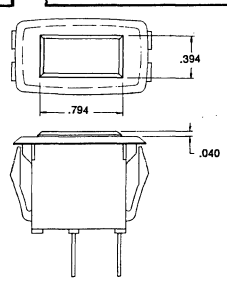
SPST	2 Positions	On	Off
SPST	Momentary	Normally On	
Lamp Voltages: Incandescent 6V, 12V or 28V Neon 125 or 250V			



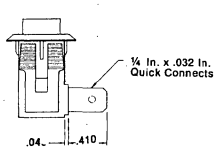
STANDARD CONFIGURATION



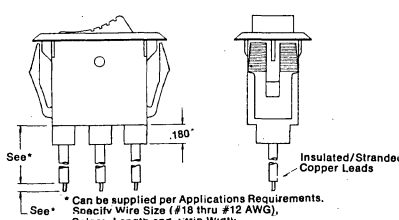
TOGGLE ACTUATOR



INDICATOR LIGHT



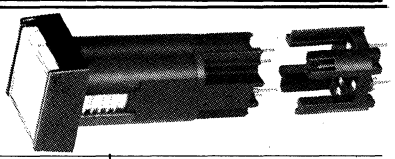
SIDE TERMINALS



LEAD TERMINALS

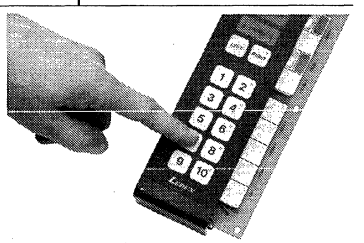
Series 75 Switches by Rafi*

Also available in watertight version.



Switch	Series 75-SL	Series 75-SL (watertight)	Series 75-PC	Series 75-PC (watertight)
Housing with bezel	Makrolon	Durethan BKV	Makrolon	Durethan BKV
Contact enclosure	Thermosetting plastic	Thermosetting plastic	Durethan BKV	Thermosetting plastic
Outer lens	Makrolon	Makrolon	Makrolon	Makrolon
Key lock	Cylinder lock with 4 operating positions and 3 keys		Cylinder lock with 4 operating positions and 3 keys	
Operating stroke	2.5 mm (.1")	2.5 mm (.1")	2.5 mm (.1")	2.5 mm (.1")
Operating force	3 to 5 N (10.8 oz. to 18 oz.) max.	3 to 6.5 N (650p) (10.8 to 23.4 oz.)	3 N (10.8 oz.)	3 N (10.8 oz.)
Contacts	Spring-loaded silver contacts, non-shorting		Self-cleaning bridging contact, 5μ gold plated	Self-cleaning bridging contact, 8μ gold plated
Life (mechanical)	Momentary >2 x 10^6 Push-Push >1 x 10^6		Momentary >2 x 10^7 Push-Push >1 x 10^6	
Switching	4 amps at 250 VAC		250 mA @ 50 VAC or DC	
Weight	.53 oz. max. (lockable latching pushbutton 1.4 oz. max.)		.53 oz. max.	

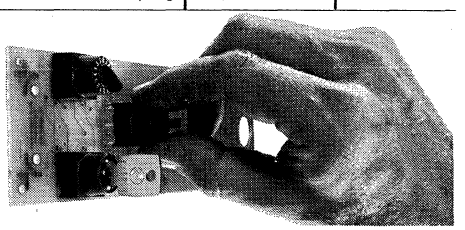
For detailed specifications, order Catalog PB-5507.



Series RF 15/19 Flat Panel Switches by Rafi*

Housing	Actuator Cap	Reflector	Lens	Spring Contact	Fixed Contact	Voltage max.	Current max.
PBT (Pocan)	Polycarbonate (Makrolon)	PBT (Pocan)	PMMA (Resarit)	Au Model X 12 Cr Ni 177 1.5 μ Au (contact material); Connection material 4... 8 μ Sn Pb 60/40; Ag model X 12 Cr Ni 177 5 μ Ag (contact material); Connection material 4... 8 μ Ag	Cu Zn 28 F 43, 2 μ Ni, μ Au (contact material); Connection material 4... 8 μ Sn Pb 60/40; Ag Model Cu Zn 28 F 43, 2 μ Ni, 5 μ Au (contact material), Connection material 0.5 μ Ag	42 V=Au 60 V Ag	100 mA=Au 250 mA Ag

For further information, order Catalog 1519.



Series 74/76 Switches by Rafi*

Type	Housing	Base	Terminals	Contact	Load max.	Operating positions	Lock	Locking positions	Life
Rotary	Novodur	Pocan B 3235	(for PC board) 0.5x0.7mm (.020x.028") 0.15x0.7mm (.006x.028")	> 5μ Au Ag 10 on nickel	42 V 100 mA	max. 4			50,000 operations
Binary Selector	Novodur	Pocan B 3235	(for PC board) 0.8x0.2mm (0.031x.008")	> 5μ Au Ag 26 Ni 3 self cleaning	42 V 100 mA	16			10,000 operations
Keylock	Novodur	Pocan B 3235	(for PC board) 0.5x0.7mm (.020x.028") 0.15x0.7mm (.006x.028")	50 m Ω silver 40 m Ω gold	42 V 100 mA	max. 4	cyl. key with pin tumblers and 2 keys	3 std.	50,000 operations

For further information, write for Bulletins 74/76.

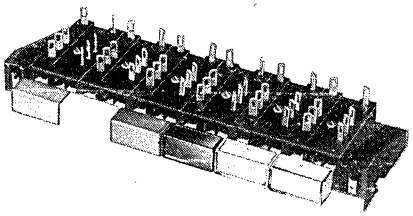
LEDEX®

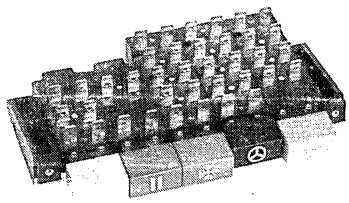
Ledex Inc.
P.O. Box 427
Vandalia, Ohio 45377-0427 U.S.A.

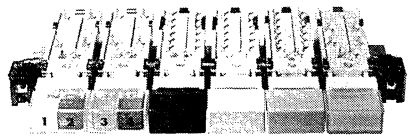
Phone: 513-898-3621
TWX: 810-450-2526
Telex: 28-8228

*Licensee rights by Rafi of West Germany

Pushbutton Switches by Rafi*



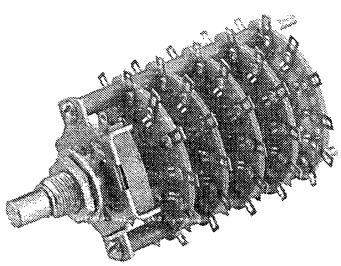




Series	Cap Size	Legend	Function	Cap Colors	Switching per module	Module capacity	Rating	Contact material	Terminals	Illumination
1400	⅜" x ¾" ¾" x ¾"	Hot stamp Engraved Film inserts	Momentary Push/push Reciprocal release Master release Reciprocal + master release Interlock	Red, yellow, green, blue, black, gray, white, clear	2P 2T Non-shorting	1-20 per frame	4A/125 VAC 2A/250 VAC	Silver (std.) Gold (opt.)	Solder or PC	6,12,24V lamps
1500	.49" x .97"	Hot stamp Engraved	Momentary Push/push Reciprocal release Master release Reciprocal + master release Interlock	Red, yellow, green, blue, black, gray, white, clear	1NO 3NC thru 4NO 1NC Non-shorting	1-15 per frame	16A/250 VAC	Silver plated Brass	Spade	Nonilluminated
1800	⅜" x ¾"	Hot stamp Engraved Film inserts	Momentary Push/push Reciprocal release Master release Reciprocal + master release Interlock	Red, yellow, green, blue, black, gray, white, clear, split screens	Lo-level to 4P 2T Hi-level to 1NO 2NC	1-20 per frame	10mA/5 VDC 6A/250 VAC	Silver plated Brass	Solder or PC	2,12,24V lamps Single or dual

For more information, write for Bulletins PB-5501, PB-5503, and PB-5505.

Rotary Manual Switches



Series	206	208	210	212	304	306	312	404	406	412	504	506	512	524
Poles – throws per deck	6P60°T	8P45°T	10P36°T	12P30°T	4P90°T	6P60°T	12P30°T	4P90°T	6P60°T	12P30°T	4P90°T	6P60°T	12P30°T	24P15°T
Combinations	6	4	5	6	2	6	6	2	6	7	2	6	7	8
Contact ratings	Brass, Silver plated		Solid Silver		Brass, Silver plated			Solid Silver						
Make/break	.5A/28VDC .25/110VAC		1A/28VDC .5A/110VAC		1A/28VDC .5A/110VAC			2A/28VDC 1A/110VAC						
Carry	5A		5A		5A			5A						
Dielectric	750 volts, contact to contact				1000 volts, contact to contact 500 volts when contacts are insulated back to back									

For more information, write for Catalog MS-5200.

LEDEX®

Ledex Inc.
P.O. Box 427
Vandalia, Ohio 45377-0427 U.S.A.

Phone: 513-898-3621
TWX: 810-450-2526
Telex: 28-8228

*Licensee rights by Rafi of West Germany

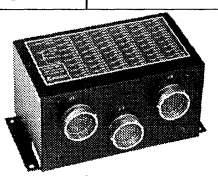
Stepping Switches (Stock Models)

Specifications

Electrical positions	4	6	8	10	10	12	12
Poles—throws per deck	3P4T	2P6T	3P8T	1P10T	2P10T	1P12T	1P12T
No. of load decks	4	5	2	7	4	5	9
Control deck Additional circuit on control deck	notch 1P4T	notch 1P6T	notch 1P8T	notch	notch	notch	notch
Total Circuitry	13P4T	11P6T	7P8T	7P10T	8P10T	5P12T	9P12T
Carry amperes, res. max.	5	5	5	5	5	5	10
Break amp. res. max @ 28 VDC (@120 VDC)	2.5 (0.5)	2.5 (0.5)	2.5 (0.5)	2.5 (0.5)	2.5 (0.5)	2.5 (0.5)	5 (1)
Dielectric, clip-to-clip, VRMS Insulated back-to-back clips	1000 500	1000 500	1000 500	1000 500	1000 500	1000 500	1000 500
Coil to case dielectric	1200 VRMS	1200 VRMS	1200 VRMS	1200 VRMS	1200 VRMS	1000 VRMS	1200 VRMS
Weight	6 oz.	6½ oz.	1 lb. 4 oz.	1 lb. 5 oz.	1 lb. 4½ oz.	7 oz.	1 lb. 4 oz.

For more information, write for Catalog S-2001.

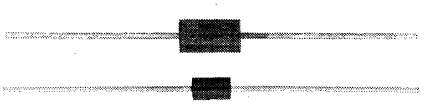
Packaged Switches (Stock Models)

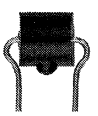


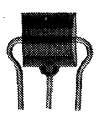
Poles—throws per deck	5P2T	13P2T	18P2T	22P2T	26P2T	35P2T	40P2T
Operating Voltage	28 VDC	28 VDC	28 VDC	28 VDC	28 VDC	28 VDC	28 VDC
Current @ rated coil voltage	2.5 amps	2.5 amps	3.5 amps	3.5 amps	4.9 amps	5 amps	3.6 amps
Coil Duty Cycle	1/10	1/10	1/10	1/10	1/10	1/10	1/4
Dielectric strength (VRMS) coil	1000	1000	1200	1200	1200	1200	1200
Coil resistance @ 20°C (Ohms ±5%)	11.03	11.03	8.02	8.02	5.67	5.67	7.72
Dielectric strengths (VRMS) decks	500	500	500	500	1000	500	500
Circuit deck ratings Carry amps resistive, max. Break amps, resistive, @ 28 VDC (@ 120 VAC)	 5 1 (.5)	 5 1 (.5)	 5 2 (1)	 5 2 (1)	 5 2 (1)	 5 2 (1)	 5 2 (1)
Weight	10 oz. max.	1 lb. max.	1 lb. 8 oz. max.	1 lb. 15 oz. max.	2 lb. 14 oz. max.	2 lb. 8 oz. max.	3 lb. 8 oz. max.

For more information, write for Catalog PS-3200.

Lucas Surge Suppressors







Series Data

Specific Device Data

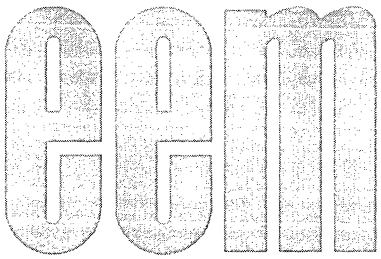
Device Series	V_{BR} range (V)	P_{RSM} max. for t_p=0.7ms (kW)	I_R max. @ V_{RSO} (μA)	Device	V_{BR} typ. (V)	V_{RSM} max. (kV) 1.2/50μs o.c. wave	V_{RSM} max. (kV) 100/700μs o.c. wave	I_{RSM} max. (A) 8/20μs s.c. wave	I_{RSM} max. (A) 1/1000μs s.c. wave	Energy max. (J) 10/700μs o.c. wave	Energy max. (J) 10/1000μs s.c. wave
ZP1000 CP1000 FP1000	10-1500 10-40 40-200	1	10	ZP1020	20	6	1.5			0.35	
ZP2000 CP2000 FP2000	10-1500 10-200 40-200	3	10	 FP2065 FP2140	 65 140	 6 6	 1.5 1.5			 1.8 2.5	
ZP3000 CP3000 FP3000	10-1500 10-200 40-200	15	10	 FP3140	 140	 12	 5	 1000	 125	 6.5	
DFP000	40-200	15	10	DFP140	140	12	5	1000	125	6.5	

For more information, write for Surge Suppressors.

LEDEX®

Ledex Inc.
P.O. Box 427
Vandalia, Ohio 45377-0427 U.S.A.

Phone: 513-898-3621
TWX: 810-450-2526
Telex: 28-8228



COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M

MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O

OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P

PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

WPS word processing software

Y

YIG yttrium iron garnet

Z

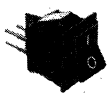
ZIF zero insertion force

Littelfuse® ROCKER AND TOGGLE SWITCHES

Twenty-three most popular rocker and toggle switches suitable for general switch applications. Non-illuminated switches have black bodies and black buttons. Illuminated types have black bodies and red buttons with 120 V neon lamps. L.E.D.'s can be operated at 3-12V.

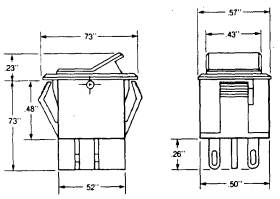
Switches are rated at 15A-125 V/7.5A 250 VAC inductive except for subminiature types which are rated at 6A-125 V/4A 250 VAC inductive.

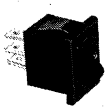
SUBMINIATURE ROCKER SWITCHES



#780698:
Circuit Configuration: DPST On-Off
Body Color: Black
Button Color: Black
Button Style: Standard Vee
Ratings: 6A-125 VAC (UL)
4A-250VAC (VDE)
4A-250VAC (SEMKO)
Terminals: Printed circuit
Hot Stamping: I-O

Panel Cutout Size: .63″ x .52″

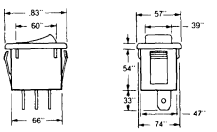




#780616:
Circuit Configuration: SPST On-Off
Body Color: Black
Button Color: Black
Button Style: Scallop
Ratings: 6A-125 VAC (UL)
6A-28 VDC (UL)
Terminals: .187″ Quick-Connect

#780807:
Circuit Configuration: SPST L.E.D. Illuminated
Body Color: Black
Button Color: Black Button with Red L.E.D.
Button Style: Scallop
Lamp Voltage: 12 V
Ratings: 6A-125 VAC
6A-12 VDC
Terminals: .187″ Quick-Connect

Panel Cutout Size: .512″ x .768″

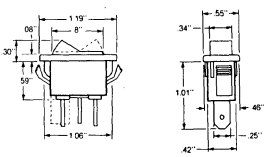


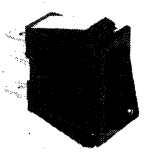
SINGLE POLE ROCKER SWITCHES

Panel Cutout Size: 1.071″ x .480″

#780609:
Circuit Configuration: SPST On-Off
Body Color: Black
Button Color: Black
Button Style: Vee
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250″ Quick-Connect

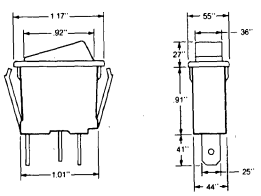
#780845:
Circuit Configuration: SPST On-Off Illuminated
Body Color: Black
Button Color: Red
Button Style: Vee
Lamp Voltage: 120 V
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250″ Quick-Connect

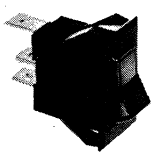




#780805:
Circuit Configuration: SPST On-Off Illuminated in Button Cradle
Body Color: Black
Button Color: Black Flat Button with Red L.E.D.
Button Style: Flat
Lamp Voltage: 12 V
Ratings: 15A-125 VAC
16A-12 VDC
Terminals: .250″ Quick-Connect

Panel Cutout Size: 1.12″ x .460″

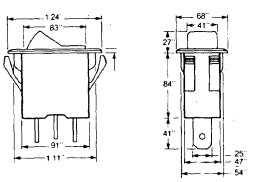


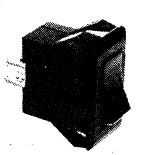


#780812:
Circuit Configuration: SPST On-Off Illuminated in Button
Body Color: Black
Button Color: Red
Button Style: Low Vee
Lamp Voltage: 120 V
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250″ Quick-Connect

Order #B990834 for matching indicator.

Panel Cutout Size: 1.125″ x .551″

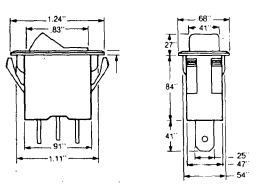




#780796:
Circuit Configuration: SPST On-Off
Body Color: Black
Button Color: Black
Button Style: Scallop
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250″ Quick-Connect

#780903:
Circuit Configuration: SPST On-Off Illuminated in Button
Body Color: Black
Button Color: Red
Button Style: Scallop
Lamp Voltage: 120 V
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250″ Quick-Connect

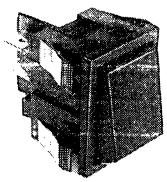
Panel Cutout Size: 1.125″ x .551″



LITTELFUSE, Inc. • Dept. EM, 800 E. Northwest Highway • Des Plaines, IL 60016 • (312) 824-1188

Littelfuse® ROCKER AND TOGGLE SWITCHES

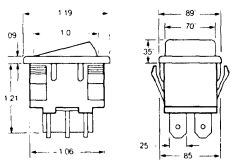
DOUBLE POLE ROCKER SWITCHES

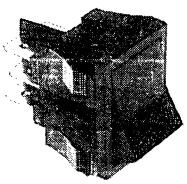


#780646:
Circuit Configuration: DPST On-Off
Body Color: Black
Button Color: Black
Button Style: Flat
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250" Quick-Connect

#780880:
Circuit Configuration: DPST On-Off Illuminated
Body Color: Black
Button Color: Red
Button Style: Flat
Lamp Voltage: 120 V
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250" Quick-Connect

Panel Cutout Size: 1.08" x .882"

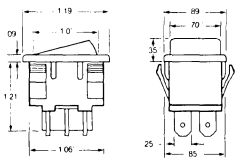


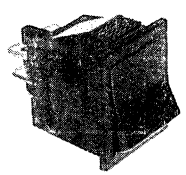


#780692:
Circuit Configuration: DPDT On-On
Body Color: Black
Button Color: Black
Button Style: Scallop
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250" Quick-Connect

#780901:
Circuit Configuration: DPST On-Off Illuminated
Body Color: Black
Button Color: Red
Button Style: Scallop
Lamp Voltage: 120 V
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250" Quick-Connect

Panel Cutout Size: 1.08" x .882"

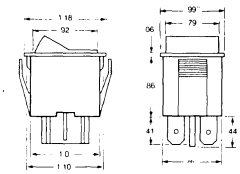


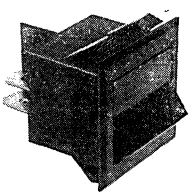


#780693:
Circuit Configuration: DPDT On-On
Body Color: Black
Button Color: Black
Button Style: Scallop
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250" Quick-Connect

#780902:
Circuit Configuration: DPST On-Off Illuminated
Body Color: Black
Button Color: Red
Button Style: Scallop
Lamp Voltage: 120 V
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250" Quick-Connect

Panel Cutout Size: 1.12" x .878"

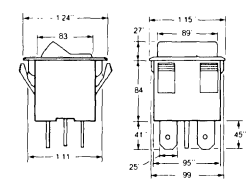


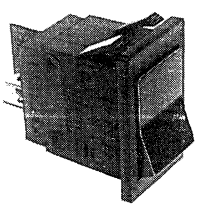


#780765:
Circuit Configuration: DPST On-Off
Body Color: Black
Button Color: Black
Button Style: Low Vee
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250" Quick-Connect

#780857:
Circuit Configuration: DPST On-Off Illuminated
Body Color: Black
Button Color: Red
Button Style: Low Vee
Lamp Voltage: 120 V
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250" Quick-Connect

Panel Cutout Size: 1.0" x 1.125"

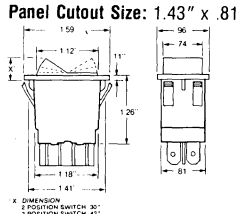




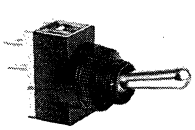
#780601:
Circuit Configuration: DPST On-Off
Body Color: Black
Button Color: Black
Button Style: Vee
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250" Quick-Connect

#780865:
Circuit Configuration: DPST On-Off Illuminated
Body Color: Black
Button Color: Red
Button Style: Vee
Lamp Voltage: 120 V
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250" Quick-Connect

Panel Cutout Size: 1.43" x .819"

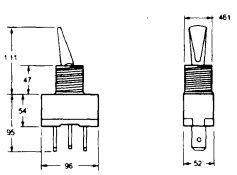


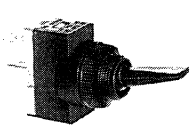
TOGGLE SWITCHES



#146765: **Circuit Configuration:** SPST On-Off
Lever Style: Tapered Round (Bat)
Lever Color: Chrome
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250" Quick-Connect

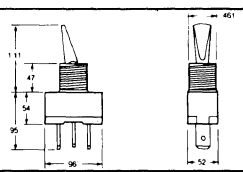
Mounting:
To fit .47" (12) diameter hole with or without key.

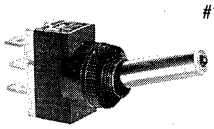




#146770: **Circuit Configuration:** SPST On-Off
Lever Style: Splayed
Lever Color: Black
Ratings: 15A-125 VAC/7.5A-250 VAC (UL and CSA)
1/2 hp-125 VAC (CSA)
10 (4)A 250 VAC (VDE)
Terminals: .250" Quick-Connect

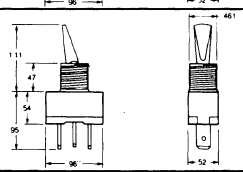
Mounting:
To fit .47" (12) diameter hole with or without key.





#146805: **Circuit Configuration:** SPST On-Off Illuminated
Lever Style: .87" Barrel with L.E.D.
Lever Color: Chrome
Lamp Voltage: 12 V
Ratings: 15A-125 VAC
16A-12 VDC
Terminals: .250" Quick-Connect

Mounting:
To fit .47" (12) diameter hole with or without key.



LITTELFUSE, Inc. • Dept. EM, 800 E. Northwest Highway • Des Plaines, IL 60016 • (312) 824-1188

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

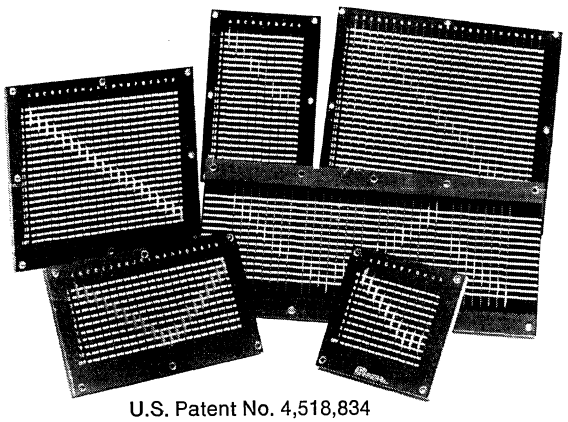
WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

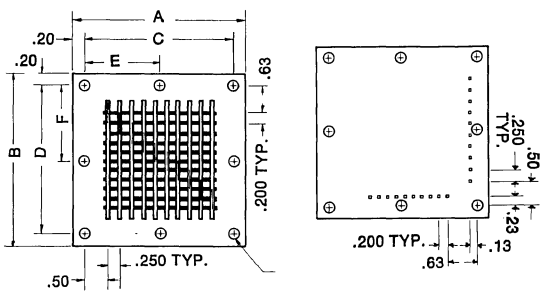
Industries Inc.

• Design, Development, and Manufacture of Sophisticated Electro-Mechanical Products • CO-ORD SWITCH DIVISION

MATRIX SLIDE SWITCHES



U.S. Patent No. 4,518,834



CO-ORD Matrix Slide Switches, patented design, provide reliable, low cost matrix switching for applications requiring manual data entry operations. These simplified, versatile switches are available in various ranges of standard sizes, with capacities including up to 25 outputs per switching line. Each output is controlled by a separate contact slide which in turn can provide as many as 25 positions (variations). Special designed Matrix Slide Switches can be supplied with added switching positions.

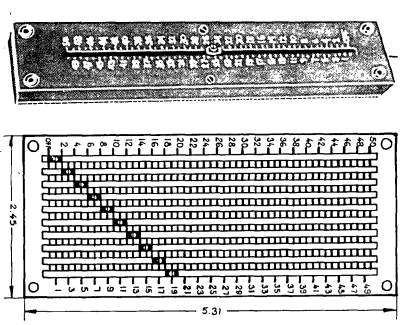
MATRIX SLIDE SWITCH — SERIES 850000

DASH	MATRIX SIZE	DIMENSIONS			
		A	B	C	D
1	10x10	3.75	3.75	3.25	3.25
2	10x20	3.75	5.75	3.25	5.25
3	20x10	6.25	3.75	5.75	3.25
4	20x20	6.25	5.75	5.75	5.25
5	25x25	7.50	6.75	7.00	6.25

MATRIX SLIDE SWITCHES SPECIFICATION

1. Contact Life Expectancy: 500,000 Crosspoint Operations.
2. Contact Resistance @ 500 Ma, 6 VDC:
   15 Milliohms (Gold Plated)
   35 Milliohms (Nickel Plated).
3. Capacitance, Between Adjacent Circuits: (Typical for 10x10 Switch)—50 Picofarids (max).
4. Contact Current Rating:
   Switching—0.5A, DC (max)
   Nonswitching—2.0A per Contact.
5. Dielectric Strength:
   AC—1.0 KV (ms)
   DC—1.5 KV.
6. Insulation Resistance @ 500 VDC: 1 x 10 OHMs.
7. Materials:
   - Slide Contacts: Beryllium Copper, Alloy 25, Condition XHMS.
   - Slider: Nylon.
   - Face Plate: Brushed Finished Aluminum, Black Anodized, White Epoxy silk screening.
   - PC Board and Conductor Strips: G10 glass epoxy, 2 oz. Copper Clad.
   - GSD Housing: Nylon.
   - Terminals: Phosfor Bronze, gold plated.
   - Finish: Nickel .0001 (min), or Gold/Nickel .00005 Gold over Nickel Flash.
   - Hardware: Nickel Plated Brass.

HIGH DENSITY MATRIX SLIDE SWITCHES



If your application requires a lot of crosspoints capability on very small front panel surface we manufacturer High Density Matrix Slide Switches. This switch can provide 1500 crosspoints (30 switching lines x 50 outputs) with front panel dimensions only 6.55 x 5.31. Because of the high cost to set up minimum order on this switch is 10 pcs.

FEATURES

- Closed entry contacts
- High mechanical environment capacity
- Low interlead capacitance
- Attractive and uncluttered
- Compact package
- Standard sizes available

APPLICATIONS

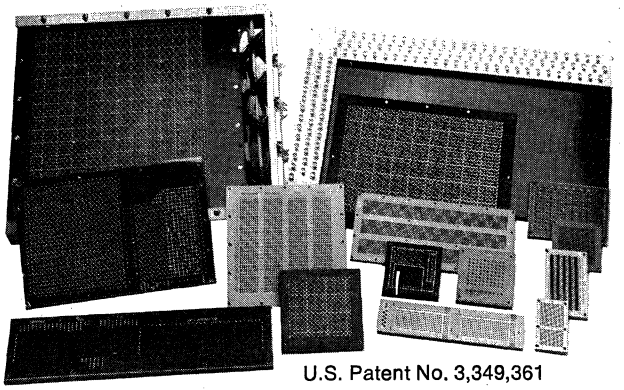
- Computer memories
- Power distributors
- Thermocouple signal selectors
- Circuit/Component test programmers
- Lighting systems (Special effects)
- Variable sequence selectors
- Code generators
- Traffic control panels
- Decade switches
- Vending machine control
- Numeric controlled machinery
- Data channeling and logging
- Communications distributors
- Wide variety of switching combinations
- Reliable
- Rugged
- Custom silk screening in multiple colors as required

23 HANSE AVENUE • FREEPORT, NEW YORK 11520 • (516) 868-1900

CO-ORD Industries Inc.

• Design, Development, and Manufacture of Sophisticated Electro-Mechanical Products • CO-ORD SWITCH DIVISION

MATRIX PROGRAM BOARDS



U.S. Patent No. 3,349,361

The matrix program board offers simple and reliable, yet low cost methods of switching and programming complex circuits. They are easily programmed and rapidly checked because of their cordless, compact construction. CO-ORD matrix program boards are composed of 2 to 16 decks of contacts that are bussed on .250" centers (Series 65000 are available on .125" and .100" centers in 2 to 4 decks). The contact rows of one deck are usually oriented perpendicular to the rows of adjacent deck(s) so as to obtain switching crosspoints. Electrical connections of the bussed contact rows are effected by inserting shorting pins at the desired crosspoints; "CO-AX", phone plug type pins are available for networks which require component insertion (diodes, resistors, etc.). Single board matrices of up to 50,000 crosspoints are available.

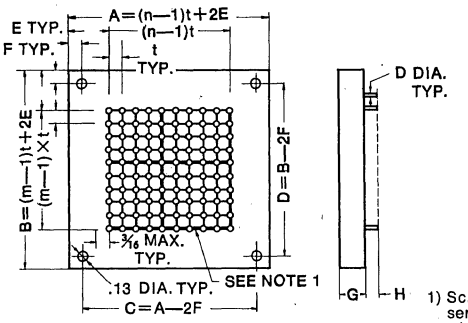
APPLICATIONS

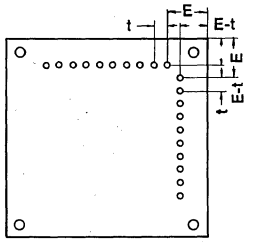
- Computer memories
- Cordless patch panels
- Function generators (Analog/Digital)
- Power distributors
- Thermocouple signal selectors
- Circuit/Component test programmers
- Lighting systems (Special effects)
- Variable sequence selectors
- Variable diode matrices
- Code generators
- Traffic control panels
- Decade switches
- Vending machine control
- Numeric controlled machinery
- Data channeling and logging
- Communications distributors

FEATURES

- Closed entry contacts
- High mechanical environment capacity
- Low interlead capacitance
- Attractive and uncluttered
- Compact package
- Standard sizes available
- Permits insertion of components into network without soldering
- Wide variety of switching combinations
- Reliable
- Rugged
- Custom silk screening in multiple colors as required

STANDARD DECK MATRIX BOARDS





1) Screen front panel is standard only on 63000 series. Characters are ⅛ high. Lines are 1/32 wide, every 5th line is 1/16 wide.

STANDARD MATRIX BOARDS — SERIES 63014865000

Dash #	—1	—2	—3	—4	—5	—6	—7	—8	—9
n x m	10 x 10	10 x 15	10 x 20	10 x 25	15 x 20	15 x 25	20 x 20	50 x 10	25 x 25

7.5	7.5	7.0	7.0
13.75	3.75	13.25	3.25
6.25	6.25	5.75	5.75
5.0	7.5	4.5	7.0
5.0	6.25	4.5	5.75
3.75	7.5	3.25	7.0
3.75	6.25	3.25	5.75
3.75	5.0	3.25	4.5
3.75	3.75	3.25	3.25
A	B	C	D
63014			

4	4	3¾	3¾
7⅛	2⅛	6⅞	1⅞
3⅜	3⅜	3⅛	3⅛
2¾	4	2½	3¾
2¾	3⅜	2½	3⅛
2⅛	4	1⅞	3¾
2⅛	3⅜	1⅞	3⅛
2⅛	2¾	1⅞	2½
2⅛	2⅛	1⅞	1⅞
A	B	C	D
65000			

3.4	3.4	3.15	3.15
5.9	1.9	5.65	1.65
2.9	2.9	2.65	2.65
2.4	3.4	2.15	3.15
2.4	2.9	2.15	2.65
1.9	3.4	1.65	3.15
1.9	2.9	1.65	2.65
1.9	2.4	1.65	2.15
1.9	1.9	1.65	1.65
A	B	C	D
65000 .100 Centers			

6300 SERIES
SPECIFICATION

1. Contact Resistance:
   - Total Pin Resistance: 0.004 OHM MAX.
   - Volume Resistivity of Strip: 0.003 OHM/IN
2. Breakdown Voltage: 1000 VRMS MIN.
3. Current Capacity: 5 AMPS.
4. Signal Frequencies: Up to 10 MHz.
5. Crosstalk: Down 100 dB or better.
6. Low Capacity.
7. Materials:
   - Plastic Parts: Black Phenolic XXX
   - Flexible Contact: Heat Treated Beryllium Copper
   - Terminals: Brass Gold plated
   - Finishes: Gold, Silver or Nickel

6500 SERIES
SPECIFICATION

1. Contact Resistance:
   - Total Pin Resistance: 0.004 OHM MAX.
   - Volume Resistivity of strip: 0.004 OHM/IN
2. Breakdown Voltage: 500 VRMS MIN. (250 VRMS .100 Centers) (1 AMP .100 Centers)
3. Current Capacity: 3 AMPS.
4. Crosstalk: Down 100 dB or better.
5. Low Capacity.
6. Materials:
   - Plastic Parts: Glass Epoxy G-10
   - Flexible Contacts: Heat Treated Beryllium Copper
   - Terminals: Brass Gold plated
   - Finishes: Gold, Silver or Nickel

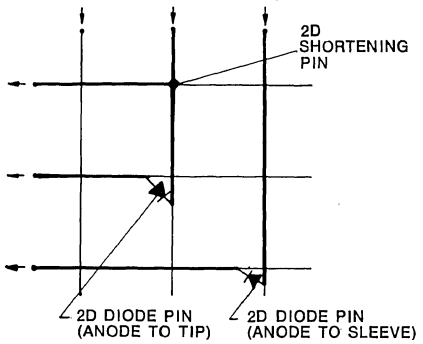
23 HANSE AVENUE • FREEPORT, NEW YORK 11520 • (516) 868-1900

Industries Inc.

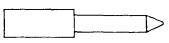
• Design, Development, and Manufacture of Sophisticated Electro-Mechanical Products • CO-ORD SWITCH DIVISION

PROGRAMMING PINS

2 DECK MATRIX (3, 4, 5 up to 16 Deck Also Available)



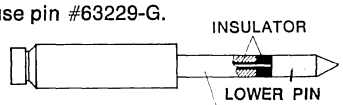
2D DIODE PIN



2D SHORTENING PIN

2D SHORTENING PINS

For 63014 Series use pin #62094-G.
For 65000 Series .125 & .100 centerline use pin #63229-G.



SHORTENING PINS

SERIES 63000 (.250 centers)

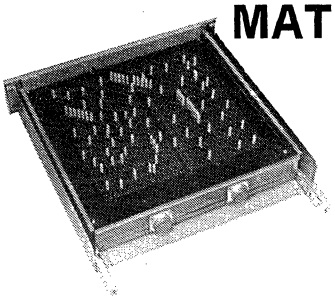
4D—#63105	14D—#63014-14P
6D—#63106	16D—#63014-16P
8D—#63107	
10D—#63014-10P	SERIES 6500
12D—#63014-12P	4D—#65000-04P

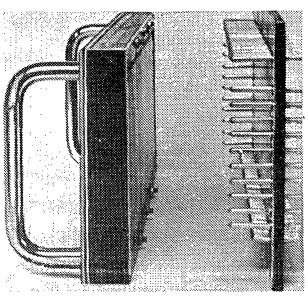
DIODE PINS

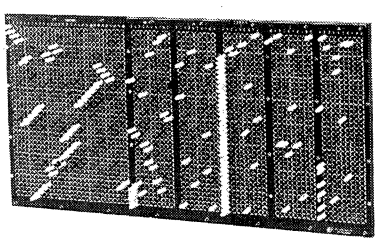
DIODE PIN	SPECIFICATIONS	
6500 series (.125 & .100 centers)	Diode	Anode To
63230-26	1N4148	Tip
63230-27	1N4148	Sleeve
63230-84	1N914	Tip
63230-85	1N914	Sleeve
63014 series (.250 centers)		
63009-26	1N4148	Tip
63009-27	1N4148	Sleeve
63009-201	1N4001	Tip
63009-202	1N4002	Sleeve

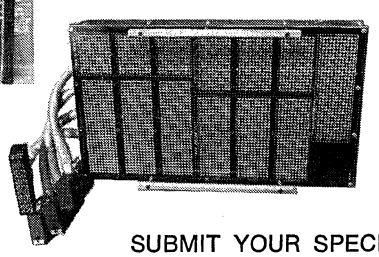
Component pins with component according to customer's specification are available.

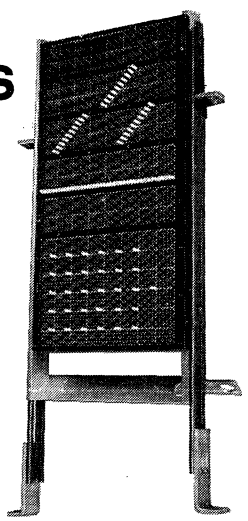
VARIETY OF SPECIAL MATRIX BOARD CONFIGURATIONS







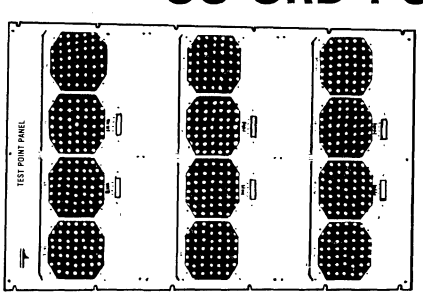




SUBMIT YOUR SPECIFICATIONS

Our design allows us to manufacture Matrix Boards with any number of inputs, outputs and switching patterns according to customer's specification.

CO-ORD POINT TO POINT TEST PANELS



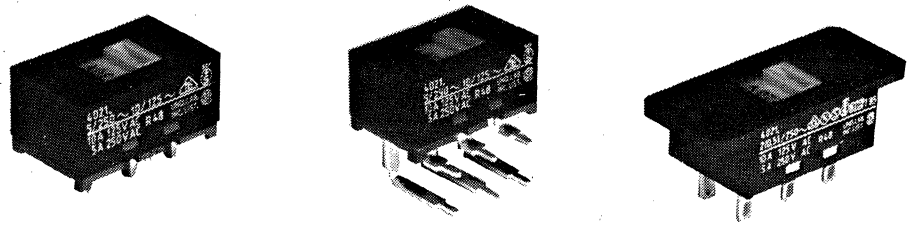
Required multiple input testing is incorporated into a single, easy access unit which evaluates the signal characteristic of critical electrical criteria prior to permanent assembly of electronic packages into a main system: alleviates tedious disassembly, equipped for debugging.

- Custom Configuration Only
- Durable Construction
- Compact Size
- Rack Mountable
- Modular Assembly
- Maximum Input Capacity: 6000 Test Points
- Mode Of Input: Your Choice Of Connector To Match System Configuration

23 HANSE AVENUE • FREEPORT, NEW YORK 11520 • (516) 868-1900

MARQUARDT

INTERNATIONAL APPROVALS

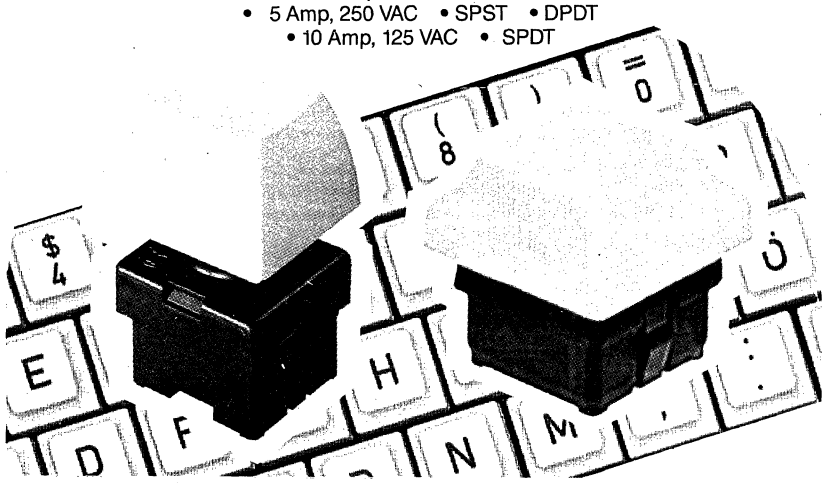


LINE VOLTAGE SELECTOR SWITCHES

Manufactured to meet both international and domestic specifications, the 4021 Series is designed for quick conversion and is available in three arrangements—straight terminals, straight terminals with ears and 90° terminals.

Specifications:

- 5 Amp, 250 VAC • SPST • DPDT
- 10 Amp, 125 VAC • SPDT



KEYBOARD SWITCHES AND KEYBOARDS

applicable to **DIN Specifications**

A snap action system with over center positive contact and extreme long life. The keyboard switch complies with all important ergonomic and DIN specification requirements.

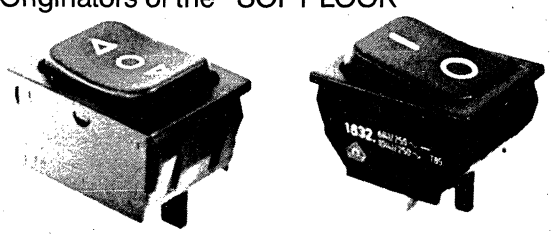
The keyboard switches are suitable for assembling to keyboards, for snap in fixing in metal frames with thickness of 1.5 mm, and for wave soldering. Complete keyboards are also available.

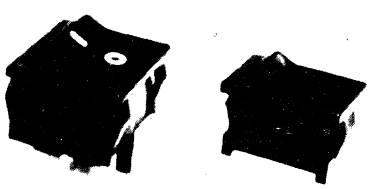
ROCKERSWITCHES

Originators of the "SOFT LOOK"

We are approved!!

not approvable or applicable.





Marquardt Switches, Inc. brings you a **complete family** of rocker, pushbutton and toggle switches, SPST, SPDT, DPST, DPDT, and 3 position, center off and momentary available in the **soft look, matte finish.**

Originally designed for consumer products, these switches will enhance your electronic instrumentation by supplying a look of quality and sophistication to your packaging.

Our 1800. Series is not approvable, or applicable to International Approvals. ***WE ARE APPROVED!*** 6A 250V AC - 10A 250V AC and 16A 250V AC. Available in a variety of colors.

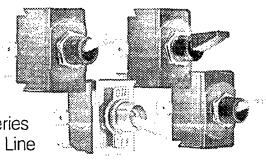
MARQUARDT SWITCHES INC.

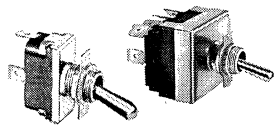
PO BOX 465 EM, CAZENOVIA, NEW YORK 13035 TEL: (315) 655-8050/TWX: 703287UD

SPECIFY McGILL SWITCHES FOR RELIABILITY AND STYLE

toggle

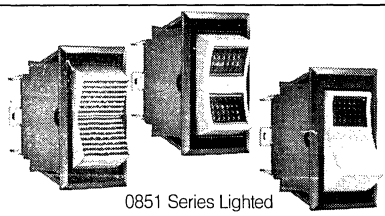
Featuring **0151 Designer Line** toggle switches with your choice of lighted or unlighted bat caps in four different designer-styled configurations. Black, white and red caps standard. Special colors available. Die-cast zinc or plastic cover-plates. 15A, 125-250-277V AC; ¾ HP, 125-250V AC. DPST, DPDT circuitry. Other toggle switch series include 6 to 20A ratings in SP, DP, 3-pole and 4-pole models. Spade, screw or solder terminals. U.L. Listed. C.S.A. Approved.

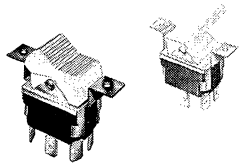

0151 Series
Designer Line



rocker and paddle

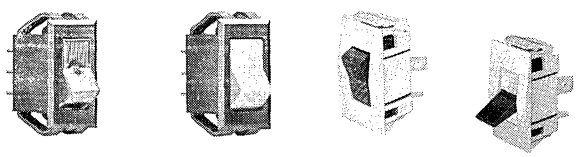
Lighted rockers with fully illuminated separable caps or one or two lenses in a broad selection of colors are features of **0851 Series Rocker Switches.** 15A, 277V AC and 6A, 125V AC models in both SP and DP circuitry. Snap-in mounting for fast installation. Other McGill rocker and paddle switches include: **0801 SP and 0811 DP Series**—20A, 277V AC, 1½ HP 125-250V AC; **1801 SP and 1811 DP Series**—6A, 125V AC, 3A 250V AC, ¼ HP 125-250V AC; **0840 3-pole and 4-pole Series**—17A, 277V AC; 6A, 600V AC, 1 HP 125V AC, 2 HP 250-480-600V AC; 1, 2, or 3 phase. U.L. Listed. C.S.A. Approved.


0851 Series Lighted



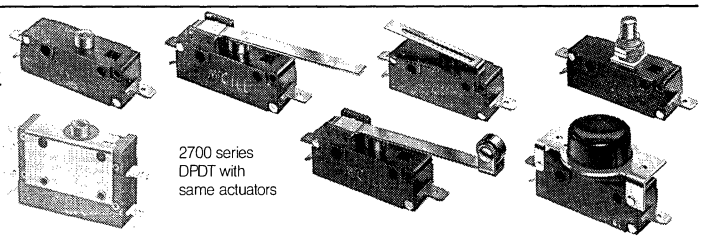
miniature rocker and paddle

0815 Series provides choice of **lighted** or **unlighted** rockers. 6 standard colors for lighted models, 3 for non-lighted. Plastic snap-in bezels, ¼" spade terminals. Ratings—12A, 125V AC, ½ HP 125-250V AC. Other series: **0805** has same electrical ratings as 0815 but in non-lighted models only. Bracket mounting and metal bezel standard. Plastic bezel and snap-in mounting optional. Rocker or paddle actuators. **0806 Series** has neon indicator light adjacent to rocker. Same ratings as 0815 and 0805 series. U.L. Listed. C.S.A. Approved.


0815 Series Lighted

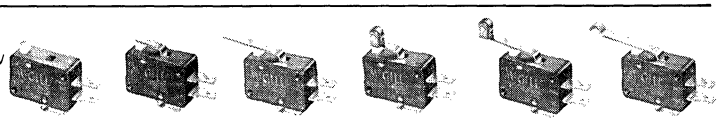
snap-action

High reliability through design simplicity. Fewer parts to wear—minimum spring flexing increases life. No coil springs. Less than .005" differential travel. SPDT, SPST. **2600 Series**—20A, 125-250V AC; 1 HP 125V AC; 2 HP 250V AC; 50/60 Hz. **2650 Series**—25A, 125-250V AC; 1½ HP 125V AC; 2 HP 250V AC. Operating force: 20 oz. max. **1600 Series**—Light operating force—10 oz. max. 15A 125-250V AC; ¾ HP 125V AC; 1½ HP 250V AC. Also available as **2700 Series** in DPDT models with same actuators and rated: 20A, 125-250V AC, 2 HP 250V AC, 50/60 Hz. U.L. Listed. C.S.A. Approved.


2700 series
DPDT with
same actuators

miniature snap-action

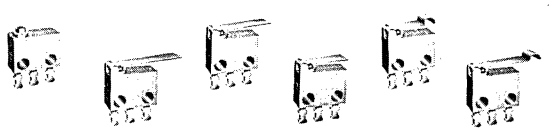
$1^{3}/_{32}$" x $^{5}/_{8}$" x $^{13}/_{32}$" case. Oversize silver contacts. Excellent wiping action and low contact bounce. SPDT, SPST. **4600 Series**—6—14 oz. max. operating force. 15A, ½ HP 125-250V AC; ½A 125V DC, ¼A 250V DC; 4A "L" 125V AC. **4700 Series**—Light operating force—8 oz. and 75 gram max. 10A, $^{1}/_{3}$ HP, 125-250V AC; 4A "L" 125V AC. U.L. Listed. C.S.A. Approved. **4613 Series** meets requirements for TV fire protection.



4775 Series with exclusive rolling cam design. An engineering breakthrough in light force switches that produces 150,000,000 cycle reliability, 1.5 millsec contact bounce, contact force that exceeds 50% of operating force.

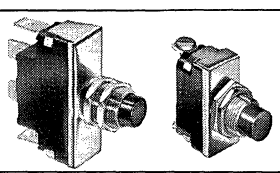
sub-miniature snap-action

4900 Series—smallest precision snap-action switches available. Case dimensions less than .250" x .300" x .100". Choice of contacts, terminals and actuators. SPDT, 2A 125-250V AC; 2A (Res.) 30V DC; 1A (Ind.) 30V DC. Meet MIL-S-8805 specifications. Temp. range—100° F to +185° F. Up to 250° F continuous duty temp. ratings available.



push button

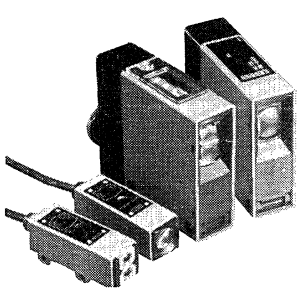
Momentary and maintained contact push-button switches up to 30A. Variety of mechanisms, including snap-action, SPST, SPDT, 2-circuit. U.L. Listed.



MODIFICATIONS OF BASIC SWITCHES
TO MEET APPLICATION REQUIREMENTS ALSO AVAILABLE

photoelectric sensors

Revolutionary integrated circuits eliminate separate plug-in modules or cards for performing optional functions. Time delay, normal and inverted logic, timing and sensitivity-adjustment circuitry are built into sensor. Operates on practically any AC or DC power source. **5000 Series**—Transmission and reflection types with built-in power supplies and relays. **4000 Series also available**—Transmission and reflecting types with built-in amplifiers.



Request Catalogs 90 and 91 for complete specifications.

McGILL®
ENGINEERED SWITCHES

McGILL MANUFACTURING CO., INC., ELECTRICAL DIVISION, VALPARAISO, INDIANA 46383 PHONE: (219) 465-2200

T-5 SERIES LIGHTED KEYSWITCHES

DESCRIPTION

The T-5 lighted keyboard switch has long life (greater than 10 million cycles), low bounce, gold-plated cross bar contacts usually found in more expensive switches.

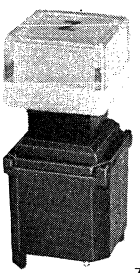
Mechanically, the T-5 switch incorporates precision tracking surfaces providing a smooth "feel" throughout its .170 travel. Each switch has two alignment studs and four to six solder points. This makes hand or wave soldered PC board assemblies extremely rugged for the most demanding applications, while keeping the manufacturing costs down by eliminating the need for metal mounting frames.

Electrical configurations include normally open, normally closed, double pole normally open, and alternate action. MEI stocks a 5V, 60 milliamp, 100,000 hour bulb for these switches. Lamp terminal spacing is .100 inch, to fit T-1 size lamps which can be changed from the front panel by end users. Lenses are stocked in eight colors.

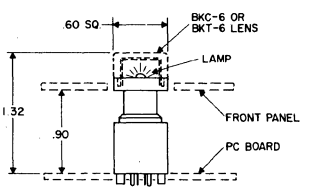
SPECIFICATIONS

CONTACT RATING, DC RESISTIVE: 3W max.
VOLTAGE: 24V max.
INITIAL CONTACT RESISTANCE: 100 mΩ max.
PLUNGER TRAVEL: .170 ±.010 in.
PRE-TRAVEL: .080 ±.030 in.
OPERATING FORCE
SINGLE POLE, MOMENTARY: 3.5 ±0.5 oz.
DOUBLE POLE AND/OR ALT. ACTION: 6.0 ±0.5 oz.
TEMPERATURE
OPERATING: −25°C to +65°C
STORAGE: −40°C to +70°C
CONTACT BOUNCE: 4 ms max.
MIN. ACTUATIONS, @ 5V, 100μ AMPS: 10 x 10^6

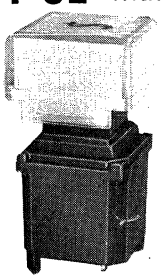
T-5K With Box Lens

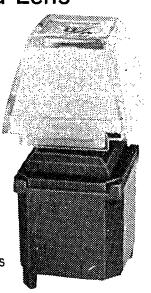


- LIGHTED WITH T-1 BI-PIN LAMP, SOCKETED
- FOR 5/8" CENTER MOUNTING

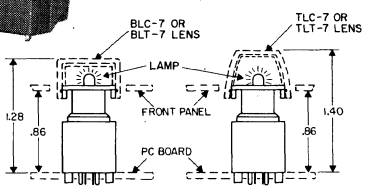


T-5L With Box Lens or Truncated Lens

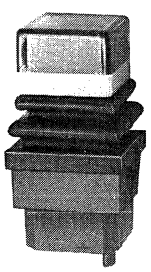




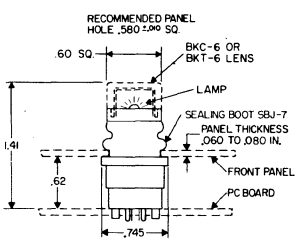
- FOR 3/4" CENTER MOUNTING
- LIGHTED WITH T-1 BI-PIN LAMP, SOCKETED



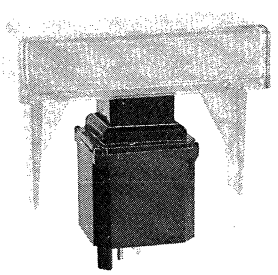
T-5J With Panel Sealing Boot and Box Lens



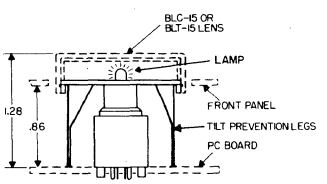
- ENVIRONMENTALLY SEALED ABOVE AND BELOW MOUNTING PANEL
- VINYL BOOT SEALS AGAINST LIQUID AND DUST
- FOR 3/4" CENTER MOUNTING
- LIGHTED WITH T-1 BI-PIN LAMP, SOCKETED



T-5Y With Double Width Box Lens



- LIGHTED WITH T1 BI-PIN LAMP SOCKETED
- OCCUPIES SPACE OF TWO T-5L W/BOX LENS



MECHANICAL ENTERPRISES INC.
461 CARLISLE DRIVE
HERNDON, VA 22070
(703) 435-9496
TWX 710-832-0942

MICRO SWITCH

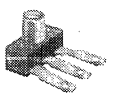
TABLE OF CONTENTS

The products described in the following pages are representative of the thousands of position sensing and manual control products manufactured and distributed by MICRO SWITCH. For comprehensive catalogs write MICRO SWITCH, Freeport, Illinois 61032, Dept. 720E. Or, call (815) 235-6600. For application assistance, contact a nearby MICRO SWITCH Sales Office. See listing in this Directory. For off-the-shelf products, see your local MICRO SWITCH Authorized Distributor listed on pages 45 & 46.

POSITION SENSORS

Hall effect position sensors

Hall effect sensors are operated by the magnetic flux from a permanent magnet or an electromagnet. The sensing element is a Hall sensor with a trigger and amplifier integrated on a silicon chip. These integrated circuits have been performance tested to over 19 billion operations. Operating speeds can exceed 100 kHz.



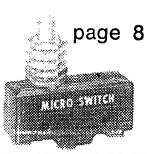
5SS ..... page 2
6SS ..... page 2
8SS ..... page 2
9SS Linear output sensor ..... page 3
SR threaded sensors ..... page 3
AV vane sensors — MG magnets ..... page 4
Application information ..... page 5

VX solid state switches page 7

VX mechanically operated Hall effect switches combine mechanical switch operating and mounting convenience with solid state reliability. The mounting dimensions and mechanical characteristics are similar to the popular V3 snap-action switch.

Z and A standard switches page 8

Standard size switches. Ratings to 25 amps. High precision-long life. Wide choice of actuators and terminals. Use for general purpose applications.

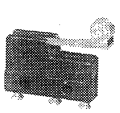


SX subminiature switches page 11

Smallest snap-action switches from MICRO SWITCH. Rated to 7 amperes. Choice of actuators and terminal styles. Use where the smallest and least weight, snap acting switch is essential.

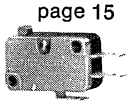
SM subminiature switches page 13

Slightly larger than SX switches. Rated to 11 amperes. Choice of contacts, actuators and terminal styles. Use for communications/office equipment and other smaller application needs.



V3 miniature switches page 15

Standard or low operating forces. Rated to 15 amperes. Use for appliance-vending machine and similar applications.



MANUAL SWITCHES

TP sealed rockers page 17

Sealed rocker toggle series. Standard size 1, 2 and 4 poles. Various actuators, termination and circuitry. Military and UL listings.

TK industrial toggles page 18

Sealed toggle series. Standard size. 1, 2 and 4 poles. Various actuators, termination, and circuitry. UL listings.

TL sealed toggles ..... page 19

As above but mil. listed.

TS standard toggles page 20

Standard size toggles, 1 or 2 pole. Various actions, circuitry and termination. Use where a lower cost standard size toggle is required.

AT toggle assemblies page 21

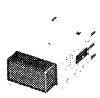
Toggle switch assemblies using basic switches. Wide variety of ratings, contacts, actuators, terminals, and sealing. Mil listings available.

AML advanced manual line page 22

AML provides a choice of solid state, electronic, or power controls with push-button, rocker, paddle or keylock actuation. Incandescent, LED or neon lighting illuminate a wide variety of display options. Single level termination with all common types available. Choice of snap-in front mount, strip or matrix mount.

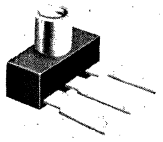
MML miniature manual line page 33

MML miniature pushbuttons provide a choice of solid state, electronic or power duty controls. Plus incandescent or LED illumination with printed wiring board or snap in panel mounting. Operating modes include momentary, two level alternate action or multi-switch interlock.



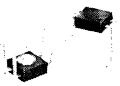
Other MICRO SWITCH Products ..... page 44
Authorized Distributor Directory ..... page 45

SS Miniature magnetically operated position sensors



.29H x .40W x .20D plus term.

5SS



.21 sq. plus term.

6SS

.30 sq. plus term.

8SS

FEATURES

- *Hall effect sensing*
- *Single digital output . . . current sinking or sourcing*
- *3 pin solder/quick-connect terminals . . . easy wiring as remote sensor*
- *Internally threaded flux concentrator . . . also used as mounting means*
- *4.5 to 5.5VDC or 6 to 16VDC supply voltages*

FEATURES

- *Hall effect sensing*
- *Dual digital outputs . . . current sinking or sourcing*
- *4 pin dual-in-line terminals . . . printed circuit board or standard DIP socket mounting*
- *Optional flux concentrator*
- *4.5 to 5.5VDC or 6 to 16VDC supply voltages*
- *Linear output sensor available . . . 4 to 10VDC supply voltage*

FEATURES

- *Hall effect sensing*
- *Single digital output . . . current sinking or sourcing*
- *3 pin in-line printed circuit board terminals . . . standard .100" mounting centers*
- *Smallest ceramic package . . . 0.3" square*
- *4.5 to 5.5VDC or 6 to 16VDC supply voltages*
- *Standard or precision magnetic characteristics*

SS ORDER GUIDE

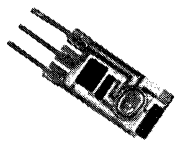
Supply Voltage (VDC)	Supply Current (mA max.)	Type	Current per Output	Operating Temperature °C	Magnetic Characteristics 25°C Typical			Catalog Listing
					Op. Gauss	Rel. Gauss	Dif. Gauss	
4.5 to 5.5	3.4	Source	10mA	0 to 70	100	−50	150	8SS9
	4.0			0 to 70	430	260	170	6SS2
				0 to 70	350	215	135	6SS4*
			20mA	0 to 70	245	150	95	5SS16
		Sink	4mA	0 to 70	430	260	170	65SS2
				0 to 70	350	215	135	65SS4*
			8mA	0 to 70	245	150	95	55SS16
				−40 to 100	100	−50	150	8SS1
				0 to 70	100	−50	150	8SS1E
	6.0		20mA	0 to 70	400	300	100	8SS7
				0 to 70	400	300	100	8SS7E
6 to 16	13.0	Source	10mA	−40 to 150	400	300	100	612SS2
				−40 to 150	330	245	85	612SS4*
			20mA	−40 to 150	230	170	60	512SS16
		Sink	10mA	−40 to 150	400	300	100	613SS2
				−40 to 150	330	245	85	613SS4*
				−40 to 150	60	−60	120	617SS2
				−40 to 150	50	−50	100	617SS4*
			20mA	−40 to 150	230	170	60	513SS16
				−40 to 150	35	−35	70	517SS16
				−40 to 150	400	300	100	8SS3
				- 0 to 70	400	300	100	8SS3E
				−40 to 150	60	−60	120	8SS5
				0 to 70	60	−60	120	8SS5E
4 to 10	3.5 Typ.	Linear: Differential outputs		−40 to 150	Sensitivity (−400 to +400 gauss) 0.75 to 1.06mV/gauss			634SS2

*With flux concentrator.

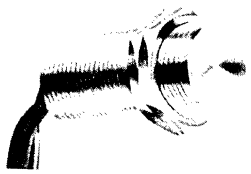
MICRO SWITCH, a Honeywell division

For more information, see Catalog 20, Solid State Sensors.

Magnetically operated position sensors 9SS LOHET™/SR



.60 H x .30 W x .07 D
9SS



15/32 thread x 1.00 L
103SR

FEATURES

- *Hall effect sensing*
- *Single linear output*
- *3 pin in-line printed circuit board terminals . . . standard. 100" mounting centers*
- *Thin ceramic package*
- *4.5 to 8 VDC or 8 to 16 VDC supply voltages*
- *Laser trimmed thick film resistors . . . minimize sensitivity variations, compensate for temperature variations*
- *Tight specifications on output as function of magnetic induction*

FEATURES

- *Hall effect sensing*
- *Single output . . . digital current sinking or sourcing*
- *Sealed threaded aluminum bushing housing . . . meets NEMA 3, 3R, 3S, 4, 4X, 6, 12 and 13*
- *20 gage, 6 inch stranded leadwires . . . color coded, teflon insulated*
- *Adjustable mounting*
- *4.5 to 5.5 VDC or 6 to 16 VDC supply voltages*
- *Linear output available*

For more information, see Catalog 20, Solid State Sensors.

9SS ORDER GUIDE

Supply Voltage (VDC)	Output Type	Supply Current (mA max.)	Span (−400 to +400 gauss)	Null (Offset at 0 gauss)	Sensitivity (mV/gauss)	Linearity (% span)	Null Shift (Max. %)	Catalog Listing
8 to 16 (Performance at 12 VDC)	Ratiometric 2	15.0	6.0V ① ②	6.0 ±0.6V ① ②	7.5 ±0.2 ① ②	±1.5 ① ②	−40 to 150°C ±5	91SS12-2
8 to 16	Regulated 3	15.0	3.0V ① ③	3.0 ±0.6V ① ③	3.75 ±0.1 ① ③	±5.0 ① ③	−40 to 150°C ±7	91SS12-2
4.5 to 8 (Performance at 5 VDC)	Unregulated 4	15.0	1.5V ④ ⑤	2.25 ±0.5V ④ ⑤	1.875 ±0.1 ④ ⑤	±2.5 ⑤	0 to 85°C ±5	93SS12-2

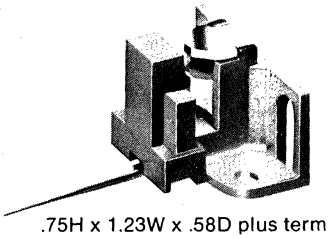
① At 25°C, 2200 Ohm load. ② Span, null, sensitivity vary in proportion to supply voltage over range of 12 ±4 VDC.
③ Characteristics apply over supply voltage range of 8 to 16 VDC.
④ Span, null, sensitivity approximately proportional to supply voltage over range of 4.5 to 8 VDC. ⑤ At 25°C, 1000 Ohm load.

SR ORDER GUIDE

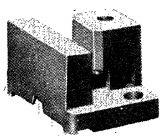
Supply Voltage (VDC)	Supply Current (mA max.)	Type	Current per Output	Operating Temperature °C	Magnetic Characteristics 25°C Typical			Catalog Listing
					Op. Gauss	Rel. Gauss	Dif. Gauss	
4.5 to 5.5	4.0	Source	20 mA	0 to 70	350	215	135	103SR11A-1
		Sink	8 mA		350	215	135	103SR5A-1
6 to 16	13.0	Source	20 mA	−40 to 100	330	245	85	103SR12A-1
		Sink			330	245	85	103SR13A-1
					50	−50	100	103SR17A-1
4 to 10	3.5 Typ.	Linear			Sensitivity (−400 to +400 gauss) 0.75 to 1.06 mV/gauss			103SR3F-5

MICRO SWITCH, a Honeywell division

AV Vane operated position sensors



.75H x 1.23W x .58D plus term.
1AV



.43H x .75W x .52D plus term.
3AV/4AV

FEATURES

- *Hall effect sensor*
- *Single digital output . . . current sinking or sourcing*
- *Versatile mounting*
- *3 pin solder/quick-connect terminals or leadwires*
- *6 to 16VDC power supply*
- *Lower operating force*
- *UL Recognized housing and leadwires*

For more information, see Catalog 20, Solid State Sensors.

FEATURES

- *Hall effect sensor*
- *Dual digital outputs . . . current sinking*
- *Small size*
- *4 pin in-line printed circuit board terminals or leadwires*
- *Closely controlled differential to predict pulse width*
- *4.5 to 5.5VDC or 6 to 16VDC power supply*
- *Connector block available*

Principle of operation

AV vane sensors are operated by passing a ferrous vane through the gap between the Hall sensor and the magnet, shunting the magnetic flux away from the sensor.* AV's can be used as limit switches by operating with a single large vane; as tachometer sensors by using a toothed wheel; or, as machinery synchronizing elements by using cams or sectors. 1AV and 4AV Series have many features in common, such as:

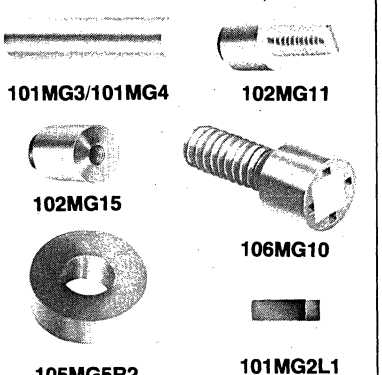
- *Operation by a low cost, easy to fabricate ferrous vane*
- *Magnet and sensor incorporated in same rugged package*
- *Sealed construction . . . unaffected by dust or dirt*
- *0 to 100kHz operating speed . . . no minimum speed of operation*
- *On and Off times programmable by vane dimensioning*
- *Precision mechanical operating characteristics*

*See Catalog 20 for vane actuation information.

AV ORDER GUIDE

Supply Voltage (VDC)	Supply Current (mA max.)	Type	Current per Output	Operating Temperature °C	Termination	Catalog Listing w/o Conn.	Catalog Listing w/Conn.
4.5 to 5.5	7.0	Sink	4 mA	−40 to 85	PC Board	3AV1C	
				−40 to 125		4AV11C	4AV11C-T1
			8 mA	−40 to 85	Leadwires	3AV2C	
				−40 to 125		4AV12C	
6 to 16	13.0	Sink	10 mA	−40 to 85	PC Board	3AV1A	
				−40 to 125		4AV11A	4AV11A-T1
		Source	20 mA	−40 to 125	Leadwires	1AV2B	
					Solder/Q.C.	1AV3B	
		Sink	20 mA	−40 to 125	Leadwires	1AV2A	
					Solder/Q.C.	1AV3A	
				−40 to 85	PC Board	3AV2A	
				−40 to 125		4AV12A	

MG Magnets



MICRO SWITCH does not manufacture magnets. However, we do supply bar and ring magnets for operating our Hall effect sensors. The most common form of magnet used to operate a Hall effect sensor is the bar magnet. The magnet should provide at least 10% flux overdrive above "Max. Operate", when at minimum distance from the sensing surface.

Ring Magnets

Outside Diameter	# Pole Pairs	Catalog Listing
44,4/1.75	10	105MG2R10
15,9/0.625	2	105MG5R2
15,9/0.625	4	105MG5R4

MG ORDER GUIDE

Bar Magnets

Outside Diameter	Length	Catalog Listing
6,3/0.25	31,7/1.25	101MG3
6,3/0.25	31,7/1.25	101MG4*
6,3/0.25	6,3/0.25	101MG7
3,2/0.125	9,5/0.375	101MG2L1
7,9/0.31	17,0/0.67	102MG11
7,9/0.31	12,2/0.48	102MG15
2,0/.078	2,0/.078	103MG5**
10,2/0.40	23,6/0.93	106MG10

*Reference magnet, calibrated to close tolerances. Useful for in-house inspection.
**125 pieces per tube. Poles not marked. Not illustrated.

MICRO SWITCH, a Honeywell division

Application information

DETERMINING MAGNETIC OPERATING CHARACTERISTICS

Magnetic sensing characteristics of Hall effect devices are specified within particular ranges. For example, assume an application with a temperature range of −40° to 100°C using a 513SS16. Referring to the table on page 2, the operate point may be up to 330 gauss and the release point may be 85 to 305 gauss. To insure reliable operation, **at least** 330 gauss must be presented to the sensor. The gauss level must then be reduced below 85 gauss to insure that the sensor will release. Therefore, it is necessary to know the flux density (gauss) measured at the chip to be able to 1) select a device with the best magnetic characteristics for your application; 2) select the best magnet; and 3) verify the desired mechanical characteristics.

The Calibrated Hall Element is used to determine the flux density produced at the sensor by the magnet. The package as well as the sensitive area is identical in size and location to the actual device. The output voltage of the Hall element, as a function of magnetic flux density, is linear, providing an electrical output which is proportional to flux density. A millivoltmeter with a one megohm input impedance should be used to measure the output. A Calibration Curve is furnished with each element, showing the Hall voltage versus flux density. When the magnetic field decreases, the output voltage decreases in a like manner. Referring to the calibration curve, a reading on the voltmeter is easily converted to gauss. Mechanical characteristics can be verified by first plotting a gauss versus distance graph. By comparing the curve to the magnetic characteristics of the sensor the possible mechanical ranges of operate point and release point can be determined.

Once the operating limits of the magnet and sensor combination have been established, feeler gages, etc., may be used during installation to insure that the correct gap is maintained.

CALIBRATED HALL ELEMENTS

Magnetic characteristics for Hall effect devices are specified within particular ranges. To insure that all devices will operate and release in your application, gauss levels should be verified. Calibrated Hall Elements are available to measure the gauss levels produced in your application. These elements are available in packages similar to the corresponding Hall sensor. The elements are intended for laboratory use only.

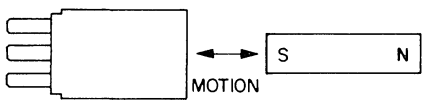
METHODS OF ACTUATION

There are many ways to apply MICRO SWITCH solid state sensors. Some of the more common sensing methods are described. Further information is as near as your telephone. Just call your nearest MICRO SWITCH sales office, and one of our trained field engineers will be happy to discuss your application with you.

If you need more information, the handbook Hall Effect Transducers, How to apply them as sensors, is available from MICRO SWITCH. It is intended to assist you in understanding and applying Hall effect devices.

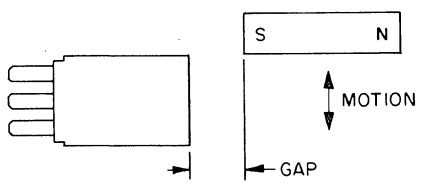
Head-on

The target is centered over the point of maximum sensitivity and is moved "head-on" to the sensor, then backed off.



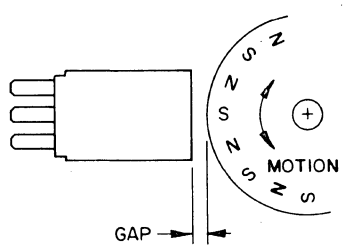
Slide-by

The target is moved across the face of the sensor at a specified distance.



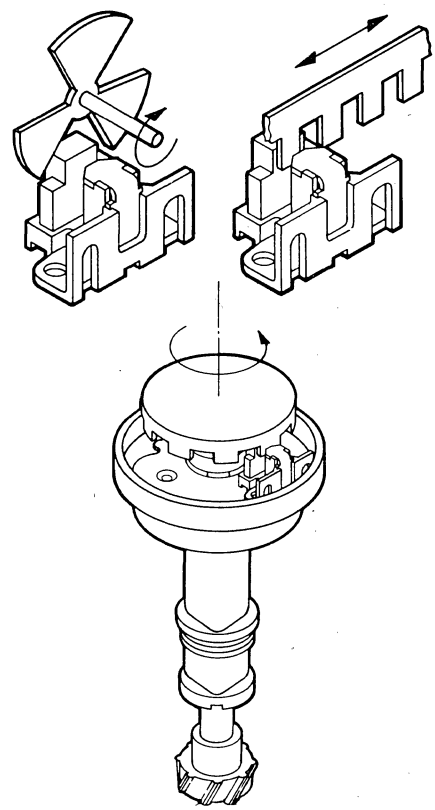
Rotary

A rotating target, such as a ring magnet, provides an alternating pattern of On-Off actuation.



Vane

The target, a ferrous metal vane, slides through (or rotates through) the gap between magnet and sensor.



CALIBRATED HALL ELEMENT ORDER GUIDE

Supply Voltage	Supply Current	Output Voltage	Sensitivity	Use With Series	Catalog Listing
5 VDC	10mA max.	0 to 10mV @ 0 gauss	0.031mV/gauss	6SS..2	632SS2
			0.038mV/gauss	6SS..4	632SS4
			0.054mV/gauss	5SS..	532SS11
	5mA max.	−11 to +5mV @ 0 gauss	0.034mV/gauss	8SS.. 9SS.. 200SR....	732SS21-1*
	15mA max.	0 to 10mV @ 0 gauss	0.031mV/gauss	103SR.... 400SR....	103SR2-3

*Actual magnetic field strength seen by the Hall effect chip can vary. Distance from sensing surface of chip can vary by ± .003" (0,08mm).

MICRO SWITCH, a Honeywell division

Application information

CURRENT SINKING AND CURRENT SOURCING

Two types of output circuits are common to solid state circuitry . . . current sinking and current sourcing. The names are derived from the location of the load in the output circuit.

Current sourcing (open emitter): The load is connected between the output and ground. The load is isolated from the supply voltage when the sensor is Off. When the sensor turns On, current flows from the power supply through the sensor, into the load. The sensor supplies a "source" of power to the load. A current sourcing output is Normally Low and goes High when the sensor is On.

Current sinking (open collector): The load is connected between the power supply and the sensor. In this circuit, the load is isolated from ground when the sensor is Off. When the sensor turns On, the circuit is complete and current flows from the supply through the load, through the sensor and then to ground. The sensor switches, or "sinks" the output current to ground. A current sinking output is Normally High and goes Low when the sensor is On.

INTERFACING FOR MICRO SWITCH HALL EFFECT SENSORS

The schematics shown are typical of the outputs with which MICRO SWITCH Hall effect sensors can be interfaced. Values shown are representative only.

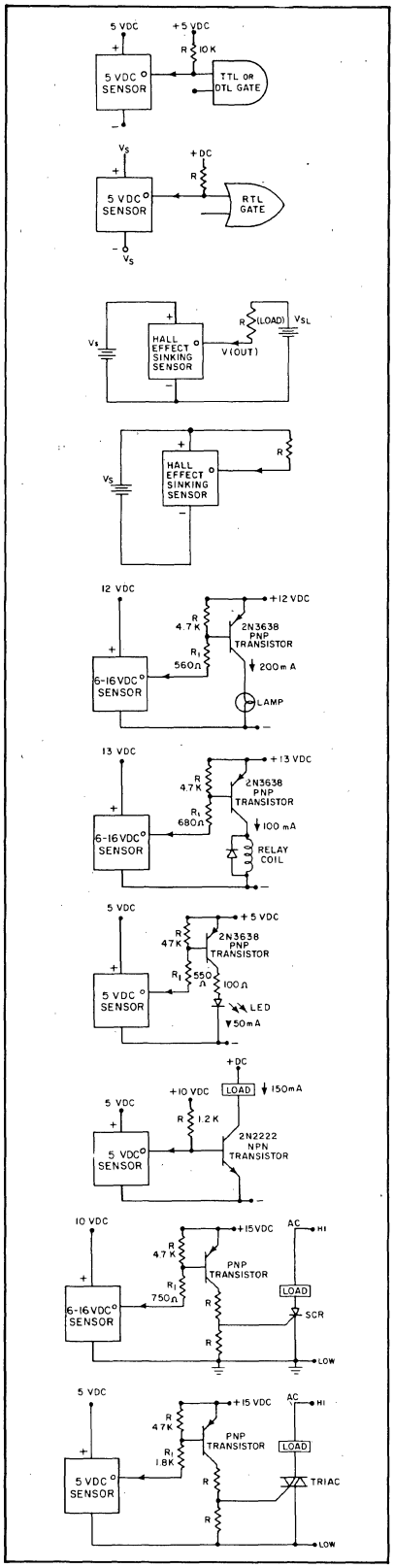
PULL-UP AND PULL DOWN RESISTORS

It is common practice to use a pull-up resistor for current sinking and a pull-down resistor for current sourcing. These resistors minimize the effect of small leakage current from the output of the device or from the electronics with which it is interfaced. In addition, they provide better noise immunity and faster rise and fall times.

The current sinking output is open collector and the current sourcing is open emitter. These outputs are floating, so the pull-up or pull-down resistor helps establish a solid quiescent voltage level. When checking sensors, a load is essential. See interface drawings.

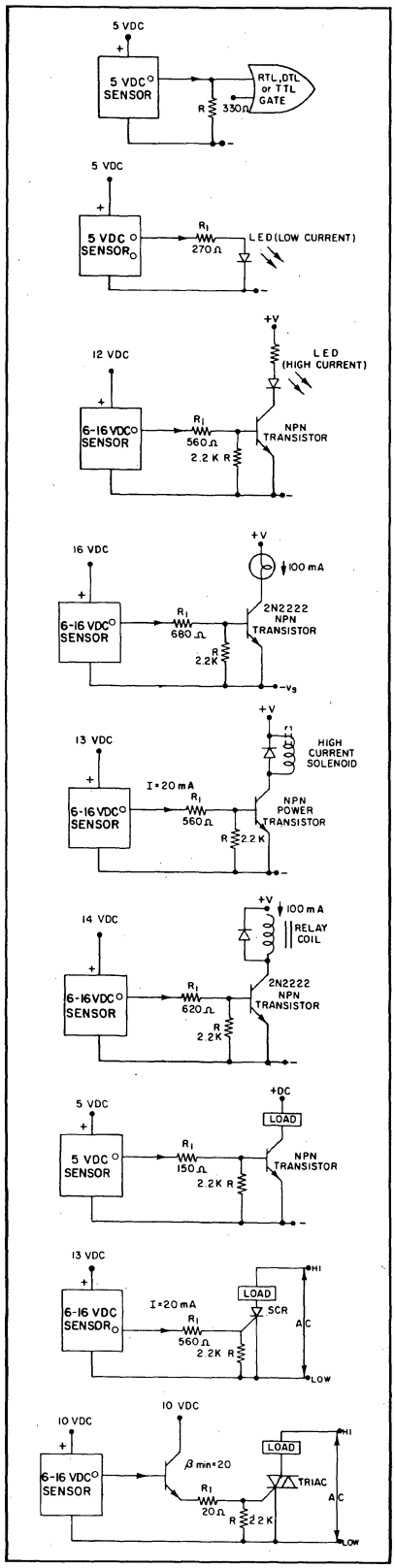
CURRENT SINKING OUTPUTS

(Current flow through load into sensor). Output terminal is open collector. In the unoperated condition (I_L = 0), the output voltage is normally High.

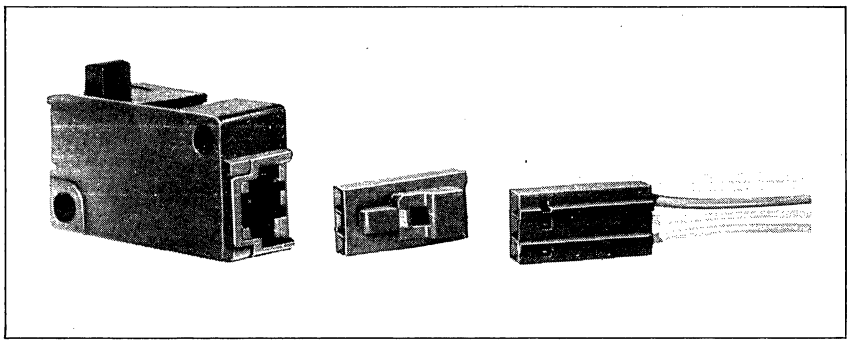


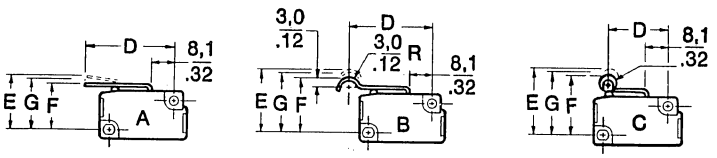
CURRENT SOURCING OUTPUTS

(Current flow from sensor through the load). Output terminal is open emitter. In the unoperated condition (I_L = 0), the output voltage is normally Low.



Mechanically Operated Solid State Switches VX





FEATURES

- *Low force operation*
- *Solid state reliability*
- *4.5 to 24 VDC supply voltage*
- *−40°C to +70°C operating temperature*
- *Direct interface to solid state circuits*
- *Reverse voltage protection*
- *Digital current sinking, normally high or normally low output (10 mA)*
- *Rugged construction*
- *Wide variety of standard levers and actuators available*
- *Lever external to switch body*
- *Industry standard mounting holes*
- *No external terminals . . . uses standard keyed and locking plug-in connectors*

GENERAL INFORMATION

The VX Series combines a miniature size mechanical switch's construction, operating and mounting convenience with solid state reliability. The switching element is a Hall effect transducer with a trigger and amplifier integrated on a silicon chip. An integral magnet molded in the plunger actuates the transducer and produces a digital logic level output.

Mounting dimensions and mechanical characteristics are similar to those of MICRO SWITCH's V3 Series snap-action switches.

Over 500 actuators are available including pin plunger, straight levers, simulated roller levers and roller levers.

ORDERING GUIDE AND OPERATING CHARACTERISTICS

Catalog Listings Accepts Amp. Con.	Accepts Molex Con.	Force At Operate Point Ounces	Force At Operate Point Grams	"D" Lever Actuation Point	Lever Type	"E" Free Position (Max.)	"F" Operating Point (Min.)	"G" Release Point (Max.)	Over Travel (Min.)	Diff. Travel (Min.)
Pin Plunger										
VX10	VX12	.35 +.18 −.14	10 +5 −4							
VX80	VX82	3.0 ±.88	85 ±25			16,38 .645	14,22 .560	15,54 .612	1,02 .040	0,05 .002
Short Lever										
VX10-A1	VX12-A1	.35 ±.2	10 ±5	21,8 .860	A	17,27 .680	14,71 .579	16,33 .643	1,02 .040	0,05 .002
VX80-A1	VX82-A1	2.8 ±1.1	80 ±30							
Medium Lever										
VX10-A2	VX12-A2	0.2 ±.1	5 +3 −2	35,6 1.400	A	19,28 .759	13,94 .549	17,32 .682	2,16 .085	0,10 .004
VX80-A2	VX82-A2	1.41 ±.50	40 ±15							
Long Lever										
VX10-A3	VX12-A3	.10 ±.07	3 ±2	59,4 2.340	A	22,58 .889	12,62 .497	18,97 .747	4,06 .160	0,20 .008
VX80-A3	VX82-A3	.75 +.35 −.25	21 +9 −7							
Simulated Roller Lever										
VX10-B1	VX12-B1	0.20 +.15 −.10	5 +4 −2	32,6 1.285	B	22,23 .875	17,02 .670	20,52 .808	1,91 .075	0,10 .004
VX80-B1	VX82-B1	1.55 ±.53	44 ±15							
Short Roller Lever										
VX10-C1	VX12-C1	.40 ±.20	12 ±15	20,6 .810	C	22,48 .885	19,99 .787	21,62 .851	1,02 .040	0,05 .002
VX80-C1	VX82-C1	3.0 ±1.06	85 ±30							

TERMINATION

Terminal pins accept either AMP 102241-1 or MOLEX 70066-0177 connectors (not furnished) depending on the switch housing design. See Ordering Guide.

Note: *The output transistors of the listings shown are "normally Off" i.e., they are not conducting and the output voltage is High with plunger in free position. To order devices which are "normally On" and the output voltage is Low (conducting with plunger in free position), change the second digit from 0 to a 1 or 2 to a 3 in the catalog listing.

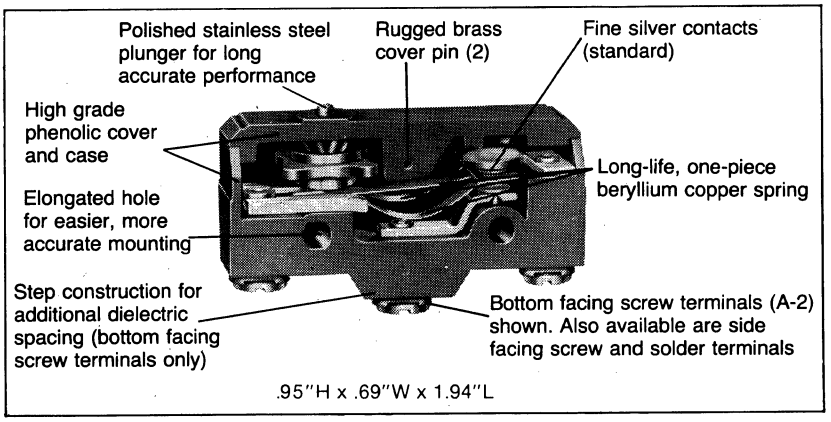
Examples VX10-A1 (VX11-A1); VX12-A1 (VX13-A1).

MICRO SWITCH, a Honeywell division

BZ/BA Standard basic switches

STANDARD BASIC SWITCH CUT-A-WAY

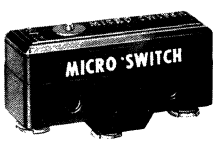
The cut-a-way shown is representative of the BZ/BA standard basic switches described.



FEATURES

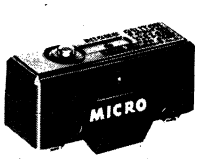
- *Operating force as low as 4 oz. (113 grams) maximum*
- *Sensitive differential travel as low as .0002 to .0003 inches (0,005 to 0,008 mm)*
- *Power load switching capability to 25 amperes*
- *Motor handling capacity to 2 horse-power at 250 VAC*
- *High temperature constructions for up to +400°F (204°C)*
- *Alloy contacts available for special application needs*
- *Variety of integral actuators*
- *Variety of auxiliary actuators*
- *Variety of terminal designs*
- *Optional sealed plunger and cover*
- *Over 50 listings available which meet MIL-S-8805 Qualified products list*

PIN PLUNGER

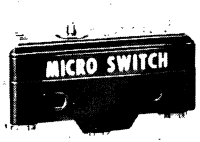


ORDER GUIDE

Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.* mm inches
BZ-2R-A2	Most applications. Screw terminals	15 Amps **L96**	2,5-3,61 **9-13**	1,11 **4**	0,38 **.015**	0,13 **.005**	0,01-0,05 **.0004-.0020**	15,88 **.625**
BZ-2R	Same as above, Solder terminals	15 Amps **L96**	2,5-3,61 **9-13**	1,11 **4**	0,38 **.015**	0,13 **.005**	0,01-0,05 **.0004-.0020**	15,88 **.625**
BZ-R21-A2	Lower force	10 Amps **L8**	1,11 **4**	0,7 **2.5**	0,30 **.012**	0,13 **.005**	0,005-0,013 **.0002-.0005**	15,88 **.625**
BZ-R-A2	Less differential travel	15 Amps **L103**	1,95-2,5 **7-9**	1,11 **4**	0,30 **.012**	0,13 **.005**	0,005-0,008 **.0002-.0003**	15,88 **.625**
BZ-R19-A2	Best repeatability	15 Amps **L103**	1,95-3,34 **7-12**	1,11 **4**	0,30 **.012**	0,13-0,2 **.005-.008**	0,005-0,02 **.0002-.0008**	16,26 **.640**
BZ-7RT04	MIL-S-8805/1-008 application requirements	15 Amps —	6,0- **12,0**	1,67 **6**	0,76 **.030**	0,13 **.005**	0,063-0,13 **.0025-.0050**	15,88 **.625**
YZ-2R-A2	SPST (normally open)	15 Amps **L96**	2,5-3,61 **9-13**	1,11 **4**	0,38 **.015**	0,13 **.005**	0,01-0,05 **.0004-.0020**	15,88 **.625**
WZ-R	SPST (normally closed) Solder terminals	15 Amps **L103**	1,95-2,5 **7-9**	1,11 **4**	0,30 **.012**	0,13 **.005**	0,005-0,009 **.0002-.00035**	15,88 **.625**



Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.* mm inches
BZ-2R5551-A2	Dustproof and splash resistant seal	15 Amp **L96**	2,5-4,17 **9-15**	1,11 **4**	— —	0,13 **.005**	0,01-0,06 **.0004-.0025**	15,88 **.625**
BZ-2R55-A2-S	Best service for sealed construction. Stainless steel spring.	15 Amps **L96**	2,5-4,17 **9-15**	1,11 **4**	— —	0,13 **.005**	0,01-0,06 **.0004-.0025**	15,88 **.625**



BA-2R	Up to 20 ampere load handling. Solder terminals	20 Amps **L23**	3,89-6,12 **14-22**	2,78 **10**	1,27 **.050**	0,25 **.010**	0,05-0,19 **.0020-.0075**	16,26 **.640**
BA-2R-A2	Up to 20 ampere load handling	20 Amps **L23**	3,89-6,12 **14-22**	2,78 **10**	1,27 **.050**	0,25 **.010**	0,05-0,19 **.0020-.0075**	16,26 **.640**
BE-2R-A2	Up to 25 ampere load handling	25 Amps —	3,89-6,12 **14-22**	2,78 **10**	1,27 **.050**	0,25 **.010**	0,05-0,19 **.0020-.0075**	16,26 **.640**

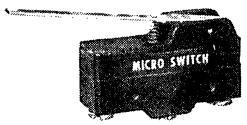
BZ-RX	Manual reset (maintained contact) applications, solder terminals	15 Amps **L67**	1,95-2,5 **7-9** 0,56-2,78 **2-10**	— — — —	0,30 **.012** — —	0,13 **.005** 0,38 **.015**	— —	15,88 **.625**

* ±0,38 mm ±.015 in.

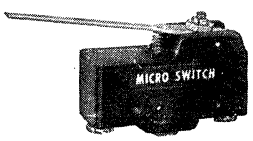
MICRO SWITCH, a Honeywell division

Standard basic switches BZ/BA

STRAIGHT LEVER ORDER GUIDES



Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.* mm inches
BZ-2RW80-A2	2.5 inch (63,5 mm) lever requirements	15 Amps L96	0,7 2.5	0,14 0.5	—	5,56 .219	0,18-1,27 .007-.050	19,1 .750
BZ-2RW84-A2	Lower force (without external return spring)	15 Amps L96	0,28 1	0,03 0.125	8,33 .328	5,56 .219	0,18-1,27 .007-.050	19,1 .750
BZ-2RW863-A2	6 inch (152 mm) long lever requirements	15 Amps L96	0,28 1	—	—	14,68 .578	0,46-3,68 .018-.145	19,1 ±1,52 .750 ±.060
BZ-2RW805551-A2	Dustproof and splash resistant seal. 2.5 inch lever	15 Amps L96	0,7 2.5	0,14 0.5	—	5,56 .219	0,18-1,27 .007-.050	19,1 .750
BA-2RV-A2	Up to 20 ampere load handling	20 Amps L23	0,7 2.5	0,14 0.5	15,88 .625	1,98 .078	2,77 .109	19,1 .750
BE-2RV-A4	Up to 25 ampere load handling	25 Amps —	0,7 2.5	0,14 0.5	15,88 .625	1,98 .078	2,77 .109 max.	19,1 .750

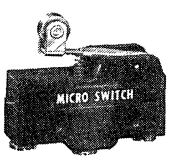


BZ-2RW899-A2	Adjustable operating point (17 mm to 22 mm) .670" to .880"	15 Amps L96	0,7 2.5	0,14 0.5	—	3,54† .125	0,18-1,27 .007-.050	17,02-22,35 .670-.880

†From 17 mm O.P. 670 in

Except where stated * ±0,76 mm ±.030 in.

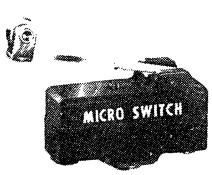
ROLLER LEVER ORDER GUIDES

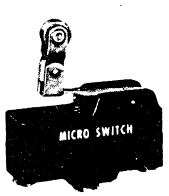


Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.** mm inches
BZ-2RW822	1.05 inch (26,7 mm) steel roller lever application. Solder terminal	15 Amps L96	1,67 6	0,42 1.5	—	2,39 .094	0,08-0,51 .003-.020	30,17 1.118
BZ-2RW822-A2	1.05 inch (26,7 mm) steel roller lever applications	15 Amps L96	1,67 6	0,42 1.5	—	2,39 .094	0,08-0,51 .003-.020	30,17 1.188
BZ-2RW8225551-A2	As above with dustproof and splash resistant seal	15 Amps L96	1,67 6	0,42 1.5	—	2,39 .094	0,08-0,51 .003-.020	30,17 1.188
BZ-2RW82255-A2-S	Dustproof and splash resistant seal with stainless steel spring	15 Amps L96	1,67 6	0,42 1.5	—	2,39 .094	0,08-0,51 .003-.020	30,17 1.188
BM-1RW822-A2	Up to 22 ampere load handling	22 Amps L68	1,67 6	0,42 1.5	—	2,39 .094	0,025-0,33 .001-.013	30,17 1.188
BA-2RV22-A2	Up to 20 ampere load handling	20 Amps L23	1,67 6	0,42 1.5	6,35 .250	0,76 .030	1,14 .045 max.	29,77 1.172
BE-2RV22-A4	Up to 25 ampere load handling	25 Amps —	1,67 6	0,42 1.5	6,35 .250	0,76 .030	1,14 .045 max.	29,77 1.172

Except where stated ** ±0,38 mm ±.015 in.

ROLLER LEVER ORDER GUIDES





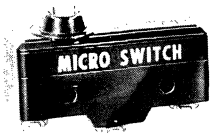
Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.* mm inches
BZ-2RW82-A2	1.90 inch (48.3 mm) steel roller lever applications	15 Amps L96	0,97 3.5	0,21 0.75	—	3,96 .156	0,10-1,0 .004-.040	30,17 ±0,76 1.188 ±.030
BA-2RV2-A2	Up to 20 ampere load handling	20 Amps L23	0,97 3.5	0,14 0.5	11,89 .468	1,52 .060	2,16 .085	30,17 ±0,76 1.188 ±.030
BZ-2RW826-A2	One-way roller (9,4 mm x 3,8 mm) .37" dia. x .15" wide roller	15 Amps L96	1,67 6	0,42 1.5	—	2,39 .094	0,08-0,51 .003-.020	41,34 1.625
BZ-2RW925-A2	One-way roller (4,83 mm x 4,83 mm) .19" dia. x .19" wide roller	15 Amps L96	2,22 8	0,42 1.5	—	1,52 .060	0,38 .015	28,96 1.14

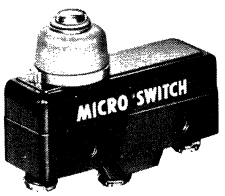
* ±0,38 mm ±0.15 in.

MICRO SWITCH, a Honeywell division

BZ/BA Standard basic switches

LARGE OVERTRAVEL PLUNGER



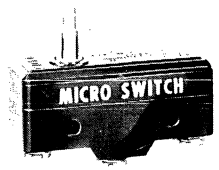


ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.** mm inches
BZ-2RD-A2	Added overtravel. For manual operation and slow 20° (max.) cam rise	15 Amps L96	2,5-3,61 9-13	1,11 4	0,38 .015	1,52 .060	0,01-0,05 .0004-.0020	21,21 .835
BA-2RB-A2	Up to 20 ampere load handling	20 Amps L23	3,89-6,12 14-22	2,78 10	1,27 .050	2,39 .094	0,05-0,19 .0020-.0075	26,20 1.03
BE-2RB-A2	Up to 25 ampere load handling	25 Amps —	3,89-6,12 14-22	2,78 10	1,27 .050	2,39 .094	0,05-0,19 .0020-.0075	26,20 1.03
BZ-2RDS-S	Dustproof and splash resistant seal. Solder terminals	15 Amps L96	3,61-5,28 13-19	1,11 4	—	1,5 .062	0,01-0,063 .0004-.0025	28,20 1.110
BZ-2RDS-A2-S	Applications requiring dustproof and splash resistant seal	15 Amps L96	3,61-5,28 13-19	1,11 4	—	1,5 .062	0,01-0,063 .0004-.0025	28,20 1.110

** ±0,51 mm ±.020 in.

SMALL OVERTRAVEL PLUNGER

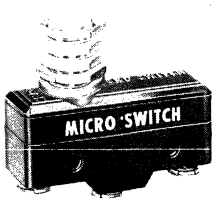


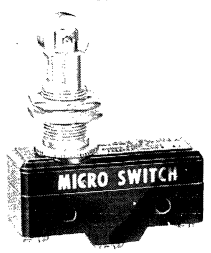
ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. newtons, ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.* mm inches
BZ-2RS-A2	Added overtravel. For in-line operation and with JR auxiliary actuators	15 Amps L96	2,5-3,61 9-13	1,11 4	0,38 .015	1,52 .060	0,01-0,063 .0004-.0025	28,20 1.110
BZ-2RS5551-A2	Dustproof and splash resistant seal	15 Amps L96	2,5-4,17 9-15	1,11 4	—	1,52 .060	0,01-0,063 .0004-.0025	28,20 1.110

* ±0,51 mm ±.020 in.

BUSHING MOUNT OVERTRAVEL PLUNGER



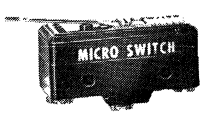


ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.** mm inches
BZ-2RQ1	Applications with bushing mount. Solder terminals	15 Amps L96	2,5-3,61 9-13	1,11 4	0,38 .15	5,56 .219	0,01-0,05 .0004-.0020	21,82 .859
BZ-2RQ1-A2	Applications with bushing mount.	15 Amps L96	2,5-3,61 9-13	1,11 4	0,38 .015	5,56 .219	0,01-0,05 .0004-.0020	21,82 .859
BA-2RQ1	Up to 20 ampere load handling. Solder terminals	20 Amps L23	3,89-6,12 14-22	2,78 10	1,27 .050	5,56 .219	0,05-0,19 .0020-.0075	21,82 .859
BA-2RQ1-A2	Up to 20 ampere load handling	20 Amps L23	3,89-6,12 14-22	2,78 10	1,27 .050	5,56 .219	0,05-0,19 .0020-.0075	21,82 .859
BZ-2RQ18-A2	Added overtravel. Roller plunger for rapid cam (30° max) rise and slide operation	15 Amps L96	2,5-3,61 9-13	1,11 4	0,38 .015	3,56 .140	0,01-0,05 .0004-.0020	33,32 ±1,14 1.312 ±.045
BZ-2RQ181-A2	Applications requiring roller plunger 90° to major axis of switch	15 Amps L96	2,5-3,61 9-13	1,11 4	0,38 .015	3,56 .140	0,01-0,05 .0004-.0020	33,32 ±1,14 1.312 ±.045

Except where stated ** ±0.76 mm ±.030 in.

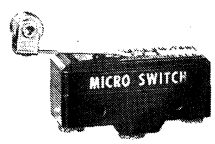
FLEXIBLE LEAF



ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P.** mm inches
BZ-2RL-A2	Force and stability of the flexible leaf actuator	15 Amps L96	1,39 5	0,14 0.5	—	1,52 .060	1,27 .050	17,48 .688
BA-2RL-A2	Up to 20 ampere load handling	20 Amps L23	2,5 9	0,28 1	—	1,57 .062	1,57 .062	17,48 .688

FLEXIBLE ROLLER LEAF



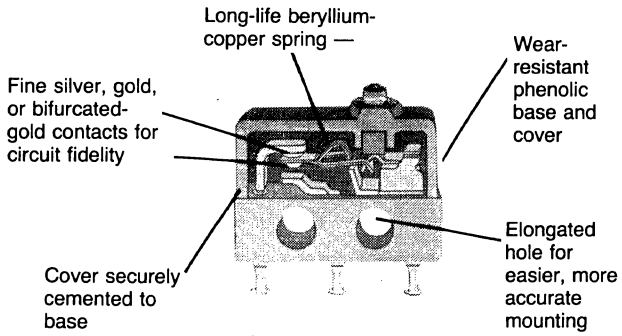
ORDER GUIDES

BZ-2RL2-A2	Force and stability of the flexible leaf with roller	15 Amps L96	1,39 5	0,14 0.5	—	1,52 .060	1,27 .050	28,6 1.125
BA-2RL2-A2	Up to 20 ampere load handling	20 Amps L23	2,5 9	0,28 1	—	1,52 .060	1,65 .065	28,6 1.125

** ± 0 76 mm ± 030 in

MICRO SWITCH, a Honeywell division

Subminiature basic switches SX



.35"H x .20"W x .50"L

Mounting holes accept pins or screws of .087 inch diameter (2,21 mm) on .19 inch (4,8 mm) centers.

FEATURES

- *Low operating force to 3 oz. (85 grams) maximum*
- *Sensitive differential travel as low as .001 inch maximum*
- *Power load switching capability up to 7 amperes — silver contacts*
- *Optional gold contacts for low energy applications*
- *Optional bifurcated gold contacts for maximum reliability*
- *Long mechanical life of 10,000,000 cycles — 95% survival for 11SX series*
- *Temperature tolerance −65° to +250°F (−54 to 121°C) on standard construction*
- *High temperature designs for up to +400°F (204°C)*
- *Variety of integral and auxiliary actuators*
- *Choice of several terminal styles*
- *Listing available which meet MIL-S-8805 Qualified products list*
- *UL recognized, CSA certified*

GENERAL INFORMATION

SX subminiature basic switches are the smallest snap-action switches from MICRO SWITCH. These switches are ideal where savings in space and weight are important. Unless otherwise noted, all listings have silver contacts.

Characteristics: O.F. — Operating Force; R.F. — Release Force; P.T. — Pretravel; O.T. — Overtravel; D.T. — Differential Travel; O.P. — Operating Position.

PIN PLUNGER

ORDER GUIDE

Catalog Listing	Recommended for	Electrical Data And UL Code	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P.* mm inches
11SX21-T	Most applications	5 Amps L4	0,70-1,39 2.5-5	0,28 1	0,51 .020	0,1 .004	0,051 .002	8,13 .320
1SX1-T	Up to 7 amps load handling	7 Amps L7	1,39 5	0,28 1	0,51 .020	0,1 .004	0,13 .005	8,13 .320
2SX1-T	Lower force	7 Amps L7	0,83 3	0,28 1	0,51 .020	0,1 .004	0,13 .005	8,13 .320
11SX1-T	Lowest differential travel	3 Amps L122	0,97 3.5	0,21 0.75	0,51 .020	0,1 .004	0,025 .001	8,13 .320
21SX1-T	Best stability under varying humidity	7 Amps L7	1,39 5	0,28 1	0,51 .020	0,1 .004	0,13 .005	8,13 .320
3SX1-T	Applications requiring gold contacts	1 Amp L22	1,39 5	0,28 1	0,51 .020	0,1 .004	0,13 .005	8,13 .320
21SX39-T (MS24547-1)	MIL-S-8805 application requirements + 180°F (82°C) maximum use	7 Amps —	1,39 5	0,28 1	0,51 .020	0,1 .004	0,13 .005	8,13 .320
23SX39-T (MS24547-2)	MIL-S-8805 application requirements for gold contacts + 180°F (82°C) maximum use	1 Amp L22	1,39 5	0,28 1	0,51 .020	0,1 .004	0,13 .005	8,13 .320
4SX1-T	Operating in temperature to + 400°F (204°C)	7 Amps L7	1,39 5	0,28 1	0,51 .020	0,1 .004	0,13 .005	8,13 .320
12SX2-T	Best reliability (Bifurcated gold contacts)	1 Amp L22	0,70-1,39 2.5-5	0,28 1	0,51 .020	0,1 .004	0,051 .002	8,13 .320
12SX1-T	Best reliability with higher current rating (28 VDC) (Bifurcated gold contacts)	1 Amp L22	1,39 5	0,28 1	0,51 .020	0,1 .004	0,076 .003	8,13 .320

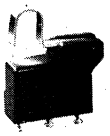
* ±0,38 mm ±.015 in.

MICRO SWITCH, a Honeywell division

SX Subminiature basic switches

INTEGRAL LEVER ORDER GUIDES

Catalog Listing	Description	Electrical Data And UL Code	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P. mm inches
311SX1-T	.135 inch (3,43 mm) straight lever (shown)	5 Amps L4	0,49 1.76	0,09 .32	1,65 .065	0,36 .014	0,51 .020	8,43 ±1,14 .332 ±.045
311SX2-T	.505 inch (12,8 mm) straight lever	5 Amps L4	0,31 1.1	0,05 .18	2,92 .115	0,64 .025	0,89 .035	8,26 ±1,91 .325 ±.075
311SX3-T	.965 inch (24,5 mm) straight lever	5 Amps L4	0,20 .71	0,03 .11	4,70 .185	1,17 .046	1,52 .060	7,75 ±2,92 .305 ±.115



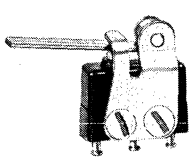
311SX4-T	.042 inch (1,1 mm) simulated roller lever (shown)	5 Amps L4	0,58 2.1	0,11 .39	1,27 .050	0,25 .010	0,38 .015	14,15 ±0,91 .557 ±.036
311SX5-T	.459 inch (11,7 mm) simulated roller lever	5 Amps L4	0,31 1.1	0,05 .18	2,67 .105	0,56 .022	0,89 .035	14,86 ±1,65 .585 ±.065

Auxiliary actuators

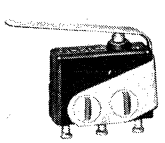
Switches are not included with actuators

Characteristics: O.F. — Operating Force;
R.F. — Release Force; P.T. — Pretravel;
O.T. — Overtravel; D.T. — Differential Travel;
O.P. — Operating Position; F.P. — Free Position
* All characteristics are taken with actuator assembled on Catalog Listing 1SX1-T as shown.

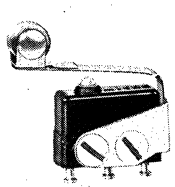
ORDER GUIDES



Catalog Listing	Description	Actuator Length mm inches	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. mm inches	O.T. mm inches	D.T. max. mm inches	O.P.†† mm inches	F.P. mm inches
JX-20	Straight lever (shown)	1,83 .72	0,28 1 approx.	0,04 .14	—	0,76 .030 approx.	0,76 .030 approx.	10,8 .425 approx.	12,3 .485 approx.
JX-25	Roller lever	16,5 .65	0,42 1.5	0,04 .14	—	0,51 .020	0,76 .030	14,9 ±1,14 .585 ±.045	16,8 .660 max.



JX-40	Straight leaf	9,4 .37	1,95 7	0,56 2	.225 approx.	0,38 .015	0,64 .025	7,5 .295	12,3 .485 ref.
JX-45	Roller leaf	6,1 .24	1,95 7	0,28 1	.225 approx.	0,38 .015	0,64 .025	12,2 .480	16,5 .650 ref.



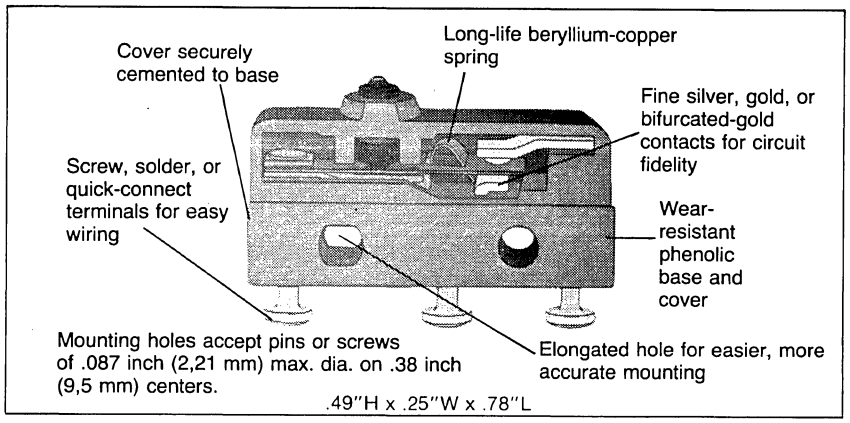
JX-41**	Reverse leaf	9,4 .37	1,67 6	0,28 1	.110 approx.	0,38 .015	0,64 .025	7,5 .295	9,4 .370 ref.
JX-51**	Reverse roller leaf	7,6 .30	1,67 6	0,56 2	.110 approx.	0,38 .015	0,64 .025	12,8 .505	14.7 .580 ref.

** Switch is mounted with plunger end reversed from JX-40.
NOTE: Above actuators should be used at temperatures below +300°F (149°C)

Except where stated †† ±0.76mm ±.030 in.

Subminiature basic switches SM

CUT-A-WAY SM SUBMINIATURE BASIC SWITCH

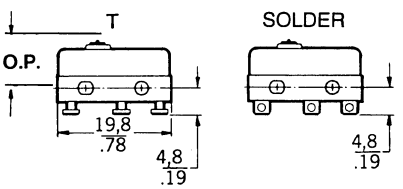


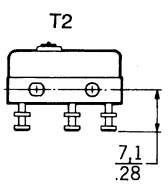
FEATURES

- *Low operating force to 2 ounces maximum.*
- *Sensitive differential travel as low as .001 inch (0,025 mm) maximum*
- *Power load switching capability available to 11 amps (VAC) — silver contacts*
- *Motor load handling capacity to ¼ horse power (VAC)**
- *Optional gold contacts for low energy applications*
- *Optional bifurcated gold contacts for maximum reliability**
- *Long mechanical life of 10,000,000 cycles — 95% survival for 11SM series*
- *Standard temperature range −65° to +180°F (−54 to 85°C)*
- *High temperature construction available for use to +400°F (204°C)**
- *Variety of integral and auxiliary actuators*
- *Choice of several terminal styles*
- *2 listings available which meet MIL-S-8805 Qualified products list.*
- *UL recognized, CSA certified*
- *BEAB and TV-2 construction available**

*Ordering information in Catalog 10.

AVAILABLE TERMINALS



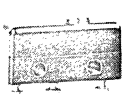


GENERAL INFORMATION

SM subminiature switches are slightly larger than SX switches. These switches combine small size and light weight with ample electrical capacity, precision operation and long life. Unless otherwise noted, all listings have silver contacts.

Characteristics: O.F. — Operating Force; R.F. — Release Force; P.T. — Pretravel; O.T. — Overtravel; D.T. — Differential Travel; O.P. — Operating Position.

PIN PLUNGERS



ORDER GUIDE

Catalog Listing	Recommended For	Electrical Data And UL Code	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P.* mm inches
1SM1	Original design. Solder posts.	5 Amps L4	0,83-1,39 3-5	0,28 1	0,76 .030	0,13 .005	0,1 .004	8,38 .330
1SM1-T	Original design. Solder terminals.	5 Amps L4	0,83-1,39 3-5	0,28 1	0,76 .030	0,13 .005	0,1 .004	8,38 .330
11SM1	Most applications,long life Solder posts.	5 Amps L4	0,83-1,39 3-5	0,28 1	0,51 .020	0,13 .005	0,1 .004	8,38 .330
11SM1-T	Same as above. Solder terminals	5 Amps L4	0,83-1,39 3-5	0,28 1	0,51 .020	0,13 .005	0,1 .004	8,38 .330
11SM1-T2	Same as above. Double terminals	5 Amps L4	0,83-1,39 3-5	0,28 1	0,51 .020	0,13 .005	0,1 .004	8,38 .330
11SM3-T	Operating in temperatures to +250°F (121°C)	5 Amps L4	0,83-1,39 3-5	0,28 1	0,51 .020	0,13 .005	0,1 .004	8,38 .330
11SM23-T	Application requiring gold contacts	1 Amp L22	0,83-1,39 3-5	0,28 1	0,51 .020	0,13 .005	0,1 .004	8,38 .330
11SM401-T	Less differential travel	5 Amps L4	0,97 3.5 max.	0,28 1	0,51 .020	0,13 .005	0,025 .001	8,38 .330
11SM701-T	Lower force	4 Amps L119	0,56 2	0,14 .5	0,51 .020	0,13 .005	0,051 .002	8,38 .330
21SM284 (MS25085-2)	MIL-S-8805 application requirements	5 Amps —	0,83-1,39 3-5	0,28 1	0,76 .030	0,13 .005	0,1 .004	8,38 .330

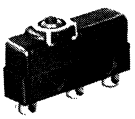
Except where stated * ±0,38mm ±.015 in

MICRO SWITCH, a Honeywell division

SM Subminiature basic switches

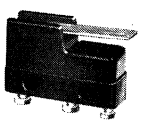
Characteristics: O.F. — Operating Force; R.F. — Release Force; P.T. — Pretravel; O.T. — Overtravel; D.T. — Differential Travel; O.P. — Operating Position; F.P. — Free Position

PIN PLUNGER ORDER GUIDES

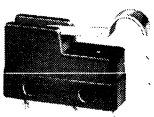


Catalog Listing	Recommended For	Electrical Data and UL Code	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P.* mm inches
411SM1	Sealed plunger construction	5 Amps L4	0,83-2,09 3-7.5	0,28 1	0,51 .020	0,13 .005	0,1 .004	8,38 .330

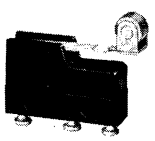
INTEGRAL LEVER ORDER GUIDES



311SM1-T	.285 inch (7,24 mm) straight lever (shown)	5 Amps L4	0,39 1.4	0,07 .25	2,16 .085	0,51 .020	0,48 .019	8,64 ±1,5 .340 ±.060
311SM2-T	.565 inch (14,35 mm) straight lever	5 Amps L4	0,31 1.1	0,05 .18	3,05 .120	0,66 .026	0,69 .027	8,51 ±2 .335 ±.080
311SM3-T	1.765 inch (44,8 mm) straight lever	5 Amps L4	0,15 .53	0,02 .07	7,87 .310	1,45 .057	2,8 .110	7,11 ±4,3 .280 ±.170



311SM4-T	.251 inch (6,38 mm) simulated roller lever	5 Amps L4	0,39 1.4	0,07 .25	2,16 .085	0,46 .018	0,48 .019	11,7 ±1,5 .460 ±.060
311SM5-T	.535 inch (13,6 mm) simulated roller lever	5 Amps L4	0,31 1.1	0,05 .18	3,05 .120	0,66 .026	0,69 .027	11,56 ±2 .455 ±.080



311SM6-T	.251 inch (6,38 mm) roller lever	5 Amps L4	0,39 1.4	0,07 .25	2,16 .085	0,46 .018	0,48 .019	14,2 ±1,5 .560 ±.060
311SM706-T	.251 inch (6,38 mm) roller lever. Lower force	4 Amps L119	0,16 .57	0.03 .11	2,16 .085	0,46 .018	0,33 .013	14,2 ±1,5 .560 ±.060

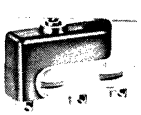
INTEGRAL LEAF ORDER GUIDES

111SM1-T	Force and stability of flexible leaf actuator (shown)	5 Amps L4	1,95 7	0,56 2	5,54 .218	0,76 .030	0,76 .030	8,89 ±0,76 .350 ±.030
111SM2-T	Flexible leaf with roller	5 Amps L4	1,95 7	0,56 2	5,56 .219	0,76 .030	0,64 .025	14,3 ±0,76 .562 ±.030

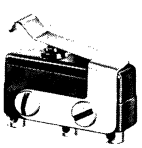
Except where stated * ±0,38 mm ±.015 in.

AUXILIARY ACTUATORS ORDER GUIDES

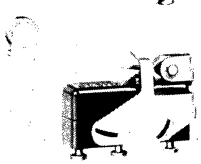
Switches are not included with actuators.*



Catalog Listing	Description	Actuator Length mm inches	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm Inches	O.P. mm inches	F.P. max. mm inches
JS-2	Straight leaf (shown)	16,8 .66	2,78 10	0,56 2	1,98 .078	0,38 .015	0,38 .015	8,89 ±0,76 .350 ±.015	11,3 .445
JS-5	Roller leaf (Bronze roller)	15 .59	2,78 10	0,83 3	1,98 .078	0,38 .015	0,38 .015	14,2 ±0,76 .560 ±.015	16,9 .665



JS-7	Formed leaf (Simulated roller)	14,7 .58	2,78 10	0,56 2	2,39 .094	0.79 .031	0,38 .015	9,65 ±0,76 .380 ±.015	12,1 .475



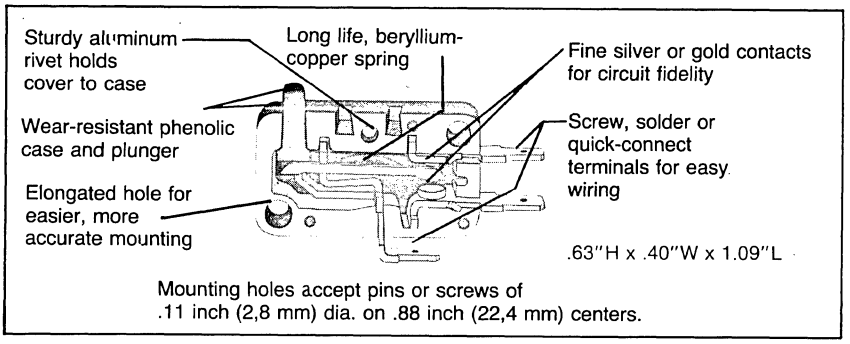
JS-220	Straight lever	26,2 1.03	0,28 1	0,04 .14	3,18 .125 approx.	0.76 .030	0,76 .030	10,3 .406 approx.	—
JS-246	Roller lever (shown) (Steel roller)	25,4 1.00	0,28 1	0,04 .14	3,18 .125 approx.	0,76 .030	0,76 .030	14,3 .562 approx.	—

NOTE: Above actuators should be used below +300°F (149°C)

* All characteristics are taken with actuator assembled to Catalog Listing 11SM3-T as shown.

Miniature basic switches V3

CUT-A-WAY V3 MINIATURE BASIC SWITCH



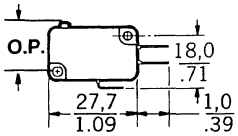
FEATURES

- *Low operating force to .53 ounce maximum*
- *Sensitive differential travel as low as .008 inch maximum**
- *Power load switching capability up to 15 amperes — silver contacts*
- *Motor handling capacity of ½ horsepower — silver contacts*
- *Gold alloy contacts for special applications*
- *Long mechanical life of 10,000,000 cycles — 95% survival for V3-100 Series.*
- *Temperature tolerance up to +180°F (82°C) on standard construction*
- *High temperature construction for use up to +600°F (316°C)**
- *3,1 mm mounting holes available*
- *UL recognized, CSA certified*

*Ordering information in Catalog 10.

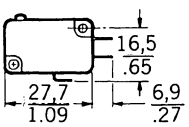
AVAILABLE TERMINALS

D8 QUICK CONNECT

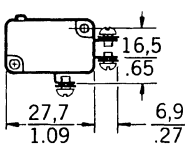


.188" wide by .020" thick terminals

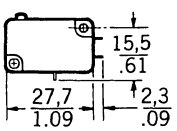
SOLDER



SCREW



SHORT SOLDER



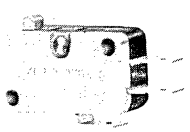
GENERAL INFORMATION

V3 miniature basic switches feature high electrical capacity and long life. Their size and shape meet design requirements in all types of applications.

The V7 series of miniature basic switches is designed to meet all leading European approval agency requirements. Terminal variations and switch dimensions conform to applicable DIN standards. Request Product Sheet V7.

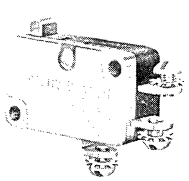
Characteristics: O.F. — Operating Force; R.F. — Release Force; P.T. — Pretravel; O.T. — Overtravel; D.T. — Differential Travel; O.P. — Operating Position.

PIN PLUNGER



ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data And UL Code	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.** mm inches
V3-1-D8	Best for use under shock and vibration	15 Amps **L83**	1,67-3,89 **6-14**	1,11 **4**	1,2 **.047**	1,02 **.040**	0,15-0,41 **.006-.016**	14,7 **.578**
V3-101-D8	Most applications	11 Amps **L156**	2,22 **8 max.**	0,56 **2**	1,2 **.047**	1,02 **.040**	0,15-0,41 **.006-.016**	14,7 **.578**
V3-1101-D8	Added overtravel	10 Amps **L112**	0,72 max. **2.6**	0,10 **.35**	1,2 **.047**	1,27 **.050**	0,051-0,25 **.002-.010**	14,7 **.578**
V3-2101-D8	Lower force, added overtravel	10 Amps **L131**	0,50 max. **1.8**	0,05 **.18**	1,2 **.047**	1,27 **.050**	0,051-0,25 **.002-.010**	14,7 **.578**
V3-70101-D8	Most 5 amp applications	5 Amps **L109**	0,24 **.9**	—	1,2 **.047**	1,27 **.050**	0,051-0,25 **.002-.010**	14,7 **.578**
V3-2451-D8	Lowest force	3 Amps **L163**	0,15 **.53**	—	1,2 **.047**	1,27 **.050**	0,051-0,25 **.002-.010**	14,7 **.578**
V3-3001-D8	Up to 15 amps load handling	15 Amps **L83**	1,33 max. **4.8**	0,15 **.53**	1,2 **.047**	1,27 **.050**	0,051-0,25 **.002-.010**	14,7 **.578**
V3-343-D8*	Applications requiring gold alloy contacts	1 Amp **L22**	2,22 **8 max.**	0,56 **2**	1,2 **.047**	1,02 **.040**	0,15-0,41 **.006-.016**	14,7 **.578**



V3-1	Best for use under shock and vibration	15 Amps **L83**	1,67-3,89 **6-14**	1,11 **4**	1,2 **.047**	1,02 **.040**	0,15-0,41 **.006-.016**	14,7 **.578**
V3-15	Some as V3-1 except short solder terminals	15 Amps **L83**	1,67-3,89 **6-14**	1,11 **4**	1,2 **.047**	1,02 **.040**	0,15-0,41 **.006-.016**	14,7 **.578**
V3-19	Same as V3-1 except solder terminals	15 Amps **L83**	1,67-3,89 **6-14**	1,11 **4**	1,2 **.048**	1,02 **.040**	0,15-0,41 **.006-.016**	14,7 **.578**
V3-101	General use.	11 Amps **L156**	2,22 **8 max.**	0,56 **2**	1,2 **.047**	1,02 **.040**	0,15-0,41 **.006-.016**	14,7 **.578**
V3-1001 (MS25253-1)	MIL-S-8805 application requirements (SPDT)	10 Amps —	1,67-3,89 **6-14**	1,11 **4**	1,2 **.047**	1,02 **.040**	0,15-0,41 **.006-.016**	14,7 **.578**

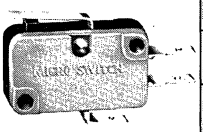
** ±0,38 ±0,15

MICRO SWITCH, a Honeywell division

V3 Miniature basic switches

Characteristics: O.F. — Operating Force; R.F. — Release Force; P.T. — Pretravel; O.T. — Overtravel; D.T. — Differential Travel; O.P. — Operating Position.

STRAIGHT LEVER ORDER GUIDES

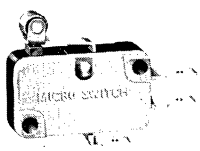


Catalog Listing	Recommended For	Electrical Data and UL Code	Length of Lever "A" mm inches	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P.* mm inches
V3L-101-D8	Most applications Short lever	11 Amps L156	21,3 .860	2,50 9	0,56 2	1,5 .060	1,02 .040	0,41 .016	15,2 ±0,51 .600 ±.020
V3L-104-D8	Most applications (Shown) med.	11 Amps L156	35,6 1.40	1,11 4	0,14 .5	3,18 .125	2,29 .090	1,27 .050	15,2 ±1,5 .600 ±.060
V3L-131-D8	Most applications long lever	11 Amps L156	59,4 2.34	0,58 2.1	0,12 .42	6,6 .260	3,81 .150	2,29 .090	14,7 ±2 .580 ±.080
V3L-3013-D8	Up to 15 amps load handling. Best performance under shock and vibration	15 Amps L83	59,4 2.34	0,39 1.4	0,03 .11	5,33 .210	4,06 .160	1,52 .060	15,2 ±1,9 .600 ±.075

SIMULATED ROLLER ORDER GUIDE

V3L-121-D8	Most applications	11 Amps L156	32,6 1.285	1,11 4	0,14 .5	3,18 .125	2,03 .080	1,27 .050	18,5 .730

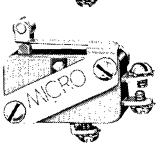
ROLLER LEVER ORDER GUIDES

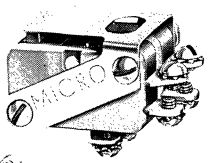


V3L-139-D8	Most applications (Shown)	11 Amps L156	20.6 .81	2,22 8	0,56 2	1,5 .060	1,02 .040	0,41 .016	20,6 ±0,76 .810 ±.030
V3L-3003-D8	Up to 15 amps load handling. Best for performance under shock and vibration	15 Amps L83	20,6 .81	1,33 4.8	0,15 .53	1,2 .047	1,02 .040	0,33 .013	20,6 ±0,76 .810 ±.030
V3L-111-D8	Most applications longer lever	11 Amps L156	34 1.34	1,11 4	0,14 .5	3,18 .125	2,16 .085	1,27 .050	20,6 ±1,5 .810 ±.060
V3L-3004-D8	Up to 15 amps load handling. Best for performance under shock and vibration	15 Amps L83	34 1.34	0,70 2.5	0,14 .49	3,18 .125	2,16 .085	0,76 .030	20,6 ±1,5 .810 ±.060

AUXILIARY ACTUATORS ORDER GUIDES

Switches are not included with actuators.*





Catalog Listing	Description	Actuator Length mm inches	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P. mm inches	F.P. max. mm inches
JV-1	Leaf type (shown)	21,3 .84	3,34 12	1,11 4	1,19 .047	0,79 .031	0,41 .016	15 ±0,38 .590 ±.015	16,4 .645
JV-7	Long leaf	32,3 1.27	2,50 9	1,11 4	1,57 .062	1,27 .050	0,64 .025	14,5 ±0,76 .570 ±.030	17,4 .685
JV-5	Roller leaf (shown)	20,6 .81	3,34 12	1,11 4	1,52 .060	0,79 .031	0,41 .016	20,3 ±0,64 .800 ±.025	22,1 .870

*Characteristics taken with actuator assembled on Catalog Listing V3-100 switch as shown.

JV-91**	Tandem leaf (shown)	20,6 .81	5,00 18	1,67 6	1,57 .062	0,89 .035	—	14,9 ±0,76 .588 ±.030	16,5 .650
JV-82**	Tandem roller leaf	20,6 .81	5,00 18	1,67 6	1,57 .062	0,89 .035	—	20,5 ±0,76 .806 ±.030	21,8 .860

JV-20	Roller lever	19,1 .750	0,83 3	0,14 .5	4,78 .188	1,57 .062	1,98 .078	19,5 ±1,4 .766 ±.055	23,8 .936
JV-26	Long lever	44,5 1.75	0,39 1.4	0,06 .21	8,33 .328	3,58 .141	4,75 .187	12,7 ±3,18 .500 ±.125	—

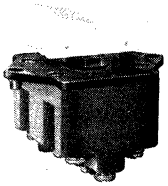
JV-30	One-way roller lever	20,6 .81	3,34 12	1,11 4	2,03 .080	0,51 .020	0,38 .015	25,7 ±0,76 1.010 ±.030	27,7 1.09

NOTE: Contact a MICRO SWITCH Sales Office for application assistance when actuators will be used at temperatures above 300°F (149°C).

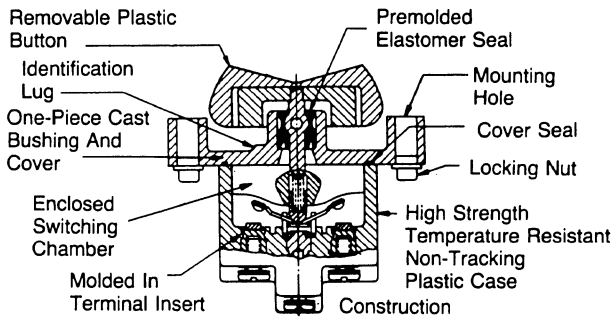
**Travel characteristics on tandem actuators vary with actual basic switch characteristics. These shown are typical for the assembly.

MICRO SWITCH, a Honeywell division

Rocker button switches TP



Above Panel



FEATURES

- *2 and 3 position pushbutton action*
- *Various button colors*
- *1, 2, and 4 pole circuitry*
- *Flush panel and above panel mounting*
- *Temperature range is from −54°C to +71°C (−65°F to +160°F)*
- *UL recognized, CSA certified*

SWITCHES WITHOUT BUTTONS

To order switches without buttons, convert catalog listings shown in the order guides. Substitute **TP7** for TP4 and TP16 above panel mounted switches; substitute **TP8** for TP1 and TP12 flush panel mounted switches. Order buttons separately from the chart below.

BUTTON ORDER GUIDE

Color	Catalog Listing
Translucent	12PA6
Transparent	12PA4
White*	12PA5-W
Yellow*	12PA5-Y
Black*	12PA5-BK
Green*	12PA5-G
Red*	12PA5-R
Blue*	12PA5-BL

*Opaque

ELECTRICAL RATINGS

(In amperes)

Elec. Rating Code	28 Volts DC			115 VDC	250 VDC	115 Volts AC 60 & 400 HZ			230 VAC
	Ind.	Res.	Lamp	Res.	Res.	Ind.	Res.	Lamp	Res.
1	15	20	5	0.75	0.5	10	15	3	6
2	10	15	4	0.75	0.5	7	15	2	6
3	15	20	7	0.75	0.5	15	15	4	6
4	10	18	5	0.75	0.5	8	11	2	6
5	12	20	5	0.75	0.5	15	15	4	6
6	10	18	4	0.75	0.5	8	11	2	6

2-POSITION ORDER GUIDE

Furnished with buttons.

No. of Poles	Circuits Made with Button At:		UL/CSA Rating Code	Elec. Rating Code	Catalog Listings			
					Flush Panel		Above Panel	
	Ident. Lug Position	Opposite Ident. Lug			Translucent Button	Transparent Button	Translucent Button	Transparent Button
1	OFF	2-3	L191	1	1TP201-2	1TP12-2	1TP216-2	1TP4-2
	1-2	2-3	L191	1	1TP201-3	1TP12-3	1TP216-3	1TP4-3
2	OFF	2-3, 5-6	L191	3	2TP201-2	2TP12-2	2TP216-2	2TP4-2
	1-2, 4-5	2-3, 5-6	L191	3	2TP201-3	2TP12-3	2TP216-3	2TP4-3
4	OFF	2-3, 5-6, 8-9, 11-12	L191	5	4TP201-2	—	—	—
	1-2, 4-5, 7-8, 10-11	2-3, 5-6, 8-9, 11-12	L191	5	4TP201-3	—	—	—

3-POSITION ORDER GUIDE

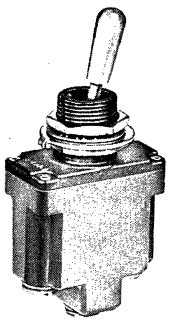
Furnished with buttons.

No. of Poles	Circuits Made with Button At:			UL/CSA Rating Code	Elec. Rating Code	Catalog Listings			
						Flush Panel		Above Panel	
	Ident. Lug Position	Center Position	Opposite Lug Lug Pos.			Translucent Button	Transparent Button	Translucent Button	Transparent Button
1	1-2	OFF	2-3	L191	1	1TP201-1	1TP12-1	1TP216-1	1TP4-1
	1-2*	OFF	2-3*	L192	2	1TP201-7	1TP12-7	1TP216-7	1TP4-7
2	1-2, 4-5	OFF	2-3, 5-6	L191	3	2TP201-1	2TP12-1	2TP216-1	—
	1-2, 4-5*	OFF	2-3, 5-6	L192	4	2TP201-5	—	—	—
	1-2, 4-5*	OFF	2-3, 5-6*	L192	4	2TP201-7	2TP12-7	2TP216-7	—
4	1-2, 4-5, 7-8, 10-11	OFF	2-3, 5-6, 8-9, 11-12	L191	5	4TP201-1	—	—	—
	1-2, 4-5, 7-8, 10-11*	OFF	2-3, 5-6, 8-9, 11-12*	L192	6	4TP201-7	4TP12-7	—	—

*These positions only are momentary. All others are maintained.

MICRO SWITCH, a Honeywell division

TK Toggle switches



FEATURES

- *Environment sealed enclosure*
- *1 and 2-pole circuitry*
- *2 and 3-position, maintained and momentary toggle action*
- *Temperature range: −40° to +71.1°C (−40° to +160°F)*
- *UL recognized, CSA certified.*

TK toggles answer the need for an environment sealed industrial grade toggle switch. When mounted with a 15PA87 seal accessory, they meet NEMA 4 requirements on food processing and other industrial panels subjected to periodic washdowns. TK's withstand heavy morning dew found in the cabs of construction and farm vehicles, and beverage spillage.

ELECTRICAL RATINGS

UL/CSA Rating Code	Electrical Rating
L192	10 amps — 125, 250, 277 VAC; ¼ Hp — 125 VAC; ½ Hp — 250, 277 VAC; 3 amps — 125 VAC "L"
L191	UL Code L-191: 15 amps — 125, 250, 277 VAC; ½ Hp — 125 VAC; 1 Hp — 250, 277 VAC; 5 amps — 125 VAC "L"

2-POSITION ORDER GUIDE

No. Of Poles	Circuit(s) Made With Toggle At: Keyway Position	Opposite Keyway	UL/CSA Rating Code	Catalog Listing
1	OFF 1-2	2-3 2-3	L191 L191	1TK1-2 1TK1-3
2	OFF 1-2, 4-5	2-3, 5-6 2-3, 5-6	L191 L191	2TK1-2 2TK1-3

3-POSITION ORDER GUIDE

No. Of Poles	Circuit(s) Made With Toggle At: Keyway Position	Center Position	Opposite Keyway	UL/CSA Rating Code	Catalog Listing
1	1-2 1-2*	OFF OFF	2-3 2-3*	L191 L192	1TK1-1 1TK1-7
2	1-2, 4-5 1-2, 4-5*	OFF OFF	2-3, 5-6 2-3, 5-6*	L191 L192	2TK1-1 2TK1-7

*These positions only are momentary. All others are maintained.

CONSTRUCTION

There is a premolded elastomer seal between the toggle lever and bushing, and an elastomer gasket seal between the cover and case. Terminal inserts are molded into the case.

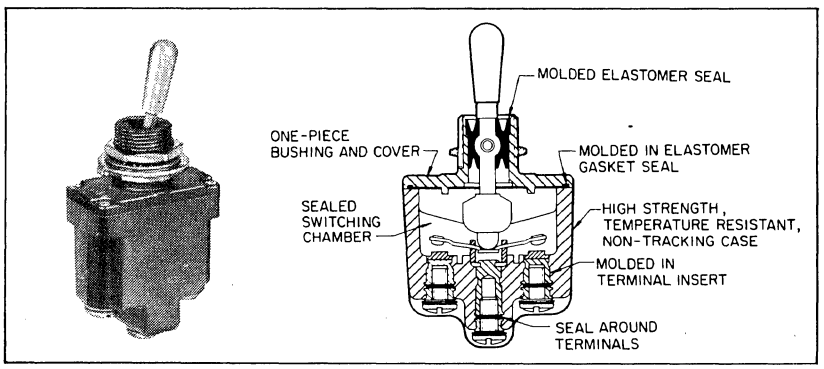
TK's embody many of the time-proven construction features of the TL design, such as: spring-loaded actuating mechanism for direct-action operation and excellent tactile feedback; stepped terminals, which aid non-shorting wiring connections; and a high strength non-tracking case, which promotes electrical stability.

TERMINAL CIRCUIT IDENTIFICATION

Terminal identifications are refered to in the Ordering Charts to indicate which circuits are made in each toggle position (i.e. 1-2 reference indicates circuit closure through terminals 1 and 2.)

MICRO SWITCH, a Honeywell division

Toggle switches TL



FEATURES

- *Qualified to MIL-S-3950*
- *Environment-proof sealing*
- *1, 2, and 4 pole circuitry*
- *Standard and pull to unlock levers*
- *2 and 3 position, maintained, and momentary toggle action*
- *Temperature range: −65°C to +71°C (−85°F to +160°F)*
- *UL recognized, CSA certified.*

2-POSITION ORDER GUIDE

No. of Poles	Circuit(s) Made w/Toggle At: Keyway Position	Opposite Keyway	Electrical Rating Code	UL/CSA Rating Code	Standard Toggle Catalog Listing	Standard Toggle Military Number	Pull-to-Unlock Toggle Add Suffix to Standard Listing	Pull-to-Unlock Toggle Military Number**
1	OFF	2-3	1	L191	1TL1-2	MS24523-22	D, F, G	MS24658-22
	OFF*	2-3	2	L192	1TL1-4	MS24523-29	F	MS24658-29
	1-2*	OFF	2	L192	1TL1-6	MS24523-30	F	MS24658-30
	1-2	2-3	1	L191	1TL1-3	MS24523-23	D, F, G	MS24658-23
	1-2*	2-3	2	L192	1TL1-8	MS24523-26	F	MS24658-26
2	OFF	2-3, 5-6	3	L191	2TL1-2	MS24524-22	D, F, G	MS24659-22
	1-2, 4-5*	OFF	4	L192	2TL1-6	MS24524-30	F	MS24659-30
	1-2, 4-5	2-3, 5-6	3	L191	2TL1-3	MS24524-23	D, F, G	MS24659-23
	1-2, 4-5*	2-3, 5-6	4	L192	2TL1-8	MS24524-26	F	MS24659-26
4	OFF	2-3, 5-6 8-9, 11-12	5	L191	4TL1-2	MS24525-22	D, F, G	MS24660-22
	1-2, 4-5 7-8, 10-11	2-3, 5-6 8-9, 11-12	5	L191	4TL1-3	MS24525-23	D, F, G	MS24660-23

*These positions only are momentary. All others are maintained.
**Also add the appropriate suffix letter to the Military number.

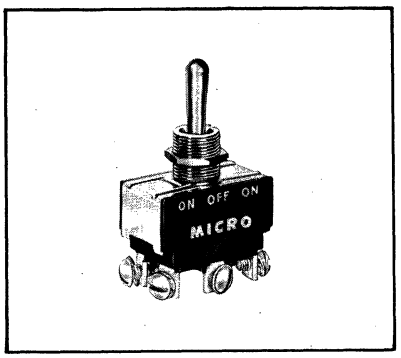
3-POSITION ORDER GUIDE

No. of Poles	Circuit(s) Made w/Toggle At: Keyway Position	Center Position	Opposite Keyway	Electrical Rating Code	UL/CSA Rating Code	Standard Toggle Catalog Listing	Standard Toggle Military Number**	Pull-to-Unlock Toggle Add Suffix to Standard Listing	Pull-to-Unlock Toggle Military Number**
1	1-2	OFF	2-3	1	L191	1TL1-1	MS24523-21	ALL TYPES	MS24658-21
	1-2*	OFF	2-3	2	L192	1TL1-5	MS24523-31	E, F, K, L, M, N	MS24658-31
	1-2*	OFF	2-3*	2	L192	1TL1-7	MS24523-27	E, L, N	MS24658-27
2	1-2, 4-5	OFF	2-3, 5-6	3	L191	2TL1-1	MS24524-21	ALL TYPES	MS24659-21
	1-2, 4-5*	OFF	2-3, 5-6	4	L192	2TL1-5	MS24524-31	E, F, K, L, M, N	MS24659-31
	1-2, 4-5*	OFF	2-3, 5-6*	4	L192	2TL1-7	MS24524-27	E, L, N	MS24659-27
	1-2, 4-5	1-2, 5-6	2-3, 5-6	3	L191	2TL1-10	MS27407-4	ALL TYPES	MS27408-4
	1-2, 4-5*	1-2, 5-6	2-3, 5-6	4	L192	2TL1-50	MS27407-5	E, F, K, L, M, N	MS27408-5
	1-2, 4-5*	1-2, 5-6	2-3, 5-6*	4	L192	2TL1-70	MS27407-6	E, L, N	MS27408-6
4	1-2, 4-5 7-8, 10-11	OFF	2-3, 5-6 8-9, 11-12	5	L191	4TL1-1	MS24525-21	ALL TYPES	MS24660-21
	1-2, 4-5 7-8, 10-11*	OFF	2-3, 5-6 8-9, 11-12*	6	L192	4TL1-7	MS24525-27	E, L, N	MS24660-27
	1-2, 4-5 7-8, 10-11	2-3, 4-5 7-8, 11-12	2-3, 5-6 8-9, 11-12	5	L191	4TL1-12	MS27406-1	ALL TYPES	MS27409-1

*These positions only are momentary. All others are maintained.
**Also add appropriate suffix letter to the Military number.

MICRO SWITCH, a Honeywell division

TS Toggle switches



FEATURES

- *2 or 3-position, momentary and maintained action*
- *1 and 2-pole circuitry*
- *Rated up to 15 amps*
- *Lever-to-bushing seal*
- *Solder, screw, or quick-connect terminals*
- *UL recognized, CSA certified.*

ELECTRICAL RATINGS

UL/CSA Rating Code	Electrical Rating
L192	10 Amps, 125, 250, 277 VAC; ¼ HP — 125 VAC; ½ HP — 250, 277 VAC; 3 amps — 125 VAC "L"
L191	15 amps, 125, 250, 277 VAC; ½ HP — 125 VAC; 1 HP — 250, 277 VAC; 5 amps — 125 VAC "L"

2-POSITION ORDER GUIDE

No. of Poles	Circuit(s) Made w/Toggle At: Keyway Position	Opposite Keyway	UL/CSA Rating Code	Screw Terminals	Solder Terminals	Quick-Connect Terminals
1	OFF	2-1 ON	L191	11TS15-2	11TS115-2	11TS95-2
	2-1 ON	2-3 ON	L191	11TS15-3	11TS115-3	11TS95-3
2	OFF	2-3 & 5-6 ON	L191	12TS15-2	12TS115-2	12TS95-2
	2-1 & 5-4 ON	2-3 & 5-6 ON	L191	12TS15-3	12TS115-3	12TS95-3

3-POSITION ORDER GUIDE

No. of Poles	(Circuits) Made w/Toggle At: Keyway Position	Center Position	Opposite Keyway	UL/CSA Rating Code	Screw Terminals	Solder Terminals	Quick-Connect Terminals
1	2-1 ON	OFF	2-3 ON	L191	11TS15-1	11TS115-1	11TS95-1
	2-1 ON*	OFF	2-3 ON	L192	11TS15-5	11TS115-5	11TS95-5
	2-1 ON*	OFF	2-3 ON*	L192	11TS15-7	11TS115-7	11TS95-7
2	2-1 & 5-4 ON	OFF	2-3 & 5-6 ON	L191	12TS15-1	12TS115-1	12TS95-1
	2-1 & 5-4 ON*	OFF	2-3 & 5-6 ON*	L192	12TS15-7	12TS115-7	12TS95-7

*Marked toggle positions are momentary. All other positions are maintained.

LOCKING CONFIGURATIONS FOR TL, 13AT AND 23AT SERIES ONLY

When ordering pull-to-unlock toggle listings, add the suffix letter shown in the chart below to the standard toggle listing and the MS number. For example, to order a 1TL1-1 pull-to-unlock toggle switch with the lever locked in the center position, add the letter **E**; i.e., 1TL1-1**E**, MS-24658-21**E**.

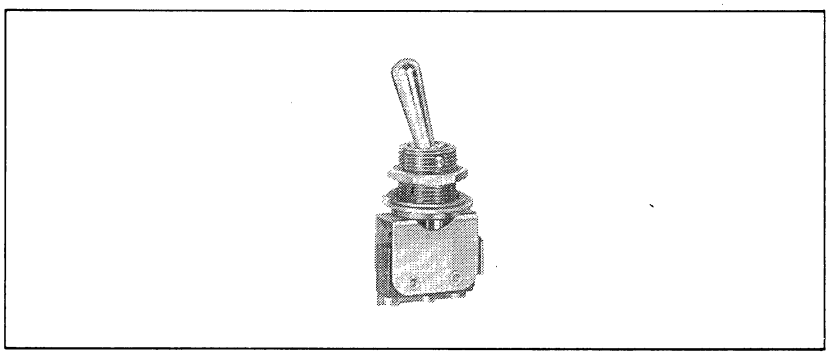
A	B	D	E	F	G	H
Locked In Three Positions	Locked In Center and Extreme Position (Keyway Side)	Locked Out Of Center Position	Locked In Center Position	Locked In Extreme Position (Opposite Keyway)	Locked In Extreme Position (Keyway Side)	Locked Out Of Center And Extreme Position (Keyway Side)

J	K	L	M	N	P
Locked Out Of Center And Extreme Position (Opposite Keyway)	Locked In Center And Extreme Position (Opposite Keyway)	Locked Out Of Extreme Position (Keyway Side)	Locked Out Of And Into Extreme Position (Opposite Keyway)	Locked Out Of Extreme Position (Opposite Keyway)	Locked Out Of And Into Extreme Position (Keyway Side)

MICRO SWITCH, a Honeywell division

Toggle switch assemblies AT

6AT SERIES



FEATURES

- *2-position, momentary and maintained action*
- *1, 2 or 3 SPDT precision basic switches*
- *Short behind-panel depth*
- *Choice of ¼ or 15/32-inch bushings*
- *Silver contacts (gold available)*
- *UL recognized, CSA certified basic switches*

ELECTRICAL RATINGS

For 6AT, 13AT, 23AT switches

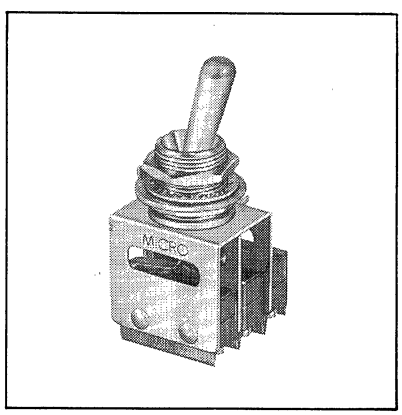
UL/CSA Rating	30VDC Rating		
	Load	Amps	
		Sea Level	50,000 ft.
5 amps, 125-250VAC	Inductive	3	2.5
	Resistive	5	5
	Max. Inrush	24	24

6AT ORDER GUIDE

Mounting Style	No. of Poles	Solder Terminals*
¼" bushing with key tab	1	6AT2
	2	6AT3
	3	6AT501
¼" bushing without key tab	1	6AT1
	2	6AT4
15/32" bushing with key washer	1	6AT6
	2	6AT7
	3	6AT10

*"T" and "T2" terminal versions, gold contact versions for low energy circuits: See Catalog 30.

13AT/23AT SERIES



FEATURES

- *2 or 3 position, momentary or maintained action*
- *2, 3 or 4 SPDT precision basic switches*
- *Standard toggle, tab or pull-to-unlock levers*
- *Silver contacts (gold available)*
- *15/32-inch bushing*
- *UL recognized, CSA certified basic switches*
- *Lever-to-bushing seal option*

23AT 2-POSITION ORDER GUIDE

Toggle Lever Position		No. of Poles	Solder Terminals*
Keyway	Opposite Keyway		
Maint.	Maint.	2	23AT1
		3	23AT2
		4	23AT3

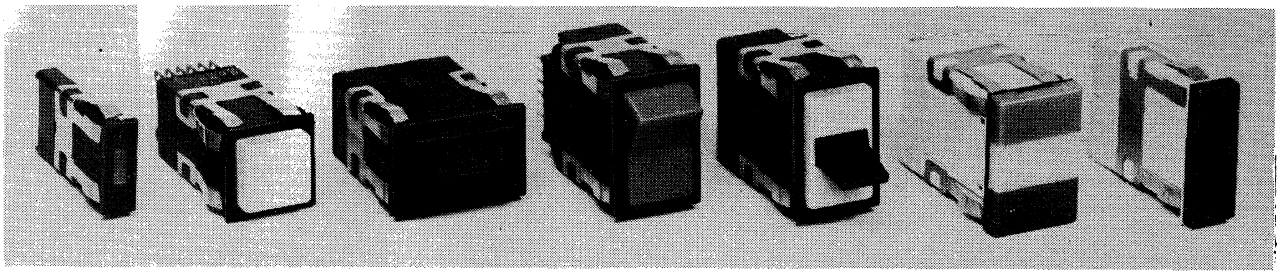
13AT 3-POSITION ORDER GUIDE

Toggle Lever Position			No. of Poles*	Solder Terminals*
Keyway	Center	Opposite Keyway		
Maint.	Maint.	Maint.	2	13AT2
Mom.	Maint.	Mom.	2	13AT1
Maint.	Maint.	Mom.	2	13AT3

*Pull-to-unlock lever, tab lever, 3 and 4-pole versions, M8805 types, gold contacts, and "T" or "T2" terminals: see Catalog 30, Manual Switches.

MICRO SWITCH, a Honeywell division

AML Advanced manual line



AML's classic design blends with other panel components to enhance total display harmony. Well-accepted as the only comprehensive line of its kind, AML features uniformly functional and attractive pushbuttons, paddles, rockers, indicators, and annunciators. LED, incandescent, and neon illumination . . . solid state to electronic and power duty control.

AML electrical data ..... p. 22
Solid state pushbuttons AML11/12 ..... p. 23
Power duty pushbuttons AML31/32 ..... p. 23
Electronic control pushbuttons AML21/22 ..... p. 24
LED application notes/panel cutouts ..... p. 24
Lighted indicators AML41/42 ..... p. 25
Buttons, lenses, lamps AML51/52/91 ..... p. 26
Solid state paddles & rockers AML13/14/15/16 ..... p. 27
Electronic control paddles & rockers AML23/24/25/26 ..... p. 28
Power duty paddles & rockers AML33/34/35/36 ..... p. 29
Paddle covers AML53/55 ..... p. 30
Rocker operators AML54/56 ..... p. 31
AML accessories ..... p. 32

A companion line of MIL-S-22885 qualified products is available. Ask for information on M22885 series.

ELECTRICAL SPECIFICATIONS

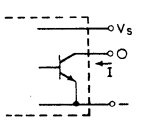
AML10 SERIES SOLID STATE SWITCHES

Electrical Characteristics						Absolute Maximum Rating			
Integrated Circuit Function	Supply Current (Max.)	Output Voltage (Operated)	Output Leakage Current Max. (Released)	Switching Time Max. Rise 10% to 90%	Switching Time Max. Fall 90% to 10%	Supply Voltage (V_s)	Voltage Externally Applied to Output	Loads to Output	Storage Temperature
5 VDC Sinking[1]	3.5 mA (Released) 6.5 mA (Operated — no load)	+.4 Volt (Sinking 8 mA)	2.0 μA	1.0 μ sec. (Sinking 8 mA)	1.0 μ sec (Sinking 8 mA)	−.5 to +7.0 VDC 0° to +65°C (+32° to +149°F)	−.5 Volt min. +15 Volts Max. (Off condition)	20 mA (Sinking)	−40°C to +65°C (−40° to +149°F)
6-16 VDC Sinking[2]	6.5 mA @ 6 VDC. 10.0 mA @ 16 VDC (Plus load current)[3]	+.4 Volt (Sinking 20mA max.)	20 μA	1.5 μ sec (Sinking 20 mA)	0.5 μ sec (Sinking 20 mA)	−1.2 to +20 VDC	+20 VDC max. in Off condition only −0.5 VDC min. in Off or On condition	40 mA	−40°C to +65°C (−40° to +149°F)

[1]Over temperature range of 0° to +55°C (+32° to +131°F) and supply voltage of 4.5 to 5.5 VDC.
[2]Over temperature range of 0° to +55°C (+32° to +131°F) and supply voltage to 16 VDC.
[3]At 24°C (+75°F).

A permanent magnet plunger moves adjacent to the Hall effect integrated circuit to give a digital, current sinking output.

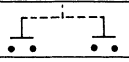
Hall effect integrated circuit



AML20 SERIES ELECTRONIC CONTROL SWITCHES

Contacts	Voltage	Current	Load Type	Contact Arrangement
Silver	250 VAC 125 VAC 24 VDC	2 Amps 3 Amps 2 Amps	75% Power Factor 75% Power Factor Resistive	1, 2, 0r 4 poles: Form C
Gold	24 VDC 5 VDC .5 VDC	100 mA 10 mA 1 mA	Resistive Resistive Resistive	

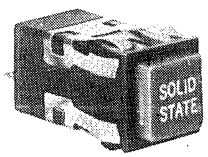
AML30 SERIES POWER DUTY SWITCHES

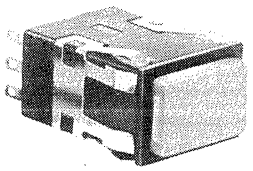
	Voltage	Current	Load Type	Contact Arrangement
Pushbutton Switches	125 VAC* 250 VAC*	10 amps 10 amps	60% Power Factor 60% Power Factor	2 poles: Form X 
Rocker & Paddle Switches	125 VAC 250 VAC	15 amps 15 amps	60% Power Factor 60% Power Factor	1 Or 2 poles: Form A

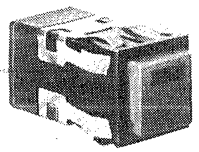
*10 amps, ⅓ hp.

MICRO SWITCH, a Honeywell division

Solid state pushbutton switches AML11/12







AML11 non-lighted or incandescent illuminated

Buttons (AML51) and incandescent lamps (AML91) are ordered separately.

AML12 w/integral LED indicator

LED "window" buttons (AML52) are ordered separately.

FEATURES

- *Hall effect reliability. (For electrical specifications, refer to facing page.)*
- *Low voltage signal interfaces with nearly all DC logic.*
- *5 or 6-16 supply voltage.*
- *UL recognized.*

AML11 B

Housing Type
Standard Bezel: **AML11B** Square Non-Lighted **AML11C** Square 1 Lamp Ckt. **AML11E** Rect. Non-Lighted **AML11F** Rect. 1 Lamp Ckt.
Standard Bezel: **AML12C** Square 1 LED

B

Bezel Color
B Black

A

Lamp Type
A No Lamp Installed

LED Color/ Voltage	
Red	
B	V*
C	5 V
Yellow	
H	V*
J	5 V
Green	
R	V*
S	5 V

2

Terminal Type
2 .110 x .020 (Solder or Quick-Connect
3 .025 x .025 (Printed Circuit or Push-On)

AA

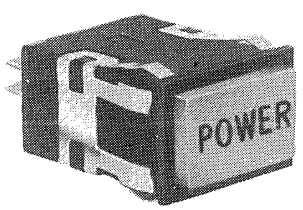
Circuitry Codes	
5 VDC Sinking	**AA** Momentary Action
6-16 VDC Sinking	**BA** Momentary Action

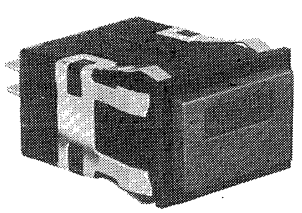
*See LED Application Notes.

Additional AML11 options: Full guard bezel, two-level alternate action, and rectangular housings with two lamp circuits.

Additional AML12 options: Full guard bezel, integral diode LED protection, 15 V LED voltage, and two-level alternate-action.

Power duty pushbutton switches AML31/32





AML31 non-lighted or incandescent illuminated

Buttons (AML51) and incandescent lamps (AML91) are ordered separately.

AML32 w/integral neon indicator

Neon "window" buttons (AML52) are ordered separately.

FEATURES

- *Up to 10 amps, 125/250 VAC.*
- *UL recognized, CSA certified.*

Additional AML31 Options: Momentary action, full guard bezel.

Additional AML32 Options: Full guard bezel, momentary action.

AML31 E

Housing Type
Standard Bezel: **AML31E** Rect. Non-Lighted **AML31F** Rect. 1 Lamp Ckt.
Standard Bezel: **AML32F** Rect. 1 Neon Lamp

B

Bezel Color
B Black

A

Lamp Type
A No Lamp Installed

Neon Lamp Voltage/Color	
Red	
B	125 VAC
C	250 VAC
Clear	
K	125 VAC
L	250 VAC

4

Terminal Type
4 .187 x .020 (Solder or Quick-Connect)

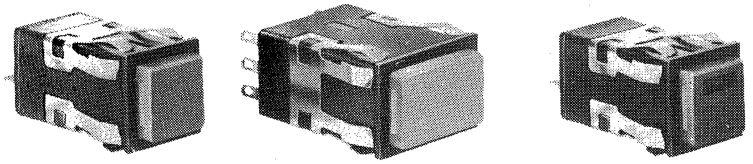
Terminal Type Lamp Circuit
4 .187 x .020 (Solder or Quick-Connect) with isolated lamp circuit
7 .187 x .020 with integral lamp circuit

AD

Circuitry Codes
2-Pole, Single-Throw Normally-Open, Form X: **AD** Alternate Action

MICRO SWITCH, a Honeywell division

AML21/22 Electronic control pushbutton switches



AML21 non-lighted or incandescent illuminated Buttons (AML51) and incandescent lamps (AML91) are ordered separately.

AML22 w/integral LED indicator LED "window" buttons (AML52) are ordered separately.

FEATURES

- *Up to 3 amps, 125 VAC.*
- *Silver or gold contacts.*
- *Momentary or 2-level alternate-action.*
- *UL recognized, CSA certified.*

AML21 B

Housing Type
Standard Bezel: **AML21B** Square Non-Lighted **AML21C** Square 1 Lamp Ckt. **AML21E** Rect. Non-Lighted **AML21F** Rect. 1 Lamp Ckt.
Standard Bezel: **AML22C** Square 1 LED

B

Bezel Color
B Black

A

Lamp Type
A No Lamp Installed

LED Color/ Voltage
Red **B** V* **C** 5.0 V **Yellow** **H** V* **J** 5.0 V **Green** **R** V* **S** 5.0 V

*See LED Application Notes.

2

Terminal Type
2 .110 x .020 (Solder or Quick-Connect) **3** .025 x .025 (Printed Ckt. or Push-On)

AA

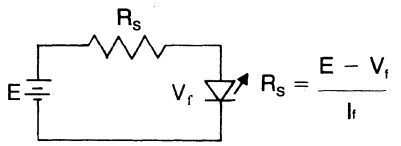
Circuitry Codes (Each pole has double-throw)	
Silver Contacts	Mom. Action **AA** 1-Pole **AC** 2-Pole
	Alt. Action **AB** 1-Pole **AD** 2-Pole
Gold Contacts	Mom. Action **BA** 1-Pole **BC** 2-Pole
	Alt. Action **BB** 1-Pole **BD** 2-Pole

Additional AML21 Options: Full guard bezel, 4 poles, and rectangular housings with two lamp circuits.

Additional AML22 Options: Full guard bezel, integral diode protection for LED, 15 V LED voltage, and 4 poles.

LED Application Notes:

1. Internal resistors control LED current to nominal 20 mA on 5 VDC devices.
2. Devices without internal current-limiting resistors require suitable external control of the LED current.
3. A minimum of 5 VDC open circuit voltage with an appropriate series resistance should drive the LED. This minimizes effect of temperature (current variation) on forward voltage of LED.
4. Reverse breakdown voltage of LED is 5 volts min.
5. Following example includes a simple DC drive circuit and equation used to determine value of series resistance.



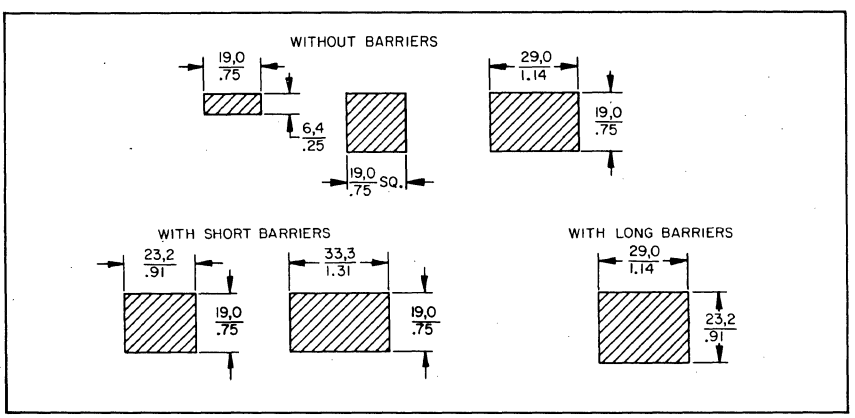
Where: R_S = Series Resistance
E = Supply Voltage
V_f = Forward Voltage of LED
I_f = Circuit Current

If a diode is added in series for reverse polarity protection then:

$$R_S = \frac{E - V_f - V_{PD}}{I_f}$$

Where: V_{PD} = Forward Voltage of Protection Diode

PANEL CUTOUTS FOR SINGLE SWITCHES/INDICATORS

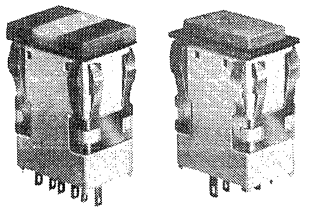


MICRO SWITCH, a Honeywell division

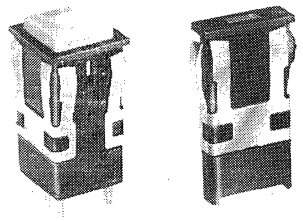
Lighted indicators AML41/42

FEATURES

- *Choice of incandescent or LED illumination.*
- *UL recognized, CSA certified (except LED indicators, which are UL recognized).*



AML41 incandescent illuminated pushbutton style (left) and lens style.



AML42 LED pushbutton style (left) and compact style.

AML41 pushbutton style indicators match display of incandescent illuminated switches.

Lens style indicators use a special cap-like button which covers the bezel to present a larger display area, without affecting family appearance. Up to 3-lamp split screen capability.

Note: Buttons (AML51) and incandescent lamps (AML91) ordered separately.

AML41 ORDER GUIDE

AML41 C — **B** — **A** — **2**

Housing Type		Bezel Color	Lamp Type	Terminal Type
Pushbutton Style:	**Lens Style:**			
AML41 C Square 1 lamp ckt.	(Use AML51-J, -K, and -L buttons only)	**B** Black	**A** No lamp installed	**2** .110 x .020 (Solder or Quick-Connect)
AML41 D Square 2 lamp ckts.	**AML41 J** Rectangular 1 lamp ckt.			**3** .025 x .025 (Printed Circuit or Push-On)
AML41 F Rectangular lamp ckt.	**AML41 K** Rectangular 2 lamp ckts.			
AML41 G Rectangular 2 lamp ckts.	**AML41 L** Rectangular 3 lamp ckts.			

AML42C housings have an integral LED indicator which is flush with the button face. Note: LED "window" buttons (AML52) are ordered separately.

AML42S feature a compact (.9 x .3") package. The LED is flush with the bezel.

AML42 ORDER GUIDE

AML42 S — **B** — **C** — **2**

Housing Type	Bezel Color	LED Color/ Voltage	Terminal Type	
			2 .110 x .020 (Solder or Q.C.)	**3** .025 x .025 (Printed Circuit or Push-On)
AML42 C Square 1 LED	**B** Black	**Red** **B** V* **C** 5 V		
AML42 S Compact 1 LED		**Yellow** **H** V* **J** 5 V		
		Green **R** V* **S** 5 V		

*See LED Application Notes.

Additional Indicator Options: 15 V LED voltage, neon indicators which match the display of neon power duty pushbutton switches.

MICRO SWITCH, a Honeywell division

AML51/52 Buttons/lenses/lamps

AML51 ORDER GUIDE

AML51 buttons are for non-lighted or incandescent illuminated display.

Specify AML51-J, AML51-K, and AML51-L buttons for use with AML41J, AML41K, and AML41L **lens style indicators only.** They do not fit other AML pushbutton switches or indicators.

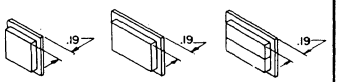
Split colors for display/legend types 10, 11, 20, and 21 are visible whether lighted or unlighted. On all other types, split colors are only visible when lighted.

AML51-C

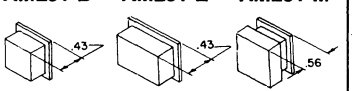
Button Type

For Pushbuttons Or Indicators

AML51-C **AML51-F** **AML51-G**



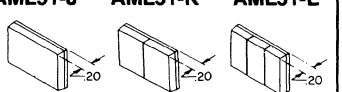
AML51-B **AML51-E** **AML51-M**



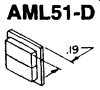
Button Types B, E, and M are available with Display/ Legend Types 10 and 20 only.

For Indicators Only
Lens Style:

AML51-J **AML51-K** **AML51-L**



Pushbutton Style:
AML51-D



10

Display Legend/Type

Transmitted Color
10 No legend
20 With legend

Transmitted Color
(Clear cap and color insert)
11 No legend
21 With legend

Dead Front
(Smoky gray cap and color insert)
30 No legend
40 With legend

Projected Color
(White cap and color insert)
50 No legend
60 With legend

R

Full Color or 1st Color Split

R Red
Y Yellow
G Green
B Blue
W White

—

2nd Color Split

R Red
Y Yellow
G Green
B Blue
W White

—

3rd Color Split

R Red
Y Yellow
G Green
B Blue
W White

INCANDESCENT LAMPS
AML91 ORDER GUIDE

Lamp Type	Industry Lamp No.	Voltage	Catalog Listing
Incandescent T-1¾ wedge base	86	6.3	AML91LA86
	73	14.0	AML91LA73
	85	28.0	AML91LA85

AML52 ORDER GUIDE

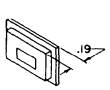
AML52 buttons have an open window which allows the LED or neon lamp lens to be flush with the button face.

AML52-N

Button Type

For LED Devices
AML52-C

For Neon Devices
AML52-N



10

Display/Legend Type

Transmitted Color
10
No Legend
20
With Legend

R

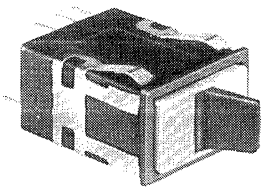
Button Color

R Red
Y Yellow
G Green
B Blue
W White
K Black

Note: Dimensions include the .060 in. bezel.

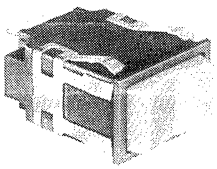
MICRO SWITCH, a Honeywell division

Solid state paddle and rocker switches Non-lighted or incandescent illuminated AML13/14



AML13

Paddle covers (AML53) and incandescent lamps (AML91) ordered separately.



AML14

Rockers (AML54) and incandescent lamps (AML91) ordered separately.

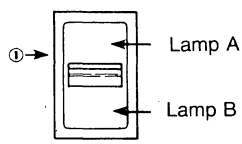
FEATURES

- *Hall effect reliability.*
- *Low voltage signal interfaces with nearly all DC logic.*
- *5 or 6-16 supply voltage.*
- *Black toggle type paddle operators. (Switch covers provide color display.)*
- *UL recognized, CSA certified.*

Additional Options: Two lamp circuits; other two and three-position operating actions; printed circuit or push-on terminals; and two 6-16V sinking IC's.

AML13 E B A 2 AA 01

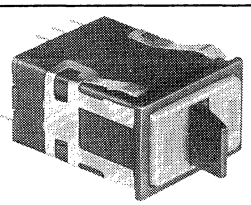
Housing Type	Operator/Bezel Color	Lamp Type	Terminal Type	Circuitry
AML13 E Rect. Paddle Non-Lighted **AML13 F** Rect. Paddle 1 Lamp Ckt. (A) **AML14 E** Rect. Rocker Non-Lighted **AML14 F** Rect. Rocker 1 Lamp Ckt. (A)	**B** Black	**A** No Lamp Installed	**2** .110 x .020 (Solder or Quick-Connect)	**One IC (Ckt. A): AA** 5 V Sinking **BA** 6-16 V Sinking **Two IC's (Ckts. A & B): AC** 5 V Sinking



Operating Action

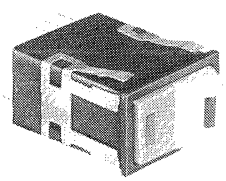
Circuit Output States	① 01 Maint.	Maint.
Ckt. A	Low (operated)	High
Ckt. B	High	Low (operated)

Solid state paddle and rocker switches With integral LED indicators AML15/16



AML15

LED "window" covers (AML55) are ordered separately.



AML16

LED "window" rockers (AML56) are ordered separately.

FEATURES

- *Hall effect reliability.*
- *Low voltage signal interfaces with nearly all DC logic.*
- *5 or 6-16 supply voltage.*
- *UL recognized.*

Additional Options: Two LED's, integral diode LED protection, 15V LED voltage, printed circuit/push-on terminals, other two and three-position operating actions.

AML15 F B B 2 AA 01 R X

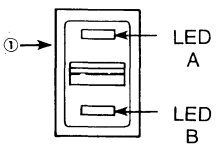
Housing Type	Operator/ Bezel Color	LED Voltage	Terminal Type	Circuitry
AML15 F Rect. Paddle 1 LED **AML16 F** Rect. Rocker 1 LED	**B** Black	**B** V* **C** 5 V	**2** .110 x .020 (Solder or Quick-Connect)	**One IC (Ckt. A): AA** 5 V Sinking **BA** 6-16 V Sinking **Two IC's (Ckts. A & B): AC** 5 V Sinking

Operating Action

Circuit Output States	① 01 Maint.	Maint.
Ckt. A	Low (operated)	High
Ckt. B	High	Low (operated)

LED Color

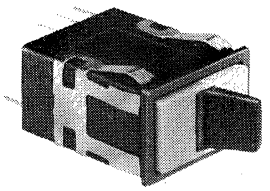
LED A	LED B
R Red **Y** Yellow **G** Green	**X** No LED



*See LED Application Notes.
① The "MICRO SWITCH" identification is shown on this side of the switch housings.

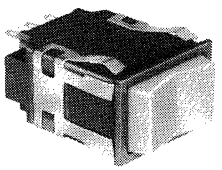
MICRO SWITCH, a Honeywell division

AML23/24 Electronic control paddle and rocker switches Non-lighted or incandescent illuminated



AML23

Paddle covers (AML53) and incandescent lamps (AML91) ordered separately.



AML24

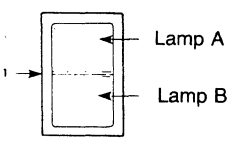
Rockers (AML54) and incandescent lamps (AML91) ordered separately.

FEATURES

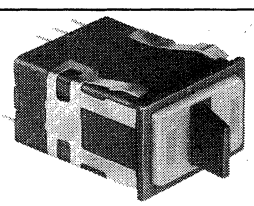
- *Up to 3 amps, 125 VAC.*
- *Silver or gold contacts*
- *Black toggle type paddle operators. (Switch covers provide color display.)*
- *UL recognized, CSA certified*

Additional Options: Two lamp circuits, printed circuit/push-on terminals, other two and three-position operating actions, and additional circuitry.

AML23 E	B	A	2	AA	01
Housing Type	**Operator/Bezel Color**	**Lamp Type**	**Terminal Type**	**Circuitry**	**Operating Action**
AML23 E Rect. Paddle Non-Lighted **AML23 F** Rect. Paddle 1 Lamp Ckt. (A) **AML24 E** Rect. Rocker Non-Lighted **AML24 F** Rect. Rocker 1 Lamp Ckt. (A)	**B** Black	**A** No Lamp Installed	**2** .110 x .020 (Solder or Quick-Connect)	Insert Code Letters from chart below	Insert Code Numbers from chart below

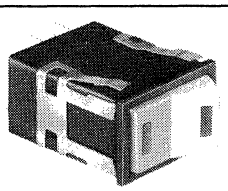


AML25/26 Electronic control paddle and rocker switches With integral LED indicator



AML25

LED "window" covers (AML55) are ordered separately.



AML26

LED "window" rockers (AML56) are ordered separately.

FEATURES

- *Up to 3 amps, 125 VAC.*
- *Silver or gold contacts.*
- *UL recognized, CSA certified*

Additional Options: Two LED's, 15V LED voltage, printed circuit/push-on terminals, other two and three-position operating actions, and additional circuitry.

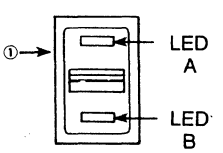
AML25 F	B	B	2	AA	01	R	X
Housing Type	**Operator/ Bezel Color**	**LED Voltage**	**Terminal Type**	**Circuitry**	**Operating Action**	**LED Color**	
						LED A	**LED B**
AML25 F Rect. Paddle 1 LED **AML26 F** Rect. Rocker 1 LED	**B** Black	**B** V* **C** 5.0 V	**2** .110 x .020 (Solder or Quick-Connect)	Insert Code Letters from chart below	Insert Code Numbers from chart below	**R** Red **Y** Yellow **G** Green	**X** No LED

Circuitry Codes		Operating Action Codes				
		2-Position		3-Position		
		01		04		
Silver Contacts	Gold Contacts	Maint.	Maint.	Maint.	Maint.	Maint.
AA	BA	3 2 1	3 2 1	3 2 1	3 2 1	3 2 1
AC[2]	BC[2]	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4

*See LED Application Notes.

① The "MICRO SWITCH" identification is shown on this side of the switch housings.

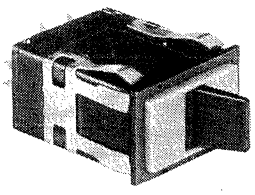
② For non-illuminated switches only



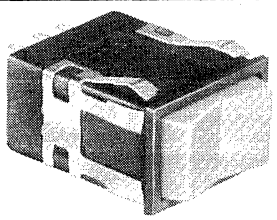
MICRO SWITCH, a Honeywell division

Power duty paddle and rocker switches Non-lighted or incandescent illuminated

AML33/34



AML33
Paddle covers (AML53) and incandescent lamps (AML91) ordered separately.



AML34
Rocker operators (AML54) and incandescent lamps (AML91) ordered separately.

FEATURES

- *Up to 15 amps, 125/250 VAC.*
- *Black toggle type paddle operators. (Switch covers provide color display.)*
- *UL recognized, CSA certified*

AML33 E

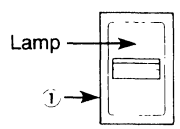
Housing Type
AML33 E Rect. Paddle Non-Lighted **AML33 F** Rect. Paddle 1 Lamp Ckt.
AML34 E Rect. Rocker Non. Illum. **AML34 F** Rect. Rocker 1 Lamp Ckt

B

Operator/Bezel Color
B Black

A

Lamp Type
A No Lamp Installed



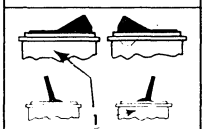
4

Terminal Type
4 .187 x .020 (Solder or Quick-Connect)

AA

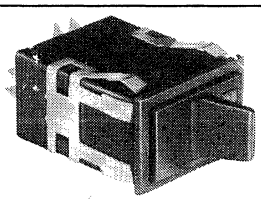
Circuitry Codes
Silver Contacts: **AA** 1-Pole (One Form A Single-Throw, Normally-Open) **AC** 2-Pole (Two Form A)

01

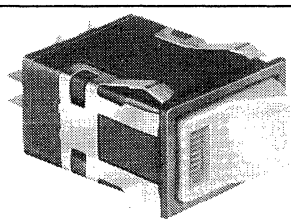
Operating Action
 **01** Maint. ON — Maint. OFF

Power duty paddle and rocker switches With integral LED indicator

AML35/36



AML35
Neon "lens" covers (AML55) ordered separately.



AML36
Neon "lens" rockers (AML56) ordered separately.

FEATURES

- *Up to 15 amps, 125/250 VAC.*
- *UL recognized, CSA certified*

AML35 F

Housing Type
AML35 F Rect. Paddle 1 Neon Lamp
AML36 F Rect. Rocker 1 Neon Lamp

B

Operator/Bezel Color
B Black

B

Lamp Voltage
B 125 VAC **C** 250 VAC

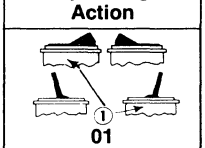
4

Terminal Type/ Lamp Circuit
4 .187 x .020 (Solder or Quick-Connect) With Isolated Lamp Circuit
7 .187 x .020 With Integral Lamp Circuit (Available with 2-Pole devices only)

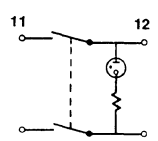
AA

Circuitry Codes
Silver Contacts: **AA** (One Form A Single-Throw) Available only with isolated lamp circuit, term. type 4. **AC** 2-Pole (Two Form A)

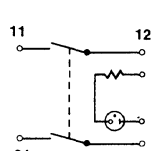
01

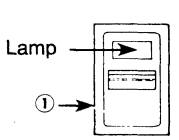
Operating Action
 **01** Maint. ON — Maint. OFF

Integral Neon Circuit



Isolated Neon Circuit





① The "MICRO SWITCH" identification is shown on this side of the switch housings.

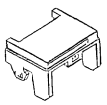
MICRO SWITCH, a Honeywell division

AML53/55 Covers for paddle switches

AML53 ORDER GUIDE

AML53 covers are for non-lighted or incandescent illuminated display.

AML53-E

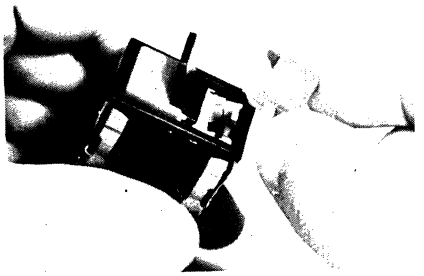
Paddle Switch Cover Type
 **AML53-E** ½ Cover

10

Display/Legend Type
Transmitted Color **10** No legend **20** With legend **Transmitted Color** (Clear cap and color insert) **11** No legend **21** With legend

R

Cover Color
R Red **Y** Yellow **G** Green **B** Blue **W** White **K*** Black



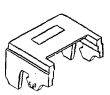
Colored covers simply snap into the top of paddle switch housings.

*Not recommended for lighted display.

AML55 ORDER GUIDES

AML55 covers are used with LED and neon display paddle switches. AML55-E covers have a "window" which allows the LED to be flush with the top surface of the cover. AML55-N covers have a colored lens which extends over the neon lamp.

AML55-E

Paddle Switch Cover Type
 **AML55-E** ½ Cover (For One LED)*

10

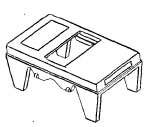
Display/Legend Type
Transmitted Color **10** No legend **20** With legend

Y

Cover Color
R Red **Y** Yellow **G** Green **B** Blue **W** White **K** Black

*To order a ½ cover without the LED "window", specify an AML53-E listing.

AML55-N

Paddle Switch Cover Type
 **AML55-N** Full Neon Cover, with Colored lens

10

Display/Legend Type
Transmitted Color **10** No Legend **20** With Legend

R

Lens Color
T Clear **R** Red

K

Cover Color
R Red **K** Black **L** Gray

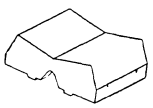
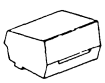
MICRO SWITCH, a Honeywell division

Rocker operators AML54/56

AML54 ORDER GUIDE

AML54 rockers are for non-lighted or incandescent illuminated display.

AML54-F

Rocker Operator Type
AML54-F Full Rocker  **AML54-E** ½ Rocker 

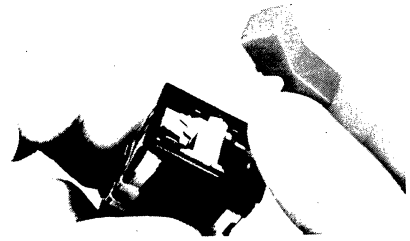
10

Display/Legend Type
Transmitted Color **10** No legend **20** With legend

R

Rocker Color
R Red **Y** Yellow **G** Green **B** Blue **W** White **K*** Black

*Not recommended for lighted display.



Rocker operators are assembled to the switches by simply snapping them into recesses in the switch actuator sockets.

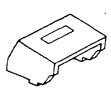
INCANDESCENT LAMPS AML91 ORDER GUIDE

Lamp Type	Industry Lamp No.	Voltage	Catalog Listing
Incandescent T-1¾ wedge base	86	6.3	AML91LA86
	73	14.0	AML91LA73
	85	28.0	AML91LA85

AML56 ORDER GUIDES

AML56 rockers are used with LED and neon display switches. AML56-E rockers have a "window" which allows the LED to be flush with the top surface of the rocker. AML56-N rockers have a colored lens which extends over the neon lamp.

AML56-E

Rocker Operator Type
AML56-E ½ Rocker* (For one LED) 

10

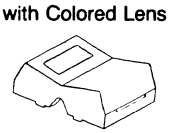
Display/Legend Type
Transmitted Color **10** No Legend **20** With Legend

R

Rocker Color
R Red **Y** Yellow **G** Green **B** Blue **W** White **K** Black

*To order a ½ rocker without the LED "window", specify an AML54-E listing.

AML56-N

Rocker Operator Type
AML56-N Full Rocker with Colored Lens 

10

Display/Legend Type
Transmitted Color **10** No Legend **20** With Legend

R

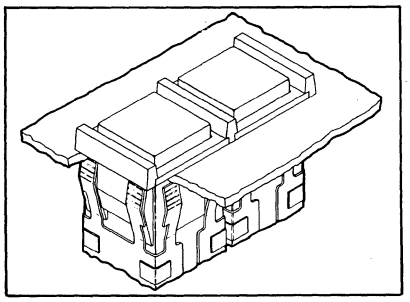
Lens Color
T Clear **R** Red

R

Rocker Color
R Red **K** Black

AML Advanced manual line accessories

BARRIERS



When mounting an individual unit, an end barrier is attached to each side of housing. The center barrier is used in a slot mount array (see drawing).

FEATURES

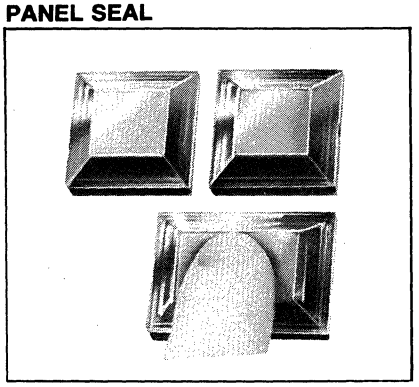
- *Helps prevent inadvertent actuation of two pushbuttons with a single push.*
- *Front of panel mounting simplifies installation.*

AML71 ORDER GUIDE

Barriers shown in order guide are black. They are not for use with AML61 mounting hardware; or with AML41J, AML41K, or AML41L lens type indicators or AML45 annunciators.

Barrier Length	Type	Catalog Listing
Short Barrier (For use with square devices and short side of rectangular devices.)	Center	AML71SCB
	End	AML71SEB
Long Barrier (For use with long side of rectangular devices.)	Center	AML71LCB
	End	AML71LEB

PANEL SEAL



AML75 panel seals are used to help protect pushbutton switches and indicators from contamination from accidental beverage spills, dust and dirt.

FEATURES

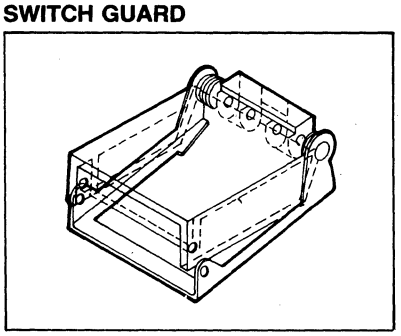
- *Easy to install, without tools.*
- *No effect on display color, light intensity, or legend quality.*
- *Replace seal or lamps without demounting switch.*

AML75 ORDER GUIDE

Panel seals are not for use with AML61 mounting hardware: or with AML41J, AML41K, or AML41L lens type indicators.

Description	For Use With: Square .19" high buttons	Rectangular .19" high buttons
Base & Seal	AML75ABC	AML75BBC
Base Only	AML75ABN	AML75BBN
Seal Only	AML75ANC	AML75BNC

SWITCH GUARD

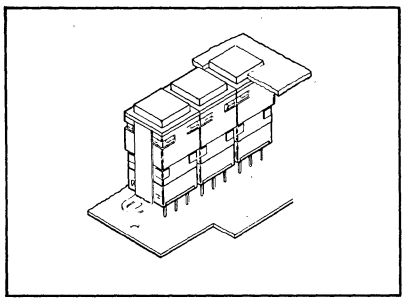


AML76 switch guard protects square and rectangular .19-inch standard height pushbuttons from inadvertent actuation. Not for use with AML61 mounting hardware, AML71 barriers or full guard bezel housings.

AML76 ORDER GUIDE

Guard Type	Catalog Listing
Square	AML76C10T01P
Rectangular	AML76F10T01P

MOUNTING HARDWARE

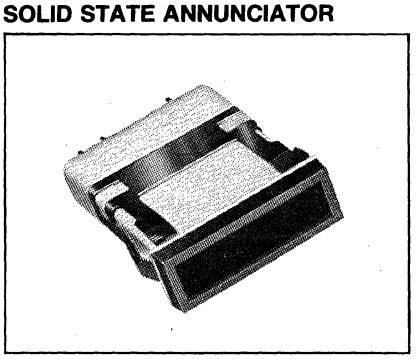


AML61 mounting hardware enables subpanel mounting of devices in factory assembled metal cans which are welded together in strips or matrices.

FEATURES

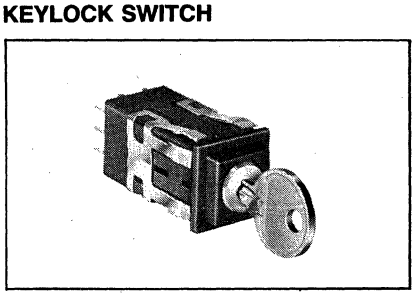
- *L-shaped mounting brackets conform to various panel thicknesses, using spacers.*
- *Simplifies panel fabrication, since only one large cutout is required.*
- *Facilitates printed circuit board mounting. For ordering information, refer to Catalog 30.*

SOLID STATE ANNUNCIATOR



AML45/59 solid state annunciators display messages which are backlighted by two LED's. Choice of full face one-color or two-color display, in red, green, and yellow.

KEYLOCK SWITCH

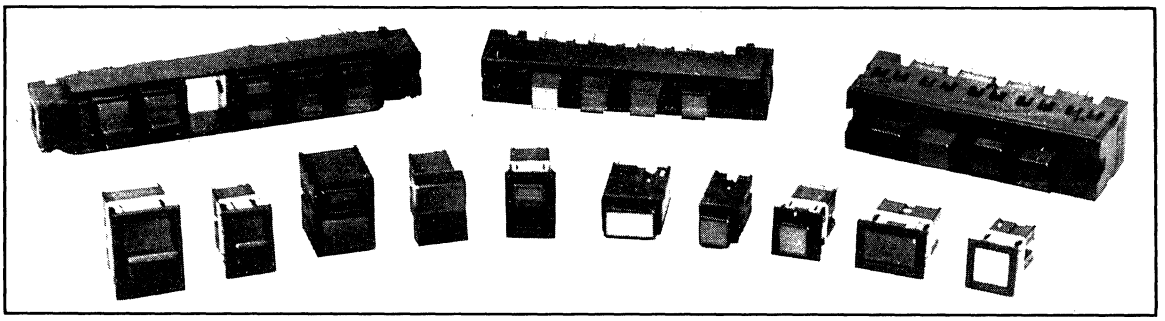


AML27 keylock switches enable control of access to computer peripherals, keyboards, point-of-sale terminals, security systems and other locations where tampering must be discouraged.

For ordering information, refer to Catalog 30.

MICRO SWITCH, a Honeywell division

MML Miniature manual line



MML provides a full line of pushbuttons, rockers, paddles, and indicators in an economical miniature package. They feature printed wiring board (PWB) mounting and panel mounting, and single level termination for cost-effective installation. Solid state, electronic control, and power duty switching options furnish electrical versatility. Lighted display colors are illuminated by LEDs, incandescent lamps or neon lamps. Mechanically interlocked switches provide latching functions.

MML order guides are based on a modular cataloging system for flexibility in choosing the combination of features that best suits your needs.

Contents

	Page
MML11 Solid State Pushbutton Switches	G19
MML21 Electronic Control Pushbutton Switches	G19
MML23 Electronic Control Paddle Switches	G20-21
MML24 Electronic Control Rocker Switches	G20-21
MML31 Power Duty Pushbutton Switches	G24
MML33 Power Duty Paddle Switches	G22-23
MML34 Power Duty Rocker Switches	G22-23
MML41/43/46 Indicators	G24-25
MML88 Interlock Switch Assemblies	G26
MML51/52 Lenses	G26
MML61/62 and MML72/73 Mounting Hardware	G27
MML91/92/93 LEDs and Incandescent Lamps/Receptacles	G28
MML94 Neon Lamp Assembly	G28

● SOLID STATE SWITCHES

Electrical Characteristics	Integrated Circuit Function		5 VDC Sinking①
	Supply Current (Max.)		3.0 mA (Released) 4.0 mA (Operated no load)
	Output Voltage (Operated)		0.3 Volt (Sinking 8 mA)
	Output Leakage Current Max. (Released)		5.0 μ A
	Switching Time Max.	Rise 10% to 90%	1.5 μ sec (Sinking 8 mA)
		Fall 90% to 10%	0.5 μ sec (Sinking 8 mA)
Absolute Maximum Ratings②	Supply Voltage (V_S)		−1.2 to +10.0 VDC
	Voltage Externally Applied to Output		−0.5 Volt min. +10.0 Volts max. (Off condition)
	Loads to Output		20 mA (Sinking)
	Storage Temperature		−40° to +85°C (−40° to +185°F)

① Over temperature range of −18° to +65°C (0° to +149°F) and supply voltage of 4.5 to 5.5 VDC.
② As with all solid state components, performance can be expected to deteriorate as rating limits are approached; however, they will not be damaged unless the limits are exceeded.

● ELECTRONIC CONTROL SWITCHES

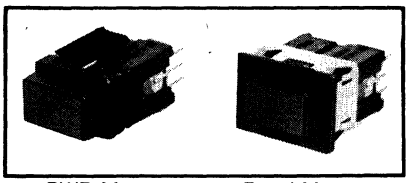
	Pushbuttons, Rockers & Paddles
Electrical Rating	Silver Contacts: Up to 1 amp, 125 VAC resistive Gold Contacts: Up to 0.25 amp, 30 VDC resistive
Contact Arrangement	1 or 2 poles Form C

● POWER DUTY SWITCHES

	Pushbuttons	Rockers & Paddles
Electrical Rating	Silver Contacts: Up to 6 amps, 250 VAC resistive; 3 amps, 30 VDC inductive	Silver Contacts: Up to 6 amps, 250 VAC resistive; 2 amps, 30 VDC inductive Gold Contacts: Up to 0.25 amp, 30 VDC resistive
Contact Arrangement	1 or 2 poles Form X	1 or 2 poles Form C Form A

Miniature manual line MML

MML11 SOLID STATE PUSHBUTTON SWITCHES



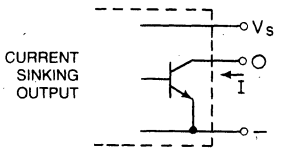
PWB Mount Panel Mount

FEATURES

- *LED, incandescent, or non-lighted display*
- *Hall effect reliability*
- *Provides low voltage signals that interface with nearly all DC logic*
- *5 VDC supply voltage*
- *Momentary action or 2-level alternate action*
- *Printed wiring board or panel mounting*
- *Legendable lenses*
- *UL recognized, CSA certified*

CURRENT SINKING OUTPUT

A permanent magnet plunger moves adjacent to the Hall effect integrated circuit to give a digital, current sinking (normally high and normally low) output.



MML11 ORDER GUIDE (No LED or incandescent lamp included)

Use as an unlighted pushbutton or add one LED or incandescent lamp for lighted display.

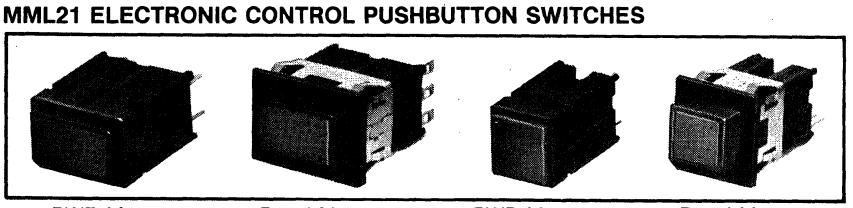
Order LED's, incandescent lamps, and lenses separately.

For snap-in panel mounting, order **MML72** bezels/mounting clips.

For strip mounting, order **MML61** mounting frames.

MML11K	A	3	AA	K
Housing Type (Rectangular)	**Mounting**	**Terminals**	**Circuitry/Action**	**Plunger**
MML11K Black housing	**A** No bezel, printed wiring board mounting	**3** Printed wiring board	**AA** 5 VDC sinking, mom. action **AE** 5 VDC sinking, alt. action	**K** Black

MML21 ELECTRONIC CONTROL PUSHBUTTON SWITCHES



PWB Mount Panel Mount PWB Mount Panel Mount

FEATURES

- *LED, incandescent, or non-lighted display*
- *1 or 2 poles (square housings 1 pole only)*
- *Silver or gold contacts*
- *Momentary action or 2-level alternate action*
- *Printed wiring board or panel mounting*
- *PWB or solder terminals*
- *Legendable lenses*
- *UL recognized, CSA certified*

MML21 ORDER GUIDE (No LED or incandescent lamp included)

Use as an unlighted pushbutton or add one LED or incandescent lamp for lighted display.

Order LED's, incandescent lamps, and lenses separately.

For snap-in panel mounting, order **MML72** bezels/mtg. clips.

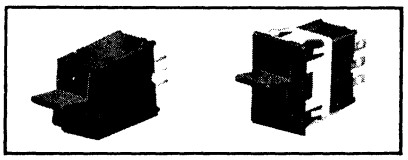
For strip mounting, order **MML61** mounting frames.

MML21K	A	3	AA	K
Housing Type	**Mounting**	**Terminals**	**Circuitry/Action** (Each pole is double throw.)	**Plunger**
Rectangular Housings: (1 or 2 poles) **MML21K** Black housing	**A** No bezel, printed wiring board mounting	**3** Printed wiring board **2** Solder	Silver Contacts: **AA** 1 pole, mom. action **AB** 1 pole, alt. action **AC** 1 poles, mom. action **AD** 2 poles, alt. action	**K** Black
Square Housings: (1 pole only) **MML21H** Black housing			Gold Contacts: **BA** 1 pole, mom. action **BB** 1 pole, alt. action **BC** 2 poles, mom. action **BD** 2 poles, alt. action	

MICRO SWITCH, a Honeywell division

MML Miniature manual line

MML23 ELECTRONIC CONTROL PADDLE SWITCHES



PWB Mount Panel Mount

FEATURES
- *1 or 2 poles*
- *2 or 3-position, momentary/maintained action*
- *Printed wiring board mounted or panel mounted with snap-in bezels/mounting clips*
- *Designed to comply with UL, CSA*

MML23 ORDER GUIDE

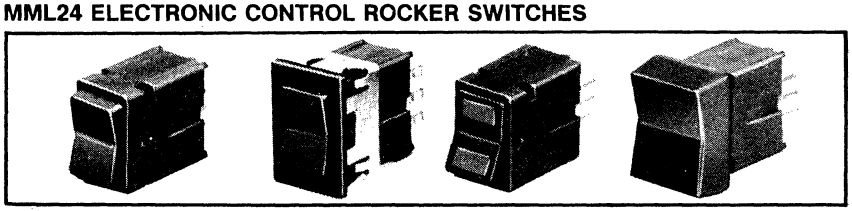
MML23 paddle operators are permanently installed in the switch housing.

For snap-in panel mounting, order **MML72** bezels/mtg. clips.

For strip mounting, order **MML61** mounting frames.

MML23 K	A	3	AA	01	K
Housing Type	**Mounting**	**Terminals**	**Circuitry**	**Action**	**Paddle**
MML23K Black housing, no bezel	**A** No bezel, printed wiring board mounting	**3** Printed wiring board **2** Solder	Insert code letters from Circuitry Chart	Insert code numbers from Operating Action Chart	**K** Black **W** White

MML24 ELECTRONIC CONTROL ROCKER SWITCHES



PWB Mount Panel Mount PWB Mount (Lighted rocker)

FEATURES
- *LED, incandescent, or non-lighted display*
- *1 or 2 poles*
- *2 or 3-position, momentary/maintained action*
- *Printed wiring board mounted, or panel mounted with snap-in bezels/mounting clips*
- *Designed to comply with UL, CSA*

MML24 ORDER GUIDE

MML24 rocker operators are permanently installed in the switch housing. They can have one or two colored lenses for LED or incandescent lamp illumination. Order LED's and incandescent lamps separately.

For snap-in panel mounting, order **MML72** bezels/mtg. clips.

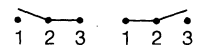
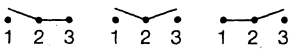
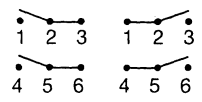
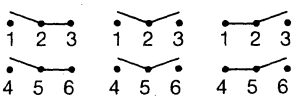
For strip mounting, order **MML61** mounting frames.

MML24 K	A	3	AA	01	K
Housing Type	**Mounting**	**Terminals**	**Circuitry**	**Action**	**Rocker**
MML24K Black housing, no bezel	**A** No bezel, printed wiring board mounting	**3** Printed wiring board **2** Solder	Insert code letters from Circuitry Chart next page	Insert code numbers from Operating Action Chart next page	**K** Black rocker, non-lighted **H** Black rocker, one lens **M** Black rocker, two lenses

To specify lens colors add letter codes from next page.

Miniature manual line MML

CIRCUITRY

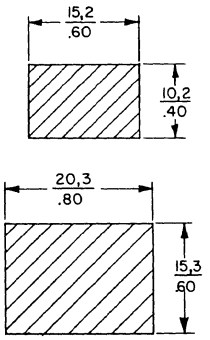
Silver Contacts	Gold Contacts	2-Position	3-Position
AA	BA		
AC	BC		

OPERATING ACTION

2-Position	**01**	Maint	None	Maint.
3-Position	**04**	Maint.	Maint.	Maint.
	05	Mom.	Maint.	Mom.

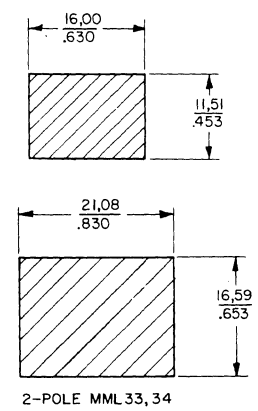
PANEL CUTOUTS FOR SINGLE PADDLE/ROCKER SWITCHES

Printed Wiring Board (PWB) Mount
(Housing thru panel)

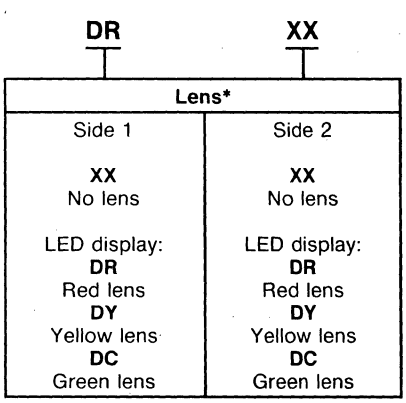


MML33 & MML34
2-Pole Housing

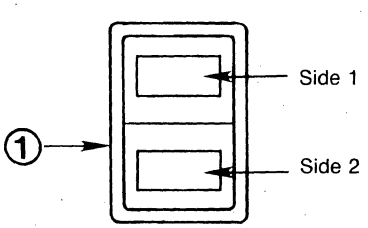
Snap-in Panel Mount



MML33 & MML34
2-Pole Housing



*Lenses for incandescent display also available.



① The "MICRO SWITCH" identification is shown on this side of the switch housings.

MML Miniature manual line

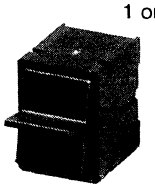
MML33 POWER DUTY PADDLE SWITCHES

1 Pole

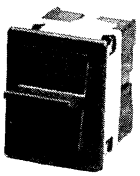
PWB Mount

Panel Mount

1 or 2 Pole



PWB Mount



Panel Mount

FEATURES

- *1 or 2 poles*
- *2 or 3-position, momentary/maintained action*
- *Printed wiring board mounted or panel mounted with integral bezels/mounting clips*
- *PWB or solder/quick-connect terminals*
- *Designed to comply with UL, CSA, and international standards*

MML33 paddle operators are permanently installed in the switch housing.

MML33 ORDER GUIDE

MML33K

Housing Type/Size	
.4″ x .6″ Housings: (1-pole only)	.6″ x .8″ Housings: (1 or 2-pole)
MML33K Black housing, no bezel	**MML33M** Black housing, no bezel
MML33N Black housing & integral bezel	**MML33P** Black housing & integral bezel

A

Mounting
A No bezel, printed wiring board mounting
B Integral bezel, mounting clips for vertical orientation
C Integral bezel, mounting clips for horizontal orientation

3

Terminals
3 Printed wiring board
2 Solder/quick connect

AA

Circuitry
Insert code letters from Circuitry Chart

01

Action
Insert code numbers from Operating Action Chart

K

Paddle
K Black
W White

MML34 POWER DUTY ROCKER SWITCHES

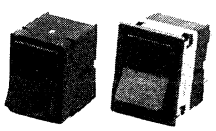
1 Pole

PWB Mount

Panel Mount

PWB Mount

1 or 2 Pole



Panel Mount

PWB Mount (Lighted rocker)

FEATURES

- *Neon or non-lighted display*
- *1 or 2 poles*
- *2 or 3-position, momentary/maintained action*
- *Printed wiring board mounted or panel mounted with integral bezels/mounting clips*
- *PWB or solder/quick-connect terminals*
- *Designed to comply with UL, CSA, and international standards*

MML34 ORDER GUIDE

MML34K

Housing Type/Size	
.4″ x .6″ Housings: (1-pole only, non-lighted display)	.6″ x .8″ Housings: (1 or 2-pole, neon or non-lighted display)
MML34K Black housing, no bezel	**MML34M** Black housing, no bezel
MML34N Black housing & integral bezel	**MML34P** Black housing & integral bezel

A

Mounting
A No bezel, printed wiring board mounting
B Integral bezel, mounting clips for vertical orientation
C Integral bezel, mounting clips for horizontal orientation

3

Terminals
3 Printed wiring board
2 Solder/quick connect

AA

Circuitry
Insert code letters from Circuitry Chart next page

01

Action
Insert code numbers from Operating Action Chart next page

Add rocker and lens color letter codes from next page.

Miniature manual line MML

CIRCUITRY

Silver Contacts	Gold Contacts	2-Position	3-Position
AA	BA	11 12 13 11 12 13	11 12 13 11 12 13 11 12 13
AC	BC	11 12 13 11 12 13 21 22 23 21 22 23	11 12 13 11 12 13 11 12 13 21 22 23 21 22 23 21 22 23

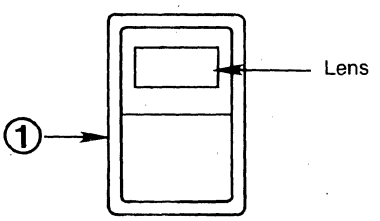
OPERATING ACTION

2-Position	**01**	Maint	None	Maint.
	02	Mom.	None	Maint.
3-Position	**04**	Maint.	Maint.	Maint.
	05	Mom.	Maint.	Mom.

MML34 rocker operators are permanently installed in the switch housing. The .6″ x .8″ housings can have a red or yellow lens, illuminated by a neon lamp (see order guide). Order 125 or 250 VAC neon lamp assembly separately.

K Rocker	XX Lens
K Black rocker, non-lighted **H** Black rocker one lens*	**XX** No lens **NR** Red lens **NY** Yellow lens

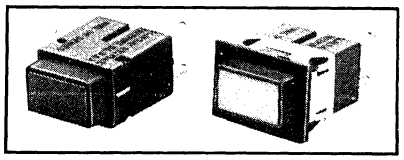
*.6″ x .8″ housing only.



1 The "MICRO SWITCH" identification is shown on this side of the switch housings.

MML Miniature manual line

MML31 POWER DUTY PUSHBUTTON SWITCHES



PWB Mount Panel Mount

FEATURES
- *1 or 2 poles*
- *Momentary or 2-level alternate action*
- *Printed wiring board or panel mounting*
- *PWB or solder/quick-connect terminals*
- *Legendable lenses*
- *Designed to comply with UL, CSA, and international standards.*

MML31 ORDER GUIDE

MML31 switches do not have a provision for illumination of buttons. Visual feedback can be achieved by using a 2-level alternate action switch. Or add a companion lighted indicator.

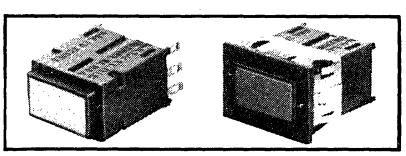
For snap-in panel mounting, order **MML72** bezels/mounting clips.

For strip mounting, order **MML61** mounting frames.

MML31 K	A	3	AA	K
Housing Type (Rectangular)	**Mounting**	**Terminals**	**Circuitry/Action** (Each pole is single-throw normally open)	**Plunger**
MML31K Black housing, non-lighted	**A** No bezel, printed wiring board mounting	**3** Printed wiring board **2** Solder/Quick-connect	**AA** 1 pole, mom. action **AB** 1 pole, alt. action **AC** 2 poles, mom. action **AD** 2 poles, alt. action	**K** Black

Order lenses separately.

MML41 INDICATORS (Pushbutton Style)



PWB Mount Panel Mount

FEATURES
- *Illumination by one LED or incandescent lamp*
- *Legendable lenses*

MML41 ORDER GUIDE (No LED or incandescent lamp, included)

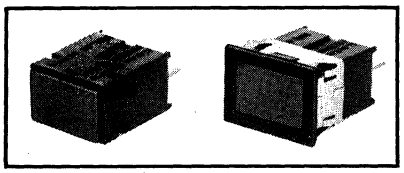
For snap-in panel mounting, order **MML72** bezels/mounting clips.

For strip mounting, order **MML61** mounting frames.

MML41 K	A	3	K
Housing Type (Rectangular)	**Mounting**	**Termination**	**Plunger**
MML41K Black housing, provision for LED or incandescent lamp Order LED's, incandescent lamps, and lenses separately.	**A** No bezel, PWB mounting	**0** None. For panel mount. **3** Support terminals for PWB mount	**K** Black

Miniature manual line MML

MML43 INDICATORS



PWB Mount Panel Mount

FEATURES
- *Illuminated by neon lamp (included)*
- *Legendable lenses*

MML43 ORDER GUIDE

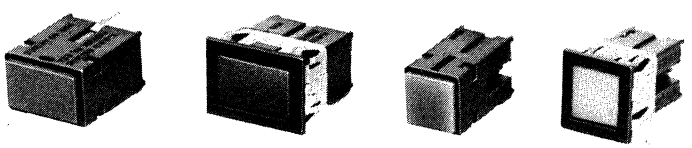
For snap-in panel mounting, order **MML72** bezels/mounting clips.

For strip mounting, order **MML61** mounting frames.

MML43 K	A	3	B
Housing Type (Rectangular)	**Mounting**	**Terminals**	**Lamp**
MML43K Black housing, with neon lamp installed.	**A** No bezel, printed wiring board mounting	**3** Printed wiring board **2** Solder	**B** Neon, 125 VAC **C** Neon, 250 VAC

Order lenses separately.

MML46 INDICATORS



PWB Mount Panel Mount PWB Mount Panel Mount

FEATURES
- *Illumination by one or two LED's or incandescent lamps*
- *Legendable lenses*

MML46 ORDER GUIDE (No LED's or incandescent lamp included)
Order LED's and lamps separately.

For snap-in panel mounting, order **MML72** bezels/mounting clips.

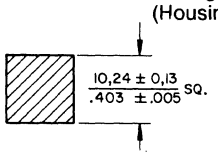
For strip mounting, order **MML61** mounting frames.

MML46 K	A	3
Housing Type	**Mounting**	**Termination**
Rectangular Housings: **MML46K** Black housing, provision for two LED's or incand. lamps **Square Housings:** **MML46H** Black housings, provision for one LED or incand. lamp	**A** No bezel, printed wiring board mounting	**0** None For panel mount **3** Support terminals For PWB mount

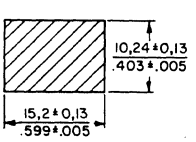
Order LED's, incandescent lamps, and lenses separately.

PANEL CUTOUTS FOR SINGLE PUSHBUTTON SWITCHES/INDICATORS

Printed Wiring Board (PWB) Mount (Housing thru panel)

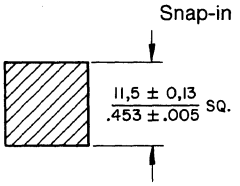


Square Style

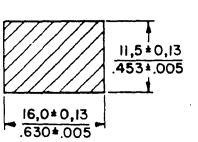


Rectangular Style

Snap-in Panel Mount



Square Style



Rectangular Style

MICRO SWITCH, a Honeywell division

MML Miniature manual line

MML51 SWITCH AND INDICATOR LENSES FOR INCANDESCENT OR NON-LIGHTED DISPLAY

MML51 ORDER GUIDE

MML51 E

Lens Type
Rectangular Lenses: **MML51E*** Switch lens **MML51G*** Indicator lens **Square Lenses:** **MML51C** Switch lens **MML51D** Indicator lens

20

Display/Legend Type
Transmitted Color. **10** No legend **20** With legend

*Use MML51E with MML41 pushbutton style indicators.

R

Color
R Red **Y** Yellow **G** Green **B** Blue **W** White **K** Black (Opaque)

MML52 SWITCH AND INDICATOR LENSES FOR LED OR NEON DISPLAY

MML52 ORDER GUIDE

MML52 G

Lens Type
Rectangular Lenses: **MML52E*** Switch lens, LED display **MML52G*** Indicator lens LED or Neon display **Square Lenses:** **MML52C** Switch lens, LED display **MML52D** Indicator lens, LED display

10

Display/Legend Type
Transmitted Color: **10** No legend **20** With legend

*Use MML52E with MML41 pushbutton style indicators.

Y

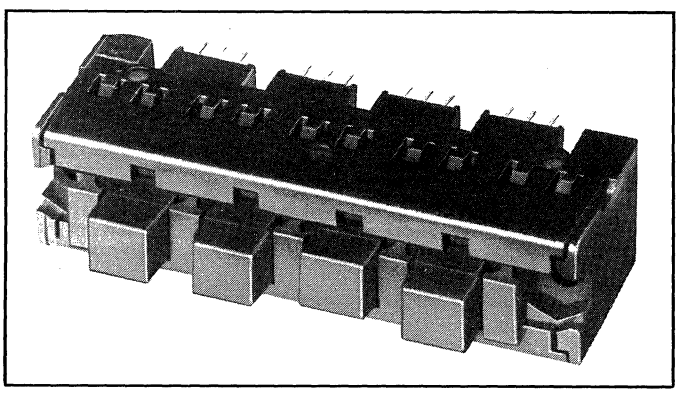
Color/Illumination	
LED Display: **R** Red **Y** Yellow **G** Green	Neon Display: **R** Red **Y** Yellow **C** Clear

MML88 INTERLOCK SWITCH ASSEMBLIES

Mechanically interlocked switches with 1-4 pole circuitry provide latching functions. They are furnished **factory assembled** in a strip frame — ready for back of panel and/or printed wiring board mounting. Each end of the strip frame has mounting holes which will accept No. 4 screws.

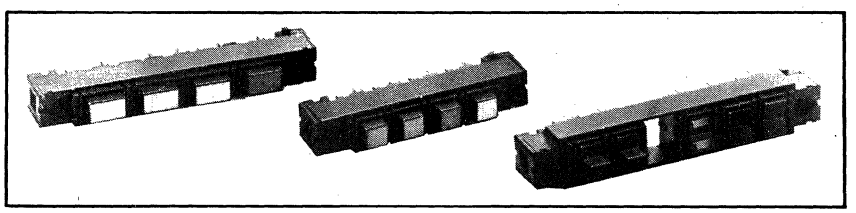
Operating Mode. Depressing a switch button will release any previously operated button within a group of interlocked switches. One button is always being held down by a mechanical detent. This provides a "key-down memory" feature which indicates which switch was last operated. Circuit transfer is maintained until another button is depressed.

Contact your nearest MICRO SWITCH Sales Office or Authorized Distributor for ordering information.



Miniature manual line MML

MML61 STRIP MOUNTING FRAMES



Switches and indicators are ordered as separate items.

MML61 ORDER GUIDE

MML61 K — **5**

Orientation/Color	
For Rectangular* Housings: **MML61K** Horizontal strip, black **MML61G** Vertical strip, black	**For Square Housings:** **MML61J** Black

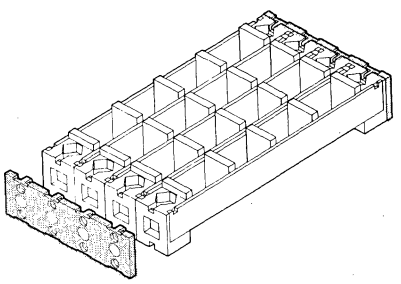
No. of Stations
3 Three
4 Four
5 Five

*.4″ x .6″ housings only.

FEATURES

- *Provides back of panel or printed wiring board mounting in a multi-unit strip of switches/indicators.*
- *Devices can be pre-wired prior to installation.*
- *Holes at each end of frame will accept No. 4 screws.*

MML62 END RAILS FOR MATRIX MOUNT



FEATURES

- *Fasten up to ten MML61 strip frames together to form matrix array.*
- *End rails snap fit into slots at each end of the strip frames.*

MML62 ORDER GUIDE

MML62 K — **4**

Orientation/Color	
For Rectangular* Housings: **MML62K** Horizontal strips, black **MML62G** Vertical strips, black	**For Square Housings:** **MML62J** Black **MML62H** White

No. of MML61 Strip Frames in Matrix
2 Two
3 Three
4 Four

*.4″ x .6″ housings only.

Each catalog listing includes a pair of end rails.

MML72 BEZELS/MOUNTING CLIPS

Slip mounting clip over top of housing and snap bezel onto mounting clip.

MML72 ORDER GUIDE (Incl. mounting clip*)

Housing Type	Bezel Type (Black)	Mounting Clip Orientation	Catalog Listing
Rectangular Housing	Switch	Horizontal Vertical	**MML72EEK**** **MML72FEK****
	Indicator	Horizontal Vertical	**MML72EGK** **MML72FGK**
Square Housing	Switch	Horiz. or Vert.	**MML72BEK**
	Indicator	Horiz. or Vert.	**MML72BGK**

*Mounting clips can be ordered separately: Rectangular — MML73EA (Horizontal) and MML73EB (vertical), Square — MML73BA.
**Also use with MML41 indicators.

MML Miniature manual line

MML91/92/93/94 LEDs AND INCANDESCENT LAMPS/RECEPTACLES

MML92 LEDs ORDER GUIDE

Order red, green, or yellow LEDs from the order guide below. They should be the same color as the lens they illuminate.

LEDs are packaged 10 per listing, including stand-off spacers for use when solder terminating to a printed wiring board.

PWB receptacles enable LEDs to be added or replaced from behind the printed wiring board, without soldering. Order PWB receptacles separately from the MML93 Order Guide.

Description	Catalog Listing	LED Color	Forward Characteristics Typ. @ 20mA	Max.	LED Manufacturers' Part Numbers
T-1-3/4 LED For Rectangular Pushbuttons & Indicators With MML52E and D Lens	**Stanley:**				
	MML92ERS	Red	1.7 V	2.0 V	**ESBR5633**
	MML92EGS	Green	2.1 V	2.5 V	**ESBG5633**
	MML92EYS	Yellow	2.1 V	2.5 V	**ESAY5633**
	Hewlett-Packard				
	MML92ERH	Red	2.2 V	3.0 V	**HLMP-3366**
	MML92EGH	Green	2.3 V	3.0 V	**HLMP-3568**
	MML92EYH	Yellow	2.2 V	3.0 V	**HLMP-3466**
T-1 LED For Square Pushbuttons & Indicators With MML52C or D Lens, and MML24 Lens Style Rockers	**Stanley:**				
	MML92HRS	Red	1.7 V	2.0 V	**ESBR3901**
	MML92HGS	Green	2.1 V	2.5 V	**ESPY3901**
	MML92HYS	Yellow	2.2 V	2.5 V	**ESAY3901**
	Hewlett-Packard:				
	MML92HRH	Red	2.2 V*	3.0 V	**HLMP-1340**
	MML92HGH	Green	2.3 V*	3.0 V	**HLMP-1540**
	MML92HYH	Yellow	2.2 V	3.0 V	**HLMP-1440**

Long lead: Anode (+). Short lead: Cathode (−). *@ 25 mA.

MML91 INCANDESCENT LAMPS/PWB RECEPTACLE ORDER GUIDE

PWB receptacles enable incandescent lamps to be added or replaced from behind the printed wiring board, without soldering.

	Lamp Type	Voltage	Catalog Listing		Industry Lamp No.
			Incl. Lamp & PWB Receptacle	T-1 Lamp Only	
For Rectangular MML11, 21, 41, 46	Unbased T-1 Lamp	5	**MML91C**	**MML91A**	683
For MML24, and Square MML21, 46	Bi-pin T-1 Lamp	5	**MML91E**	**MML91F**	2413

INCANDESCENT LAMPS FOR USE WITH SOLDER RECEPTACLE ORDER GUIDE

The lamps listed in the order guide at right are used with solder terminal receptacles. They enable lamps to be added or replaced without rewiring.

	Lamp Type	Voltage	Catalog Listing	Industry Lamp No.
For Rectangular MML21, 41, 46 (Panel Mount)	Bi-pin T-1 Lamp	5	**MML91B**	7683

MML93 RECEPTACLE ORDER GUIDE

Catalog Listing	Description
MML93K	PWB style LED receptacle. Use with rectangular MML11, 21, 41, 46. Will accept T-1-3/4 LED's. No LED furnished. (Refer to MML92 Order Guide)
MML93G	PWB style receptacle for T-1 LED's or T-1 bi-pin incandescent lamps. Use with MML24 and square MML21, 46. No LED's or lamps furnished. (Refer to MML91 and MML92 Order Guides.)
MML93J	Solder terminal lamp receptacle. For T-1 bi-pin incandescent lamps. Use with panel mount, rectangular MML21, 41, 46. No lamp furnished. (Refer to MML91 Lamp Order Guide.)

MML94 NEON LAMP ASSEMBLIES ORDER GUIDE

MML34 power duty rocker switches will accept MML94 neon lamp assemblies.

Catalog Listing	Description
MML94A	125 VAC T-1 neon lamp, with leadwire and connectors.
MML94B	250 VAC T-1 neon lamp, with leadwire and connectors.

Other MICRO SWITCH products

MICRO SWITCH's reputation as an innovator in the design and manufacture of quality position sensing and manual control products spans 40 years. Shown is a cross-section of the many varieties. This broad selection offers a wide range of technologies, sizes, actuation means, circuitries, electrical capacities, and terminations, for in-plant and original equipment needs.

Contact your nearest MICRO SWITCH Sales Office or Authorized Distributor for complete catalog information. Sales Office location's are shown in this Directory. Authorized Distributors are listed on the next pages.

Limit and enclosed switches

MICRO SWITCH offers the world's most advanced line of heavy duty limit switches and a wide selection of application proven enclosed switches (precision snap-acting switches sealed in rugged metal housing). Sealed versions keep out moisture and other contaminants. Explosion-proof types are designed for use in hazardous locations.

Request Catalog 40.

Proximity sensors

Proximity sensors detect the presence of metals or react to a magnetic field. Cylindrical, cannister, and limit switch style housings provide application versatility. Their high speed operation keeps pace with production. Models are available for operation at AC line voltage or 8.5 to 30 VDC. Optional LED indicators signal on-off condition.

Request Catalog 50.

Photoelectric sensors

MICRO SWITCH has a complete offering of modulated LED and incandescent controls. These no-touch devices detect opaque or translucent material at long or short range.

Single unit retroreflective and separate emitter/receiver styles fill a variety of application requirements. High intensity models penetrate foggy, dusty, and other poor visibility conditions. Scanning capability ranges from a fraction of an inch to hundreds of feet.

Request Catalog 60.

Oiltight manual controls

Featuring a contemporary square appearance and lighted display, these families offer a wide selection of industrial pushbuttons, selectors, and indicators. Standard, miniature, and compact sizes provide flexibility in format and circuitry. Contact blocks feature heavy duty, standard or electronic duty capabilities plus solid state.

Request Catalog 70.

Environmentally protected switches

Rugged, high performance designs; environment-proof or hermetically sealed. A complete selection includes miniature limit switches, miniature and standard size basic switches, sealed toggle switches and the highest quality lighted pushbuttons.

Request Catalog 80.

Manual control switches

Whether you're prototyping a new design or planning to face-lift an existing panel, you'll benefit by considering the wide selection of pushbuttons, indicators, toggles, rockers, paddles, rotary selectors and interlock switches available from MICRO SWITCH. Developed with adherence to good human factors principles, these products aid the designer by offering almost limitless options in visual display techniques, operators, and arrangement of components. Many are military qualified.

Request Catalog 30.

Keyboards

MICRO SWITCH offers the world's widest selection of keyboard designs. It includes capacitance membrane and contact membrane keyboards in standard or low-profile versions; touch panels; and time-proven solid state Hall effect keyboards. With our experienced application engineers and complete capabilities, we can handle virtually any keyboard application. See Section 5150.

For further information contact your local MICRO SWITCH sales office.

Current Sensors

MICRO SWITCH current sensors monitor AC or DC current flow and in turn produce either a digital or linear output signal.

Built in voltage regulation and temperature compensation assure reliable operation. Thru hole design permits maximum currents limited only by conductor size. For more information on listings and custom current sensors, see our insert in section 5500.

Temperature Sensors

MICRO SWITCH temperature sensors are precision interchangeable sensors that operate on a change in resistance as a function of temperature. Fast linear sensing of air or liquid temperature, at a low cost, with long-term stability is featured. For standard and custom packaging capabilities see our insert in section 5300.

Pressure transducers

MICRO SWITCH piezoresistive pressure transducers accurately measure gaseous pressure as the sensitive silicon diaphragm integral to the IC chip distorts ever so slightly, resulting in linear output voltage directly proportional to pressure.

Both signal conditioned (amplified and temperature-compensated) and unamplified transducers of absolute, differential, and gage pressure design are available. Applications range from medical instruments to home appliances to altimeters. Accurate repeatability, low hysteresis, and long-term stability are characteristics of these tranducers, whose pressure range extends to 250 psi. See Section 5500.

SID-2000 sensor interface

SID-2000 is a sensor interface which expands sensing and manual control capabilities. You get a flexible system that includes sensors, manual products, logic control, and an interface to link them to your automated machines and processes. SID-2000 simplifies sensor management by allowing you to plan the sensors and their interface in one easy step. Basically, SID-2000 consists of a central processing unit (with microprocessor, power supply, and memory), various input and output modules, a modular backplane assembly, a programmer, plus your choice of the world's largest offering of sensors and manual controls. With SID-2000 you get a coordinated package of sensors and manual products, with logic control and an interface. It's a systematic approach to the management of sensor and manual inputs. **SID-2000 Literature**

MICRO SWITCH AUTHORIZED DISTRIBUTOR DIRECTORY

ALABAMA

Birmingham
MG Electronics and Equip.
Phone: 205/328-4525

Dothan
Mack Electric Supply Co.
Phone: 205/792-2111

Mobile
Southern Electric Supply Co.
Phone: 205/342-5072

ALASKA

Anchorage
HASCO, Inc.
Phone: 907/272-8734

ARIZONA

Phoenix
BeSwitched
Phone: 602/275-4805

East Side Electric Supply, Inc.
Phone: 602/273-1415

Electric Supply, Inc.
Phone: 602/252-2343

Kierulff Electronics
Phone: 602/243-4101

Tucson
Tucson Electric Supply Inc.
Phone: 602/624-8241

ARKANSAS

Fort Smith
Carlton-Bates Company
Phone: 501/646-8201

Little Rock
Carlton-Bates Company
Phone: 501/562-9100

CALIFORNIA

Anderson
Industrial Electric Service Co.
Phone: 916/365-3381

Arcata
Industrial Electric Service Co.
Phone: 707/822-2485

Bakersfield,
Controlco
Phone: 805/323-8111

Carson
Nunn-Royal Wholesale Electric, Inc.
Phone: 213/637-6377

Crescent City
Industrial Electric Service Co.
Phone: 707/464-4123

El Monte
Howland Electric Wholesale
Phone: 818/444-0503

Fresno
Electric Motor & Supply Co.
Phone: 209/486-0960

Gardena
California Switch & Signal
Phone: 213/770-2330

La Mirada
Associated Wholesale Electric Co.
Phone: 714/739-4999

Los Angeles
Argo Electric Supply
Phone: 213/588-8233

Electric Switches, Inc.
Phone: 213/660-1310

Kierulff Electronics
Phone: 213/725-0325

Minarik Electric Co.
Phone: 213/624-3161

Richey Western Electronics, Inc.
Phone: 213/820-3777

Modesto
Wille Electric Supply Co., Inc.
Phone: 209/527-6800

Oakland
Western Electro-Mechanical
Phone: 415/452-1936

Orange
County Wholesale Electric
Phone: 714/633-6440

Pico Rivera
Amfac Electrical Supply Co.
Phone: 213/949-7841

Riverside
Consolidated Electrical Dist.
Phone: 714/684-7811

CALIFORNIA — Cont'd

Sacramento
Kaman Bearing & Supply Corporation
Phone: 916/444-0700

Sacramento Electronics Supply
Phone: 916/441-4821

Salinas
Electric Supply of Salinas
Phone: 408/422-4786

San Diego
Amfac Electrical Supply Co.
Phone: 619/268-1020

County Wholesale Electric Co.
Phone: 619/578-0210

San Jose
Buckles-Smith Electric Co.
Phone: 408/280-7777

Consolidated Parts, Inc.
Phone: 408/263-9521

Powell Electronics
Phone: 408/943-9020

Quement Electronics
Phone: 408/998-5900

San Leandro
Nunn Royal Electric Supply Co.
Phone: 415/895-9810

So. San Francisco
Consolidated Electrical Dist.
Phone: 415/871-2893

Steven Engineering
Phone: 415/588-9200

Stockton
Valley Electric Co. of Stockton
Phone: 209/948-1911

Ukiah
Industrial Electric Service
Phone: 707/468-5400

Visalia
Medallion Supply, Inc.
Phone: 209/625-0333

COLORADO

Denver
Integrated Electronics Co., Inc.
Phone: 303/292-6121

Newark Electronics
Phone: 303/757-3351

Ryall Electric Supply Co.
Phone: 303/629-7721

TESSCO
Phone: 303/778-1119

CONNECTICUT

Bridgeport
Electric Maintenance Service
Phone: 203/333-6163

Danbury
Spring & Buckley
Phone: 203/743-0034

Hartford
Frank A. Blesso Inc.
Phone: 203/527-6461

New Britain
Spring & Buckley
Phone: 203/224-2451

Norwalk
Machine Drives & Controls, Inc.
Phone: 203/846-2007

Old Saybrook
Saybrook Electric (Hesco)
203/388-4484

Wallingford
Marshall Industries
Phone: 203/265-3822

DELAWARE

Wilmington
United Electric Supply Inc.
Phone: 302/322-3333

FLORIDA

Fort Lauderdale
Powell Electronics
Phone: 305/972-4300

Jacksonville
Turner Electric Works
Phone: 904/757-7790

Lakeland
A.A. Electric S.E., Inc.
Phone: 813/665-6941

Miami
Industrial Control & Drives
Phone: 305/651-0196

Orlando
Brownell Instruments & Cont.
Phone: 305/843-6770

Hammond Electronics, Inc.
Phone: 305/849-6060

Pensacola
Trio Electric Supply Co., Inc.
Phone: 904/476-5580

Pompano Beach
Peerless Radio Corp
Phone: 305/973-4141

Tampa
Tampa Armature Works, Inc.
Phone: 813/621-5661

GEORGIA

Albany
Mack Electric Supply Co.
Phone: 912/883-5156

Atlanta
A-A Electric, Inc.
Phone: 404/449-8670

A-C Equipment Co.
Phone: 404/451-2747

Brownell Instruments & Cont.
Phone: 404/762-5181

Augusta
Electrical Equipment Co.
Phone: 404/722-6685

Macon
Lowe Electric Company
Phone: 912/743-8661

Rome
Battey Machinery Company
Phone: 404/291-4141

Savannah
Rigby Electric Supply Co.
Phone: 912/234-2231

West Point
Georgia Alabama Supply Co.
Phone: 404/645-1321

HAWAII

Honolulu
ATECS Corporation
Phone: 808/845-2991

ILLINOIS

Addison
LCOMP, Inc.
Phone: 312/628-1400

Aurora
Electric Supply Corporation
Phone: 312/897-8663

Champaign
Klaus Radio Co.
Phone: 217/356-1896

Chicago
Revere Electric Co.
Phone: 312/738-3636

Danville
Danville Electric Supply Co.
Phone: 217/442-5282

ILLINOIS — Cont'd

Decatur
Englewood Electrical Supply
Phone: 217/875-7300

Lakeland Engineering Equip.
Phone: 217/423-2531

Elgin
Fox Electric Supply Company
Phone: 312/695-7400

Revere Electric Supply Co.
Phone: 312/741-8900

Freeport
Koym Electric Supply
Phone: 815/235-7595

Joliet
Englewood Electrical Supply
Phone: 815/725-3900

Kankakee
Blitz Electrical Supply Co.
Phone: 815/933-5536

Lombard
MacGregor and Co.
Phone: 312/629-5752

Peoria
Kiefer Electrical Supply Co.
Phone: 309/674-1143

Klaus Radio, Inc.
Phone: 309/691-4840

Peru
Englewood Electrical Supply
Phone: 815/223-2650

Quincy
Heintz Electric Company
Phone: 217/222-0113

Rockford
Forest City Electric Supply Co.
Phone: 815/968-5781

Skokie
Electric Supply Corporation
Phone: 312/673-1600

Wood Dale
Electric Supply Corp.
Phone: 312/595-3170

INDIANA

Anderson
Ralph David Inc.
Phone: 317/649-3504

Columbus
Daniel Hayden Electric Co.
Phone: 812/372-2596

Evansville
Evansville Supply Company
Phone: 812/424-7541

Fort Wayne
Graham Electronics
Phone: 219/423-3422

National Mill Supply, Inc.
Phone: 219/484-0575

Hammond
Electric Supply Corp.
Phone: 312/374-6000
219/932-8840

Indianapolis
Graham Electronics Supply
Phone: 317/634-8202

Peerless Electric Supply Co.
Phone: 317/635-2361

Logansport
Ralph David, Inc.
Phone: 219/722-2200

South Bend
Koontz-Wagner Electric Co.
Phone: 219/232-2051

IOWA

Cedar Rapids
Hupp Electric Motors, Inc.
Phone: 319/366-0761

Davenport
Industrial Eng. Equip. Co.
Phone: 319/323-9721

Des Moines
Electrical Engineering & Equipment
Phone: 515/282-0431

A-C Supply Co., Inc.
Phone: 515/243-3102

IOWA — Cont'd

Sioux City
Lakeland Engineering Equip.
Phone: 712/252-3611

KANSAS

Kansas City
Kornfeld Thorp Electric Co.
Phone: 913/321-7070

Lakeland Engineering Equip.
Phone: 913/384-0050

Wichita
Kriz-Davis, Inc.
Phone: 316/267-4354

LCOMP, Inc.
Phone: 316/265-8501

KENTUCKY

Bowling Green
Randolph, Hale & Meredith, Inc.
Phone: 502/781-1460

Lexington
Radio Electronic Equip. Co.
Phone: 606/255-6661

Louisville
E & H Electric Supply Co., Inc.
Phone: 502/587-0991

Paducah
Hannan Supply Company
Phone: 502/442-5456

LOUISIANA

Baton Rouge
A.W.C. Inc.
Phone: 504/275-5480

Industrial Electronic Supply
Phone: 504/357-4249

Harahan
MG Electronics & Equip. Co.
Phone: 504/733-0070

Shreveport
Industrial Electronic Supply
Phone: 318/222-9459

MAINE

Newport
Gilman Electrical Supply
Phone: 207/368-4306

Portland
The Leen Company
Phone: 207/774-6266

MARYLAND

Baltimore
Automation Industrial Control
Phone: 301/944-8400

Lee Electric Company
Phone: 301/752-4080

Columbia
Powell Electronics
Phone: 301/621-4070

Cumberland
Clayton Electric, Inc.
Phone: 301/724-6321

Kensington
Marine Air Supply Co., Inc.
Phone: 301/949-9560

MASSACHUSETTS

Boston
Controller Service & Sales Co.
Phone: 617/269-1300

Burlington
Marshall Industries
Phone: 617/272-8200

Springfield
T. F. Cushing, Inc.
Phone: 413/788-7341

Westborough
Powell Electronics
Phone: 617/366-6100

MASSACHUSETTS — Cont'd

Woburn
Brownell Instruments & Cont.
Phone: 617/935-7820

Worcester
Coghlin Electric Company
Phone: 617/791-7861

MICHIGAN

Ann Arbor
McNaughton-McKay Electric Co.
Phone: 313/995-9515

Wedemeyer Electronic Supply
Phone: 313/665-8611

Battle Creek
All-Phase Electric Supply Co.
Phone: 616/962-7557

Benton Harbor
All-Phase Electric Supply Co.
Phone: 616/926-6194

Flint
Advance Electric Supply Co.
Phone: 313/238-5611

Grand Rapids
RS Electronics
Phone: 616/241-3483

United Electric Supply Co.
Phone: 616/531-5310

Jackson
Fulton Radio Supply Co.
Phone: 517/784-6106

Kalamazoo
RS Electronics
Phone: 616/381-5470

Lansing
All-Phase Electric Supply Co.
Phone: 517/482-4449

Livonia
RS Electronics
Phone: 313/525-1155

Madison Heights
McNaughton-McKay Electric
Phone: 313/399-7500

Muskegon
Fitzpatrick Electric Supply Co.
Phone: 616/722-6621

Saginaw
Fischer-Flack Inc.
Phone: 517/752-4181

Southfield
Michigan Lectrols Corp.
Phone: 313/353-1350

Traverse City
Fitzpatrick Electric Supply
Phone: 616/946-7262

MINNESOTA

Duluth
Mielke Electric Works, Inc.
Phone: 218/727-7411

Minneapolis
Lakeland Eng. Equip. Co.
Phone: 612/544-0321

Northland Electric Supply Co.
Phone: 612/341-6100

St. Paul
Gopher Electronics Co.
Phone: 612/483-3322

Power/Mation Divn.
Phone: 612/645-0781

MISSISSIPPI

Jackson
Ellington Electronic Supply
Phone: 601/355-0561

MISSOURI

Bridgeton
Van Dusen Aircraft Supplies
Phone: 314/731-1700

Joplin
Four State Radio Supply Co.
Phone: 417/624-0368

Kansas City
LCOMP, Inc.
Phone: 816/221-2400

Maryland Heights
Barrett Electrical Supply Co.
Phone: 314/878-1300

French Gerleman Electric Co.
Phone: 314/569-3122

LCOMP, Inc.
Phone: 314/291-6200

Springfield
Southern Materials Company
Phone: 417/865-2822

MONTANA

Billings
Glacier State Electric Supply
Phone: 406/252-4663

Missoula
West Electric Distributors
Phone: 406/728-4020

NEBRASKA

Omaha
Enterprise Electric Company
Phone: 402/592-7500

Lakeland Engineering Equip.
Phone: 402/734-2600

NEVADA

Reno
WEDCO, Inc.
Phone: 702/329-1131

NEW HAMPSHIRE

Manchester
Controller Service & Sales Co.
Phone: 603/623-7225

NEW JERSEY

Cherry Hill
Fromm Electric Supply
Phone: 609/662-8300

Dover
Kahant Electrical Supply Co.
Phone: 201/366-2966

Edison
Brownell Instruments Cont.
Phone: 201/287-2030

Miller Knapp Incorporated
Phone: 201/985-2600

Hanover
State Electronics Parts Corp.
Phone: 201/887-2550

Linden
Turtle & Hughes, Inc.
Phone: 201/574-3600

Newark
Keer Electrical Supply Co.
Phone: 201/484-7400

Piscataway
Fromm Electric Supply Corp.
Phone: 201/981-0400

Saddlebrook
Ribble Engineering Co.
Phone: 201/791-0233

Secaucus
Franklin & Smith, Inc.
Phone: 201/864-0555

Trenton
Griffith Electric Supply Co.
Phone: 609/695-6121

Vineland
CED-Kay Electric Supply
Phone: 609/692-2020

NEW MEXICO

Albuquerque
Sterling Electronics
Phone: 505/884-1900

Carlsbad
H & E Electric Supply Co.
Phone: 505/887-1146

NEW YORK

Albany
Edwin E. Taylor Co., Inc.
Phone: 518/438-7811

Henzel Powers, Inc.
Phone: 518/465-2351

Brooklyn
Coleman Electrical Supply
Phone: 718/272-1313

Buffalo
Genesee Radio & Parts Co.
Phone: 716/873-9661

Wehle Electric Company, Inc.
Phone: 716/854-3270

Elmira
Brady Supply Corporation
Phone: 607/733-6591

Forest Hills
The Jack Miller Company
Phone: 718/263-4446

Jamestown
Westburgh Electric Inc.
Phone: 716/488-1172

Lynbrook
Peerless Radio Corporation
Phone: 516/593-2121

Mamaroneck
Logicomp Electronics
Phone: 914/698-9332

New York
Blan Electronics Corporation
Phone: 212/233-6288

Brownell Instruments Cont.
Phone: 212/924-6000

City Electric Distributors, Inc.
Phone: 212/564-5454

Plainview L.I.
Mid Island Electrical Sales Co.
Phone: 516/293-9300

Rochester
Requa Electrical Supply Co.
Phone: 716/475-1600

Simcona Electronics Corp.
Phone: 716/328-3230

Wehle Electric Company, Inc.
Phone: 716/461-0200

Syracuse
Baldwin Hall Co., Inc.
Phone 315/463-9251

Utica
M & L Electric Supply Corp.
Phone: 315/733-2326

Vestal
Wholesale Electric Supply Co.
Phone: 607/729-1526

White Plains
H. H. Benfield Elec. Supply
Phone: 914/948-6660

NORTH CAROLINA

Charlotte
Brownell Instrument & Controls Co.
Phone: 704/597-1270

Lakeland Engrg. Equip. Co.
Phone: 704/597-0044

Mill Power Supply Company
Phone: 704/527-2800

Greensboro
Hammond Electronics
Phone: 919/275-6391

Laurinburg
Electrical Equipment Co.
Phone: 919/276-2141

Raleigh
Electrical Equipment Co.
Phone: 919/828-5411

Southeastern Electronics
Phone: 919/828-2311

Shelby
Shelby Supply Co., Inc.
Phone: 704/482-6781

OHIO

Akron
Akron Electronic Supply
Phone: 216/762-8818

The Sacks Electrical Supply Co.
Phone: 216/253-2141

Cincinnati
Graham Electronics, Inc.
Phone: 513/772-1661

Hughes-Peters, Inc.
Phone: 513/351-2000

The Johnson Electric Supply
Phone: 513/421-3700

Columbus
Basic Distribution Corp.
Phone: 614/481-8801

Hughes-Peters, Inc.
Phone: 614/294-5351

Dayton
John A. Becker Electric Co.
Phone: 513/226-1341

The Stotts-Friedman Co.
Phone: 513/298-5555

Elyria
Brohl & Appell, Inc.
Phone: 216/366-6844

Lancaster
Basic Distribution Corp.
Phone: 614/653-9231

Lima
LPR Electronics Corp.
Phone: 419/228-1220

Mansfield
Mansfield Electric Supply Co.
Phone: 419/529-2750

Newark
Basic Distribution Corporation
Phone: 614/522-1116

Sandusky
Brohl & Appell Inc.
Phone: 419/625-6761

Solon
Midland Electric Co.
Phone: 216/248-3800

REPCO
Phone: 216/248-8900

Toledo
The H. Poll Electric Company
Phone: 419/255-1660

Warren
REM Electronics Supply Co.
Phone: 216/373-1300

OKLAHOMA

Oklahoma City
Electro Enterprises, Inc.
Phone: 405/427-6591

Hunzicker Brothers
Phone: 405/239-7771

Tulsa
Carlton-Bates Co.
Phone: 918/250-1626

PEI/Genesis Electronics, Inc.
Phone: 918/254-6591

OREGON

Bend
Eoff Electric Company
Phone: 503/388-1544

Eugene
North Coast Electric Co.
Phone: 503/343-7701

Klamath Falls
North Coast Electric Co.
Phone: 503/884-4171

Medford
North Coast Electric Co.
Phone: 503/772-7131

Portland
North Coast Electric Co.
Phone: 503/228-5111

Platt Electric Supply Inc.
Phone: 503/228-6121

Tek-Electric Controls, Inc.
Phone: 503/246-5451

OREGON — Cont'd

Roseburg
Roseburg Electric Wholesale
Phone: 503/673-6657

Salem
Stusser Elec. Co.
Phone: 503/581-3711

PENNSYLVANIA

Allentown
Crowder Jr. Company
Phone: 215/791-1551

Altoona
Allegheny Electronics, Inc.
Phone: 814/946-0871

Bradford
McKean Supply Division
Phone: 814/362-3523

Erie
Erie Industrial Elec. Supply
Phone: 814/455-8051

Kingston
ANESCO
Phone: 717/287-2101

Philadelphia
Powell Electronics, Inc.
Phone: 215/365-1900

Royal Electric Supply Co.
Phone: 215/221-1200

Rumsey Electric Company
Phone: 215/456-2500

Pittsburgh
CAM/RPC Electronics
Phone: 412/782-3770

McCullough Electric Co.
Phone: 412/261-2420

Reading
Barbey Electronics
Phone: 215/376-6116

St. Marys
B & R Electric Company
Phone: 814/834-2814

West Chester
West Chester Electric Supply
Phone: 215/696-7500

York
Graybill's Incorporated
Phone: 717/843-0786

PUERTO RICO

Bayamon
Caribbean Contracting Corp.
Phone: 809/786-7815

RHODE ISLAND

Providence
Controller Services & Sales Co.
Phone: 401/781-7100

William Dandreta & Company
Phone: 401/861-2800

Leavitt-Colson Company
Phone: 401/521-8800

SOUTH CAROLINA

Charleston
Wholesale Industrial Electronics
Phone: 803/722-2634

Columbia
Dixie Electronics, Inc.
Phone: 803/779-5332

Greenville
Hammond Electronics
Phone: 803/233-4121

Shealy Electrical Wholesale
Phone: 803/242-6880

SOUTH DAKOTA

Aberdeen
McLaughlin Electric Supply
Phone: 605/225-7100

TENNESSEE

Chattanooga
Mills & Lupton Supply Co.
Phone: 615/266-6171

Kingsport
Wholesale Electric, Inc.
Phone: 615/246-2900

Knoxville
Brownell Instruments & Cont.
Phone: 615/966-3441

Stokes Electric Company
Phone: 615/525-0351

TENNESSEE — Cont'd

Memphis
Bluff City Distributing Co.
Phone: 901/345-9500

Brownell Instr. & Controls
Phone: 901/795-8483

Nashville
Brownell Instruments & Cont.
Phone: 615/889-8230

Carlton-Bates
Phone: 615/244-3562

Electra Distributing
Phone: 615/329-3971

TEXAS

Amarillo
Snook & Aderton, Inc.
Phone: 806/374-5229

Austin
Harrison Equipment Co.
Phone: 512/458-3555

Beaumont
Ralph's Industrial Electronics
Phone: 409/833-9443

Corpus Christi
Nunn Electric Supply Corp.
Phone: 512/884-0311

Dallas
Associated Aircraft Supply Co.
Phone: 214/331-4381

King Bearing, Inc.
Phone: 214/630-7600

Norvell Electronics, Inc.
Phone: 214/233-0020

Denton
Lakeland Engrg. Equip. Co.
Phone: 817/566-5084

El Paso
Midland Specialty Company
Phone: 915/533-9555

Triangle Electric Supply Co.
Phone: 915/533-5981

Fort Worth
SWIECO, Inc.
Phone: 817/335-6521

Harlingen
Bush Supply Co., Inc.
Phone: 512/428-1613

Houston
Industrial Equipment of Houston
Phone: 713/928-3181

King Bearing, Inc.
Phone: 713/688-5701

Norvell Electronics, Inc.
Phone: 713/777-1666

Lubbock
Snook & Aderton, Inc.
Phone: 806/763-9323

Odessa
Western Controls Co.
Phone: 915/332-0771

San Antonio
Blackburn Drives & Ctrls., Inc.
Phone: 512/349-2621

Stafford
Harrison Equipment Co., Inc.
Phone: 713/879-2727

UTAH

North Salt Lake
Western Controls
Phone: 801/292-5900

Salt Lake City
Stuart Electric Supply, Inc.
Phone: 801/466-8603

VIRGINIA

Harrisonburg
Electrical Wholesalers, Inc.
Phone: 703/434-1751

Lynchburg
ECK Supply Co.
Phone: 804/846-6555

Norfolk
Priest Electronics, Inc.
Phone: 804/855-0105

VIRGINIA — Cont'd

Richmond
Electrical Equipment Co.
Phone: 804/353-7841

Roanoke
Williams Supply, Inc.
Phone: 703/343-9333

WASHINGTON

Aberdeen
Industrial Electric Service Co.
Phone: 206/533-2792

Bellevue
Powell Electronics
Phone: 206/641-4446

Bellingham
North Coast Electric Co.
Phone: 206/671-1100

Everett
North Coast Electric Co.
Phone: 206/259-7263

Longview
North Coast Electric Co.
Phone: 206/423-1550

Pasco
AMFAC Electrical Supply Co.
Phone: 509/547-9733

Seattle
North Coast Electric Co.
Phone: 206/682-4444

Platt Electric Supply, Inc.
Phone: 206/624-4083

Tek-Electric Control, Inc.
Phone: 206/243-6007

Spokane
Amfac Electrical Supply
Phone: 509/534-0611

Tacoma
Consolidated Electrical Dist.
Phone: 206/383-5961

Yakima
Picatti Brothers, Inc.
Phone: 206/248-2540

WEST VIRGINIA

Clarksburg
Tolley Electric Company
Phone: 304/624-7468

Dunbar
State Electric Supply Co.
Phone: 304/768-8856

Huntington
West Virginia Electric Supply
Phone: 304/525-0361

Wheeling
Gee Electric Company
Phone: 304/233-3200

WISCONSIN

Appleton
Langstadt Electric Supply Co.
Phone: 414/733-3791

Cedarburg
A.A. Electric, Inc.
Phone: 414/377-8000

Green Bay
A.A. Electric Division
Phone: 414/499-0258

Beemster Electric Company
Phone: 414/437-3238

Janesville
Cole Electric Supply, Inc.
Phone: 608/752-9496

Manitowoc
Englewood Electric Supply
Phone: 414/684-6653

Milwaukee
Standard Electric Supply Co.
Phone: 414/272-8100

Racine
Nelson Electric Supply Co.
Phone: 414/637-7661

Waukesha
Power/Mation Division
Phone: 414/542-2868

Service to the Customer ... Worldwide

molex®

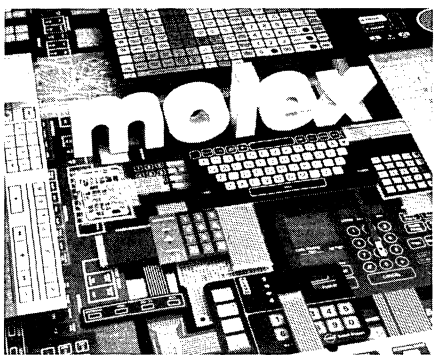
Custom-Designed and Standard Membrane Switches

The 10900 Membrane Switch consists of silver contacts deposited on two sections of a thin, flexible polyester sheet. A spacer layer with openings to create a contact gap is sandwiched between the two circuit halves and sealed with adhesive. Upon actuation the contact gap in the membrane decreases until both silver contact surfaces meet and close the circuit.

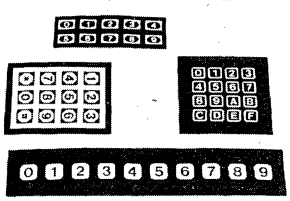
They are designed to be used in any application with low energy logic level switching requirements (28 V DC, 30mA) and resistance at termination in the 10/15 Ohm range or greater.

A custom graphic overlay is generally added for aesthetic appeal. As many as 15 colors are available on various laminates including velvet, suede, gloss or matte polyester or polycarbonate. Embossing, metallic finishes, and backlighting can also be specified as well as various circuitry and mounting options.

Tactile feedback and hybrid construction are also available



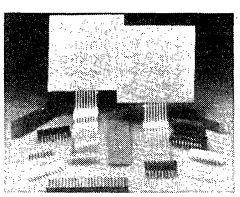
Molex Standard Membrane Switches



Molex realizes that often times your touch panel requirements could be satisfied by a **standard configuration** designed to easily interface with most common digital circuits.

We have, therefore, established a line of **readily available** Membrane keypads for those applications that do not justify a custom switch.

Standard switches are available from your local Molex distributor and may be purchased with or without standard graphic overlays and adhesive mounting sheets.



Molex Connectors for Membrane Switch Tails

Specifications (Standard switches)

Electrical:

Contact Rating - 28V DC, 30mA max.
Life - 5 million operations min. at maximum contact rating
Termination Resistance - 10/15 ohms nominal (depends on circuit configuration); 100 ohms max.
Contact Bounce - Less than 3 milliseconds
Switch Capacitance - Less than 20 Pf
Available Circuit Codes - a. SPST with 2 outputs per switch
b. SPST with common bus
c. X-Y Matrix
d. Other circuit variations available upon request

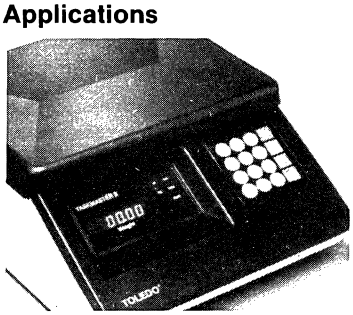
Mechanical:

Actuation Force - 2 to 8 ounces
Button Travel - .005 to .008
Shock - 50 G. (3 hits on each axis)
Panel Thickness - .025/.040 typical
Graphics - 2nd surface printing of multiple colors; special effects, textures and embossing
Mounting - Adhesive back or mounting holes

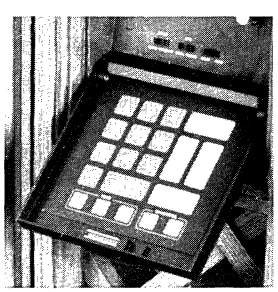
Environmental:

Temp. Range (storage & oper.) - 40°C to 70°C
Humidity - Per Mil STD 202E, Method 103B
Salt Fog - 5% salt solution for 48 hours

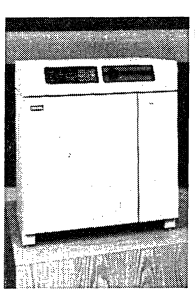
Applications



Commercial Counting Scales



Television Controls



Industrial Controls

Telecommunications

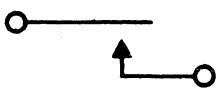
Also: Security systems, Professional music synthesizers, Audio-visual equipment, Data processing equipment, Electronic typewriters, Electronic organs, Microwave ovens, Electronic games

Write for a free copy of our Switch Catalog

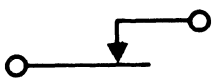
Molex Incorporated, Dept. JJ • 2222 Wellington Ct. • Lisle, IL 60532 • (312) 969-4550

MINIGLOSSARY
RELAY CONTACT FORMS

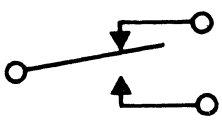
A
Make
SPST-NO



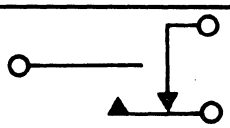
B
Break
SPST-NC



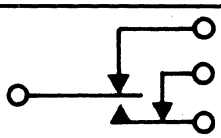
C
Break, Make
(Transfer)
SPDT



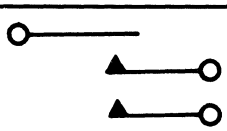
D
Make, Break
(Continuity
Transfer)



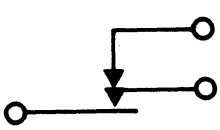
E
Break,
Make,
Break



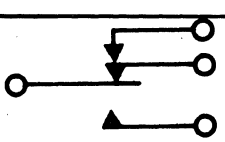
F
Make,
Make



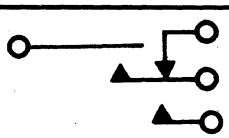
G
Break,
Make



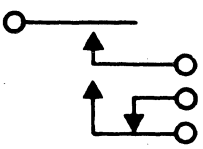
H
Break,
Break,
Make



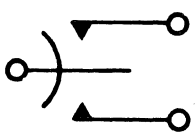
I
Make,
Break,
Make



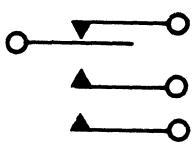
J
Make,
Make,
Break



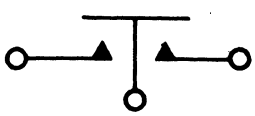
K
Center off
SPDT



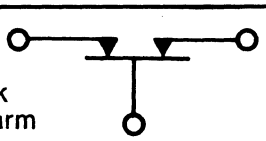
L
Break,
Make,
Make



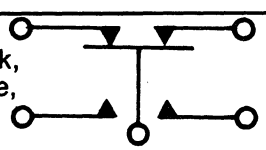
U
Double
make
Contact
on arm



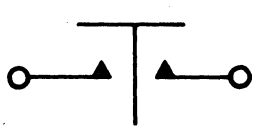
V
Double break
Contact on arm



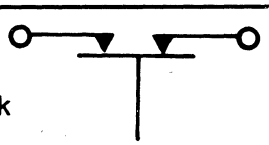
W
Double break,
Double make,
Contact
on arm



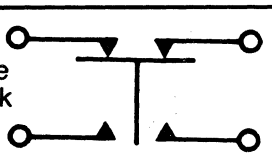
X
Double
make



Y
Double break



Z
Double make
Double break
SPDT-DB



NKK switches

There's only one thing we haven't changed in 30 years.

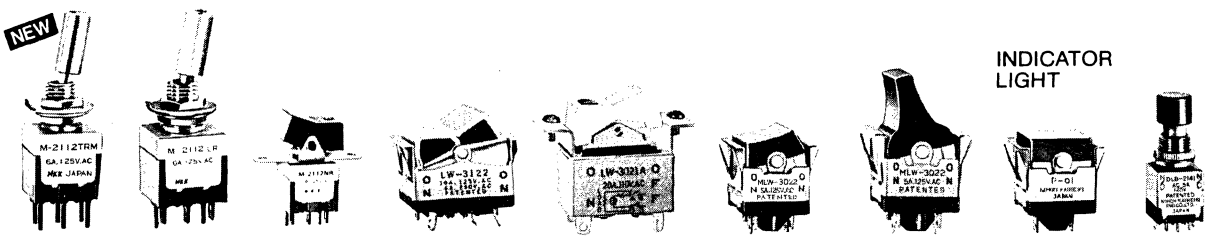
Our quality. We developed the first super-subminiature washable switches, the first 10-Amp rated miniature toggles and the first miniature lighted snap-in rockers—just to name a few. But while innovation became an NKK trademark, quality remained a tradition. Today, you'll find that quality in over 607,000 different switches. In fact, we can offer you just about every type of switch you'd expect from a major manufacturer, plus a lot you won't find anywhere else.

Send for our 200-page catalog, then compare the performance specs, construction materials and standard features of our switches with those of the ones you are now using. You'll see why, dollar for dollar, NKK is the standard of comparison.

We put our 30 years of experience to good use—just so you could do the same.

ILLUMINATED SWITCHES (TOGGLE, LEVER, ROCKER AND PUSHBUTTON TYPES)

NEW



M-2112TRM M-2112LR M-2112NR LW-3122 LW-3021A MLW-3022 MLW-3022 P-01 DLB-2141

LIGHTED DEVICES

A variety of lighted devices is offered which include push-button, rockers, paddle and L.E.D. lighted toggles and rockers. The pushbuttons are available in DPDT momentary or alternate actions. The lighted rockers and paddles, "MLW" Series, are available in SPDT or DPDT in all normal circuit configurations. The LW Series is a 10 Amp device with dual lamp capabilities. All units incorporate a variety of lens colors and all are provided with isolated lamp terminations offering more user flexibility. Optional colored bezels are available for rocker configurations. The single L.E.D. toggles and rockers can be provided with the L.E.D. as part of the switching circuit or isolated from the circuit.

L.E.D. ILLUMINATED TOGGLE

Model No.	Poles	Position			Rating
		Up (keyway)	Center	Down	Resistive
					AC 125V
M2112T☐	SPDT	ON	—	ON	6A
*M2112L☐	//	ON	—	ON	6A
M2113T☐	//	ON	OFF	ON	6A
*M2113L☐	//	ON	OFF	ON	6A

* Isolated lamp circuit

☐ should be filled with SUFFIX for L.E.D. color selection.
Example: R for RED, M for GREEN & Y for YELLOW.

NEW Bicolor L.E.D. toggles and rockers are now available. Specify 2 colors. Example: RM for RED/GREEN, RY for RED/YELLOW & YM for YELLOW/GREEN.

L.E.D. ILLUMINATED ROCKER

Model No.	Poles	Position			Rating
		Up	Center	Down	Resistive
					AC 125V
M2112N☐	SPDT	ON	—	ON	6A
*M2112R☐	//	ON	—	ON	6A
M2113N☐	//	ON	OFF	ON	6A
*M2113R☐	//	ON	OFF	ON	6A

*Isolated lamp circuit

☐ should be filled with SUFFIX for L.E.D. color selection. Example: R for RED, M for GREEN & Y for YELLOW.

ILLUMINATED ROCKER

Model No.	Poles	Position			Rating	
		< >=Momentary			Resistive Load	
		Up	Center	Down	AC 125V	AC 250V
LW-3122	DPDT	ON	—	ON	10A	6A
LW-3123	//	ON	OFF	ON	10A	6A
LW-3125	//	ON	—	<ON>	10A	6A
LW-3128	//	<ON>	OFF	<ON>	10A	6A
LW-3129	//	ON	OFF	<ON>	10A	6A
LW-3021A	DPST	ON	—	OFF	20A(100V)	
MLW-3022	DPDT	ON	—	ON	5A	
MLW-3023	//	ON	OFF	ON	5A	
MLW-3025	//	ON	—	<ON>	5A	
MLW-3028	//	<ON>	OFF	<ON>	5A	
MLW-3029	//	ON	OFF	<ON>	5A	

ILLUMINATED PUSHBUTTON

Model No.	Poles	Position		Rating
		< >=Momentary		Resistive Load
				AC 125V
DLB-2141	DPDT	ON	<ON>	5A
DLB-2145	//	ON	ON	5A

Contact Factory for lens styles and colors.

NKK switches

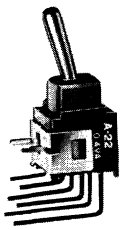
NKK SWITCHES OF AMERICA INC.
14415 NORTH SCOTTSDALE ROAD, SCOTTSDALE, AZ 85260
TEL: (602) 991-0942 TWX: 910-950-1167

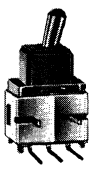
WASHABLE!

Series A SUPERSUBMINIATURE'S

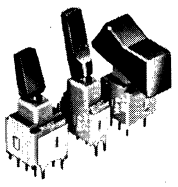
STC SLIDING TWIN CROSSBAR CONTACT MECHANISM

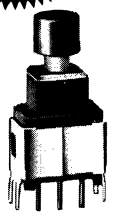
nkk switches

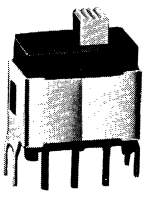

A-22AV


A-12JH

A-01BR


With Paddles & Rocker on A-12KB etc.


AB-15AB With AT-475


AS-12AB

FEATURES

This supersubminiature family of SPDT, SP3T, & DPDT "Washable" PCB switches with Sliding Twin Cross-Bar Contacts are available in toggle, paddle, rocker & pushbutton versions. The series incorporates a bushing seal and the back is sealed which allows the unit to be subjected to wave soldering and flux cleaning operations. The series is available with a variety of toggle styles, colored paddles and rockers in all switching actions including "ON-ON-ON". All normal printed circuit board terminations are offered. Optional caps are for the pushbutton types.

SPECIFICATIONS

SPDT, SP3T and DPDT in 5 different actions. Contact rating: 0.4VA MAX. 28V ac/dc MAX. Contact resistance: 50 milliohms max. @10mA /20mV. Insulation resistance: 500 megohms min. 500V dc. Dielectric strength: 500V ac min. Endurance: 50,000 ~ 100,000 cycles mechanical, 50,000 cycles electrical min.

		TYPE NBR.	LEVER POSITION ( ) = Momentary		
		TOGGLE	Up	Center	Down
VERTICAL MTG. PC	SPDT	A-12□V	ON	—	ON
		A-13□V	ON	OFF	ON
		A-15□V	ON	—	(ON)
		A-1R□V	(ON)	—	ON
		A-18□V	(ON)	OFF	(ON)
		A-19□V	ON	OFF	(ON)
		A-1S□V	(ON)	OFF	ON
	DPDT	A-22□V	ON	—	ON
		A-23□V	ON	OFF	ON
		A-25□V	ON	—	(ON)
		A-2R□V	(ON)	—	ON
		A-28□V	(ON)	OFF	(ON)
		A-29□V	ON	OFF	(ON)
		A-2S□V	(ON)	OFF	ON
		SP-3T	—	—	—
		A-24□V	ON	ON	ON
		A-26□V	(ON)	ON	(ON)
		A-27□V	ON	ON	(ON)
RIGHT ANGLE MTG. PC	SPDT	A-12□H	ON	—	ON
		A-13□H	ON	OFF	ON
		A-15□H	ON	—	(ON)
		A-1R□H	(ON)	—	ON
		A-18□H	(ON)	OFF	(ON)
		A-19□H	ON	OFF	(ON)
		A-1S□H	(ON)	OFF	ON
	DPDT	A-22□H	ON	—	ON
		A-23□H	ON	OFF	ON
		A-25□H	ON	—	(ON)
		A-2R□H	(ON)	—	ON
		A-28□H	(ON)	OFF	(ON)
		A-29□H	ON	OFF	(ON)
		A-2S□H	(ON)	OFF	ON
		SP-3T	—	—	—
		A-24□H	ON	ON	ON
		A-26□H	(ON)	ON	(ON)
		A-27□H	ON	ON	(ON)

		TYPE NBR.	LEVER POSITION ( ) = Momentary		
		TOGGLE	Up	Center	Down
STRAIGHT MTG. PC with SUPPORT BRACKET	SPDT	A-12□B	ON	—	ON
		A-13□B	ON	OFF	ON
		A-15□B	ON	—	(ON)
		A-18□B	(ON)	OFF	(ON)
		A-19□B	ON	OFF	(ON)
	DPDT	A-22□B	ON	—	ON
		A-23□B	ON	OFF	ON
		A-25□B	ON	—	(ON)
		A-28□B	(ON)	OFF	(ON)
		A-29□B	ON	OFF	(ON)
		SP-3T	—	—	—
		A-24□B	ON	ON	ON
		A-26□B	(ON)	ON	(ON)
		A-27□B	ON	ON	(ON)
STRAIGHT MTG. PC	SPDT	A-12□P	ON	—	ON
		A-13□P	ON	OFF	ON
		A-15□P	ON	—	(ON)
		A-18□P	(ON)	OFF	(ON)
		A-19□P	ON	OFF	(ON)
	DPDT	A-22□P	ON	—	ON
		A-23□P	ON	OFF	ON
		A-25□P	ON	—	(ON)
		A-28□P	(ON)	OFF	(ON)
		A-29□P	ON	OFF	(ON)
		SP-3T	—	—	—
		A-24□P	ON	ON	ON
		A-26□P	(ON)	ON	(ON)
		A-27□P	ON	ON	(ON)

		TYPE NBR.	LEVER POSITION		
		SLIDE	Side A	Center	Side B
RIGHT ANGLE MTG. PC	SPDT	AS-12AH	ON	—	ON
		AS-13AH	ON	OFF	ON
	DPDT	AS-22AH	ON	—	ON
		AS-23AH	ON	OFF	ON
STRAIGHT PC with BRACKET	SPDT	AS-12AB	ON	—	ON
		AS-13AB	ON	OFF	ON
	DPDT	AS-22AB	ON	—	ON
		AS-23AB	ON	OFF	ON
STRAIGHT PC	SPDT	AS-12AP	ON	—	ON
		AS-13AP	ON	OFF	ON
	DPDT	AS-22AP	ON	—	ON
		AS-23AP	ON	OFF	ON

		PUSH BUTTON	Normal	Center	Down
VERTICAL	○	AB-15AV	ON	—	(ON)
	◎	AB-25AV	ON	—	(ON)
RIGHT ANGLE	○	AB-15AH	ON	—	(ON)
	◎	AB-25AH	ON	—	(ON)
STR.PC W/BRACKET	○	AB-15AB	ON	—	(ON)
	◎	AB-25AB	ON	—	(ON)
STRAIGHT PC	○	AB-15AP	ON	—	(ON)
	◎	AB-25AP	ON	—	(ON)

○ = SPDT ◎ = DPDT ( ) = Momentary

NOTE: ACTUATOR STYLES
□ Should be filled with SUFFIX for selection of toggles like
A = (.394" long/STANDARD),
J = (.248" long/SHORT),
E = (.394" long/FLAT),
H = (.248" long/FLAT & SHORT) and
K = (For Rocker or Paddle types).

MATCHING INDICATOR LIGHT

MODEL NO.	DESCRIPTION	COLOR
A-01P	.118"dia. L.E.D./Straight PC	Red, Green & Yellow
A-01B	.118"dia. L.E.D./Straight PC with Support Bracket	Red, Green & Yellow
A-01V	.118"dia. L.E.D./Vertical Mtg. PC	Red, Green & Yellow
A-01H	.118"dia. L.E.D./Right Angle Mtg. PC	Red, Green & Yellow
A-02P	.197"dia. L.E.D./Straight PC	Red, Green & Yellow

ACCESSORIES

MODEL NO.	DESCRIPTION
AT-467	Paddle .370" long
AT-468	Paddle .559" long
AT-469	Rocker .748" x .528"
AT-062	Rocker .600" x .250"
AT-475	Button .201" dia.
AT-496	Button .295" dia.
AT-4003	Cap for toggle .394" long
Red, White & Black are available	
AT-530	Snap-in Mounter/Single Pole
AT-531	Snap-in Mounter/Single & Double Pole

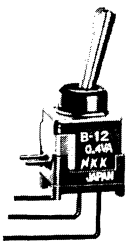
NKK SWITCHES OF AMERICA INC. 14415 NORTH SCOTTSDALE ROAD, SCOTTSDALE, AZ 85260 TEL: (602)991-0942 TWX: 910-950-1167

WASHABLE! **B** "Static-proof" Top

Series SUPERSUBMINIATURE'S

STC SLIDING TWIN CROSSBAR CONTACT MECHANISM

NKK switches



B-12AV

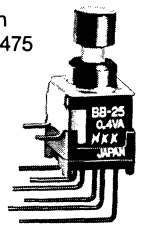
B-12JH

B-22HB

B-22EP

BB-15AB

With AT-475



BB-25AV

FEATURES

This is a supersubminiature family of "Static-proof", "Washable" PCB switches with Sliding Twin Cross-Bar Contacts. The family is available in toggle and pushbutton versions in SPDT and DPDT in 5 different switching actions. The units have a bushing made of a carbon impregnated resin, which when used with a support bracket and the bracket is taken to ground provides a path to ground for "static" electricity. The series incorporates a bushing seal and the backs are ultrasonically welded offering a unit which can be subjected to wave soldering and flux cleaning operations. The toggle versions are offered in a variety of shapes and sizes. The devices are available in all normal printed circuit board terminal configurations. Optional caps are available for the pushbutton types.

SPECIFICATIONS

SPDT and DPDT in 5 different actions. Contact rating: 0.4VA MAX. 28V MAX. ac/dc Contact resistance: 500 milliohms max. @10mA/20mV. 50 milliohms max. @10mA/20mV. Insulation resistance: 500 megohms min. 500V dc. Dielectric strength: 500V ac min. Endurance: 50,000 ~ 100,000 cycles mechanical, 50,000 cycles electrical min.

TOGGLE		BASIC TYPE NBR.	LEVER POSITION (〈 〉=Momentary) Up (Slot)	Center	Down
VERTICAL MTG. PC	SP•DT	B-12□V	ON	—	ON
		B-13□V	ON	OFF	ON
		B-15□V	ON	—	〈ON〉
		B-18□V	〈ON〉	OFF	〈ON〉
		B-19□V	ON	OFF	〈ON〉
	DP•DT	B-22□V	ON	—	ON
		B-23□V	ON	OFF	ON
		B-25□V	ON	—	〈ON〉
		B-28□V	〈ON〉	OFF	〈ON〉
		B-29□V	ON	OFF	〈ON〉
RIGHT ANGLE MTG. PC	SP•DT	B-12□H	ON	—	ON
		B-13□H	ON	OFF	ON
		B-15□H	ON	—	〈ON〉
		B-18□H	〈ON〉	OFF	〈ON〉
		B-19□H	ON	OFF	〈ON〉
	DP•DT	B-22□H	ON	—	ON
		B-23□H	ON	OFF	ON
		B-25□H	ON	—	〈ON〉
		B-28□H	〈ON〉	OFF	〈ON〉
		B-29□H	ON	OFF	〈ON〉

TOGGLE		BASIC TYPE NBR.	LEVER POSITION (〈 〉=Momentary) Up (Slot)	Center	Down
STRAIGHT MTG. PC with SUPPORT BRACKET	SP•DT	B-12□B	ON	—	ON
		B-13□B	ON	OFF	ON
		B-15□B	ON	—	〈ON〉
		B-18□B	〈ON〉	OFF	〈ON〉
		B-19□B	ON	OFF	〈ON〉
	DP•DT	B-22□B	ON	—	ON
		B-23□B	ON	OFF	ON
		B-25□B	ON	—	〈ON〉
		B-28□B	〈ON〉	OFF	〈ON〉
		B-29□B	ON	OFF	〈ON〉
STRAIGHT MTG. PC	SP•DT	B-12□P	ON	—	ON
		B-13□P	ON	OFF	ON
		B-15□P	ON	—	〈ON〉
		B-18□P	〈ON〉	OFF	〈ON〉
		B-19□P	ON	OFF	〈ON〉
	DP•DT	B-22□P	ON	—	ON
		B-23□P	ON	OFF	ON
		B-25□P	ON	—	〈ON〉
		B-28□P	〈ON〉	OFF	〈ON〉
		B-29□P	ON	OFF	〈ON〉

TYPE NBR.	PUSH BUTTON	OPERATOR POSITION Normal	Down
VERTICAL	BB-15AV	ON	〈ON〉
	BB-25AV	ON	〈ON〉
RIGHT ANGLE	BB-15AH	ON	〈ON〉
	BB-25AH	ON	〈ON〉
STR. PC W/BRACKET	BB-15AB	ON	〈ON〉
	BB-25AB	ON	〈ON〉
STRAIGHT PC	BB-15AP	ON	〈ON〉
	BB-25AP	ON	〈ON〉

=SPDT =DPDT 〈 〉=Momentary

NOTE: ACTUATOR STYLES
□should be filled with SUFFIX for selection of toggles like

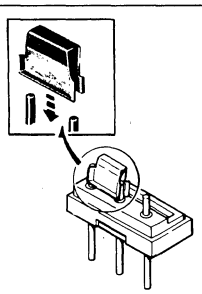
A=(.394" long/STANDARD)
J=(.248" long/SHORT)
E=(.394" long/FLAT)
H=(.248" long/FLAT & SHORT)

ACCESSORIES

MODEL NO.	DESCRIPTION
AT-475	Button .201"dia.
AT-496	Button .295"dia.
AT-4003	Cap for toggle .394"long

Red, White & Black are available

STC : WORLD'S MOST RELIABLE LOGIC LEVEL CONTACT



Patented gold-plated Sliding Twin Cross-Bar Contact provides unmatched logic-level reliability. Sealed contact allows wave soldering and washing.

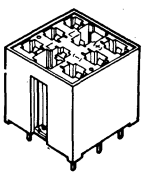
NKK SWITCHES OF AMERICA INC. 14415 NORTH SCOTTSDALE ROAD SCOTTSDALE, AZ 85260 TEL: (602)991-0942 TWX: 910-950-1167

Series LB PUSHBUTTON SWITCHES AND INDICATORS

ROUND | RECTANGULAR | PCB SOCKET | SQUARE | PROTECTIVE GUARD | SPLASH COVER

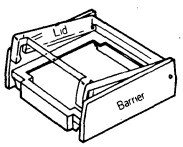
LB-26CKSI

LB-15RGSI

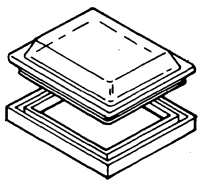


AT-712

LB-25SKSI



AT-499



AT-4011

FEATURES

The LB Series is a compact front panel snap-in switchlight available in round, square or rectangular configurations. The round unit snaps into a .866" diameter hole, the square, a .638" square panel cutout and the rectangular, a .638" × .882" cutout. These units can be provided with front panel re-lampable incandescent lamps or L.E.D.s. The terminals can be soldered or used as a #110 quick-connect terminal. Gold plated versions are available for dry circuit applications. Protective guards, splash covers, barriers and sockets for P.C. mounting are optional.

SPECIFICATIONS

SPDT and DPDT, momentary or alternate action. Contact rating: 3Amps @125 or 250Vac or 30Vdc (Resistive). 0.4 VA 28V MAX. ac/dc. Contact resistance: 50 milliohms max. @ 2-4V 0.1A DC. Insulation resistance: 200 milliohms min. 500VDC. Dielectric strength: 1000V AC terminals to terminals, 1500V terminals to ground. Endurance: 1,000,000 cycles min. (momentary), 200,000 min. (alternate action) mechanical, 100,000 cycles min. electrical.

PUSHBUTTON SWITCHES

Configurations	MODEL NUMBER		CIRCUIT	ACTION
	SILVER CONTACT/TERM.	GOLD CONTACT/TERM.		
Round	LB-15C[K]S1	LB-15C[K]G4	SPDT	Mom.
	LB-16C[K]S1	LB-16C[K]G4	SPDT	Alt.
	LB-25C[K]S1	LB-25C[K]G4	DPDT	Mom.
	LB-26C[K]S1	LB-26C[K]G4	DPDT	Alt.
Square	LB-15S[K]S1	LB-15S[K]G4	SPDT	Mom.
	LB-16S[K]S1	LB-16S[K]G4	SPDT	Alt.
	LB-25S[K]S1	LB-25S[K]G4	DPDT	Mom.
	LB-26S[K]S1	LB-26S[K]G4	DPDT	Alt.
Rectangular	LB-15R[K]S1	LB-15R[K]G4	SPDT	Mom.
	LB-16R[K]S1	LB-16R[K]G4	SPDT	Alt.
	LB-25R[K]S1	LB-25R[K]G4	DPDT	Mom.
	LB-26R[K]S1	LB-26R[K]G4	DPDT	Alt.

* Suffix [K] means Black Housing, Use [G] for Gray.

MATCHING INDICATOR LIGHT

MODEL NO.	DESCRIPTION
LB-01[K]S1	Square Lens Face
LB-02[K]S1	Round Lens Face
LB-03[K]S1	Rectangular Lens Face

* Use [G] for Gray Housing.

BUTTONS

Configurations	LENS STYLE		COLORS*	
	MODEL NO.	DESCRIPTION	Cover	Filter
Round	AT-4012	For Incandescent Lamp	B,M,R,W,Y.	Trans.
	AT-4013	For Incandescent Lamp	Trans.	B,M,R,W,Y.
	AT-4014	For Single L.E.D.	Trans.	M,R,Y.
	AT-4015	For 4 L.E.D. Array	Trans.	M,R,Y.
	AT-4016	L.E.D./Spot	K,M,R.	(L.E.D.) M,R,Y.
	AT-4017	Non-Illuminated	B,G,K,M,R,W,Y	—
Square	AT-476	For Incandescent Lamp	B,M,R,W,Y.	Trans.
	AT-477	For Incandescent Lamp	Trans.	B,M,R,W,Y.
	AT-478	For Single L.E.D.	Trans.	M,R,Y.
	AT-479	For 4 L.E.D. Array	Trans.	M,R,Y.
	AT-480	L.E.D./Spot	K,M,R.	(L.E.D.) M,R,Y.
	AT-484	Non-Illuminated	B,M,R,W,Y.	—
Retangular	AT-4026	For Incandescent Lamp	B,M,R,W,Y.	Trans.
	AT-4027	For Incandescent Lamp	Trans.	B,M,R,W,Y.
	AT-4028	For Single L.E.D.	Trans.	M,R,Y.
	AT-4029	For 4 L.E.D. Array	Trans.	M,R,Y.
	AT-4030	Non-Illuminated	B,G,K,M,R,W,Y	—

* B = Blue, G = Gray, K = Black, M = Green, R = Red, W = White, Y = Yellow

LAMPS or L.E.D.

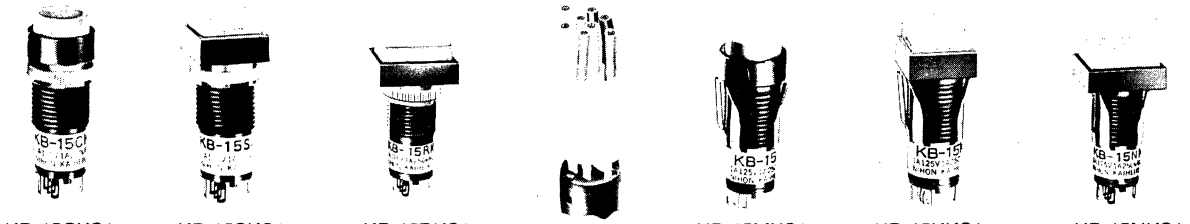
MODEL NO.	DESCRIPTION	COLORS
AT-607	Incandescent Lamp 5V,12V,28V.	—
AT-608	Single L.E.D./Square	Red,Green,Yellow.
AT-609	4 L.E.D. Array w/o Ballast Resistor	Red,Green,Yellow.
AT-610	4 L.E.D. Array w/Ballast Resistor.	Red,Green,Yellow.
AT-614	Single L.E.D./Round & Rectangular	Reb,Green,Yellow.

ACCESSORIES

MODEL NO.	DESCRIPTION
AT-109	Lens Extractor
AT-497	End Barrier Strip
AT-498	Center Barrier Strip
AT-499	Protective Guard/Square
AT-711	Socket for PCB Mtg. (Single Pole)
AT-712	Socket for PCB Mtg. (Double Pole)
AT-4001	Splash cover/Square
AT-4002	Splash cover/Round
AT-4011	Splash cover/Rectangular

Series KB PUSHBUTTON SWITCHES AND INDICATORS

BUSHING MOUNTING | INSULATION COVER | SNAP-IN MOUNTING



KB-15CKS1 KB-15SKS1 KB-15RKS1 KB-15MKS1 KB-15KKS1 KB-15NKS1

FEATURES

This compact lighted series is provided in a round, square or rectangular lens face which mounts into a .484" diameter panel cutout for bushing or snap-in mounting. The unit can be provided with front panel replaceable incandescent lamps or LED's. Gold plated designs are available for dry circuit applications. Matching indicator lights are available. Protective guards, splash covers and sockets for P.C. mounting are optional.

SPECIFICATIONS

SPDT and DPDT, momentary or alternate action, Contact rating: 1Amps @125 or 250Vac or 30Vdc (Resistive). 0.4 VA 28V MAX. ac/dc. Contact resistance: 50 milliohms max. @ 2-4V 0.1A DC. Insulation resistance: 1000 megohms min. 500 V DC; Dielectric Strength: 1000V AC terminals to terminals, 1500V terminals to ground. Endurance: 40,000 cycles mechanical, 20,000 cycles electrical min.

PUSHBUTTON SWITCHES

	Configurations	MODEL NUMBER: SILVER CONTACT/TERM.	MODEL NUMBER: GOLD CONTACT/TERM.	CIRCUIT	ACTION
Bushing Mounting	.551 Dia. Round	KB-15CKS1	KB-15CKG4	SPDT	Mom.
		KB-16CKS1	KB-16CKG4	SPDT	Alt.
		KB-25CKS1	KB-25CKG4	DPDT	Mom.
		KB-26CKS1	KB-26CKG4	DPDT	Alt.
	.551 Square	KB-15SKS1	KB-15SKG4	SPDT	Mom.
		KB-16SKS1	KB-16SKG4	SPDT	Alt.
		KB-25SKS1	KB-25SKG4	DPDT	Mom.
		KB-26SKS1	KB-26SKG4	DPDT	Alt.
	.728 × .551 Rectangular	KB-15RKS1	KB-15RKG4	SPDT	Mom.
		KB-16RKS1	KB-16RKG4	SPDT	Alt.
		KB-25RKS1	KB-25RKG4	DPDT	Mom.
		KB-26RKS1	KB-26RKG4	DPDT	Alt.
Snap-in Mounting	.551 Dia. Round	KB-15MKS1	KB-15MKG4	SPDT	Mom.
		KB-16MKS1	KB-16MKG4	SPDT	Alt.
		KB-25MKS1	KB-25MKG4	DPDT	Mom.
		KB-26MKS1	KB-26MKG4	DPDT	Alt.
	.551 Square	KB-15KKS1	KB-15KKG4	SPDT	Mom.
		KB-16KKS1	KB-16KKG4	SPDT	Alt.
		KB-25KKS1	KB-25KKG4	DPDT	Mom.
		KB-26KKS1	KB-26KKG4	DPDT	Alt.
	.728 × .551 Rectangular	KB-15NKS1	KB-15NKG4	SPDT	Mom.
		KB-16NKS1	KB-16NKG4	SPDT	Alt.
		KB-25NKS1	KB-25NKG4	DPDT	Mom.
		KB-26NKS1	KB-26NKG4	DPDT	Alt.

MATCHING INDICATOR LIGHT

Configurations	LENS STYLE: MODEL NO.	DESCRIPTION
Bushing Mtg.	KB-01KS1	Square Lens Face
	KB-02KS1	Round Lens Face
	KB-03KS1	Rectangular Lens Face
Snap-in Mtg.	KB-04KS1	Square Lens Face
	KB-05KS1	Round Lens Face
	KB-06KS1	Rectangular Lens Face

BUTTONS

Configurations	LENS STYLE: MODEL NO.	DECRIPTION	COLORS: COVER	FILTER
Round	AT-486	For Incandescent Lamp	B,M,R,W,Y,	B,M,W.
	AT-488	For Incandescent Lamp	Trans.	B,M,R,W,Y.
	AT-490	For L.E.D. Lamp	Trans.	M,R,Y.
Square	AT-485	For Incandescent Lamp	B,M,R,W,Y,	B,M,W.
	AT-487	For Incandescent Lamp	Trans.	B,M,R,W,Y.
	AT-489	For L.E.D. Lamp	Trans.	M,R,Y.
Rectangular	AT-4021	For Incandescent Lamp	B,M,R,W,Y,	B,M,W.
	AT-4022	For Incandescent Lamp	Trans.	B,M,R,W,Y.
	AT-4023	For L.E.D. Lamp	Trans.	M,R,Y.

* B = Blue, M = Green, R = Red, W = White, Y = Yellow.

LAMPS or L.E.D.

MODEL NO.	DESCRIPTION	COLORS
AT-608	Single L.E.D. for Round/ Square Types	Red,Green,Yellow
AT-611	Incandescent Lamp 5V, 12V or 28V.	—
AT-612	Dual L.E.D. with IC Chip 5~28V w/o Ballast Resistor	Red,Green,Yellow.
AT-614	Single L.E.D. for Rectangular Types	Red,Green,Yellow
AT-615	Neon Lamp 85V min.	—

ACCESSORIES

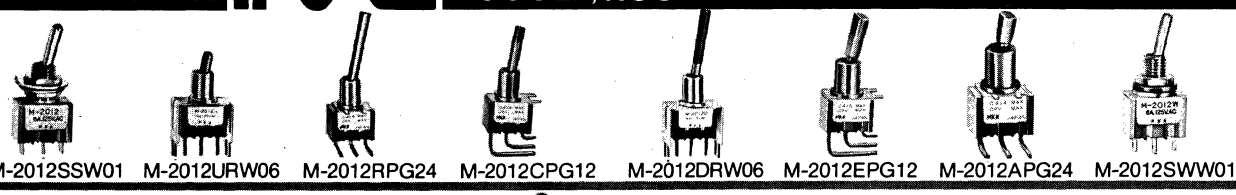
MODEL NO.	DESCRIPTION
AT-108	Socket Wrench/Bushing Mtg.
AT-494	Protective Guard/Round/Square
AT-495	Splash Cover/Round/Square
AT-701	Socket for PCB Mtg. (Single Pole)
AT-702	Socket for PCB Mtg. (Double Pole)
AT-4024	Protective Guard/Rectangular
AT-4025	Splash Cover/Rectangular

NKK SWITCHES OF AMERICA INC. 14415 NORTH SCOTTSDALE ROAD, SCOTTSDALE, AZ 85260 TEL: (602)991-0942 TWX: 910-950-1167

nkk switches

Over 500,000 types

Series ML TOGGLE, ROCKER AND PADDLE SWITCHES



M-2012SSW01 M-2012URW06 M-2012RPG24 M-2012CPG12 M-2012DRW06 M-2012EPG12 M-2012APG24 M-2012SWW01

M-2012SPG24 M-2012NRW06 M-2012BBW01 M-2012LMG12 M-2012TNW01 M-2012TZW06 M-2012SSG13 M-2012 KSW01 etc.

FEATURES

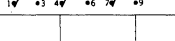
This competitively priced subminiature family of toggles, rockers and paddle switches is available in SPST to 4PDT in all switching actions, including ON-ON-ON configurations. The wide variety of toggles, rockers, paddles, bushing shapes, sizes, brackets for printed circuit versions and terminal configurations offer up to 500,000 possible combinations. The switches are provided with epoxied terminals. The hi-torque bushings have a built-in anti-jamming mechanism as standard features. Included in this series are leverlocks, watertight bushings and panel sealed versions.

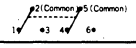
SPECIFICATIONS

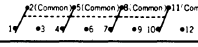
SPST, SPDT, SP3T, DPST, DPDT, DP3T, 3PST, 3PDT, 4PST and 4PDT in 5 different actions. Contact rating: 6Amp @125Vac or 30Vdc (Silver/Resistive) 0.4VA 28V MAX. ac/dc (Gold). Contact resistance: 10 milliohms max. (Silver) 50 milliohms max. (Gold). Insulation resistance: 1,000 megohms min. 500Vdc. Di-electric strength: 1,000Vac min. Endurance: 100,000 cycles min. mechanical, 25,000 (Silver)~50,000 (Gold) cycles min. electrical.

POLES AND FUNCTIONS

	Switching Position		
SPDT	Up	Center	Down
M-2012	ON	—	ON
M-2013	ON	OFF	ON
M-2015	ON	—	⟨ON⟩
M-2018	⟨ON⟩	OFF	⟨ON⟩
M-2019	ON	OFF	⟨ON⟩
Term. Conn.	2-3	Open	1-2
Schematic			

	Switching Position		
3PDT	Up	Center	Down
M-2032	ON	—	ON
M-2033	ON	OFF	ON
M-2035	ON		⟨ON⟩
M-2038	⟨ON⟩	OFF	⟨ON⟩
M-2039	ON	OFF	⟨ON⟩
Term. Conn.	2-3, 5-6 8-9	Open	2-1, 5-4 8-7
Schematic			

DPDT (INCL SP3T)			
M-2022	ON		ON
M-2023	ON	OFF	ON
M-2025	ON		⟨ON⟩
M-2028	⟨ON⟩	OFF	⟨ON⟩
M-2029	ON	OFF	⟨ON⟩
Term. Conn.	2-3, 5-6	Open	2-1, 5-4
M-2020	ON	ON	ON
M-20208	⟨ON⟩	ON	⟨ON⟩
M-20209	ON	ON	⟨ON⟩
Term. Conn.	2-3, 5-6	2-3, 5-4	2-1, 5-4
Schematic			

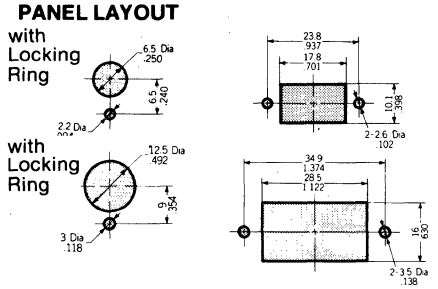
4PDT (INCL DP3T)			
M-2042	ON		ON
M-2043	ON	OFF	ON
M-2045	ON		⟨ON⟩
M-2048	⟨ON⟩	OFF	⟨ON⟩
M-2049	ON	OFF	⟨ON⟩
Term. Conn.	2-3, 5-6 8-9,11-12	Open	2-1, 5-4 8-7,11-10
M-2040	ON	ON	ON
M-20408	⟨ON⟩	ON	⟨ON⟩
M-20409	ON	ON	⟨ON⟩
Term. Conn.	2-3,5-6 8-9,11-12	2-3,5-6 8-9,11-10	2-1,5-4 8-7,11-10
Schematic			

ACTUATORS (Option)
S = STANDARD TOGGLE (.413)
U = SHORT TOGGLE (.256)
V = EXTRA SHORT T. (.201)
Q = MEDIUM LONG T. (.550)
R = LONG TOGGLE (.839)
L = LOCKING LEVER
C = COLOR TIP TOGGLE
D = LONG/COLOR TIP TOGGLE
M = COLUMN LEVER
N = COLUMN/COLOR TIP LEVER
A = SHORT FLAT TOGGLE
E = STANDARD FLAT TOGGLE
F = LONG FLAT TOGGLE
B = LARGE TOGGLE/.472 BUSH
G = LONG/LARGE TOGGLE/.472 BUSH
T = SPECIAL FOR PADDLE/ROCKER
K = SPECIAL FOR PLASTIC LEVER
Q = SPECIAL with SUPPORT
Z = SPECIAL with LARGE BRACKET
Y = SPECIAL with LARGE FLAT FRAME

BUSHINGS (Option)
S = STANDARD (1/4-40: .315 LONG)
A = SHORT (1/4-40: .245 LONG)
C = STANDARD with BRACKET
X = SPECIAL FOR BENT TERMINALS (1/4-40: .310 LONG)
D = D FLAT (1/4-40: .315)
F = NON-THREADED (.244: .350)
H = NON-THREADED (.244: .245)
R = SPECIAL with BRACKET (N.-T.)
P = SPECIAL with SUPPORT (N.-T.)
W = WATERTIGHT (1/4-40: .291)
L = LOCKING (1/4-40: .256)
K = LOCKING with BRACKET (N.-T.)
M = LOCKING with SUPPORT (N.-T.)
T = LOCKING/WATERTIGHT (1/4-40)
B = LARGE (.472: .472)
G = LARGE/WATERTIGHT (.472)
N = SPECIAL with FLAT FRAME
J = SPECIAL with SNAP-IN FRAME
V = SPECIAL with BRACKET

TERMINALS/CONTACT MATERIALS (Option)
W 01 = SOLDER LUG/SILVER/SILVER
W 02 = SOLDER LUG/SILVER/GOLD
G 03 = SOLDER LUG/COPPER/GOLD
W 04 = .150 LONG PC/SILVER/GOLD
G 05 = .150 LONG PC/COPPER/GOLD
W 06 = .150 LONG PC/SILVER/SILVER
W 07 = .964 Wirewrap/SILVER/GOLD
G 08 = .964 Wirewrap/B RASS/GOLD
W 34 = .964 Wirewrap/SILVER/SILVER
W 11 = .100 PITCH VERTICAL/SILVER/GOLD
G 12 = .100 PITCH VERTICAL/BRASS/GOLD
W 25 = .100 PITCH VERTICAL/SILVER/SILVER
W 23 = RIGHT ANGLE MTG PC/SILVER/GOLD
G 24 = RIGHT ANGLE MTG PC/BRASS/GOLD
W 28 = RIGHT ANGLE MTG PC/SILVER/SILVER
W 26 = .150 PITCH VERTICAL/SILVER/GOLD
G 27 = .150 PITCH VERTICAL/BRASS/GOLD
W 29 = .150 PITCH VERTICAL/SILVER/SILVER
W 36 = QUICK CONNECT/SILVER/SILVER
W 37 = QUICK CONNECT/SILVER/GOLD
G 38 = QUICK CONNECT/COPPER/GOLD
G 13 = .748 Wirewrap/GOLD/BRASS
W 35 = .748 Wirewrap/GOLD/SILVER
W 14 = .748 Wirewrap/SILVER/SILVER

PANEL LAYOUT



Recommended Panel Thickness 3.2mm Max.

Recommended Panel Thickness
1mm·32mm W/O Bezel
1mm·25mm With Bezel

ACCESSORIES

MODEL NO.	DESCRIPTION	COLOR
AT-415	Lever Cap/.472"long/Round Top	B, K, M, R, W, Y.
AT-428	Waterproof Boot/.563"long	K.
AT-427	Lever Top/.315"long	B, K, R.
AT-444	Lever Cap/.453"long/Flat Top	B, K, M, R, W, Y.
AT-448	Rocker/.531" X .366"	B, G, K, M, R. W, Y.
AT-449	Paddle/.740"long	B, G, K, M, R, W, Y.
AT-450	Rocker/.350" X .453"	B, G, K, M, R, W, Y.
AT-451	Paddle/.650"long	B, G, K, M, R, W, Y.
AT-456	Rocker/.913" X .598"	B, G, K, M, R, W, Y.
AT-457	Paddle/1.173"long	B, G, K, M, R, W, Y.
AT-460	Lever Cap/.646"long	B, K, M, R, W, Y.
AT-461	Paddle/.866"long	B, G, K, M, R, W, Y.

B = Blue, G = Gray, K = Black, M = Green, R = Red, W = White, Y = Yellow

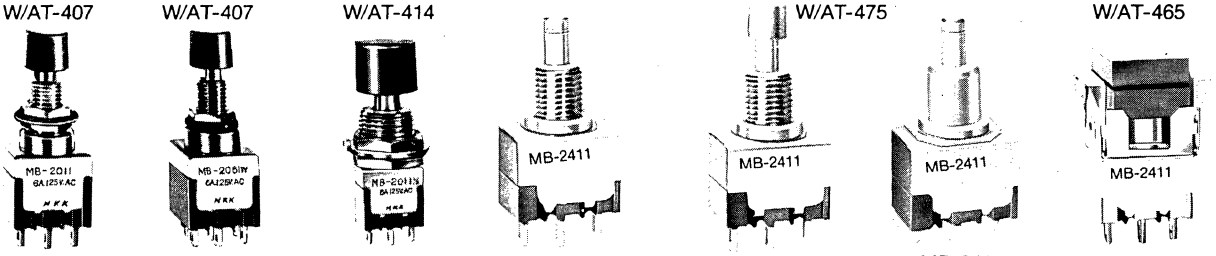
NKK SWITCHES OF AMERICA INC. 14415 NORTH SCOTTSDALE ROAD, SCOTTSDALE, AZ 85260 TEL: (602)991-0942 TWX: 910-950-1167

NKK switches

Series ML PUSHBUTTON SWITCHES

Over 500,000 types

W/AT-407 W/AT-407 W/AT-414 W/AT-475 W/AT-465



MB-2011 SW01 | MB-2061 WW01 | MB-2011 BW01 | MB-2411 E3W01 | MB-2411 E3W01 | MB-2411 HIG24 | MB-2411 JW01

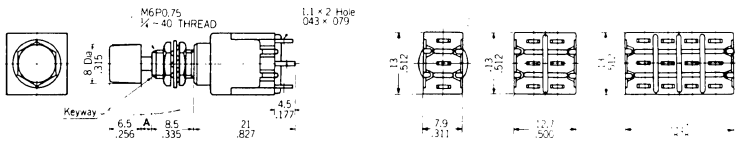
MB-2000 SERIES

This is a competitively priced pushbutton family of switches available in SPDT, DPDT and 4PDT circuits in momentary or alternate action models. A wide range of bushing types and terminal configurations for power or dry circuit applications are available. The 1/4" bushing versions are provided with a metal plunger. Large bushing (12 mm) sizes are available. A variety of colored caps in three(3) different sizes, a wide range of bushing types, brackets for printed circuit board mounting and termial configuration offers a broad product line. This series can be provided with a watertight bushing and a panel seal.

ML series PUSHBUTTON SWITCHES

SPECIFICATIONS

RATING: 6A 125V ac or 30V dc (Silver) 0.4VA MAX. 28V MAX. ac de (Gold)
MECHANICAL LIFE: 100,000 operations min.
ELECTRICAL LIFE: 25,000 operations min. (Silver) 50,000 operations min. (Gold)



POLE	TYPE	Solder Lug SILVER	Straight PC SILVER	PC/Bracket SILVER	Large Bsg SILVER	Water-tight SILVER	Wire-Wrap GOLD
SPDT	Momentary	MB-2011-SW01	MB-2011-SW06	MB-2011-RW06	MB-2011-BW01	MB-2011-WW01	MB-2011-SG13
	Push ON/ON	MB-2065-SW01	MB-2065-SW06	MB-2065-RW06	MB-2065-BW01	MB-2065-WW01	MB-2065-SG13
DPDT	Momentary	MB-2061-SW01	MB-2061-SW06	MB-2061-RW06	MB-2061-BW01	MB-2061-WW01	MB-2061-SG13
	Push ON/ON	MB-2085-SW01	MB-2085-SW06	MB-2085-RW06	MB-2085-BW01	MB-2085-WW01	MB-2085-SG13
4PDT	Momentary	MB-2181-SW01	MB-2181-SW06		MB-2181-BW01	MB-2181-WW01	MB-2181-SG13
	Push ON/ON	MB-2185-SW01	MB-2185-SW06		MB-2185-BW01	MB-2185-WW01	MB-2185-SG13

Washable! NEW ML series PUSHBUTTON SWITCHES

MB-2400 SERIES

This competitively priced family of "washable" pushbutton switches is available in SPDT and DPDT circuits in momentary action models. A short-travel snap-action type mechanism provides an exceptionally light touch and long-life operation. Rubber O-ring bushing seal, epoxy terminal seal and flexible molded housing seal allow this series to be wave soldered and cleaned without fear of contamination.

SPECIFICATIONS

SPDT and DPDT in momentary action. Contact rating: 3Amp @125Vac or 30Vdc (Silver/Resistive) 0.4VA 28V MAX. ac/dc. Contact resistance: 20 milliohms max. (Silver) 30 milliohms max. (Gold). Insulation resistance: 1,000Vac min. 500Vdc. Di-electric strength: 1,000Vac min. Endurance: 200,000 cycles min. mechanically, 25,000 (Silver) 100,000 (Gold) cycles min. electrical.

SOLDER LUG TERMINALS
(Bushing : .250" long ; 1/4-40 Threaded)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 〈ON〉	MB-2411E3W01	MB-2411E3G03
DP	1-2 4-5 ON	1-3 4-6 〈ON〉	MB-2461E3W01	MB-2461E3G03

〈 〉= Momentary

STRAIGHT PC TERMINALS
(Bushing : .250" long ; 1/4-40 Threaded)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 〈ON〉	MB-2411E3W06	MB-2411E3G05
DP	1-2 4-5 ON	1-3 4-6 〈ON〉	MB-2461E3W06	MB-2461E3G05

〈 〉= Momentary

STRAIGHT PC TERMINALS with SUPPORT BRACKET
(Bushing : .280" long ; .244"dia. Non-threaded)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 〈ON〉	MB-2411H2W06	MB-2411H2G05
DP	1-2 4-5 ON	1-3 4-6 〈ON〉	MB-2461H2W06	MB-2461H2G05

〈 〉= Momentary

RIGHT ANGLE MTG. PC TERMINALS with SUPPORT
(Bushing : .280" long ; .244"dia. Mon-threaded)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 〈ON〉	MB-2411H1W28	MB-2411H1G24
DP	1-2 4-5 ON	1-3 4-6 〈ON〉	MB-2461H1W28	MB-2461H1G24

〈 〉= Momentary

VERTICAL MTG. PC TERMINALS with SUPPORT
(Bushing : .280" long ; .244"dia. Non-threaded)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 〈ON〉	MB-2411H1W29	MB-2411H1G27
DP	1-2 4-5 ON	1-3 4-6 〈ON〉	MB-2461H1W29	MB-2461H1G27

〈 〉= Momentary

WIREWRAP TERMINALS (.750" long)
(Bushing : .250" long ; 1/4-40 Threaded)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 〈ON〉	MB-2411E3W35	MB-2411E3G13
DP	1-2 4-5 ON	1-3 4-6 〈ON〉	MB-2461E3W35	MB-2461E3G13

〈 〉= Momentary

SNAP-IN MTG. with SOLDER LUG TERMINALS
(Bushing : Special with Snap-in Bracket)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 〈ON〉	MB-2411JW01	MB-2411JG03
DP	1-2 4-5 ON	1-3 4-6 〈ON〉	MB-2461JW01	MB-2461JG03

〈 〉= Momentary

ACCESSORIES

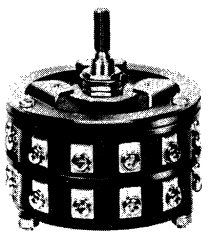
MODEL NO.	DESCRIPTION	COLOR
AT-207	Bezel	B, G, K, M, R, W, Y.
AT-465	Button/.453" square	B, K, M, R, W, Y.
AT-475	Button/.201" dia.	K, R, W.
AT-496	Button/.295" dia.	K, R, W.

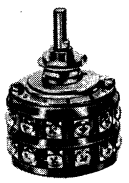
B = Blue, G = Gray, K = Black, M = Green, R = Red, W = White, Y = Yellow

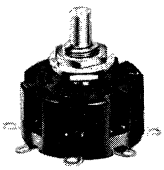
NKK SWITCHES OF AMERICA INC. 14415 NORTH SCOTTSDALE ROAD, SCOTTSDALE, AZ 85260 TEL: (602)991-0942 TWX: 910-950-1167

Wide Variety

ROTARY SWITCHES


PS-2


TS-2


HS-13Z

MRX-108

MR-A112

MR-K112

MR-F112

NEW DR series BINARY CODED DIP ROTARY SWITCHES

FEATURES

The new binary coded rotaries have terminals on a .100X.300 grid and are DIP socket compatible. The terminals are formed to insure device security in board insertion, eliminating float during wave soldering. These decimal or hexidecimal coded devices are offered in real or complement codings.

DR-FR10P (Real Coded)

DR-KC16P (Complement Coded)

CIRCUIT FORMAT
● = ON
RATING : 0.4VA MAX. 28V ac/dc MAX.

Model No.		Code				Model No.		Code			
		1	2	4	8			1	2	4	8
DR-FR16P DR-KR16P	0	●				DR-FC16P DR-KC16P	0	●	●	●	●
DR-FR10P DR-KR10P	1	●				DR-FC10P DR-KC10P	1		●	●	●
	2	●	●				2	●		●	●
	3	●	●				3			●	●
	4	●		●			4	●	●		●
	5	●		●			5		●		●
	6	●	●	●			6	●			●
	7	●	●	●			7				●
	8	●			●		8	●	●	●	
	9	●			●		9		●	●	
	A	●	●		●		A	●		●	
	B	●	●		●		B			●	
	C	●		●	●		C	●	●		
	D	●		●	●		D	●	●		
	E		●	●	●		E	●			
	F	●	●	●	●		F				

SUBMINIATURE ROTARY SWITCHES

Model No.	Poles	Applicable Stopper Setting Terminal No.	Rating Resistive Load AC 125V
MR-A112	1 Pole/2~12 Positions	2,3,4,5,6,7,8,9,10,11,12.	250mA
MR-A206	2 Pole/2~6 Positions	2,3,4,5,6.	250mA
MR-A403	4 Pole/2~3 Positions	2,3.	250mA
MR-F112	1 Pole/2~12 Positions	2,3,4,5,6,7,8,9,11,12.	0.4VA 28V MAX.
MR-F206	2 Pole/2~6 Positions	2,3,4,5,6.	0.4VA 28V MAX.
MR-F403	4 Pole/2~3 Positions	2,3.	0.4VA 28V MAX.
MR-K112	1 Pole/2~12 Positions	2,3,4,5,6,7,8,9,10,11,12.	0.4VA 28V MAX.
MR-K206	2 Pole/2~6 Positions	2,3,4,5,6.	0.4VA 28V mAX.
MR-K403	4 Pole/2~3 Positions	2,3.	0.4VA 28V MAX.
MRX-108	1 Pole/2~8 Positions	2,3,4,5,6,7,8.	2A
MRX-204	2 Pole/2~4 Positions	2,3,4.	2A
MRX-402	4 Pole/ 2 Positions	Unadjustable	2A
MRY-106	1 Pole/2~6 Positions	2,3,4,5,6.	3A
MRT-22	DPDT ON 2-3 5-6 — 1-2 4-5 ON		10A
MRT-23	// ON 2-3 5-6 OFF 1-2 4-5 ON		6A

NEW Washable

ROTARIES

Rotary switches are available in a variety of family types from large 30 Amp devices to sealed dry circuit binary coded rotaries. With the exception of the binary coded rotaries all are provided with adjustable stops. The MR-A Series, MR-F, MR-K and the binary coded rotaries are "washable" types. These units have been designed to be subjected to wave soldering and flux cleaning operations.

MINIATURE ROTARY SWITCHES

Model No.	Poles	Rating Resistive Load AC 125V	Rating Resistive Load AC 250V
HS-13X	1 Pole/2 Positions	6A	3A
HS-13Y	1 Pole/2~3 Positions	6A	3A
HS-13Z	1 Pole/2~4 Positions	6A	3A
HS-13W	1 Pole/2 Positions	6A	3A

Model No.	Poles	Rating (Resistive) AC 125V	Rating (Resistive) AC 250V
TS-1	1 Pole/2~11 Positions	6A	6A
TS-2	2 Pole/2~11 Positions	6A	6A
TS-3	3 Pole/2~11 Positions	6A	6A
TS-4	4 Pole/2~11 Positions	6A	6A
TS-5	5 Pole/2~11 Positions	6A	6A

ROTARY SWITCHES

Model No.	Poles	Rating (Resistive) AC 125V	Rating (Resistive) AC 250V
HS-16-1	1 Pole/2~11 Positions	12A	6A
*HS-16-1S	1 Pole/2~11 Positions	12A	6A
HS-16-2	2 Pole/2~11 Positions	12A	6A
*HS-16-2S	2 Pole/2~11 Positions	12A	6A
HS-16-3	3 Pole/2~11 Positions	12A	6A
*HS-16-3S	3 Pole/2~11 Positions	12A	6A
HS-16-4	4 Pole/2~11 Positions	12A	6A
*HS-16-4S	4 Pole/2~11 Positions	12A	6A
HS-16-5	5 Pole/2~11 Positions	12A	6A
*HS-16-5S	5 Pole/2~11 Positions	12A	6A
HS-16-6	6 Pole/2~11 Positions	12A	6A
*HS-16-6S	6 Pole/2~11 Positions	12A	6A

Model No.	Poles	Rating (Resistive) AC 125V	Rating (Resistive) AC 250V
PS-1	1 Pole/2~11 Positions	30A	30A
PS-2	2 Pole/2~11 Positions	30A	30A
PS-3	3 Pole/2~11 Positions	30A	30A
PS-4	4 Pole/2~11 Positions	30A	30A
PS-5	5 Pole/2~11 Positions	30A	30A

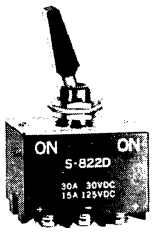
*marked items are BREAK BEFORE MAKE types.

TOGGLE, PUSHBUTTON AND ROCKER SWITCHES

STANDARD SIZE SWITCHES

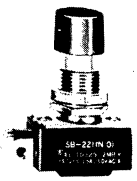
These product lines offer a variety of devices with current carrying capacity from 3Amps to 50 Amps. The families include pushbutton, toggle and rocker types.

TOGGLE SWITCHES

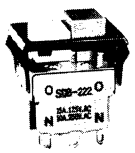


S-822D

PUSHBUTTON SWITCHES

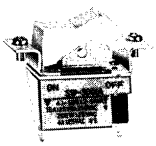


SB-221N/O



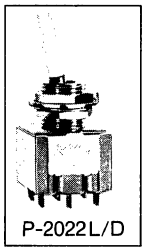
SDB-222

ROCKER SWITCHES



SW-3001A

SW-3822



P-2022L/D

UL/CSA/SEV/SEMKO/VDE APPROVED TOGGLE, ROCKER, PADDLE SWITCHES

The "P" series, our 10Amps toggle, rocker or paddle family has U/L, CSA, SEV, SEMKO and VDE approvals. A variety of toggle configuration and bushing types are available along with colored rockers and paddles. Optional terminals configuration in solder lug, straight PC or 0.187 spade are offered.

Model No.	Poles	Positions			Rating			
		Up	Center	Down	Resistive		Inductive	
					AC 125V	AC 250V	AC 125V	AC 250V
P-2021□	DPST	ON	—	OFF	10A	6A	6A	6A
P-2022□	DPST	ON	—	ON	10A	6A	6A	6A
P-2023□	—	ON	OFF	ON	10A	6A	6A	6A

Wide variation of operator is available on request.
Straight PC terminal & 187 QC terminal are also available on request.
For Paddle/Rocker type, add suffix Y-J for rocker, Y-H for paddle.

Model No.	Poles	〈 〉=Momentary			Rating: Resistive Load		
		Up	Center	Down	AC 125V	AC 250V	DC 30V
S-1A	SPST	ON	—	OFF	15A	6A	20A
S-1B	//	ON	—	OFF	10A	5A	10A
S-2A	SPDT	ON	—	ON	15A	6A	20A
S-2B	//	ON	—	ON	10A	5A	10A
S-3A	//	ON	OFF	ON	15A	6A	20A
S-21A	DPST	ON	—	OFF	15A	15A	15A
S-21B	//	ON	—	OFF	10A	5A	10A
S-6A	DPDT	ON	—	ON	20A	10A	20A
S-6B	//	ON	—	ON	10A	5A	10A
S-7A	//	ON	OFF	OK	20A	10A	20A
S-7B	//	ON	OFF	ON	5A	3A	5A
S-114	DPST	ON	—	OFF	5A		5A
S-116	DPDT	ON	—	ON	5A	3A	4A
S-211	SPST	ON	—	OFF	5A	1.5A	1.5A
S-31	3PST	ON	—	OFF	3A	9A	20A
S-32	3PDT	ON	—	ON	25A	9A	20A
S-33	//	ON	OFF	ON	25A	9A	20A
S-35	//	ON	—	〈ON〉	25A	6A	20A
S-38	//	〈ON〉	OFF	〈ON〉	15A	6A	15A
S-39	//	ON	OFF	〈ON〉	15A	6A	15A
S-41	4PST	ON	—	OFF	15A	9A	20A
S-42	4PDT	ON	—	ON	25A	9A	20A
S-43	//	ON	OFF	ON	25A	9A	20A
S-45	//	ON	—	〈ON〉	25A	6A	20A
S-48	//	〈ON〉	OFF	〈ON〉	15A	6A	20A
S-49	//	ON	OFF	〈ON〉	15A	6A	20A
S-301	SPST	ON	—	OFF	15A	6A	20A
S-301T	//	ON	—	OFF	15A	6A	20A
S-302/302T	SPDT	ON	—	ON	15A	6A	20A
S-303/303T	//	ON	OFF	ON	15A	6A	20A
S-305/305T	//	ON	—	〈ON〉	15A	6A	20A
S-308/308T	//	〈ON〉	OFF	〈ON〉	15A	6A	20A
S-309/309T	//	ON	OFF	〈ON〉	15A	6A	20A
S-331	DPST	ON	—	OFF	25A	25A	25A
S-332	DPDT	ON	—	ON	25A	15A	25A
S-333	//	ON	OFF	ON	25A	15A	25A
S-335	//	ON	—	〈ON〉	15A	6A	20A
S-338	//	〈ON〉	OFF	〈ON〉	15A	6A	20A
S-339	//	ON	OFF	〈ON〉	15A	6A	20A
S-532	//	ON	—	ON	30A	15A	30A
S-533	//	ON	OFF	ON	30A	15A	40A
S-732	DPDT	ON	—	ON	50A	30A	50A
S-532-D	//	ON	—	ON	30A	15A	30A
S-533-D	//	ON	OFF	ON	30A	15A	30A
S-821	DPST	ON	—	OFF	30A	30A	—
S-822	DPDT	ON	—	OFF	30A	30A	—
S-823	//	ON	OFF	ON	30A	30A	—
S-821D	DPST	ON	—	OFF	39A	30A	30A
S-822D	DPDT	ON	—	ON	30A	30A	30A
S-823D	//	ON	OFF	ON	30A	30A	30A
S-831	3PST	ON	—	OFF	30A	30A	—
S-832	3PDT	ON	—	ON	30A	30A	—
S-833	//	ON	OFF	ON	30A	30A	—
S-831D	3PST	ON	—	OFF	30A	30A	30A
S-832D	3PDT	ON	—	ON	30A	30A	30A
S-833D	//	ON	OFF	ON	30A	30A	30A

Model No.	Poles	〈 〉=Momentary		Rating: Resistive Load	
				AC125V	AC250V
SB-61A	DPDT	ON	〈ON〉	10A	5A
SB-61B	// //	ON	〈ON〉	3A	1.5A
SB-63A	//	ON	〈ON〉	10A	5A
SB-221N/O	SPST	OFF	〈ON〉	3A	1.5A
SB-221N/C	//	ON	〈OFF〉	3A	1.5A
SB-265	//	ON	OFF	6A	3A
SB-285	DPDT	ON	ON	6A	3A
SB-25	//	ON	ON	15A	9A
MS-V-B	SPDT	ON	ON	15A	15A
SDB-222S/F/M	DPDT	ON	ON	15A	10A
SB-4011N/O	SPST	OFF	〈ON〉	3A	—
SB-4011N/C	//	ON	〈OFF〉	3A	—
SB-4015	//	ON	OFF	3A	—

ModelrNo.	Poles	〈 〉=Momentary			Rating: Resistive Load			Inductive Load
		Up	Center	Down	AC 125V	AC 250V	DC 30V	AC125V (P.F, = 0.5)
SW-3012	SPST	ON	—	OFF	6A	1.5A	4A	—
SW-3211	// //	ON	—	OFF	3A	1.5A	1.5A	1.5A
SW-3001A	//	ON	—	OFF	15A	5A	15A	10A
SW-3001B	//	ON	—	OFF	10A	6A	—	—
SW-3002A	SPDT	ON	—	ON	15A	5A	15A	10A
SW-3002B	//	ON	—	ON	10A	6A	—	—
SW-3003A	//	ON	OFF	ON	15A	6A	15A	10A
SW-3003B	//	ON	OFF	ON	10A	5A	—	—
SW-3006A	DPDT	ON	—	ON	20A	10A	20A	10A
SW-3008B	//	ON	—	ON	10A	5A	10A	5A
SW-3007A	//	ON	OFF	ON	15A	6A	15A	10A
SW-3007B	//	ON	OFF	ON	5A	3A	5A	5A
SW-3008A	//	ON	OFF	〈ON〉	15A	6A	15A	10A
SW-3008B	//	ON	OFF	〈ON〉	5A	3A	5A	5A
SW-3116	//	ON	—	ON	5A	2A	5A	3A
SW-3532	//	ON	—	ON	30A	15A	30A	15A
SW-3533	//	ON	OFF	ON	30A	15A	30A	15A
SW-3821	DPST	ON	—	OFF	30A	30A	—	—
SW-3822	DPDT	ON	—	ON	30A	30A	—	—
SW-3823	//	ON	OFF	ON	30A	30A	—	—
SW-3831	3PST	ON	—	OFF	30A	30A	—	—
SW-3832	3PDT	ON	—	ON	30A	30A	—	—
SW-3833	//	ON	OFF	ON	30A	30A	—	—

NKK SWITCHES OF AMERICA INC. 14415 NORTH SCOTTSDALE ROAD, SCOTTSDALE, AZ 85260 TEL: (602)991-0942 TWX: 910-950-1167

Setting The Pace For Things To Come...

CIRCUIT BREAKERS
- Carling
- Idec
- Heinemann

CONNECTORS
- Beau Plugs
- Beau Barrier Strips
- Entrelec
- Hollingsworth
- Molex
- Panduit
- Switchcraft
- Vaco
- Wiedmuller

CONTROLS
- Gould-Rundel
- Idec
- Telemecanique

ENCLOSURES
- Carlon
- Control Engineering
- Hammond

FUSES
- Bussmann
- Cefco

INDICATOR LIGHTS
- Chicago Miniature
- Solico
- Switchcraft

LAMPS
- Chicago Miniature
- Micro Lamps
- Oshino

PHOTOELECTRIC
- Banner Engineering

PROXIMITY
- Telemecanique

RELAYS
- Amperite
- Idec
- Midtex
- Omnetics
- Struthers-Dunn
- Syracuse

SOCKETS
- Idec
- Gould-Rundel
- Young

SWITCHES
- Acro/Robert Shaw
- Arcoelectric
- Arrow Hart
- Burgess
- Carling
- Cemco
- Compu-Lite
- JBT/Cutler Hammer
- R B Dennison
- EAO
- Fujisoku
- Interspec
- Linemaster-Footswitch
- Lutron
- Molex
- Oslo
- Switchcraft
- TAIKO
- Telemecanique
- TH Unimax
- Unimax-Micro
- Stackpole

TEST EQUIPMENT
- Amprobe

TIMERS
- Idec
- Midtex
- NCC
- Omnetics
- Struthers-Dunn
- Syracuse

TOOLS
- Panduit
- Steelcraft
- Ty-Wraps
- Vaco

WIRE
- Carol Cable
- Columbia
- Shrink Tubing

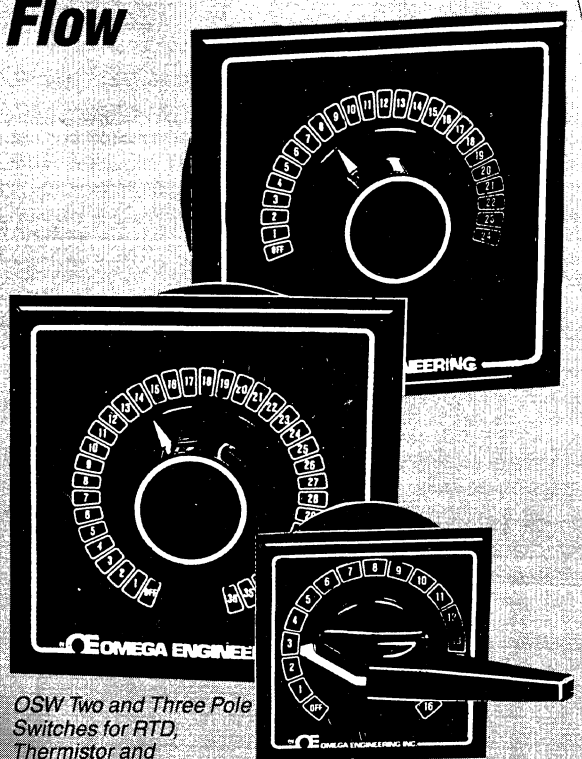
Your Source for Switches, Relays, Timers & Electrical Controls.

Switches Timers Relays Controls **Switches Unlimited, Inc.**

34-11 56th Street, Woodside, NY 11377
In New York 718-478-5000 • Toll Free 800-221-0487

SWITCHES

For Temperature Pressure, Strain and Flow



OSW Two and Three Pole Switches for RTD, Thermistor and Thermocouple Connections

Solid State Relays Up to 45 Amps

OMEGA® Features Multiposition, 2 and 3 Pole Switches for Thermocouples, RTD's and Thermistor Circuits designed for rugged Industrial Environments.

Thousands of Products Ready for Immediate Delivery!

THE 3 MOST VALUABLE HANDBOOKS IN MEASUREMENT AND CONTROL!

ALL NEW! FULL COLOR! ABSOLUTELY, POSITIVELY FREE!

Prices Are Listed!!

☑ **TEMPERATURE MEASUREMENT HANDBOOK AND ENCYCLOPEDIA™**
Over 690 pages! Over 15,000 products!

☑ **PRESSURE AND STRAIN MEASUREMENT HANDBOOK™**
Over 225 pages of new pressure and strain products.

☑ **FLOW MEASUREMENT HANDBOOK AND ENCYCLOPEDIA™**
Over 230 pages of Flow products, systems, and technical information.

ORDER YOUR FREE COPIES TODAY!

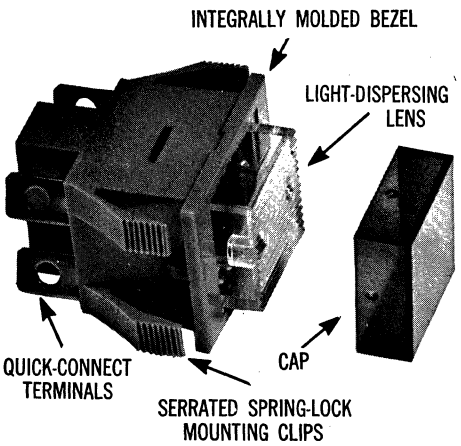
OMEGA® ENGINEERING, INC.

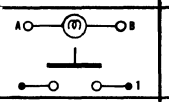
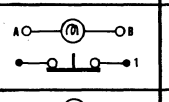
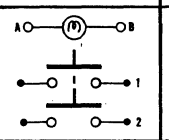
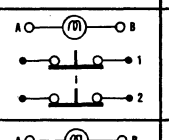
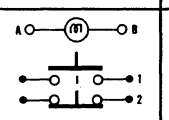
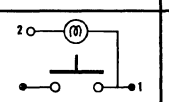
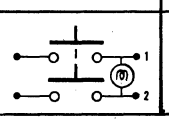
(203) 359-RUSH

One Omega Drive, Box 4047, Stamford, CT 06907
Telex 996404 Cable OMEGA FAX (203) 359-7700

©COPYRIGHT 1985 OMEGA ENGINEERING, INC.

OSLO • PUSHBUTTON SWITCHES



Circuit Number	Circuit Diagram	Switching	TYPE DL LIGHTED CATALOG NUMBER Momentary Action	TYPE DL LIGHTED CATALOG NUMBER Alternating Action	TYPE DP NON-LIGHTED CATALOG NUMBER Momentary Action	TYPE DP NON-LIGHTED CATALOG NUMBER Alternating Action
1		single-pole single-throw normally open	DLM1	DLA1	DPM1	DPA1
2		single-pole single-throw normally closed	DLM2	DLA2	DPM2	DPA2
3		double-pole single-throw normally open	DLM3	DLA3	DPM3	DPA3
4		double-pole single-throw normally closed	DLM4	DLA4	DPM4	DPA4
5		double-pole cir. #1 normally open cir. #2 normally closed	DLM5	DLA5	DPM5	DPA5
6		single-pole single-throw normally open	DLM6	DLA6		
7		double-pole single-throw normally open	DLM7	DLA7		

Above types do not include lamp-circuit.

ELECTRICAL FEATURES

Load rating: 10 amperes 125/250 volts ac.
Contacts: fine silver, double-break, break-before-make
Circuits: single-pole and double-pole
Dielectric strength: 2000 volts ac rms.
Life: 25,000 operations at maximum rating

MECHANICAL FEATURES

One-piece molded-nylon body has integral, serrated, spring-lock clips.
Bezel molded integral with body.
Metal bezel available.
Molded-in light-dispersing lens.
Interchangeable lens-caps in wide choice of colors.
Positive mechanical indication of switch-contact position.
100,000 mechanical operations.

TERMINALS

Style A—1/4-inch quick-connect
Style B—3/16-inch quick-connect
Style C—Solder-lug, for #12 wire

STANDARD LAMPS

Integral with switch;
Internally connected per diagrams above.
6, 12, and 28 volt incandescent lamps standard.
125 and 250 volt neon lamps standard.

SPECIAL ORDER LAMPS

125 and 250 volt Blue or Green neon lamps available. Consult factory for price and delivery information.

COLOR DESIGNATIONS

Body and integral bezel
White—C7, Grey—C8, Black—C9,

Transparent lens-cap
Red—1, Clear—2, Amber—3, Green—4, Blue—5

Opaque pushbutton-cap
White—7, Grey—8, Black—9, Blue—10, Green—11, Red—12

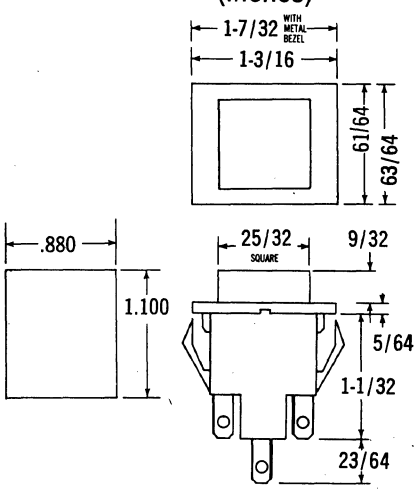
TYPE DG – Lighted Indicators

Type DG Lighted Indicators are identical in size and mounting with Type DL and DP switches and can be grouped easily with them without need for special mounting provision. A choice of different lens-cap heights is available.

TYPE DGS the low-profile indicator extends the same distance from the panel as the Type DL or DP switch in its ON position (1/16 inch).

TYPE DGT the high-profile indicator extends the same distance from the panel as the Type DL or DP switch in its OFF position (9/32 inch).

OUTLINE DIMENSIONS (inches)



METAL BEZELS (optional)

Gold-color—F1, Chrome—F2

MARKINGS

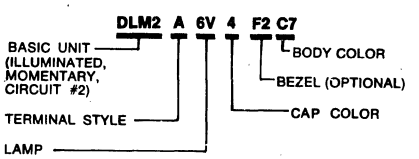
Letters, numbers, and symbols can be applied to lens-caps.

MOUNTING

Snap-in mounting in rectangular hole; fits any panel-thickness 1/32 to 3/16 inch.

ORDERING EXAMPLE

Develop catalog-number of unit by adding to the basic Type Number, shown above, the applicable code-letters or numbers in the sequence shown below.

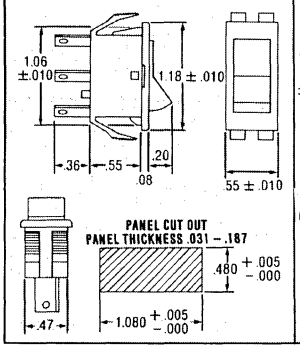


OSLO CONTROLS INC.
328 Industrial Avenue, Cheshire, Connecticut 06410
Tel.: (203) 272-2794 TWX 710 455 3774

OSLO • ROCKER SWITCHES

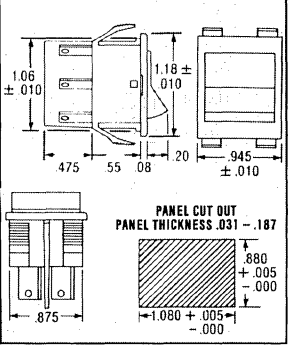
TYPE RSP

ALL DIMENSIONS IN INCHES



TYPE RTP

ALL DIMENSIONS IN INCHES



Electrical Features
Load Rating: 15 amperes 125/250 volts AC
Contacts: Fine silver for long life dependability
Dielectric strength: 1250 volts (live parts to ground)
Electrical Life: 25,000 operations at maximum rating.
Insulation Resistance: 5 megohms

Terminals
Style A – ¼ inch quick-connect

Lamps
6, 12, 28 volt incandescent, 125, 250 volt Neon

Mechanical Features
One-piece molded-nylon housing, available in choice of colors.
Integral spring-lock clip design speeds assembly.
Optional metal bezels available.
Rocker actuator available in choice of colors.
100,000 mechanical operations.

Markings
Letters, numbers, and symbols can be applied to rocker actuator or to integral nylon bezel.

Mounting
Snap-in mounting in rectangular hole; fits any panel thickness from .031 to .125 inch.

ORDERING PROCEDURE

To the basic catalog number listed, suffix letters and numbers are added in the sequence indicated below:

Example: RSL1A6V1C9F2 This specifies a SPST, lighted, maintained Off-On switch with ¼" quick-connect terminals, transparent red actuator, black housing and optional chrome bezel.

LAMP VOLTAGE	LENS COLORS	HOUSING-COLORS	METAL BEZEL (OPTIONAL)
6V=6 Volt Incandescent	1 = Red 2 = Clear 3 = Amber *4 = Green *5 = Blue 6 = White	C7 = White C8 = Grey (Non-Stock) C9 = Black	F1=Gold Colored F2=Chrome
12V=12 Volt Incandescent			
28V=28 Volt Incandescent			
125V=125 Volt Neon			
250V=250 Volt Neon			

*Blue or green actuators are not recommended for units with neon lamps

RSL1A 6V 1 C9 F2

- RSL1A — BASIC UNIT LIGHTED MAINTAINED ON-OFF SWITCH ¼" QUICK TERM
- 6V — LAMP
- 1 — LENS COLOR
- C9 — HOUSING COLOR
- F2 — BEZEL (OPTIONAL)

NON-LIGHTED SWITCHES

CIRCUIT	BASIC CAT. NO. Single Pole Body	BASIC CAT. NO. Double Pole Body
SPST Maintained (2 1 OFF; 2 1 ON)	RSP1A	RTP1A
SPDT Maintained (2 1 3 ON; 2 1 3 ON)	RSP2A	RTP2A
SPDT Maintained Center Off (2 1 3 ON; 2 1 3 OFF; 2 1 3 ON)	RSP3A	RTP3A
SPST (Momentary) Normally Open (2 1 OFF; 2 1 (ON))	RSP4A	RTP4A
SPST (Momentary) Normally Closed (2 1 ON; 2 1 (OFF))	RSP5A	RTP5A
SPDT (Momentary) Transfer (2 1 2 ON; 2 1 3 (ON))	RSP6A	RTP6A
SPDT Maintained Center Off (Momentary) (2 1 3 ON; 2 1 3 OFF; 2 1 3 (ON))	RSP7A	RTP7A
SPDT (Momentary) Center Off (Momentary) (2 1 3 (ON); 2 1 3 OFF; 2 1 3 (ON))	RSP8A	RTP8A

LIGHTED ROCKER SWITCHES

CIRCUIT	BASIC CAT. NO. Single Pole Body	BASIC CAT. NO. Double Pole Body
SPST Maintained (2 1 3 OFF; 2 1 3 ON)	RSL1A	RTL1A
SPDT (Momentary) Normally Open (2 1 3 OFF; 2 1 3 (ON))	RSL4A	RTL4A

LIGHTED INDICATORS

BASIC CATALOG NO.
RSOA

Basic catalog number includes ¼ inch quick-connect terminals.
CODE: SPST = Single-Pole, Single Throw
SPDT = Single-Pole, Double Throw
( ) = Momentary Action

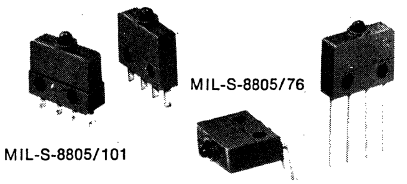
OSLO CONTROLS INC.
328 Industrial Avenue, Cheshire, Connecticut 06410
Tel.: (203) 272-2794 TWX 710 455 3774

OTTO CONTROLS

OTTO® SNAP-ACTION SWITCHES...

because the OTTO design features inherent rocking-action

BASIC SWITCHES sub-miniature
DOUBLE-BREAK B3 SERIES



CHARACTERISTICS

- Contact Resistance: .025Ω max.
- 10 million mechanical cycles.
- Operating Force: 5 $^{+3}_{-2}$ oz.
- Release Force: 1.5 oz. min.
- Overtravel: .006″ min.
- Move. Diff.: .018 ±.008″
- Rating: 7A Res., 115 VAC, 28 VDC.

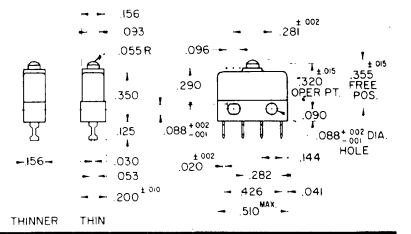
MIL-S-8805/76 THIN **B3-22141**

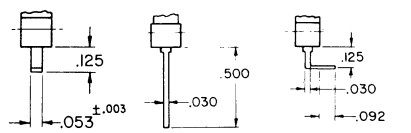
For your run-of-the-"MIL" projects, OTTO's B3-22141 Series is only .200″ thick. Contact resistance less than 25 milliohms, contact pressure higher than normal, minimal contact bounce. Gold flashed contacts, solder terminals in diallyl case. Rated 7A Res.

MIL-S-8805/101 THINNER **B3-12141**

OTTO inspired military spec. is only .156″ thin, yet all the rating, life, and reliability of the /76 version. Five B3-12141 Series in the space of four B3-22141. Choice of double-break from X, Y, Z and single break form C. B3-12141 turret terminals, B3-11141 p.c. pins. Also commercial versions.

BASIC SWITCH, TURRET TERMINALS

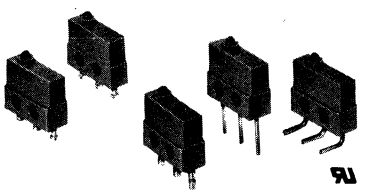




P.C. PINS **MACHINE WRAP** **RIGHT ANGLE P.C. PINS**

All terminals are .020″ thick.

SINGLE-BREAK B2 SERIES



CHARACTERISTICS

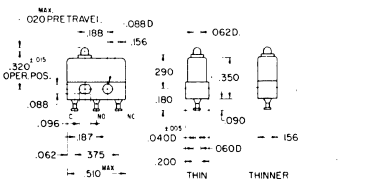
- Contact Resistance: .025Ω max.
- 1 million mechanical cycles.
- Operating Force: 5 oz. max.
- Release Force: 1 oz. min.
- Overtravel: .004″ min.
- Move. Diff.: .005″ max.
- Rating: 7A res. @ 115 VAC, 28 VDC.

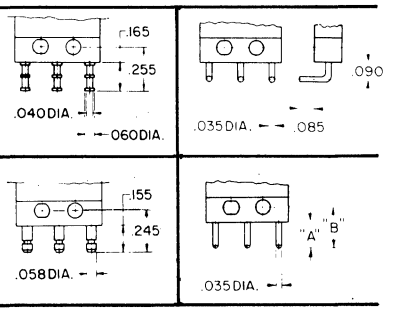
Now available in a choice of .200 and .156 inch wide models. While the OTTO B2 is qualified to MIL-S-8805/4, the same switch can be specified for commercial use at a cost savings. Whether it be military or commercial, low-level "dry circuit" or high ampacity, large or close differentials, you can specify the exact switch to meet your needs. Case is diallyl. Terminals are gold-flashed brass. Contacts are silver or gold.

APPROVALS TO MIL-S-8805/4

MS P/N	OTTO P/N
MS24547-1	B2-211351
MS24547-2	B2-211353
MS24547-4	B2-212351
MS24547-5	B2-212353

DIM. "A"	DIM. "B"	CAT. P/N CODE
.090	.180	6
.150	.240	4
.270	.360	5

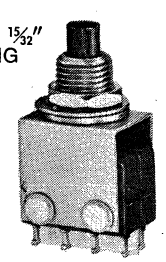




ACTUATORS FOR BASICS

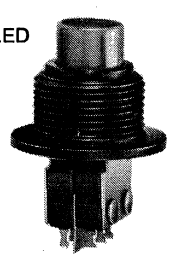
PUSHBUTTONS

¼″ OR $^{15}/_{32}$″ BUSHING



¼″ or $^{15}/_{32}$″ bushings, red or black button, 1 to 4 poles. Feature B3 basics. Overtravel: .006″ min. Total travel: .036″ Typical.

SEALED

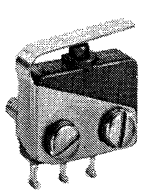


Choice of 3 panel bezels styles, 1 or 2 poles. Feature B3 basics. Operating force: 4 lbs. max. Total travel: .050″ Typical.

TOGGLES

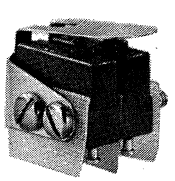
¼″ or $^{15}/_{32}$″ bushings, 1 to 3 poles, B2 or B3 basics. Momentary and three position.

LEVERS



For B3 Basics

# Poles	Cat. No.
1	A3-101
2	A3-102



For B2 Basics

# Poles	Cat. No.
1	A2-101
2	A2-102

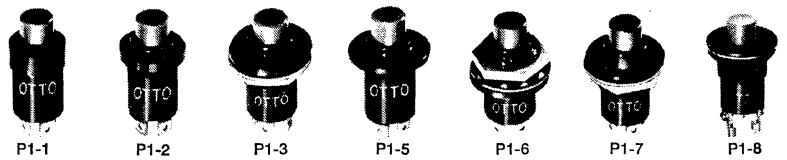
OTTO CONTROLS Division / OTTO Engineering Inc.

...MAKE AND BREAK EVERYTIME

...that breaks welds and wipes contacts clean

PUSHBUTTONS miniature & moistureproof

OTTO CONTROLS

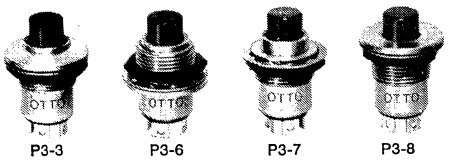


FEATURES

- 250,000 mechanical cycles.
- High Contact Pressure: 120 gr.
- Low Contact Resistance:
- Repeatable trip point within .001″.
- Rolling sleeve principle seals button.
- Sealed case and terminals.

TYPE P1 (MIL-S-8805/3)

Pushbutton is sealed by silicone rubber boot operating on a "rolling sleeve" principle to give long life and smooth operation. Case and terminals sealed against environment and solder flux. Load ratings: 10A res., 5A ind., 3A lamp. Contact forms: N.O., N.C., 2-circuit. Red or black button.



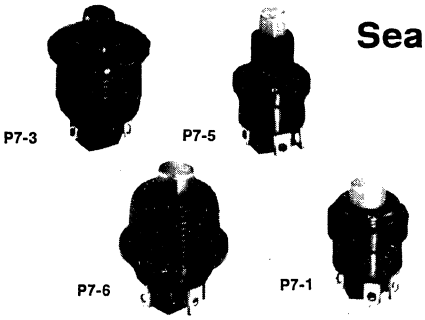
TYPE P3 Commercial Grade

Momentary or push-pull double-break action. Same specs as P1 military series. Choice of solder or screw terminals. Designed for use in panel boards, computers, business machines, instruments. Can be used as limit switch.

NEW

FEATURES:

- Mini size and sealed.
- .025 ohms max. contact resistance.
- Positive tactile feed back.
- 4 mounting styles.
- 6 circuit variations.



Sealed Subminiature Pushbutton

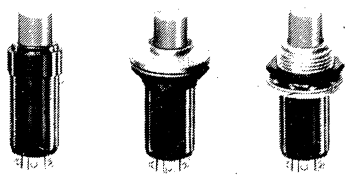
TYPE P7

Double-break action with sealed pushbutton meets environmental and electrical requirements of MIL-S-8805. Switches loads from 10 mA @ 30 mV to 5 amps @ 28 VDC. Choice of black or silver bezel and nine button colors. The P7-1 series features swage bushing, P7-3's have front panel bezel, P7-5's have ¼″ bushing while P7-6's have 15/32″ bushing. Seal is either moisture-proof/dust-tite or water-proof. Back-of-panel less than .500″. Front panel .437″ to .562″ diameter.

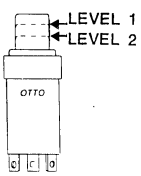
twostep™ for applications requiring 3 modes of operation

FEATURES

- Unique 2-position design.
- Sequential contact action.
- 12 contact arrangements.
- Make-before-break contact option.
- Moistureproof construction.
- 25,000 mechanical cycles.

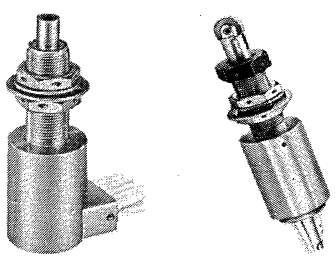


Ideal for "off-high-low," "off-slow-fast," "Stop-fine-course" applications. Each level operates an independent set of SPDT circuits rated to 5A. Twelve contact arrangements are offered to satisfy just about any circuit requirement. Also available as DPDT single detent.



SPECIAL PURPOSE SWITCHES

ENVIRONMENT-FREE

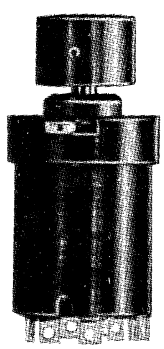


One piece housing, sealed at plunger with ring seals and at base with hermetic header for immersion proof and against corrosive atmospheres. Case grounded for EMI reduction. P6 Series available with roller or in-line plunger.

CHARACTERISTICS

- Rating: 7A res. at 28 VDC.
- Actuating Force: 9 lbs. Typ.
- Reset Force: 5 lbs. min.

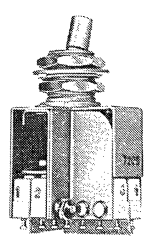
TOGGLE/ PUSHBUTTON



T2-0001

Combo toggle and pushbutton. It's a 2-position toggle and a pushbutton switch all in one. 30° toggle throw, .135″ total pushbutton travel with 4.5 lbs. operating force. Rated 10A res. and ind.

TOGGLE



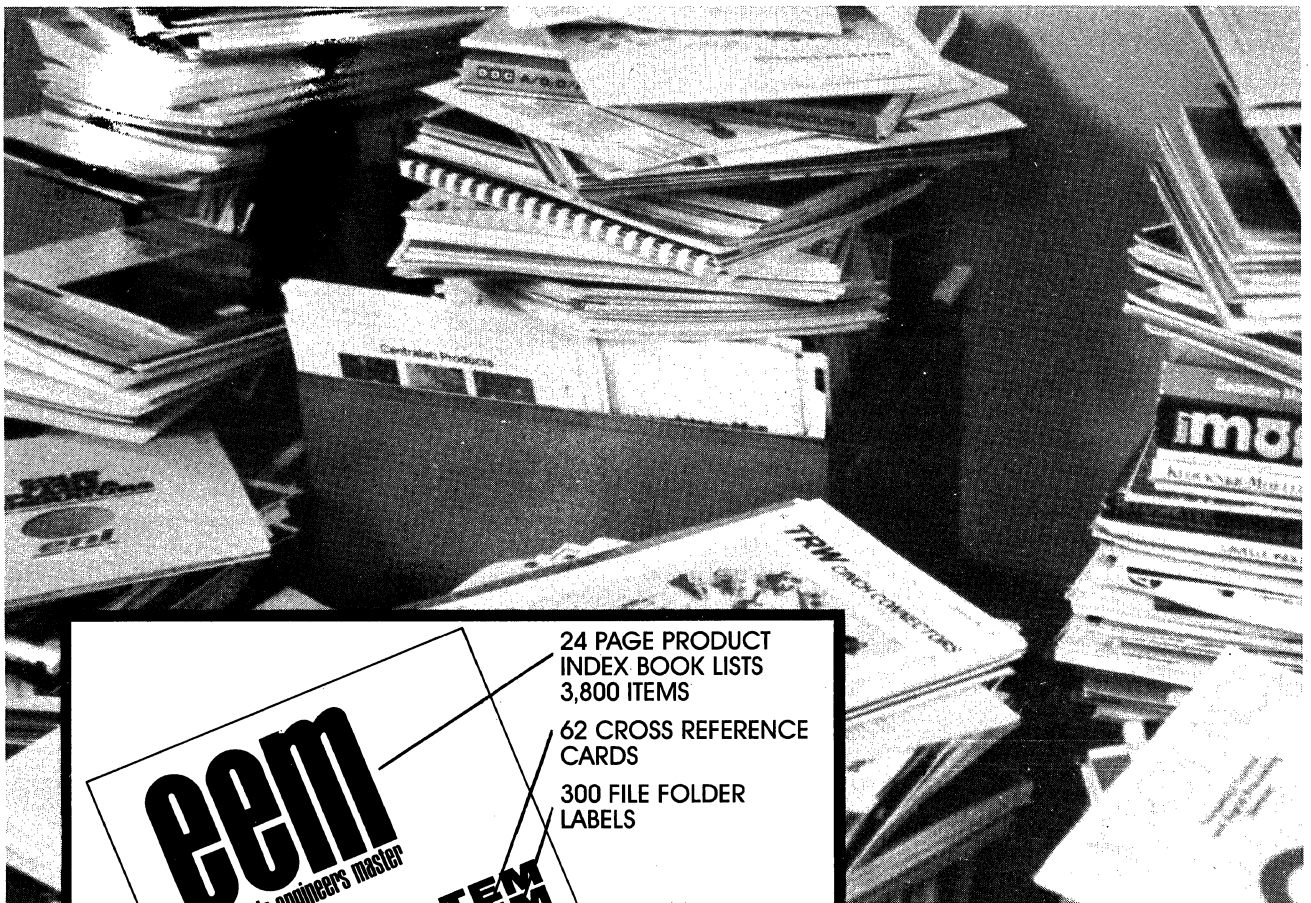
T1-0001

Four position, 6-pole toggle featuring MIL-S-8805/4 basic switches. Positions #1 and #3 are 2PDT maintained action each, position #4 is 2PDT momentary, position #2 is center "off." Rated 7A. res. each pole.

T1-0004

Same except 3-position, 4-pole toggle. Position #1 is 2PDT momentary, position #2 is center "off," position #3 is 2PDT maintained action.

DEPT. EM, 2 EAST MAIN STREET / CARPENTERSVILLE, ILLINOIS 60110 / TEL: (312) 428-7171 / TELEX: 72-2426



ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

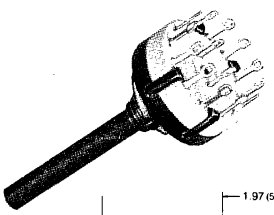
Power Dynamics, Inc.

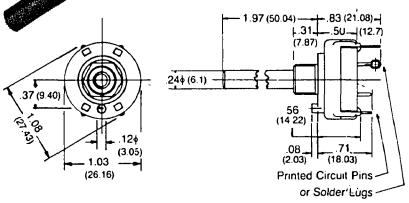
P.O. Box 539, 59 Lakeside Avenue, West Orange, NJ 07052 • (201) 736-5722 • TWX: 136567 (PDI) • Intl. Telex: 666173 (PDI)

SWITCHES

TYPE JP ROTARY SWITCHES

SOLDER OR PC TERMINALS





(Metric dimensions in mm are in parenthesis)

Electrical & Mechanical Specifications:

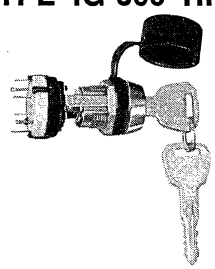
Maximum working voltage:	300V≅
Voltage breakdown:	1,000V RMS at sea level
Current carrying capacity:	5 Amp.
Contact rating:	150mA @ 250V≅ (AC or DC)
Insulation resistance:	>25,000M
Contact resistance:	<50mΩ
Electrical rating:	1 AMP @ 125 VAC
Electrical life:	10,000 cycles full load
Switching configuration:	Shorting & Non-shorting
Rotational torque:	15 inch oz. nominal
Contacts:	Silver plated brass ensures a life minimum of >10,000 cycles.
Indexing:	30°
Material:	Glass filled nylon
Stops:	Adjustable 2-12 or continuous rotation.
Terminals:	PC or Solder lugs. (Brass Silver plated)

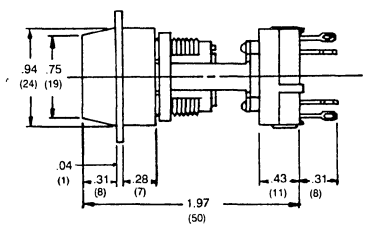
Standard Part Numbers

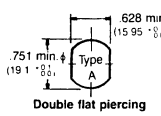
Circuit	.250 Shaft Shorting	.250 Shaft Non-Shorting
1 Pole 12 Position Solder Terminals	JPM-100-S-Q	JPB-100-S-Q
Printed circuit	JPM-100-PC-Q	JPB-100-PC-Q
2 Pole 6 Position Solder Terminals	JPM-200-S-Q	JPB-200-S-Q
Printed circuit	JPM-200-PC-Q	JPB-200-PC-Q
3 Pole 4 Position Solder Terminals	JPM-300-S-Q	JPB-300-S-Q
Printed circuit	JPM-300-PC-Q	JPB-300-PC-Q
4 Pole 3 Position Solder Terminals	JPM-400-S-Q	JPB-400-S-Q
Printed circuit	JPM-400-PC-Q	JPB-400-PC-Q

To order 6mm Shaft, eliminate suffix "Q"

TYPE IG-500 HIGH SECURITY KEYLOCK ROTARY SWITCHES





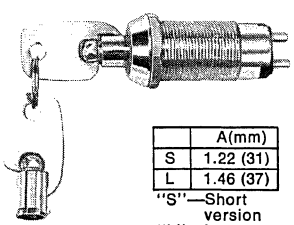


(Metric dimensions in mm are in parenthesis)

FEATURES:

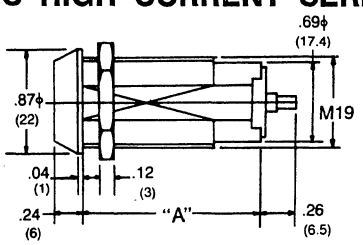
- 60° Indexing angle
- Solder terminals
- Lock opening spring snaps closed when key is removed. Prevents entry of dust, dirt and other foreign objects.
- Attached environmental dust cap (standard).
- Double-bitt keys
- Key may be removed in either position.

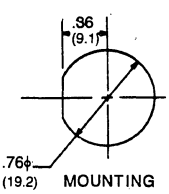
TYPE IG-051, IG-051MC HIGH CURRENT SERIES KEYLOCK SWITCHES



	A(mm)
S	1.22 (31)
L	1.46 (37)

"S"—Short version
"L"—Long version





(Metric dimensions in mm are in parenthesis)

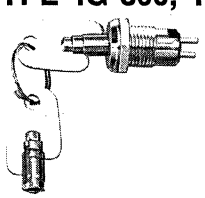
SPECIFICATIONS:

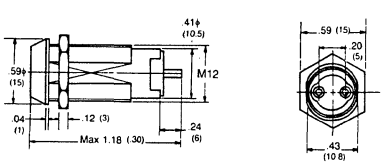
Contact rating:	4 Amps @ 125 VAC 2 Amps @ 220 VAC or 28 VDC
Contact Resistance:	10 Milliohms Max.
Insulation Resistance:	500 Megohms Min.
Dielectric Strength:	1,500 VAC at sea level
Contacts:	Silver alloy

- 90° Indexing angle
- Tubular Key is standard

TYPE IG-300, IG-300 MC ULTRA-MINIATURE KEYLOCK SWITCHES

The Smallest Keylock Switch Available! • ULTRA MINIATURE SERIES

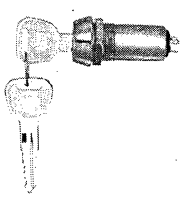


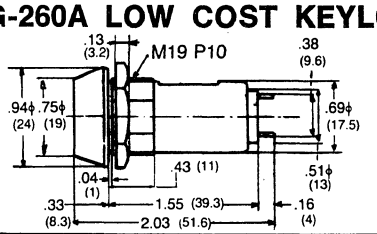


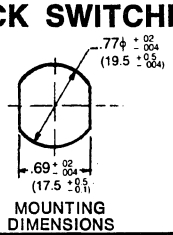
FEATURES:

- Chrome plated Brass or Solid Zinc alloy housing
- Tubular key to aid in prevention of duplication
- Diameter less than ½"
- Current Rating: 1 Amp @ 220 VAC

TYPE IG-260, IG-260A LOW COST KEYLOCK SWITCHES







FEATURES:

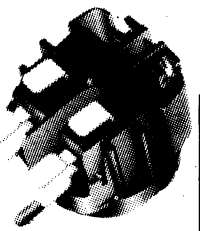
- 5 Amps @ 125 VAC
- Zinc housing, Silver plated contact
- Double bitt keys
- Key can be drawn out at both "On" and "Off" position

PRES:AIR:TROL CORP
1009 W. Boston Post Road, Mamaroneck, NY 10543
(914) 698-2026 • **800-431-2625** (OUTSIDE NY)

PRESSURE AND VACUUM SWITCHES
• AND •
SAFE SWITCHING SYSTEMS
(Shock-Proof • Water-Proof • Explosion-Proof)

Low Cost Pressure Switches

U.L. File Number E 80254

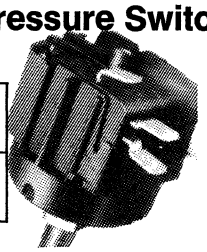


Low Pressure

SPDT	Range Inches Water	Electrical Rating
6731/03	1.5 - 7	3A 125 VAC
6731/06	5 - 45	10A @ 250 VAC
6731/10	20 - 55	15A

Approx. Overall Size
2¼" x 2⅛" O.D.

AIR INLET:
Pressure Connector ⅛" NPT brass thread or ⅛" O.D. spout



Approx. Overall Size
2¼" x 2" O.D.

Medium Pressure

SPDT	DPDT	P.S.I.	Electrical Rating
6741/20	6742/20	1.5 - 3.5	
6741/30	6742/30	3.0 - 5.5	
6741/40	6742/40	5 - 10	
6741/50	6742/50	8 - 18	16A
6741/60	6742/60	16 - 30	125/250 VAC
*6741/70	6742/70	25 - 50	
*6741/80	6742/80	45 - 70	
*6741/90	6742/90	55 - 120	
——	6702	20 - 200	

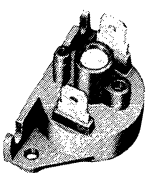
Pressure Connector ⅛" NPT brass thread

* Consult Factory For Repeat Accuracy

Microswitches accept Standard .250" slide on terminal.
Repeat accuracy ±2% at constant temperature.
Field pressure adjustment is Phillips Head Screw.

See main catalog for Air Operated Potentiometer

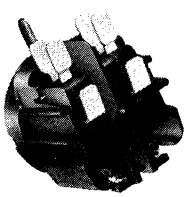
Sensitive Pressure, Vacuum and Differential Pressure Switching
(Your Choice)



Part No.	Rating	Adjustable Pressure Range Inches W.G.	Adjustable Vacuum Range	Adjustable Max. Diff. Pressure
6753	.5 Amp	.5 to 16 Inches W.G.	.5 to 16 Inches W.G.	16 Inches W.G.

Low Cost Vacuum Switches

U.L. File Number E 80254

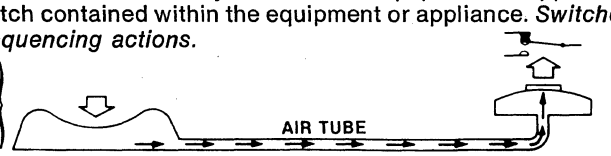


Inches of Water Vacuum (Adjustable)*	6721/03	6721/06	6721/20	6721/40	6721/30
	3" - 8"	7" - 15"	13" - 38"	28" - 80"	75" - 270"
Electrical Rating	SPDT — 3A 125/250 VAC	SPDT — 10A 125/250 VAC	SPDT — 15A 125/250 VAC	SPDT — 15A 125/250 VAC	SPDT — 15A 125/250 VAC

All switches available in SPDT and DPDT configurations with ⅛" O.D. spout or ⅛" NPT brass entry.

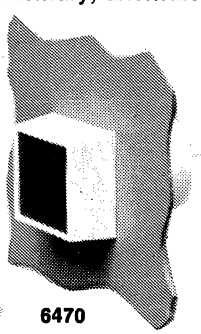
WATER, SHOCK AND EXPLOSION PROOF SWITCH SYSTEMS

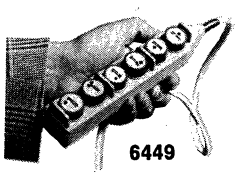
Instead of a switch connected by cable to the equipment or appliance, an air bellows is joined by tubing to a pressure switch contained within the equipment or appliance. *Switches are available in momentary, alternate action, or sequencing actions.*

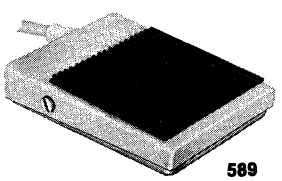


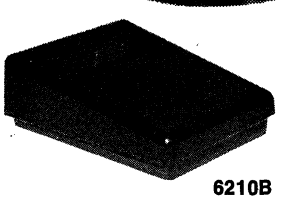
The air bellows actuators in any of the various forms, are not affected by water, dirt, dust or flammable gases. Only a few of the many actuators available are shown here. Standard electrical footswitches also available.

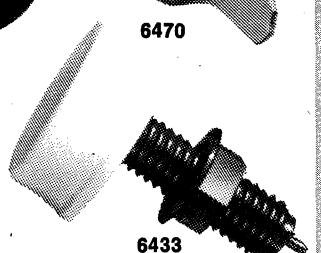
6448

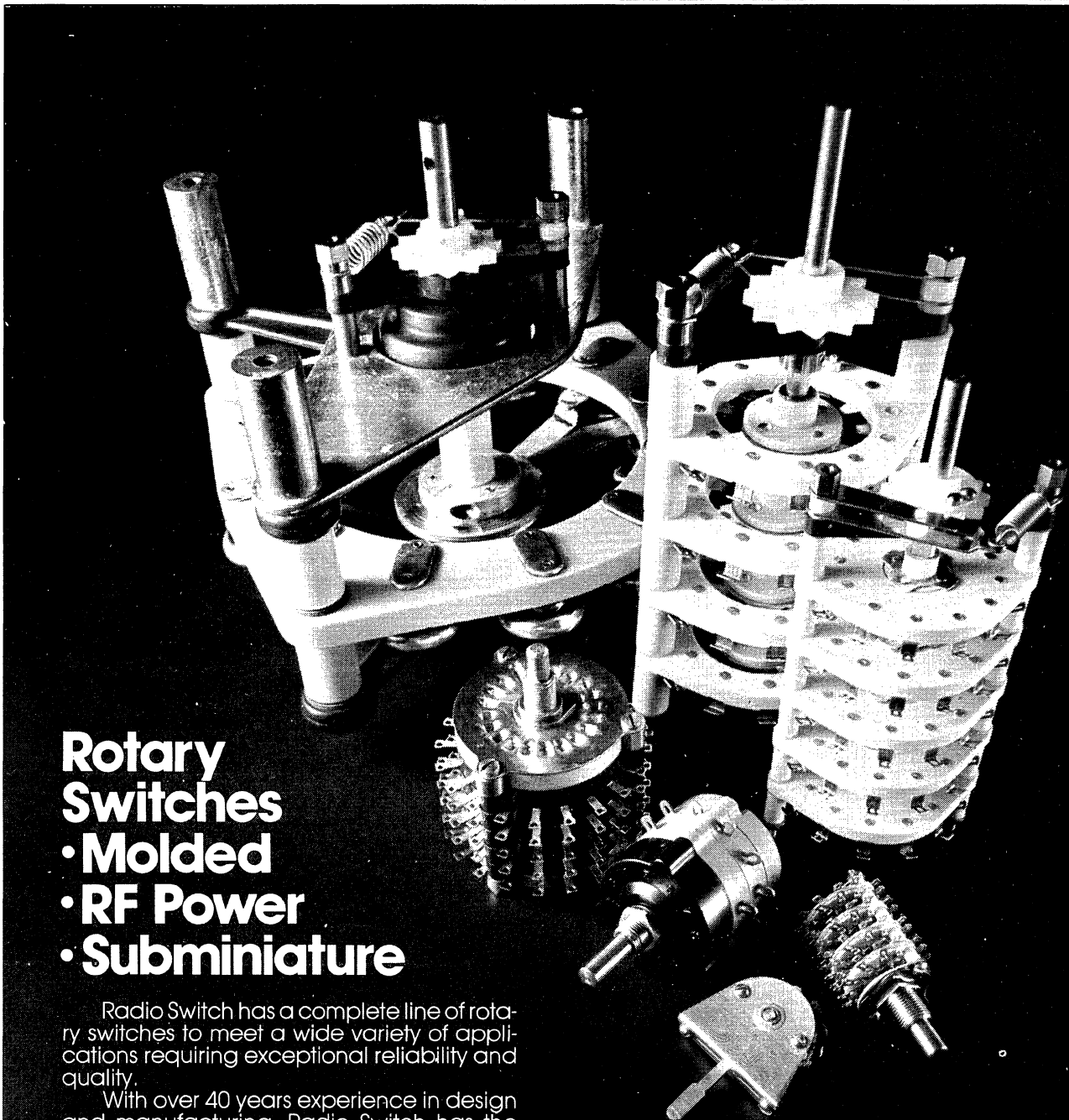

6470


6449


589


6210B


6433



Rotary Switches
• Molded
• RF Power
• Subminiature

Radio Switch has a complete line of rotary switches to meet a wide variety of applications requiring exceptional reliability and quality.

With over 40 years experience in design and manufacturing, Radio Switch has the capability of providing a broad selection of standard switches as well as supplying switches to customers stringent specifications. Our staff will work closely with your engineering personnel to develop, test, and implement the rotary switch that is custom-designed for your application.

Our RF and power switches range from 2,000 volts peak flashover at 20 amperes to 24,000 volts peak flashover at 100 amperes. In the sub-miniature size, coin silver current carrying components can carry 5 amperes with initial contact resistance of only .010 ohms max. where low current switching applications are critical. Our molded type switches have the capability of switching 20 positions per circuit and are ideal for test equipment and industrial control systems.

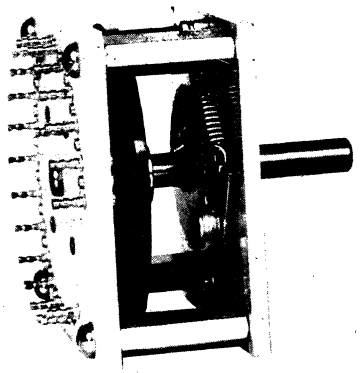
For high performance, quality, and fast delivery, specify Radio Switch.

RSC **RADIO SWITCH CORPORATION**

ROUTE 79 • MARLBORO, NEW JERSEY 07746 • 201•462-6100

ROTARY SWITCHES FOR INDUSTRY

Shallco ROTARY SWITCHES SERIES C, D, AND E

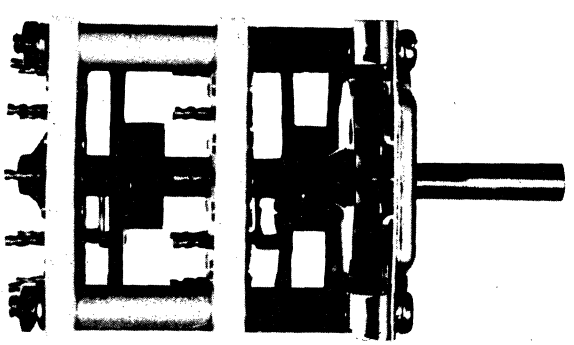


SPECIFICATIONS

GENERAL:
Meets or surpasses requirements of MIL-S-3786

ELECTRICAL:
Current carrying capacity—10 amps.
Current switching capacity—up to 2 amps.
Contact resistance—Initial—.005 ohms max.
Contact resistance—After Life—.010 ohms max.
Insulation resistance—50,000 megohms
Dielectric withstanding voltage—1500V rms
Dielectric withstanding voltage after life—1000V rms

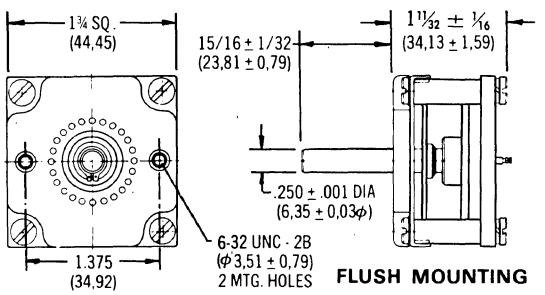
MECHANICAL:
Rotational life—50,000 cycles* min.@.250 amps.@85° C
Stop torque—50 In. Lbs.
Type construction—Open frame
Stops—Factory set to desired position.
Optional features—⅜-32 UNEF-2A bushing mount with anti-rotation pin. Shaft and front panel "O" ring seals. Spring return feature.
Concentric shafts available
Progressive shorting available
*One cycle = one full cw plus one full ccw rotation.



FEATURES OF SHALLCO 1¾, 2¼, 2¾ SQUARE SERIES C, D, E SINGLE DECK SWITCH MULTI DECKS AVAILABLE

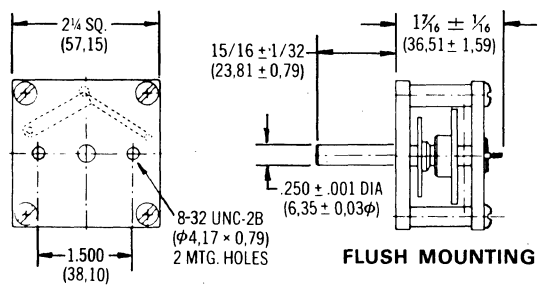
- Meets or surpasses requirements of MIL-S-3786
- Available in one pole 2-48 position through four pole 2-15 position. See ordering information
- High current carrying capacity
- Low contact resistance

SERIES C



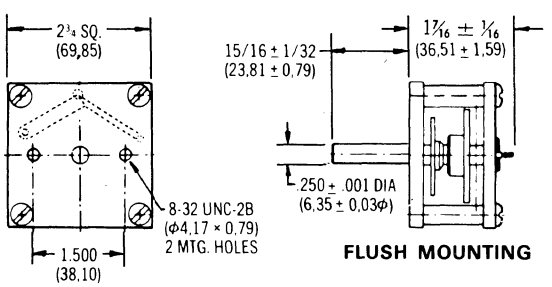
FOR ADDITIONAL DECKS ADD. 29/32 (23,02) PER DECK

SERIES D



FOR ADDITIONAL DECKS ADD 1 1/16 (26,99) PER DECK

SERIES E



FOR ADDITIONAL DECKS ADD 1 1/16 (26,99) PER DECK.

REQUEST CATALOG IO FOR COMPLETE INFORMATION

NUMBERS IN ( ) ARE METRIC EQUIVALENT (MILLIMETERS)

USE ORDER FORM

SHALLCO INC. / SMITHFIELD IND. PARK / P.O. BOX 1089 / SMITHFIELD, N.C. 27577 / (919) 934-3135

SHALLCO ORDERING INFORMATION

SHORTING				NON-SHORTING		
SERIES	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE	NUMBER OF POLES	SERIES	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE
111-CM	15°	24*	one	111-CB	30°	12**
112-CM	11¼°	32*		112-CB	22½°	16**
121-CM	15°	11	two	121-CB	30°	6
122-CM	11¼°	15		122-CB	22½°	8
131-CM	15°	5	three	131-CB	30°	3
132-CM	11¼°	7		132-CB	22½°	4
141-CM	15°	5	four	141-CB	30°	3
142-CM	11¼°	7		142-CB	22½°	4

*Maximum number of positions may be used with continuous rotation only.
**Normally supplied as continuous rotation; stops available on request.

SHORTING				NON-SHORTING		
SERIES	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE	NUMBER OF POLES	SERIES	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE
111-DM	15°	24*	one	111-DB	30°	12*
112-DM	11¼°	32		112-DB	22½°	16*
113-DM	7½°	48		113-DB	15°	24*
121-DM	15°	24*	two	121-DB	30°	12*
122-DM	11¼°	32		122-DB	22½°	16*
123-DM	7½°	23		123-DB	15°	12
141-DM	15°	11	four	141-DB	30°	6
142-DM	11¼°	15		142-DB	22½°	8
143-DM	7½°	11		143-DB	15°	6

*Normally supplied as continuous rotation; stops available on request.

SHORTING				NON-SHORTING		
SERIES	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE	NUMBER OF POLES	SERIES	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE
111-EM	15°	24*	one	111-EB	30°	12*
112-EM	11¼°	32		112-EB	22½°	16*
113-EM	7½°	48		113-EB	15°	24*
121-EM	15°	24*	two	121-EB	30°	12*
122-EM	11¼°	32		122-EB	22½°	16*
123-EM	7½°	48		123-EB	15°	24*
141-EM	15°	11	four	141-EB	30°	6
142-EM	11¼°	15		142-EB	22½°	8
143-EM	7½°	23		143-EB	15°	12
161-EM	15°	7	six	161-EB	30°	4
162-EM	11¼°	9		162-EB	22½°	5
163-EM	7½°	15		163-EB	15°	8
181-EM	15°	5	eight	181-EB	30°	3
182-EM	11¼°	7		182-EB	22½°	4
183-EM	7½°	11		183-EB	15°	6

*Normally supplied as continuous rotation; stops available on request.

(Order Form to order Series C, D, E)

Order by using a six-place "shorthand" description

Example: 211—EB—12

Rotary Selector Switch, two decks, 1 pole per deck, 30° of spacing between positions, E series, non-shorting, 12 positions.

2 1 1 - E B - 12

PLACE 1	PLACE 2	PLACE 3	PLACE 4	PLACE 5	PLACE 6
indicates number of decks:* 1 = One Deck 2 = Two Decks 3 = Three Decks, etc.	indicates number of poles per deck: 1 = One Pole 2 = Two Poles 3 = Three Poles 4 = Four Poles	indicates degrees of spacing between positions: Shorting 1 = 15° 2 = 11¼° 3 = 7½° Non-Shorting 1 = 30° 2 = 22½° 3 = 15°	indicates series of switch: C = C Series D = D Series E = E Series	indicates Shorting or Non-Shorting: M = Shorting (make before break) B = Non-Shorting (break before make)	indicates number of positions per pole: 2 = Two positions 3 = Three positions 4 = Four Positions, etc.

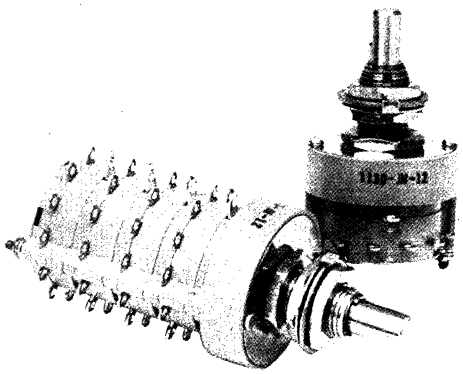
Request catalog 10 for more detailed information and additional switch types.

Shallco

SHALLCO, INC.
PRECISION ELECTRONIC COMPONENTS
SMITHFIELD INDUSTRIAL PARK • P.O. BOX 1089 • SMITHFIELD, N.C. 27577 • 919/934-3135

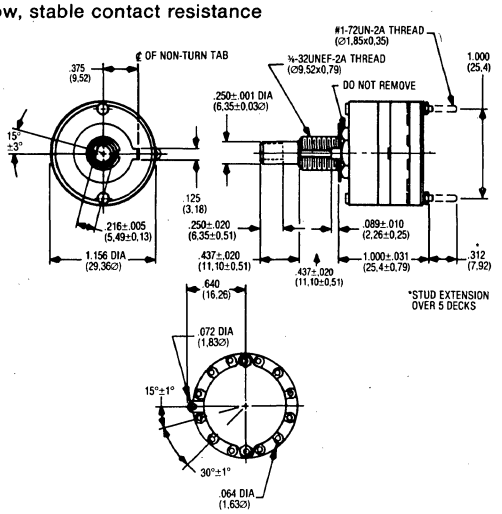
series **J**

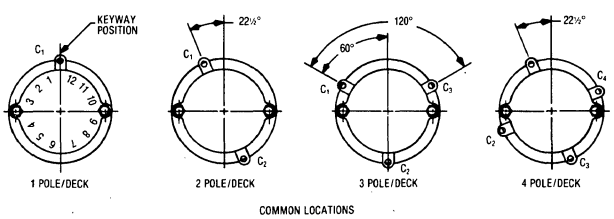
ROTARY SELECTOR SWITCHES



FEATURES OF SHALLCO ONE INCH SERIES J SINGLE OR MULTIDECK SWITCH

- Designed to meet requirements of MIL-S-3786
- Closed construction
- Smooth, positive detent
- Low, stable contact resistance





COMMON LOCATIONS

SPECIFICATIONS

GENERAL:

Designed to meet the requirements of MIL-S-3786/SR04

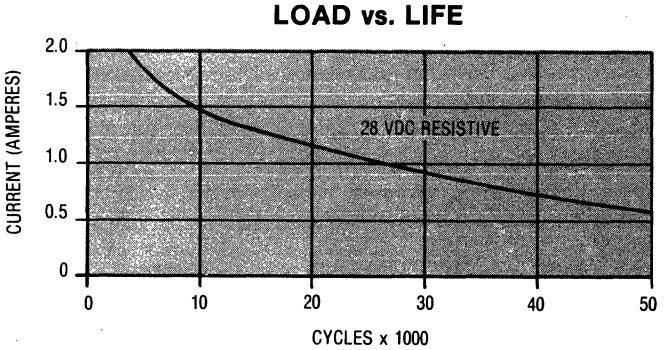
ELECTRICAL:

Current carrying capacity - 10 amperes
Current switching capacity - 1 ampere (28 VDC, Resistive)
Contact resistance - Initial - 5 milliohms maximum
Contact resistance - After Life - 20 milliohms maximum
Insulation resistance - 50,000 megohms
Voltage breakdown - 1000 VAC
Voltage breakdown - After Life - 500 VAC minimum

MECHANICAL:

Rotational life - 50,000 cycles
Stop torque - 15 pound-inches minimum
Construction - Enclosed
Stops - Factory set
Torque - 8 to 120 ounce-inches (dependent on decks, poles/deck)
Shaft flat - Opposite moving contact, see diagrams

LOAD vs. LIFE



BACK-PANEL DEPTH

DECKS	INCHES	MM	DECKS	INCHES	MM
1	1.000	25.4	7	2.992	76
2	1.332	33.8	8	3.324	84.4
3	1.664	42.3	9	3.656	92.9
4	1.996	50.7	10	3.988	101.3
5	2.328	60.5	11	4.320	109.7
6	2.660	67.6	12	4.652	118.2

APPROXIMATE WEIGHT

Switch, 1 Deck/W Hardware ..... 50 grams
Additional Deck ..... 8 grams

MATERIALS AND FINISHES

Insulation - Diallyl Phthalate
Rotor/Stator Contacts - Silver Alloy
Shaft, Stampings, Hardware - Stainless Steel
Detent Spring - Tinned Music Wire
Terminals - Brass under Silver or Gold
Mounting Bushing - Brass, Zinc Plated - Chromate

NUMBERS IN ( ) ARE IN MILLIMETERS

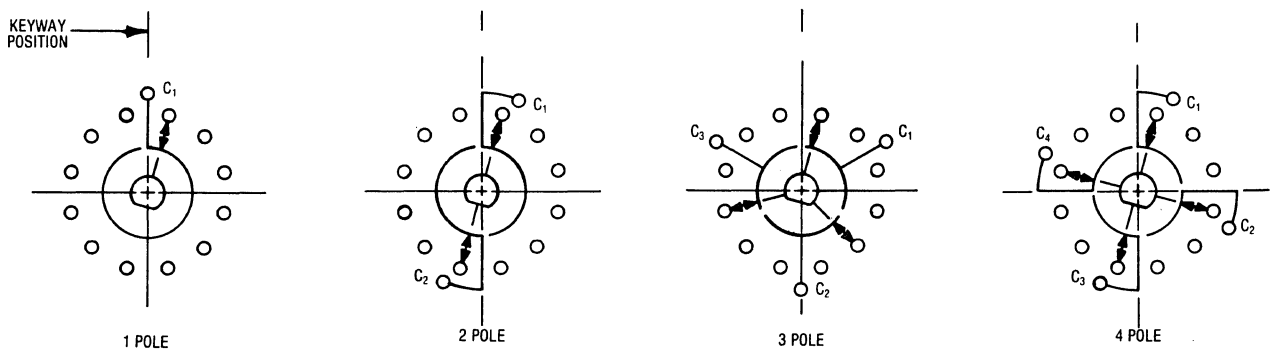
Shallco

SHALLCO, INC.
PRECISION ELECTRONIC COMPONENTS
SMITHFIELD INDUSTRIAL PARK • P.O. BOX 1089 • SMITHFIELD, N.C. 27577 • 919/934-3135

SHORTING				NON-SHORTING		
CODE	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE	NUMBER OF POLES	CODE	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE
1130-JM	30°	12	ONE	1130-JB	30°	12
1230-JM		6	TWO	1230-JB		6
1330-JM		4	THREE	1330-JB		4
1430-JM		3	FOUR	1430-JB		3

SINGLE DECK SHOWN. FOR MULTI-DECK, INCREASE FIRST DIGIT OF ABOVE CODES.

CIRCUIT DIAGRAMS



(VIEWED FROM SHAFT END AND SHOWN IN POSITION 1, EXTREME CCW POS.)

ORDERING CODE

NO. DECKS		DETENT		B = BBM; M = MBB			OPTIONS
3	1	30	–	J	B	– 12	
	POLES/DECK			SERIES		POSITIONS	

SPECIFY

G = GOLD PLATED
C = CONTINUOUS ROTATION
M = CUSTOMER MARKING
S = SEALED SHAFT

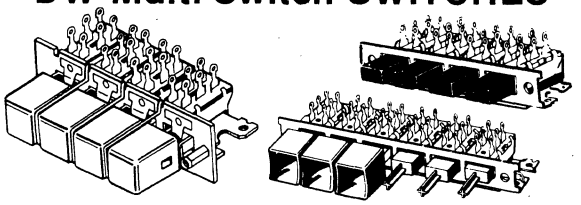
ADDITIONAL PRODUCTS

Audio Attenuators and Attenuation Networks Request Catalog A82 for complete product listing and Engineering Data.

Switchcraft®

A **Raytheon** Company

DW Multi-Switch SWITCHES



The DW (double-wipe) Multi-Switch switch is available up to 18 stations in a single row; or on special order, ganged assemblies with interaction between rows. Max. switching per station is 4-C (4PDT). Each station utilizes specially designed switching modules with U-shaped, high reliable bifurcated contactors rated at 3 amps, A.C.; 0.5 amp. D.C., 125 V, non-inductive load. DW Multi-Switch switches are available in 5 series: 65000, 66000, 67000, 70000, and 71000. All provide four standard functions: **Interlock**—actuating a pushbutton automatically restores to normal the pushbutton previously actuated. **Lock-Out**—prevents operation of more than one pushbutton at a time. This feature is included on all interlock switches. **Non-Lock**—each pushbutton has momentary action. **All-Lock**—all pushbuttons, except release, lock when depressed. All pushbuttons restored to normal by actuating (momentary) release pushbutton. **Push-Lock/Push-Release**—pushbuttons lock when depressed and release when again depressed. **All Series**—pushbuttons on ⅜" centers. DW Multi-Switch switches are available in single row assemblies with interlock and all-lock functions from one to twelve stations; with non-lock and push-lock/push-release functions up to eighteen stations.

Series 65000—Non-illuminated, integral pushbutton.
Series 66000—Non-illuminated version of Series 67000.
Series 67000—Illuminated pushbuttons.
Series 70000, 71000—Non-illuminated, cross-rib plungers, accept up to 12 different styles of pushbuttons.

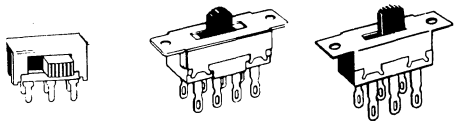
MOMENTARY Button Switch SWITCHES

Miniature pushbutton switches are enclosed in metal housing. Terminals: solder lug. Contacts: internal nickel silver, 250 mA, 30 W max., AC, non-inductive. **Series 903, 913:** behind panel mtg. **Series 923, 933:** front mount. All switches: bushing mount.

903 & 913

923 & 933

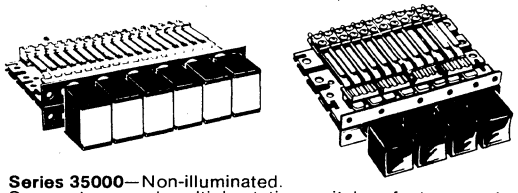
"Tini-Slide" SWITCHES



Miniature "**Tini-Slide**" switches are precision locking switches with unique lift/wipe/slide action and silver contacts. Ratings: 0.5 A, 125 V AC or DC, non-inductive. 2- and 3-position types. U.L. listed. Solder lugs or PC terminals. Crowned knobs.

Series 56000 — DPDT & DPTT **Series C63000 — 4PDT**
Series C62000 — Side Knobs

littel Multi-Switch SWITCHES



Series 35000—Non-illuminated.
Compact, rugged multiple-station switches feature up to 6PDT per station in .6 square inch space. Excellent selection of contacts for low or high current switching. Plungers accept nine different Switchcraft pushbuttons. Mechanical functions are: interlock, all-lock, non-lock and push-lock/push-release. One to 12 stations; many legends are possible.

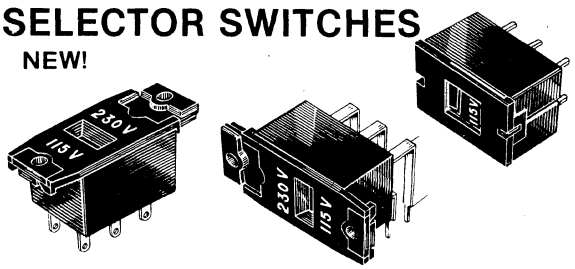
Series 36000—Non-illuminated companion series to Series 37000. All other basic functions and features are same as Series 35000.

Series 37000—Single lamp illumination at each station. All other basic functions and features are same as Series 35000.

Series 38000—Twin lamp illumination using low power, low heat lamps. All other basic functions and features same as Series 35000.

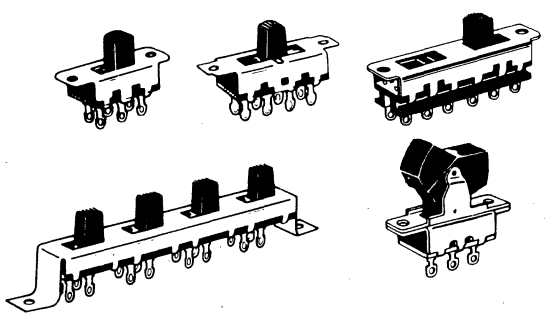
EUROPEAN LINE VOLTAGE SELECTOR SWITCHES

NEW!



Durable slide switches provide quick and easy programming/selection of 115 V or 230 V primary power in electrical/electronic equipment for international marketplace. UL, CSA and VDE (Verband Deutscher Elektrotechniker) approved. Mounting are flange or PC (straight or right angle), DPDT, locking. Ratings: UL & CSA: 2 A, 250 V AC & 4 A, 125 V AC. VDE: 2 A, 250 V AC. Switches also designed to comply with CEE and IEC requirements. Legends: 115 V-230 V.

SLIDE SWITCHES

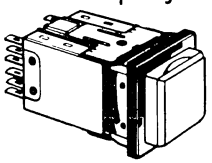


Instrument quality Switchcraft slide switches have low cost, precision "double-wipe" contacts with "U"-shaped bifurcated contacts rated at 0.5 A DC, 3 A AC, 125 V, non-inductive. Solder lugs have 5/64" dia. center holes and wrap-around notch. Many knob styles: crowned, rocker, flush. U.L. & C.S.A. listed types. Up to 4 poles of switching with locking or momentary action.

Series 46000E — General purpose slide switches
Series 47000E — Tandem switches
Series 51000E — Rocker switches
Series 58000 — Slide switches (6 amp)

Switchcraft, Inc., 5555 N. Elston Ave., Chicago, IL 60630 Tel. (312) 792-2700 TWX 910-221-5199

Switchcraft®
A **Raytheon** Company

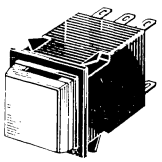


NOTE: All switches are available with a variety of actuator colors, circuitry, terminal styles and mechanical functions. Contact Switchcraft for a detailed catalog.

SERIES PL "Push-Lite" SWITCHES

Completely enclosed, lighted pushbutton switches feature long-life, highly-reliable, leaf-springs. Available with or without barriers, full or split-face display. Mounts with clamp-type bracket; no screws, washers or nuts needed. Can be mounted in vertical or horizontal rows and in matrixes. Accepts standard T-1¾ flange-base lamp (not furnished with switch) in either 6 V or 28 V rating. Specify 1 lamp for single lamp type or 2 lamps for twin-lamp type when redundant or split-face lighting is required. Barriers and colored filter snap-inserts optional (order separately). Palladium contacts rated at 2 A, 125 V max., non-inductive load. Silver contacts rated at 8 A, 125 V max., non-inductive load.

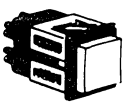
SERIES BXL — "Box Switch" SWITCHES



NOTE: All switches are available with a variety of actuator colors, circuitry, terminal styles and mechanical functions. Contact Switchcraft for a detailed catalog.

Miniature momentary or locking pushbutton switches offer lighted or unlighted options in minimum panel space. Molded black plastic housing protects agains dust and dirt; prevents bending/disfiguring contacts caused by excessive handling. Bezel frames pushbutton, acting as built-in escutcheon. Mounted in rows or matrixes and completely compatible with Series BXR "Box-Switch" switches. Accepts standard incandescent T 1-3/4 wedge base lamps. Relamp from front of panel. Omit lamp for non-illuminated switch. Lamps not supplied. Order pushbuttons separately from chart at left.
Mounting hole: .625 in. (15.88 mm) square. Panel thickness: .031 in. (.79 mm) to .093 in. (2.36 mm). Behind panel depth: 1.219 in. (30.96 mm) max.

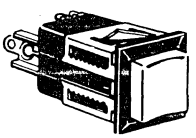
SERIES BXR — MOMENTARY "Box Switch" SWITCHES



NOTE: All switches are available with a variety of actuator colors, circuitry, terminal styles and mechanical functions. Contact Switchcraft for a detailed catalog.

Miniature, non-illuminated momentary pushbutton switch offers broad switching capabilities in minimum panel space. Switch only .688 in. (17.48 mm) square. Molded plastic body protects against dust and dirt; prevents bending/disfiguring of contacts caused by excessive handling. Attractive bezel frames switch and acts as a built-in escutcheon plate. "Adjusto-Clip" mounting provides snap-in, front of panel mounting. Pushbuttons have .109 in. (2.77 mm) stroke. Mtg. hole: .620 in. (15.75 mm). Max. Panel Thickness: .047 in. (1.19 mm) to .281 in. (7.14 mm). Ratings: 250 mA, 30 W max. AC non-inductive load. Contacts: brass, silver plated. U.S. Patent Nos. 3,446,467 and 3,419,696.

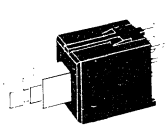
SERIES US & LUS — "Uniswitch" SWITCHES



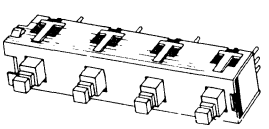
NOTE: All switches are available with a variety of actuator colors, circuitry, terminal styles and mechanical functions. Contact Switchcraft for a detailed catalog.

Low cost, momentary pushbutton switches are only .688 in. (17.48 mm) square. SERIES US non-illuminated. SERIES LUS illuminated — use only 6 V, 0.5 W, T 1¾ bi-pin lamp Switchcraft Part No. P-2290 (not supplied with switch). Lamps replaced from front of panel. Both switch series incorporate "Adjusto-Clip" allowing simple "snap-lock" mounting. Solder lug terminals also accept #5-40 screw connections. PC terminals mount in single- or double-sided boards or multilayers. Solder/quick-connect terminals accept AMP Series 110 receptacles. Terminals: Solder lug, PC (PC suffix); quick-connect/solder (ST suffix). Contacts are bronze, silver plated, 250 mA, 30 W max., AC, non-inductive load, 1A circuitry. Switching is SPST (NO). Mounts in panels from .047 in. (1.19 mm) min. to .266 in. (6.76 mm) max. thick. Behind panel depth 1.313 in. (33.35 mm). Minimum square hole size .617 in. (15.67 mm). U.S. Pat. No. 3,446,467

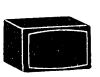
IBS MINIATURE PUSHBUTTON SWITCHES



SERIES 98000



Type I



Type II

Series 98000 IBS miniature pushbutton switches can be gang mounted on common frames, up to 12 stations long with center-to-center spacing of 10 mm, 15 mm or 20 mm. Available with interlock, non-lock, momentary or push-lock/push-release mechanical functions. .130 in. (3.30 mm) x .130 in. (3.30 mm) square plungers accept a full line of industry standard pushbuttons. Switches are stocked without pushbuttons due to wide variety that can be used. Order pushbuttons separately, Switches have .157 in. (4 mm) long PC terminals for mtg. single- or double-sided PC boards up to .094 in. (2.39 mm) thick. Close stacking (centers) permits high density within minimum front panel space. Plunger travel: .144 in. (3.66 mm).

IBS PUSHBUTTONS

IBS pushbutton faces are concave for operator convenience with full legend capability. Can be mounted horizontally or vertically. Pushbutton dimensions: Type I — .388 in. (9.86 mm) W x .216 in. (5.49 mm) H x .425 in. (10.80 mm) D. Type II — .464 in. (11.79 mm) W x .288 in. (7.32 mm) H x .432 in. (10.97 mm) D. Pushbuttons must be ordered separately.

We're stocked and ready to go.

We're the Switch Specialists. We stock the leading switch and electronic component lines. Call us. You'll get what you want, when you want it.

WES-GARDE COMPONENTS GROUP, INC.

CALIFORNIA
Pacific Switch Controls, Inc.
16116 Leadwell Street
Van Nuys, CA 91406
(213) 873-4802
Bay Area: (408)268-8075
Orange County: (714) 953-1254
San Diego: (619) 264-6117
San Fernando Valley: (818) 786-3724
Outside CA: (800) 624-1515

CONNECTICUT
Atlantic Switch Controls, Inc.
194 Elliott Street
Hartford, CT 06114
(203) 527-7705
Toll Free: (800) 842-8491
Outside CT: (800) 243-9364

FLORIDA
Switch Controls, Inc.
3815 Industry Blvd.
Lakeland, FL 33803
(813) 644-7564
Toll Free: (800) 282-7619
Outside FL: (800) 237-7635

ILLINOIS
Conectrix, Inc.
376 E. Gunderson St.
Carol Stream, IL 60188
(312) 653-1460
Toll Free: (800) 323-9431

NEW HAMPSHIRE
Atlantic Switch Controls, Inc.
5 Coliseum Avenue
Nashua, NH 03063
(603) 880-1971
Toll Free: (800) 732-8500
Outside NH: (800) 345-0600

NEW JERSEY
Jerseyswitch, Inc.
129-A Gaither Drive
Mt. Laurel, NJ 08054
(609) 778-8190
Toll Free: (800) 232-6508
Outside NJ: (800) 257-7915

OHIO
Ohioswitch, Inc.
6534 Singletree Drive
Columbus, OH 43229
(614) 885-0319
Toll Free: (800) 282-6939

TEXAS
Texaswitch, Inc.
2512 Program Drive, #108
Dallas, TX 75220
(214) 357-1768

CIRCUIT BREAKERS
- Alco
- Carlingswitch
- Littelfuse

CONNECTORS
- Beau Vernitron
- Cole Hersee
- Switchcraft
- Teledyne/Ansonia

FUSES, FUSEHOLDERS
- Littelfuse

INDICATOR LIGHTS
- Alco
- Littelfuse
- Oslo
- SoLiCo
- Taiko
- Unimax

KNOBS
- Alco
- Front Panel Devices

OILTIGHT CONTROLS
- Alco
- Unimax
- Wild Rover

RELAYS
- Aleph
- Deltrol
- Grayhill
- Omron
- Sigma
- Stancor

SWITCH SEALS
- Alco
- Carlingswitch
- Multiflex

SWITCHES
- Acro Switch
- Alco
- Brady Xymox
- C & K
- Carlingswitch
- Cole Hersee
- Grayhill
- Omron
- Oslo
- Pollak
- Refac
- Switchcraft
- Taiko
- Unimax
- Unimec

LAMPS
- Alco
- Oshino
- Xenell

L.E.D.'s
- Refac
- SoLiCo

WIRE, CABLE, TUBING
- Markel
- Olympic

TERMINAL BLOCKS
- Beau Vernitron

TIMERS
- Deltrol
- NCC
- Syracuse

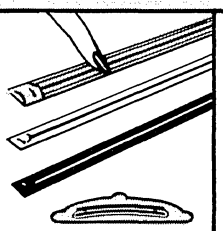
TRANSFORMERS
- Stancor

Tapeswitch

PRESS-AT-ANY-POINT

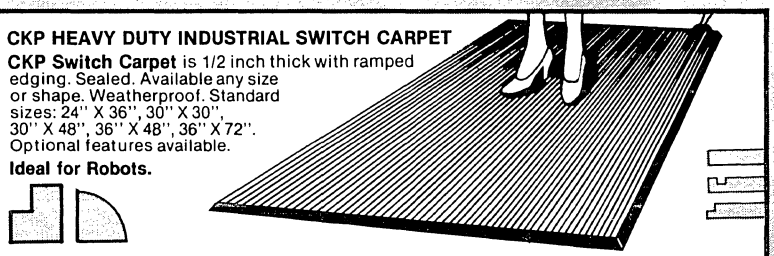
SENSING SWITCHES

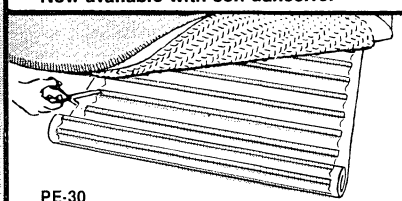
RIBBON SWITCHES
Factory sealed units with 18 inch connecting leads at one end. Sensitivity: 8, 12, or 40 ounce finger pressure. Standard lengths: 1, 2, 5, 8, 10, 12, 15, 18, 20 ft. Double leads on order. See text at bottom.



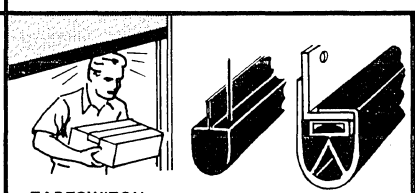
Now available with self adhesive.

CKP HEAVY DUTY INDUSTRIAL SWITCH CARPET
CKP Switch Carpet is 1/2 inch thick with ramped edging. Sealed. Available any size or shape. Weatherproof. Standard sizes: 24" X 36", 30" X 30", 30" X 48", 36" X 48", 36" X 72". Optional features available.
Ideal for Robots.



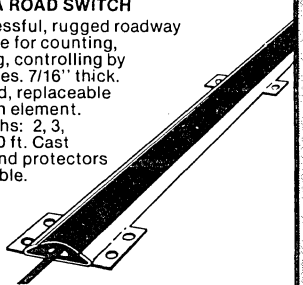


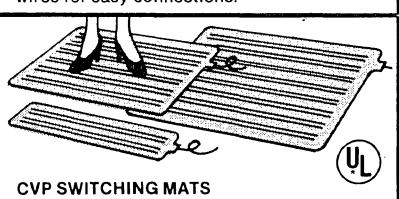
PE-30
UNDER CARPET SWITCHING RUNNER
30 inches wide X 3/32 inches thick 5ft., 25ft., 50ft. roll. Can be cut to any length from roll. For indoor use under carpeting. Excellent under plywood or tile. Parallel Tapeswitches between clear sheeting. Tinned wires for easy connections.



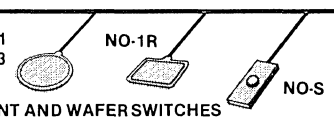
TAPESWITCH
CONTROFLEX® SAFETY EDGES
Serve as cushioned sensing switches for the leading edges of doors, gate arms, machinery, etc., to stop or reverse the action. Numerous styles available. Write or call for details.

RBMA ROAD SWITCH
Successful, rugged roadway treadle for counting, timing, controlling by vehicles. 7/16" thick. Sealed, replaceable switch element. Lengths: 2, 3, 5, 8, 10 ft. Cast iron end protectors available.

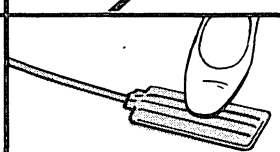




CVP SWITCHING MATS
CVP style mats are durable flexible area switches for use exposed or under rubber mat or carpeting. UL listed for use in alarms. 3/32" thick. Available 6" X 23", 17" X 23", 23" X 35".

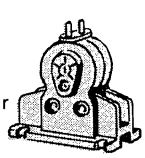


POINT AND WAFER SWITCHES
NO-1 and **NO-1R**—Rugged compact wafer switch. Normally Open. For under valuable objects or general purpose detection. 2 lb. nom. sensitivity.
NC-3—Normally Closed detector switch. Opens when weight is lifted off. 2 lb. nom. sensitivity.
NO-S—1 ounce sensitivity wiping action. Super sensitive.

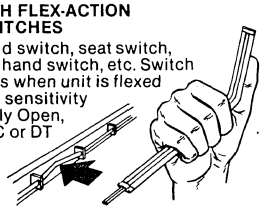


111 CONTROFLEX® FOOTSWITCH
Rugged, low-profile sealed vinyl footswitch. Rated at 100 watts. Employs Controflex® in flat pad. Non tiring. Stand or jump on it. 2″ x 5″ x ⅜″ 6 ft. lead wire. SPST N.O.

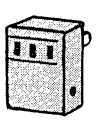
SENSITIVE AIRWAVE SWITCH MODEL AW
High quality diaphragm switch, adjustable sensitivity. Operates from tubing squeeze, air motion, light vacuum, breath pressure, etc. Silver contacts. Many adjustment features.



TAPESWITCH FLEX-ACTION RIBBON SWITCHES
Ideal for wand switch, seat switch, limit switch, hand switch, etc. Switch action occurs when unit is flexed 10°. Nominal sensitivity 4 oz. Normally Open, standard. NC or DT available.



TAPESWITCH RELAY R-1
FOR AC CONTROL WITH ANY TAPESWITCH. This plug-in unit has AC outlet sockets giving Normally ON or Normally OFF 117 Volts AC at 5 Amperes. Built-in low voltage transformer. Simultaneous action.



HAND . . . . . FOOT . . . . . VEHICLE

Tapeswitch products are proven in all industries. Patented construction withstands tons of force yet can close on light finger pressure. TAPESWITCHES are unexcelled for—*safety . . . automation . . . antiburglar systems . . . counting . . . timing . . . door control . . . light switching . . . machine control . . . material handling . . . seat switching . . . computer and console switching . . .* plus many other applications. TAPESWITCH RIBBON SWITCHES can be bought in the size and length needed.

Features: Inherently sealed. Self bottoming. **Press-at-any-point operation** eliminates linkages. All styles except flex-action switches can be coiled without shorting. Millions of impacts at one point.
Rating: All Tapeswitches are rated at more than 1 ampere, 117 VAC. However, for floor switching a lower voltage is recommended.
TAPESWITCHES are designed in accord with the best principles of switch and cable design, with jacketing and insulation meeting the requirements of MIL-C-9154 and MIL-I-631C respectively.
Unique Fail-Safe circuitry is feasible with all Tapeswitches.

Call or write for complete information:

TAPESWITCH CORPORATION OF AMERICA
100 SCHMITT BOULEVARD, FARMINGDALE, NEW YORK 11735

(516) 694-6312
Telex: 144611

Tech Labs SINCE 1935

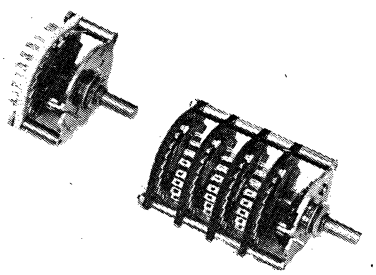
SWITCHES AND ATTENUATORS

TECH LABORATORIES, INC.
DEPT. EM
BERGEN AND EDSALL BOULEVARDS
PALISADES PARK, N.J. 07650
TEL: (201) 944-2221

SQUARE ROTARY SWITCHES

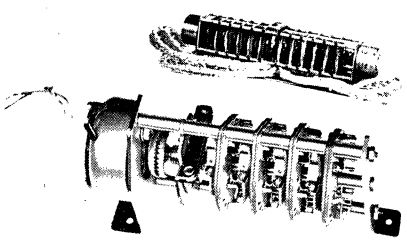
- 13 models available
- 1 5/16" sq. to 8" sq. x 15 decks (max.)
- 1 to 12 poles
- Up to 150 positions/pole
- Fixed stops or continuous rotation
- 3 amps at 120 VAC to 15 amps at 120 VAC
- Precious metal contacts
- Adjustable stops available

TYPE 2 ROTARY SWITCH



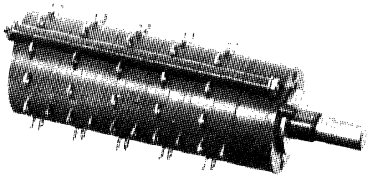
- Two insulation materials available
- 1 to 4 poles/deck
- Up to 24 positions/pole
- Adjustable stops
- 5 amps, 120 VAC max.
- Precious metal contacts

REMOTELY CONTROLLED ROTARY SWITCHES

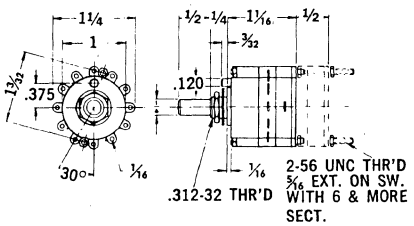


- All Tech Lab Switches can be supplied as stepping switches or continuous motor driven
- Solenoid drives
- Motor and Geneva drives
- Enercon AC incremental motor drive
- Available with interrupters or homing decks
- Completely pre-wired ready to install
- Hermetic sealing available
- May be remotely controlled by: Master-slave arrangement; Computer or other; External pulse
- Either AC or DC operation

TYPE 3 ROTARY SWITCH



DIMENSIONS



- Enclosed molding in diallyl phthalate
- Molded in terminals
- 1 or 2 poles/deck
- Up to 12 positions/pole
- 1¼" OD up to 8 decks (max.)
- Adjustable stops
- 12 amps, 28 VDC
- Precious metal contacts
- Mixed decks of shorting and non-shorting
- Mixed shorting and non-shorting contacts on each deck
- Choice of either 3/8-32 or 5/16-32 mounting bushing
- External adjustable stops
- Offset wipers

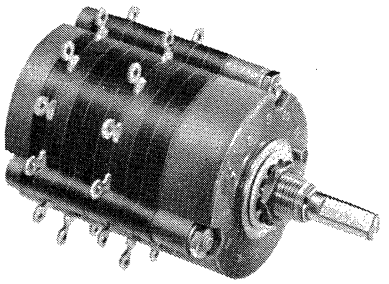
THUMBWHEEL SWITCHES

- Compact modular construction
- Positive detent, 8, 10, 11, 12 pos.
- Simple installation
- Two models available
- Wide range of codes
- Various terminations
- Illuminated
- Adjustable stops
- Decade transfer drive
- KV voltage dividers
- Precision Res. Dec.
- Capacitance decades
- Various colors

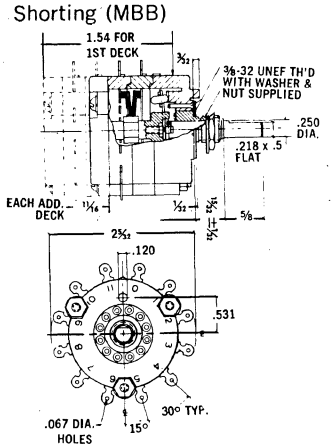
SPECIALS

Tech Labs can customize your Switch and Attenuator requirements, completely pre-wire your switches ready for installation. We can also undertake prototype design and manufacturing. Contact our factory for quotations.

ROTARY INSTRUMENT SWITCH SERIES 2000



- SP or DP/Deck
- Extremely low contact resistance — <1 milliohm
- Extremely high insulation resistance — more than one million megohms
- Totally enclosed -- dust tight
- Long life — > one million
- 12 position/1-6 pole/deck max.
- Silver alloy contacts
- External adjustable stops
- Shorting (MBB)



SPECIAL DESIGN VARIATIONS

SIX AND ELEVEN POSITION DETENTS
The six position detent is 60° throw, skipping every other contact. The eleven position detent is 30° throw with the eleventh position omitted so that the detent goes 60° from position ten to position zero.

OFFSET WIPERS
30° and 180° offset wipers are available for use in special circuits.

CAPACITANCE
Less than 1 micromicrofarad between contacts or to ground.

CURRENT CAPACITY
5 amps maximum continuous duty.

THERMAL EMF
Extremely low. Silver contacts & brushes.

VOLTAGE BREAKDOWN
Withstands 1500V RMS between contacts and to ground.

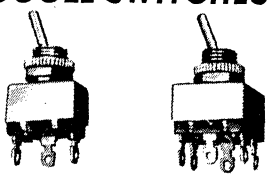
LOSSES
Low electrical losses at frequencies up to several megacycles.

Tech labs SINCE 1935

SWITCHES AND ATTENUATORS

TECH LABORATORIES, INC.
DEPT. EM
BERGEN AND EDSALL BOULEVARDS
PALISADES PARK, N.J. 07650
TEL: (201) 944-2221

TOGGLE SWITCHES



Tech Lab switches are available in many **combinations** of bushings, terminals, handles, housings and electrical styles.

OPERATING CHARACTERISTICS

- **Insulation Resistance**
  Greater than 100,000 megohms at 100 VDC and 70°F
- **Dielectric Strength**
  At sea level 1,000V rms at 60 cps for 1 min.
- **Contact Resistance**
  Initial — less than .010 ohms
- **Contact Rating**

DC Load Inductive	AC Load Inductive
28V	**125V**
5 amp	5 amp

- **Temperature Range**
  −55°C to 85°C
- **Vibration Endurance**
  10 to 2,000 cps per MIL-R-25018
- **Shock Endurance**
  75G
- **Contact Chatter**
  10 microseconds or less MIL-R-5757
- **Corrosion Resistance**
  of complete assembly 50 hrs per QQ-M-151
- **Mechanical Endurance**
  100,000 cycles switching 10 amp. 50 VDC resistive load

MATERIAL SPEC

- **Base**
  Rogers RX-600
  Phenolic Glass Fiber
- **Housing and Mounting Bushing**
- **Brass**
- **Contacts**
  Fine silver-gold plated

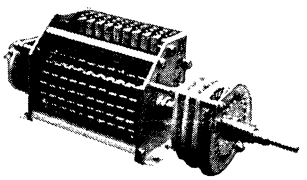
DIMENSIONS

- SP ¼" x ½" x 5/16"
- DP ½" x ½" x 5/16"
- ¼-40 TH'D Bushing
  ¼ or ⅜ long with Keyway
- Various type actuator levers
- Solder or PC Terminals

APPLICABLE MIL SPEC

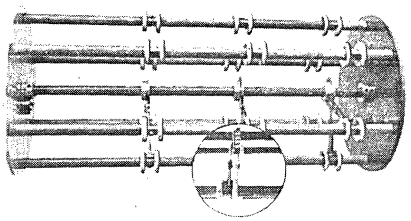
MIL-S-3950 MS-75028 MS-75029

PROGRAMMING SWITCH



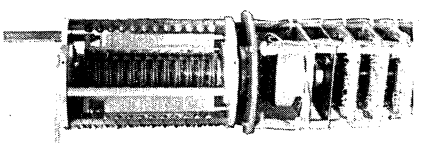
- Adjustable programming for process control, testing, sequencing, scanning, etc.
- SP or DP switches/section
- Up to 25 amp. contact rating
- Up to 48 pos./section/switch
- Remote control
- Computer interface opto-isolated

HIGH VOLTAGE SWITCHES



- Up to 100 KV (low power)
- Corona shields

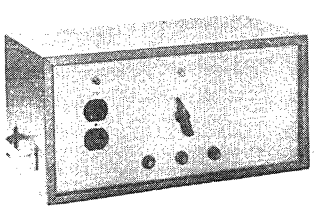
SLIP RING COMMUTATORS



- Integrated with remote controlled stepping switch
- Lift off brushes
- Multiplexing for temp. and strain gauge read out of rotating machinery

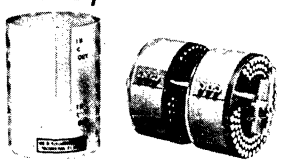
INSTRUMENTS

DC-AC INVERTERS
PREC. DECADE RESISTORS
KV-VOLTAGE DIVIDERS
MILLIOHM METER



ATTENUATORS

ROTARY/VARIABLE



- Five basic models — 1 7/16" to 3" dia.
- All circuit configurations
- Wide range of impedance
- Available with detents, tapers and cueing
- Aluminum anodized can
- Precious metal contacts
- Up to 45 steps
- Audio, video and RF

FIXED ATTENUATORS

- Two basic models
- Standard circuits "T" and Bridged "H" — others available
- Octal plug-in base available
- Up to 80 db loss
- Many impedance available

VERTICAL/VARIABLE

- Two basic models — 1" and 1½" wide
- Many circuit configurations available
- Wide range of impedance
- Available with detents, tapers and cueing
- Black anodized escutcheon plate
- Precious metal contacts
- Up to 30 steps

PRECISION ATTENUATORS

TYPE 11T AND 11H PRECISION ATTENUATORS — DC to 10 MHz*

- Circuit: "T" or Balanced "H"
- Impedance: 50 to 600 ohms, as specified
- Resistor Accuracy: ±0.1% or better
- Accuracy: ±0.1 db to 200 KHz (overall) ±0.6 db to 2 MHz
  Lower values of loss, essentially flat to 10 MHz

Type No.	Circuit	db Range	db/ Step	Dimensions
11-T	"T"	111	0.1	5¼"x19"x5"
11-H	Bal. "H"	111	0.1	5¼"x19"x10"

* On Low Impedance Units, Lower Losses Usable to 100 MHz.

TYPE 850T AND 850H FOR THE AUDIO RANGE

- Circuit: "T" or Balanced "H"
- Impedance: 600/600 ohms unless specified — Other values to order
- Range: 2 dial unit gives 93 db in 0.1 db steps: 3 dial unit gives 111 db in 0.1 db steps
- Terminals: Telephone type jacks for input and output — Solder terminals provided on rear for permanent connections: Insertion of plugs into jacks lifts rear connections
- Accuracy: Resistors adjusted to ±0.1% excepting low values of loss are ±.25%

UNIMAX: BETTER SWITCHING SOLUTIONS

Lighted Pushbutton Switches

Status Symbols®

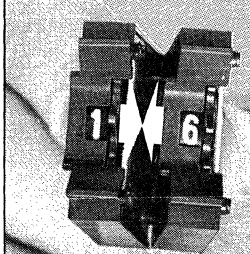
In a field full of appearance quality/performance switching variables, Unimax switches are the ones that show you care about quality, performance and price.

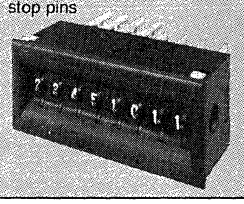
■*Single Lamp* – LED or incandescent. Round, square or rectangular, lighted and unlighted, momentary or alternative switching. 1-4 poles. Flat, concave and mushroom caps. Also available with pre-wirable switch modules in solder, quick connect and wire-wrap terminals.
■*Oil-Tight* – Key-operated, interlock and Multi-position models also available.
Ask for catalogs 53, 54 and B522.

they SNAP together!

"No Hardware" Digital Thumbwheel Switches

- No assembly hardware required
- Large selection of output codes on standard models
- Built-in logic standard on "Smart Switches"
- Either Snap-in front, or rear hard mount
- Matte finish standard
- Only 5 parts per switch
- Standard .315" (8mm) width
- Removable stop pins

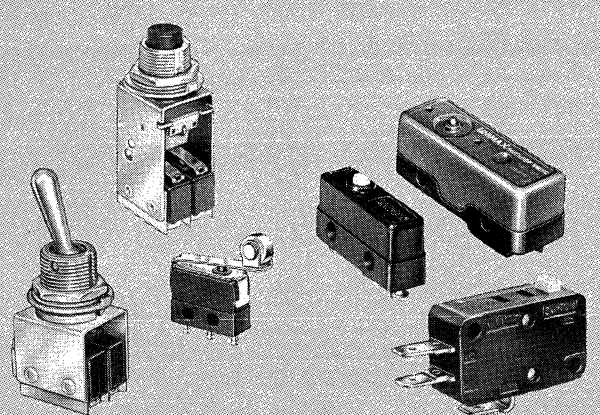




Ask for catalogs 80 and 82.

A wide selection of precision, general purpose, miniature and sub-miniature snap-action switches, as well as toggle and push-button switch assemblies. Ratings from low-level to 25A. All actuator styles available. Ask for catalog 60.

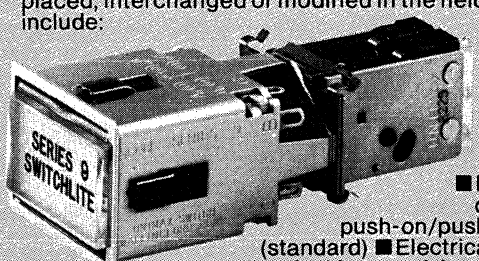
Snap-Action Switches



High-Reliability, Four-Lamp Illuminated Push Button Controls

For flexibility, LPB Series 9 controls are hard to beat. Their four-lamp pushbutton panel design offers an array of combinations for display arrangements. Color coding, switching and customized messages. In addition, they meet Military Specifications MIL-S-22885/9 thru /13.

Used as LPB switches, or with modification, as indicator switches, they can be simply and economically replaced, interchanged or modified in the field. Features include:



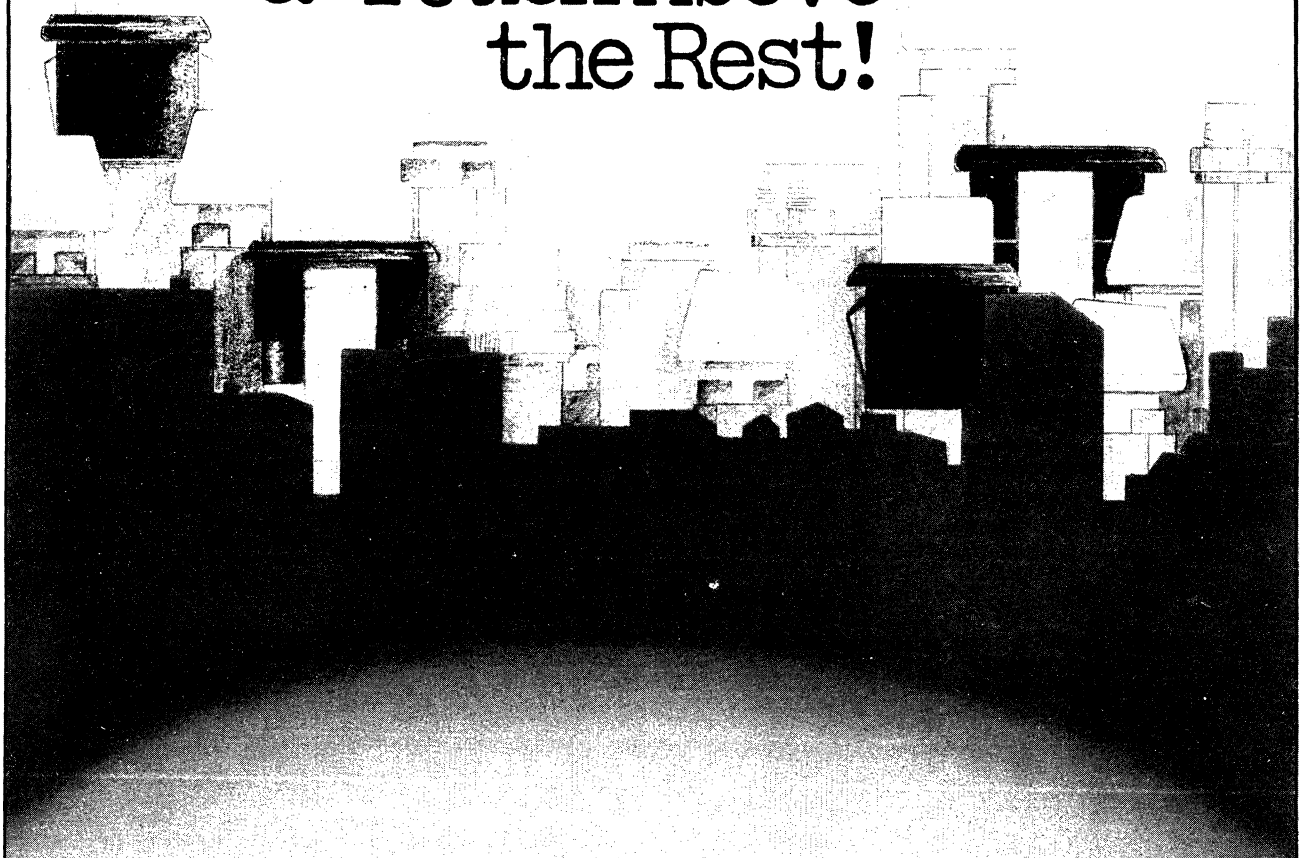
■2, 3 or 4 SPDT switches (standard) ■Momentary or alternate push-on/push-off action (standard) ■Electrical inter-unit interlocking provisions (standard) ■Single, line or matrix mounting ■Available in high shock versions

Ask for catalogs 50 and C-9D

Unimax® Switch

Wallingford, Conn. 06492 • (203) 269-8701
or your local distributor

In a World of Touch'n Go switch to VEETRONIX & find out why we think we're a Touch Above the Rest!



OUR REPUTATION WILL TELL YOU:
With a decade of experience in designing and building switches our objective is to produce a reliable switch that meets your specifications, your time table and at a competitive price. With an in-house tool and mold shop we can respond to your needs quickly. We also furnish several OEM's with special items produced on proprietary tooling.

OUR SWITCH DESIGN WILL TELL YOU:
We design panel switches and keyboard switches, long and short series with momentary, latching and alternate action switch forms.

Both are hermetically-sealed reed switches with optional illumination. The keyboard switches are for PCB mounting with several options. We also design and manufacture a wide variety of key caps, space-bars and supporting mechanisms.

Contact us today
and find out for yourself why we think we're a
TOUCH ABOVE THE REST!

THE KEY TO QUALITY

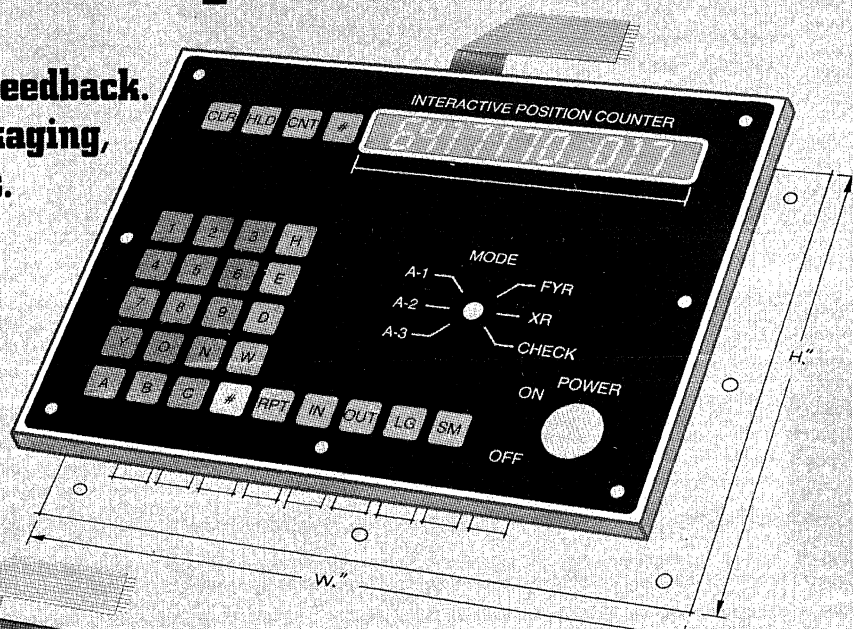
VEETRONIX™

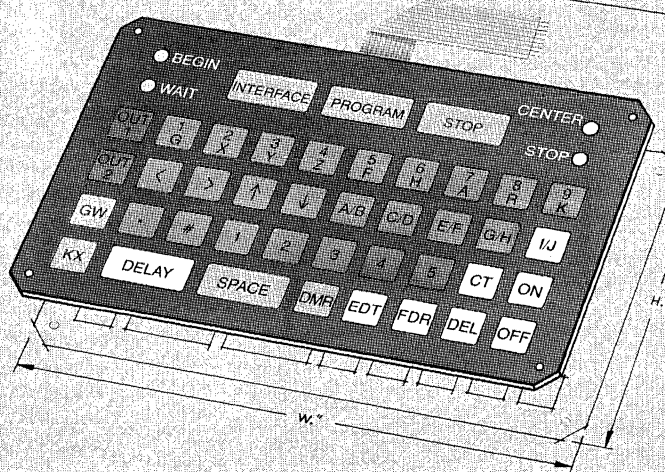
VEETRONIX, INC.
P. O. Box 480 • Lexington, Nebraska 68850
308-324-4600

Grayhill will customize your keyboard panel.

Tactile and audible feedback. Lots of graphic, packaging, and circuitry options.

"Packaging your problem" is Grayhill's way of responding to your front panel switching needs. We'll design you a custom keyboard that provides tactile, snap-dome contact, logic-compatible switches with up to 3,000,000 operations per button, and design options that stretch the imagination!





Complete graphics and display selection.

- choice of colors
- choice of legends
- "dead front" legends
- embossing of actuation areas
- electroluminescent lighting
- integral LED's or other components

Wide range of possible requirements.

- additional electronics
- panel cutouts for displays or switches
- clear or tinted display windows
- flexible cable or standard connector termination
- through holes, studs, or adhesive mounting
- environmental sealing
- EMI and RFI shielding
- MIL durability requirements

Plus the panel size and keyboard circuitry you require.

Our keyboard literature fully describes and displays unusual keyboards we've designed and problems we've solved for other customers. Ask for your free copy... then describe your problem to us, and watch us solve it!

Grayhill INC.

561 Hillgrove Ave., LaGrange, IL 60525
Phone (312) 354-1040 • TWX 910-683-1850

KEYBOARDS

Manufacturer	Key Switches	Type					Features								Keypads
		Mechanical (Hard Contact)	Capacitive	Hall Effect	Membrane		Conductive Elastomers	Low Profile	Sealed Keyboard	Back Lighted	Illum. Switches	Modular	Custom Legends & Symbols	Custom Capabilities	
					Full Travel	Nonfull Travel									
AMP Inc.		B•1706*						B•1706*	B•1706*	B•1706*			B•1706*	B•1706*	B•1706
Bowmar		B•1702*								B•1702*	B•1702*		B•1702*	B•1702*	B•1702
Cherry Electrical	B•1712	B•1709, B•1710	B•1709, B•1711					B•1708-B•1711				B•1708, B•1709	B•1711	B•1710	B•1711
Coba		B•1535							B•1535				B•1535	B•1535	
Dai-Ichi Shoji		B•1548					B•1548	B•1548							
EAO Switch	B•1557										B•1557				
Flex-Key		B•1714					B•1715*	B•1714	B•1715	B•1714	B•1714		B•1714	B•1714	B•1714
Frederick Components		B•1717			B•1717	B•1717	B•1717	B•1717							B•1717
Grayhill	B•1724	B•1718-B•1724				B•1776		B•1722	B•1720, B•1721	B•1720, B•1721	B•1724	B•1778	B•1719, B•1722-B•1724	B•1724	B•1718-B•1724
Industrial Electronic Engineers		B•1726*						B•1726	B•1726				B•1726	B•1726	
ITT Schadow	B•1598 B•1599														
Mantex		B•1727				B•1727		B•1727	B•1727	B•1727			B•1727	B•1727	B•1727
Marquardt	B•1622														
Mechanical Enterprises	B•1728, B•1729	B•1728, B•1729												B•1728	
Memtron					B•1731	B•1731	B•1731	B•1731	B•1731	B•1731	B•1731	B•1731	B•1731	B•1731	B•1731
Micro Switch		B•1732	B•1732	B•1732		B•1732		B•1732	B•1732						
Moxness					B•1734	B•1734	B•1734	B•1734	B•1734						B•1734
Oak Switch	B•1789	B•1789			B•1789			B•1789	B•1789						B•1789
Orbit		B•1735*						B•1735	B•1735	B•1735			B•1735	B•1735	
Preh Electronics					B•1736			B•1736				B•1736		B•1736	
George Risk Inds.	B•1737	B•1737											B•1737	B•1737 B•1792	B•1737 B•1792
SP America	B•1739						B•1739			B•1739	B•1739				B•1739

* Mil. Spec.

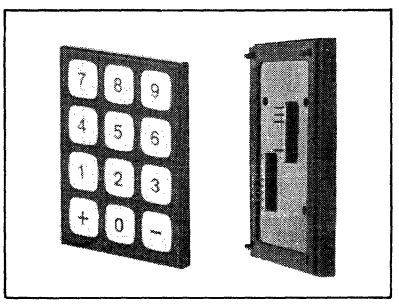
AMP keyboards—technology and experience to give your products a competitive edge.

Proven in more than 1,000 diverse applications . . .
■ Consumer products ■ Telecommunications ■ Data processing ■ Appliances ■ Instrumentation

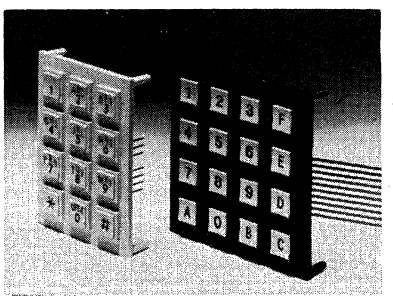
Gives you more choice . . .
■ Standard or custom designs ■ Micromotion to full travel ■ Sublimated graphics that won't peel or wear ■ Static protection ■ EMI/RFI Shielding

And more choice . . .
■ Temperature range: −40°C to +65°C ■ Key travel: 0.005 to 0.125 inch ■ Profile thickness: 0.015 to 0.625 inch ■ Life: .5 to 10 million operations ■ Encoding: single pole, matrix, or custom ■ Operating force: 3 to 18 ounces ■ Termination: Printed or flex tail (range of center to center, 0.100 inch minimum) ■ Capacitance: ≤20 pf ■ Contact Bounce ≤6 ms ■ Contact Rating: 20 ma at 30 vdc

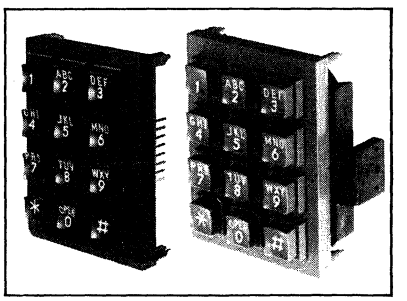
And high reliability
■ Designed and tested to meet the requirements of **MIL STD 810C**



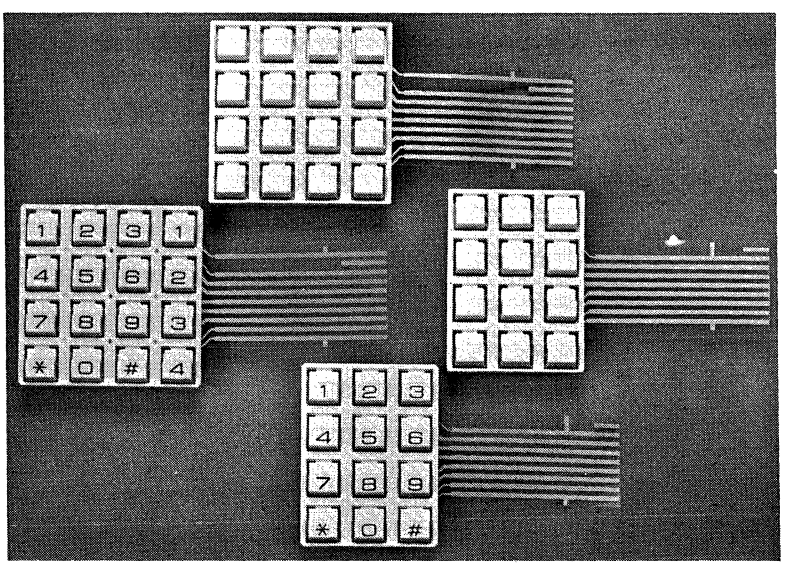
Model EC Environmentally-Sealed Tactile Keyboards
■ Environmentally resistant design ■ "Snap action" feedback for positive data entry ■ Electrically and physically stable ■ Standard and custom legend formats available ■ Life — 1 million operations
Request Catalog No. 81-637



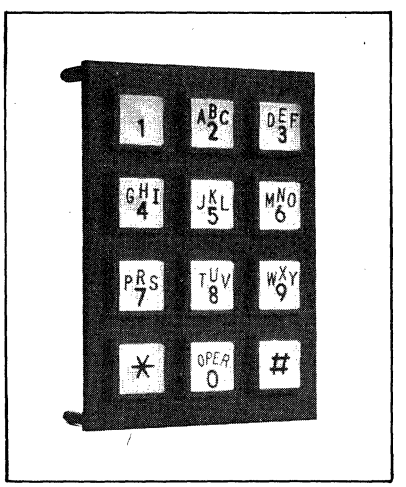
Short-Stroke ET Keyboards
■ "Snap action" feel ■ 12 and 16 key models available ■ Long life — 10 million operations ■ Matrix encoding standard with other options available
Request Catalog No. 81-639



Long-Stroke LT & BT Telephone Keyboards
■ Western Electric and GTE telephone keyboard "look-alike" ■ Simple mounting ■ Standard and optional encodings available ■ Low cost ■ .125 [3.18] key travel ■ Life — 10 million operations
Request Catalog No. 81-641



Model EH Hinged-Key Keyboards
■ Several encodings available ■ Low profile tactile feedback ■ Stackable for large arrays ■ Life—½ million operations
Request Catalog No. 81-640



Model BL (Back Lightable) Tactile Keyboards
■ Translucent keytops ■ Proprietary key marking insures long wear ■ Snap-action tactile feel ■ Long life—1 million operations ■ Easy front panel mounting
Request Catalog No. 81-642

Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

Specifications subject to change. Consult AMP Incorporated for latest design specifications.

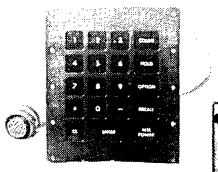
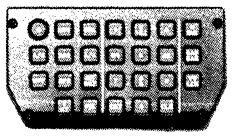
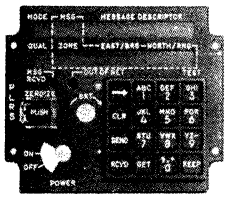
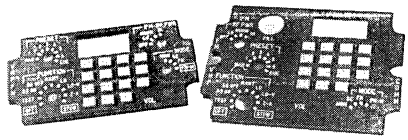
AMP — Trademark of AMP Incorporated

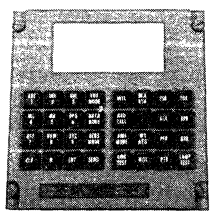
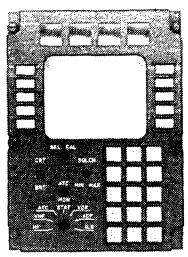
AMP INCORPORATED

Bowmar

BOWMAR INSTRUMENT CORPORATION/Aerospace Division
8000 Bluffton Road
Fort Wayne, IN 46809
(219) 747-3121

your worldwide source of aerospace keyboards, components displays, and systems

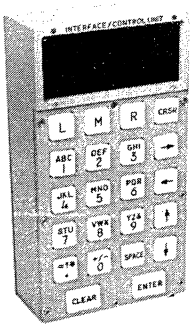



Pertinent Keyboard Specifications

- Actuation force: 25 oz. ± 5 oz. standard (other forces available)
- Travel: 0.015 in.; 0.031 in.; 0.062 in. Standard
- Contact Resistance: Digital Logic Compatible (Gold on Gold)
- Contact Bounce: 1 ms typical
- Tactile Element: Various metallic materials plated gold
- Lighting: Incandescent, LED and electroluminescent lamp sources
- Environmental standards are in accordance with typical airborne/ground military specifications for:
  - Temperature • Altitude • Rain • Humidity • Salt Spray
  - Vibration and Shock

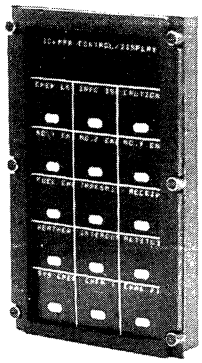
Each design produced meets environmental requirements for the specific application.

- High Reliability—Trouble free and long lasting construction.
- Keyboards combined with electronic packages.
- Custom designs—stand alone keyboards.
- Keyboards combined with panels.
- Dedicated or programmable keystations or controllers.
- Lighted or unlighted configurations.
- Personalized service for solving your problem or design.
- Prompt turn around and delivery.
- MIL-Q-9858A Quality System.

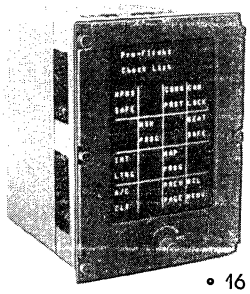


Display and Entry System

This computer Peripheral Display & Entry System provides complete interface capability with only four control lines and an 8-bit bi-directional data bus.

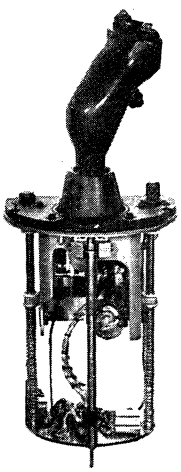


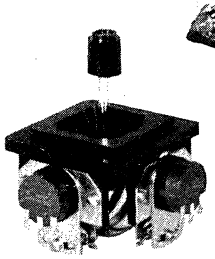
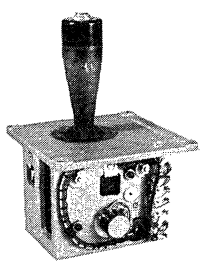
- 15 Keystations
- 16 Segment LED Legends (red)
- Low power
- Ideal for use where panel depth is limited (less than 2")
- Standard 5¾" wide mounting
- RS232C interface standards



• 16 Station Multifunction Keyboard Assembly

Joysticks—Customized to individual needs. . .



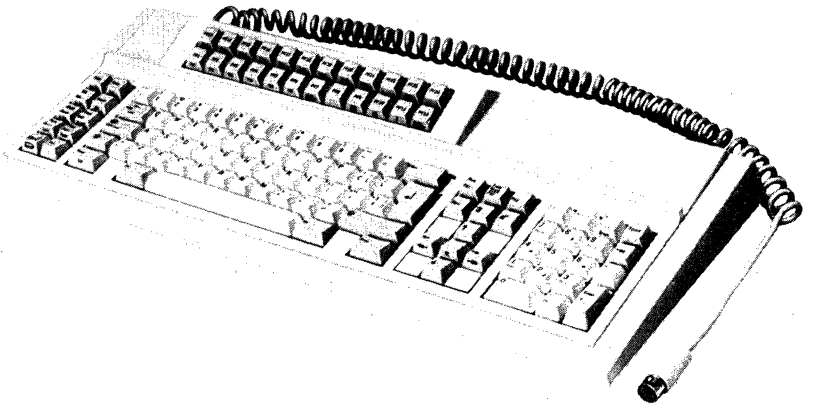



Proportional rate control of such operations as slewing in motors, setting fire control systems, controlling cursor movement on computer display terminals and other types of positioning in X & Y coordinates are some applications of Bowmars Joysticks. Deflection of handle in either the X or Y directions results in corresponding rotation of output means, which could be Potentiometers, Pulse Generators, Encoders or Synchros. Special Bowmar Joysticks incorporating a third (Z) axis can be designed to meet special requirements. The Joysticks may be specified either self centering or non self centering and may or may not have a "dead man" thumb switch on top of the handle specified. Joysticks may be specified with detent switches for "Axis Recognition" of position of handle. The units are designed to withstand military environmental conditions of shock and vibration and operate in a temperature range of −54°C to +71°C.

CHERRY KEYBOARDS

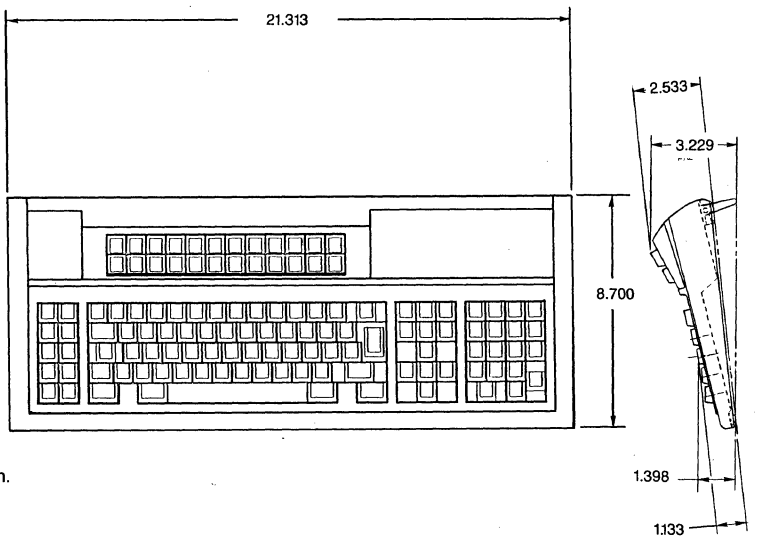
KXN5-C251 CHERRY 122 KEY IBM* 3270 PC* COMPATIBLE ENHANCED KEYBOARD

No modification necessary to use with IBM 3270 Personal Computer. More keys than the standard IBM PC keyboard ... including an extra cluster of 24 function keys above the main key array! Comes in case molded of tough, high impact, polystyrene. Solid metal bottomplate for rigidity, stability. Color and texture matched to IBM PC product line.

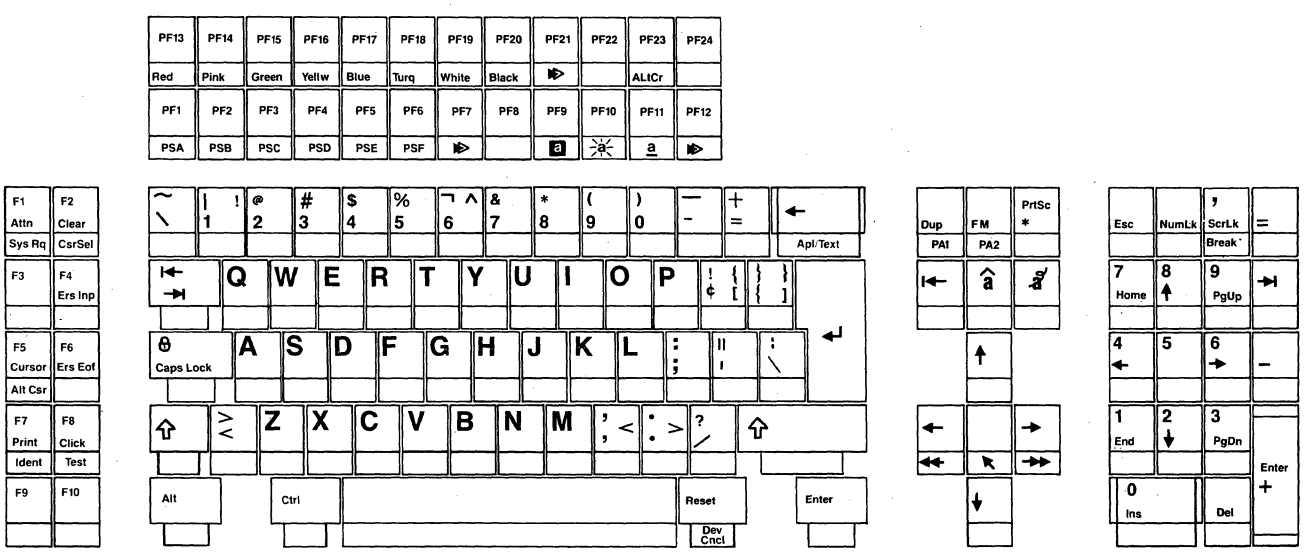


STANDARD FEATURES

- Sends IBM PC synchronous format. Responds to handshake and reset signals from the IBM PC and XT.
- Proven Cherry MX full travel gold crossbar contact configuration key module.
- Full N-key rollover with auto-repeat, chassis ground.
- Low profile – 29mm (1.133") from enclosure base to center point at home row keycap top.
- Keyboard micro with 16-deep FIFO; scanning pause in the event that FIFO is filled.
- Hardware watchdog circuit for extra ESD protection.
- TTL output and input signals.
- Open collector TTL output driver with 4.7 K-OHM pull-up.
- 6-ft. mylar shielded coiled cord with 5-pin circular DIN connector. (Compatible with IBM PC and XT systems.)
- Input power: +5VDC @ 175 mA typ., 275 mA max.
- Tested and approved for FCC Class B requirements.



*Registered trademark of International Business Machines Corporation.

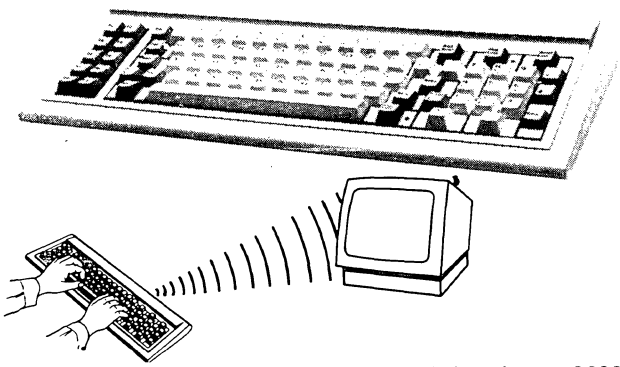


CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

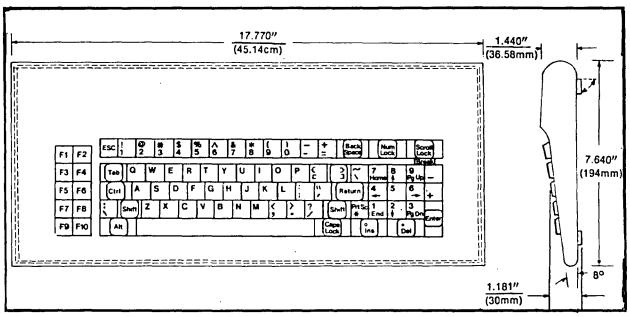
CHERRY Keyboards

KXN3-8451 CHERRY IR WIRELESS™ KEYBOARD–84 KEY, COMPATIBLE WITH IBM PC* and PCjr* COMPUTERS AND 0B99-13AL IR WIRELESS™ RECEIVER

Comes in DIN enclosure. This state-of-the art keyboard is equipped with CMOS electronic components and special circuitry which requires power only when a key is depressed. This extends life of 4 AA alkaline batteries. May be used in a wireless, simplex mode at distances of 20 feet (line-of-sight) with IBM PC jr. For use with IBM PC use the Cherry IR Receiver Part No. 0B99-13AL which may be plugged into the keyboard jack on the IBM PC. Included with keyboard is a detachable coiled cable for wired use.



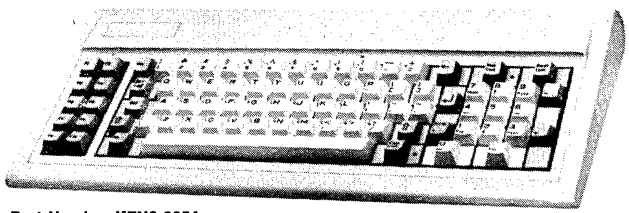
The IR receiver features IBM PC compatible interface at 9600 Baud serial output with UP/DOWN codes and special handshaking.



- 2-shot molded keycap matté finish
- Pseudo N-Key rollover
- Chassis ground. Matching color shielded, detachable coil cord. Auto repeat
- Low profile-30mm (1.181") from enclosure base to center point of home row key cap top

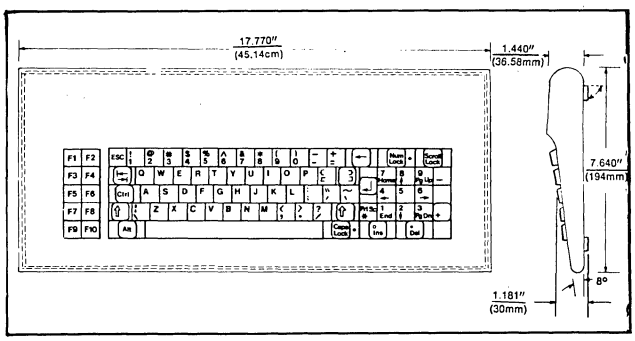
KFN3-8354

83 KEY IBM*PERSONAL COMPUTER COMPATIBLE KEYBOARD IN A 30mm DIN ENCLOSURE



Part Number KFN3-8354
(Without housing specify **Part Number BFN3-8354)**

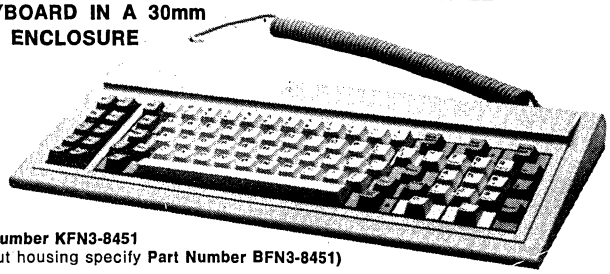
- Selectable output formats:
  1. IBM* compatible interface at 18K Baud serial output with UP/DOWN codes and special handshaking
  2. Jumpers allow conversion to ASCII with TTL differential output. (Baud rates 300, 1200 or 9600)
- 2-shot molded keycaps with matté finish
- Full N-key rollover



- Lighted "alpha lock" and "num lock" keys
- Chassis ground.• External reset • Matching color, shielded coil cord with 5-pin circular DIN connector. • Auto-repeat
- Low profile — 30mm (1.181") from enclosure base to center point at home row keycap top
- Input Power: +5 VDC @ 250 mA typ., 360 mA max.

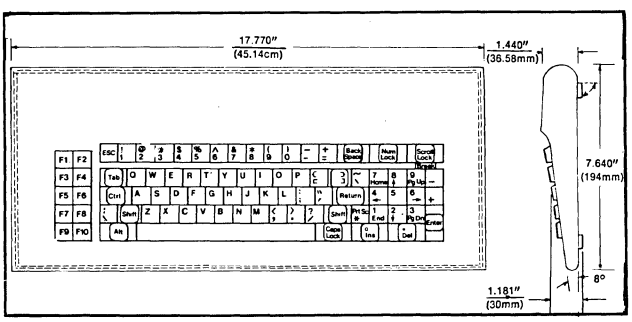
KFN3-8451

84 KEY IBM*PERSONAL COMPUTER COMPATIBLE KEYBOARD IN A 30mm DIN ENCLOSURE



Part Number KFN3-8451
(Wthout housing specify **Part Number BFN3-8451)**

- Enhanced layout (shift in proper position, horizontal return key, extra return key)
- Selectable output formats
  1. IBM* compatible interface at 18K Baud serial output with UP/DOWN codes and special handshaking
  2. ASCII jumpers allow conversion to serial with TTL differential output. (Baud rates 300, 1200 or 9600)
- 2-shot molded keycaps with matté finish



Full N-key rollover

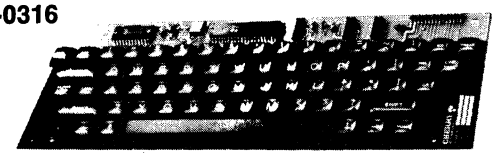
- Lighted "alpha lock" and "num lock" keys
- Chassis ground • External reset • Matching color, shielded coil cord with 5-pin circular DIN connector • Auto-repeat
- Low profile — 30mm (1.181") from enclosure base to center point at home row keycap top
- Input Power: +5 VDC @ 250 mA typ., 360 mA max.

* IBM is the registered trademark of the International Business Machines Corp.

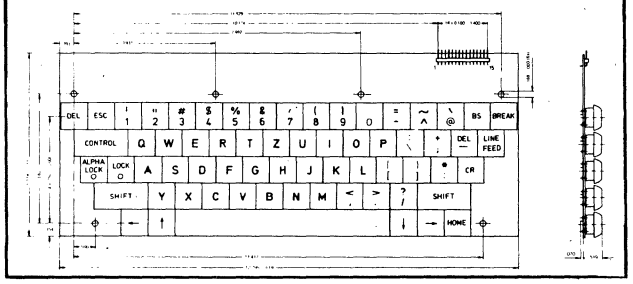
CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Keyboards

G80-0316



LEGEND FORMAT



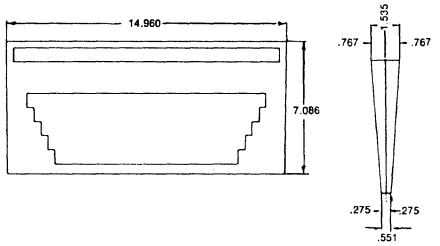
- Serial ASCII Coded • 1200 Baud • Super Low Profile
- M8 Type Key Module
- DIN Compatible • Gold wire crossbar contacts
- 65 key array • 3 Modes
- Electronic Shift/Lock function and Alpha/Lock function with LED signal
- Automatic Power On/Reset function
- Power requirement: +5V/100 mA
- Negative logic Data output with open collectors or Tri-State (optional)
- Attractive brown keycaps with contrasting legends

MECHANICAL SPECIFICATIONS

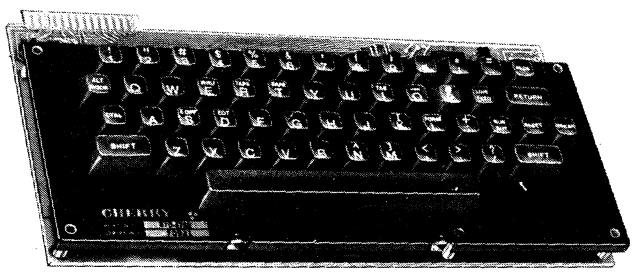
Rest Height Uncovered (spherical) — .426″ ±.015″ (11.68 ±0.38 mm)
Total Travel — .100 Nom. (2.54 mm)
Operating Force — 2½ oz. typical (70 grams)
Life — 20 x 10^6
Feel — Linear — positive stop

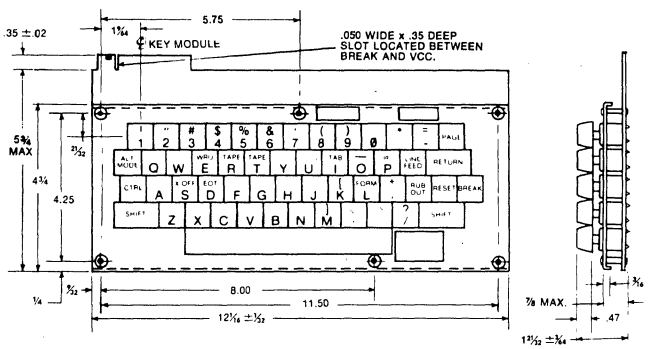
OPTIONAL G99-0056 HOUSING

- Modern Design
- Compatible with DIN requirements
- Attractive brown/beige color



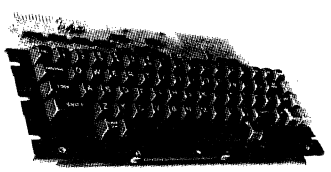
B 70-4753 KEYBOARD FOR TELETYPEWRITERS

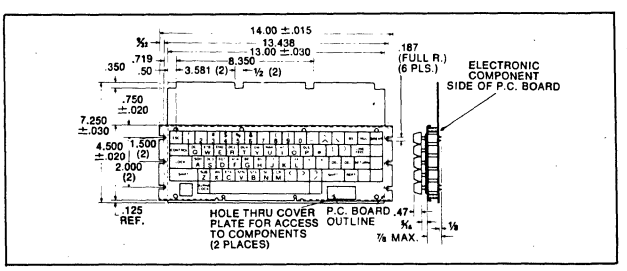




- 53 keymodules • Key Module Layout according to ASR 33
- 4 Modes (Alpha-Field only letters) • ASCII code

B 70-05AB UNIVERSAL-KEYBOARD WITH ALPHA-LOCK

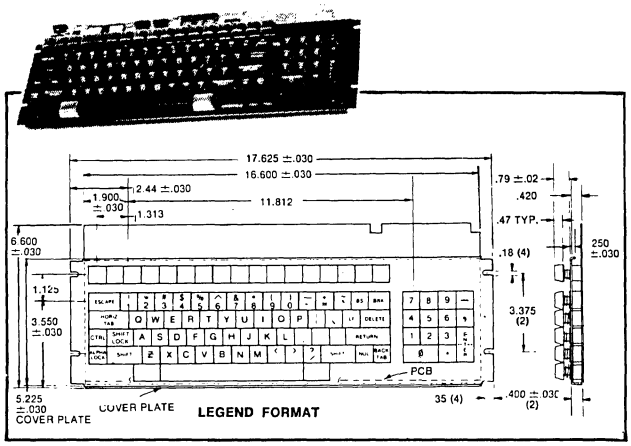




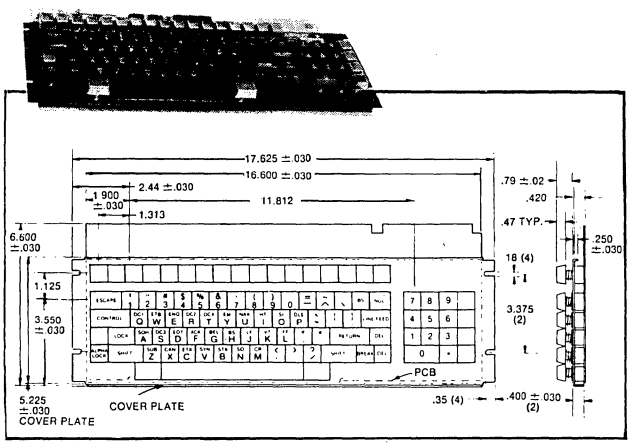
- Full 67 key array
- Five user-definable spare keys with keycaps that have "quick change" clear plastic tops. These keyswitches are not connected electrically, but can be conveniently hard-wired to output any code.
- TTL and DTL compatible output circuitry.
- Only one power supply voltage required: +5 volts at 325 ma. max.
- Positive logic with outputs resting low.
- Four mode keyboard offers (1) lower case mode, (2) upper case mode, (3) control case mode and (4) teletypewriter alpha lock configuration (alpha lock depressed).

CHERRY Keyboards

B4VE-9501 SECRETARIAL



B4VE-9601 COMMUNICATIONS

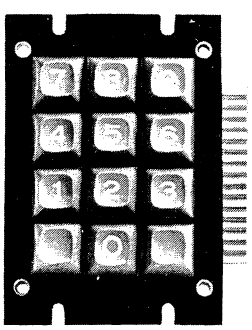


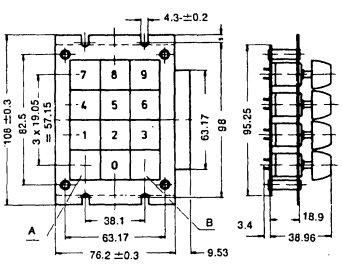
CHERRY SOLID STATE KEYBOARDS

The B4VE-9501 and B4VE-9601 keyboards are comprised of 95 and 96 capacitive encoded keys respectively. Both include the full ASCII alphanumeric typing array, a right hand pad, and a top row of 17 keys with re-legendable caps. Both have two user labeled keys on either side of the space bar. The B4VE-9501 has a 14 key auxiliary right hand numeric pad and the B4VE-9601 has a 15 key right hand numeric pad of which four are user labeled.

KEYPADS

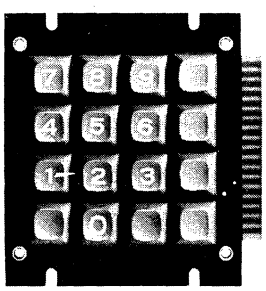
B65-1712 3 x 4

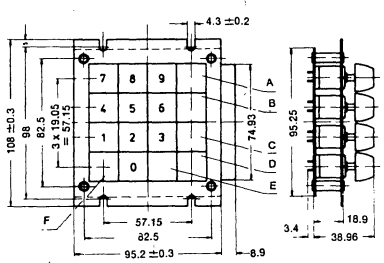




B 65-1712 (M6 TYPE)
12 Keymodules
Standard keycap-color: grey
Non-encoded

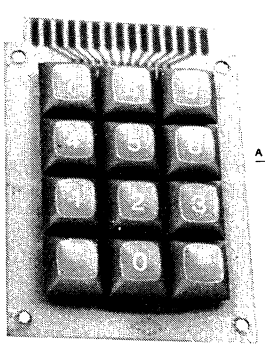
B65-1716 4 x 4

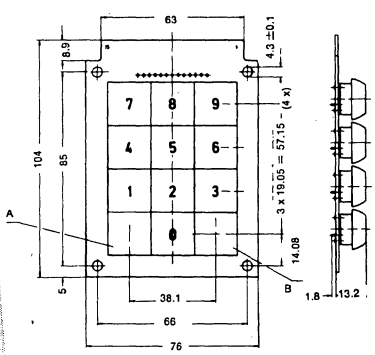




B65-1716 (M6 TYPE)
16 Keymodules
Non-encoded

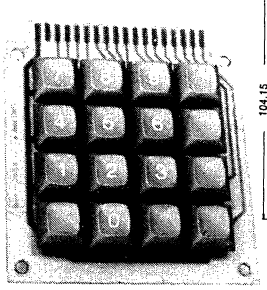
G80-0077 3 x 4

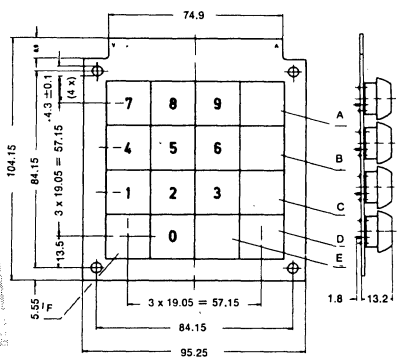




Super Low Profile M8 Type
Keypad of 12 Keymodules
Non-encoded

G80-0084 4 x 4

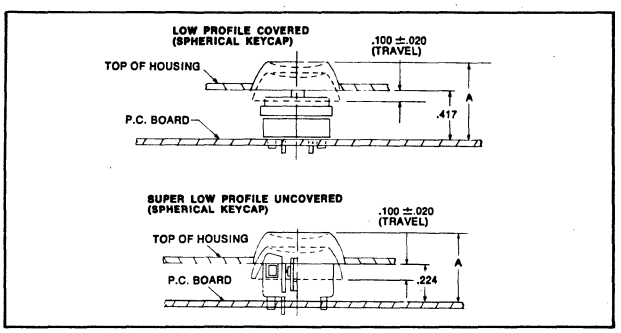




Super Low Profile M8 Type
Keypad of 16 Keymodules
Non-encoded

CHERRY Keyboard Switches

M8 SERIES — SUPER LOW PROFILE DIN-COMPATIBLE GOLD CROSSPOINT CONTACT



Super low profile technology is available in individual keymodules or as complete keyboards. Keymodules are offered in covered or uncovered version with spherical caps and covered version with cylindrical sculptured caps.

- Super low profile from P.C. board to center point of home row keycap top—
  .426″ uncovered spherical keycap
  .619″ covered spherical keycap
- Linear feel with positive stop
- New ergonomic cylindrical button set
- Gold Crosspoint Contact switching

SUPER LOW PROFILE M8 MODULES

Part Number	Description
M81A-0100	Standard Force, Uncovered, Very Low Profile.
M81A-01R0	Standard Force, Uncovered, Very Low Profile, Red LED.
M81G-0100	Higher Force, Uncovered, Very Low Profile.
M81E-0500	Standard Force With Cover.
M81E-05R0	Standard Force With Cover With Red LED.
M81H-0500	Higher Force With Cover.

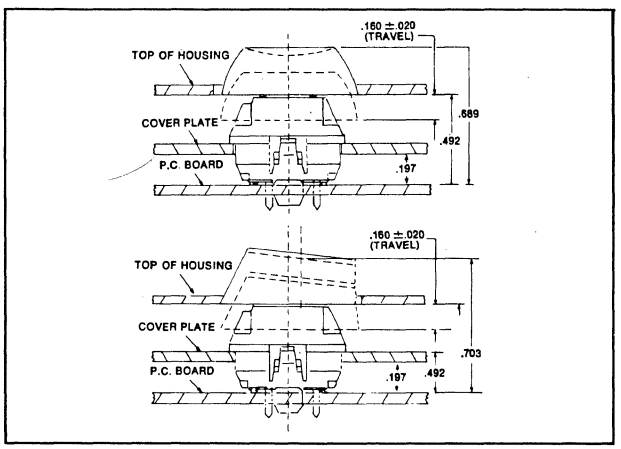
MECHANICAL SPECIFICATIONS

Rest Height (A)	.426″ ±.015″ (10.82 ±0.38mm) — Type I
Pretravel	.063″ ±.024″ (1.60 ±0.61mm)
Total Travel	.100 Nom. (2.54mm)
Operating Force	2½ oz. typical (70 grams)
Life	10 x 10^6
Mounting	Printed Circuit Board (no coverplate)
Feel	Linear — positive stop

ELECTRICAL SPECIFICATIONS

Contact Rating:	
DC Resistive	3W max.
AC Resistive	3 VA max.
Current switching	0.125A max.
Current carry	0.5 max.
Voltage	28V max.
Initial Contact Resistance — milliohms	200 max. (typically 25m)

MX SERIES — LOW PROFILE DIN-COMPATIBLE GOLD CROSSPOINT CONTACT



- Low profile — .689″ from PC board to the center point of home row keycap top with lo-pro spherical cylindrical sculptured keycaps.
- Linear or tactile feel — positve stop.
- Full Travel — .160″.

LOW PROFILE MX MODULES

Part Number	Description
MX1A-11NN	Standard Force, Linear, Face Plate Mount.
MX1A-21NN	Higher Force, Linear, Face Plate Mount.
MX1A-11NW	Standard Force, Linear, PCB Mount.
MX1A-21NW	Hgher Force, Linear, PCB Mount.
MX1A-A1NN	Standard Force, Tactile, Face Plate Mount.
MX1A-B1NN	Higher Force, Tactile, Face Plate Mount.
MX1A-A1NW	Standard Force, Tactile, PCB Mount.
MX1A-B1NW	Higher Force, Tactile, PCB Mount.
MX1A-31NN	Alternate Action, Face Plate Mount.
MX1A-31NW	Alternate Action, PCB Mount.

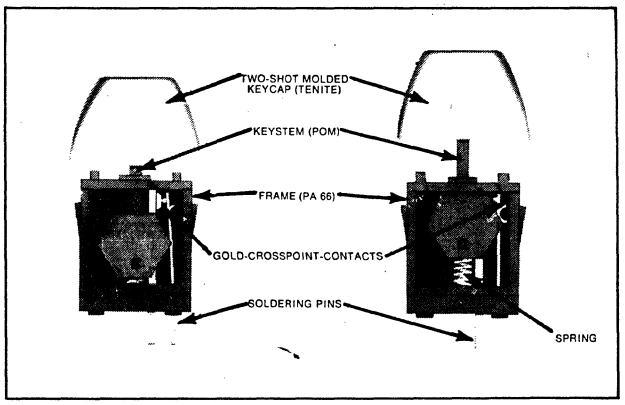
MECHANICAL SPECIFICATIONS

Rest Height ("A")	.689″ ±.015″ (17.5 ±0.38 mm)
Pretravel	.080″ ±.025″ (2.03 ±0.64 mm)
Total Travel	.160″ Nom. (4.06 mm)
Operating Force	2.5 oz. typical (70 grams)
Life	20 x 10^6
Mounting	Cover Plate
Feel	Linear or tactile feel — positive stop

ELECTRICAL SPECIFICATIONS

Contact Ratng:	
DC Resistive	3W max.
AC Resistive	3 VA max.
Current switching	0.125A max.
Current carry	0.5A max.
Voltage	28V max.
Initial Contact Resistance — milliohms	200 max. (typically 25m)

M4/M5/M6 SERIES — REGULAR PROFILE GOLD CROSSPOINT KEYBOARD SWITCHES



The proven design concept — crossed knife edge contact configuration — provides high force per unit of contact area and virtually eliminates contact closure interference by contaminates. Precious metal contact material (W/E Alloy #1) consists of 69% gold, 25% silver and 6% platinum. Contact interfaces are inert to chemical action with resultant low contact resistance (typically 25 milliohms).

REGULAR PROFILE KEYSWITCH

Part Number	Operating Force	Stem Angle	Action
M41-0100	6 oz.	0°	Momentary, Lighted, 1A Contact
M41-0103	2½ oz.	0°	Momentary, Lighted, 1A Contact
M51-0182	2½ oz.	10°	Momentary, 1A Contact
M51-0143	6 oz.	0°	Momentary, 1A Contact
M51-0229	4 oz.	0°	Momentary, 1A Contact
M61-0120*	2½ oz.	0°	Momentary, 1A Contact
M61-0800	2-4½ oz.	0°	Alternate Action, 1A Contact
M62-0100	2-4½ oz.	0°	Momentary, 2A Contact

* Replaces M61-0100

MECHANICAL SPECIFICATIONS

Operating Force	2½ oz. ±½ oz. Std. (Also available in forces from 2 oz. and higher)
Pretravel	.085 ±.030 Std. (Alternate action version pretravel .030″ to .065″)
Total Travel	.160 ±.020 Std.
Key Module Case Material:	Thermoplastic (Nylon)
Temperature	Operating — 0°/60°C Storage — −35°C/65°C

ELECTRICAL SPECIFICATIONS

Contact Rating (Form A contacts)	
DC Resistive	3W max.
AC Resistive	3 VA max.
Current	0.125 amp. max. switching 0.5 amp. max. carry
Voltage	28V max.
Initial Contact Resistance	200 milliohms max. (typically 24 milliohms)

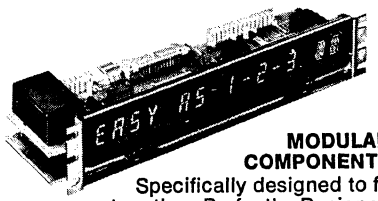
CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Displays

TECHNICAL INFORMATION

- 100,000 hour display life. • Wide viewing angle.
- Baud rates from 300 to 9600 selectable on back panel.
- RS232C, RS422, 20 ma loop, or TTL parallel interface operation.
- End of Line Modes — left entry with automatic carriage return; writeover carriage return, horizontal scroll.
- Self-test mode: ASCII character set scrolled across panel.
- Environmental Operating Range: 0-70°C, 5-95% relative humidity (non-condensing).
- Designed to meet NEMA Pub. ICS 2-230 standard for EMI noise immunity (showering arc transients).
- Metal enclosure wth sealed bezel compatible with NEMA 12 standards.
- 115/220 VAC • Full address capability

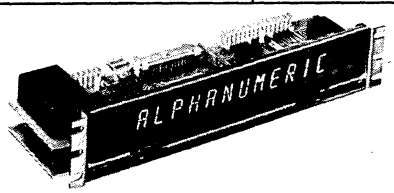
ALPHANUMERIC DISPLAY SYSTEMS



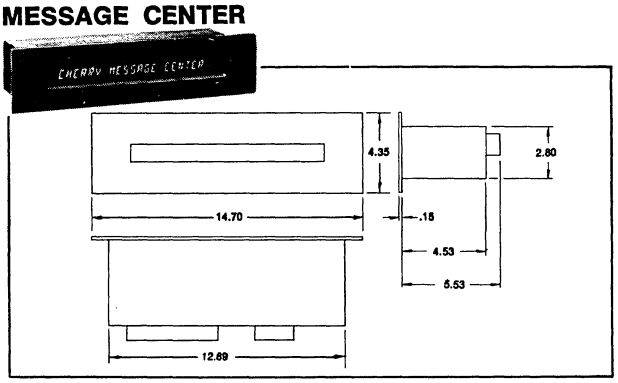
MODULAR COMPONENTS
Specifically designed to fit together. Perfectly. Designed so you can use each module alone . . . or put them all together.

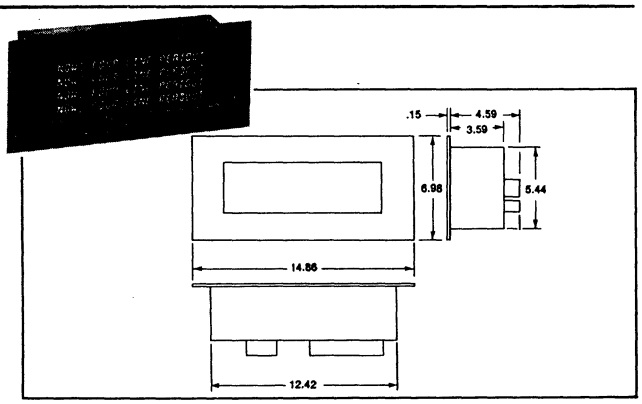
24 CHARACTER ALPHANUMERIC DISPLAY MODULE
A totally self-contained system. Complete microprocessor controlled circuitry includes drivers, character generator, refresh memory and provides all standard functions.

Result	Characteristics
W424-1051 . . . requires 12 VDC only and accepts parallel or serial input — serial in either RS232 or 20 ma current loop. Selectable baud rates.	Receives only, in parallel or serial.
W424-1053 . . . requires 12 VDC only and accepts parallel or serial input (RS232 or 20 ma current loop.) Selectable baud rates. Fully interactive with half and full duplex operation capability.	Receives in parallel or serial. Sends in serial only.
W424-1058 . . . requires 12 VDC only and accepts binary input, 6 bits and strobe.	Will output a total of 64 messages, each being as long as 32 bytes. User can program his own message EPROM (2716). Requires no ASCII code or serial input.



MESSAGE CENTER





- 24 Characters • Alphanumeric
- Receives serial or parallel ASCII output.
- Microprocessor Controlled

W424-105B — It displays up to 24 character messages in large half-inch bright orange neon 14 segment characters.

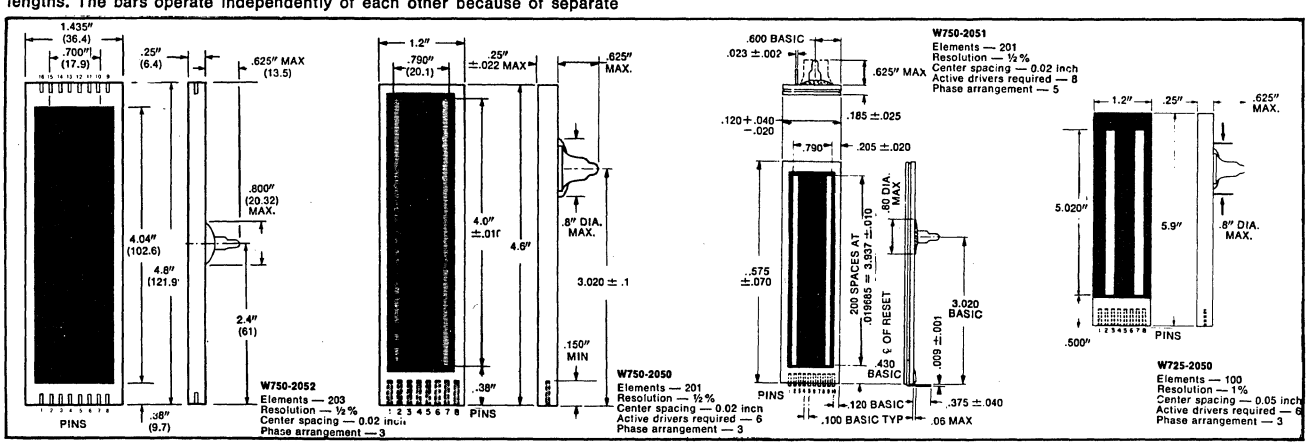
W424-105D — It can display up to 256 messages that have been stored in a nonvolatile, battery backed CMOS RAM.

W424-4040 — On a 4-line by 24 character display, the W424-4040 can show any of the 256 messages stored in the battery backed CMOS RAM memory. Each message may be up to 32 characters in length.

GAS DISCHARGE BAR GRAPH DISPLAY

The single wide bar graph is 10 inches long and is viewable at 50 feet. The elements are bussed together in a 5-phase arrangement for high brightness and provide for a flicker-free continuous appearing display.

Two separate graphs give continuous glow on precisely controlled bar lengths. The bars operate independently of each other because of separate connections. Each bar graph can be viewed from both directions at once, or from either direction. Two separate pieces of information can be viewed in each bar as long as the total elements do not exceed 201. Cathodes in each bar are bussed together in a 3-phase arrangement.

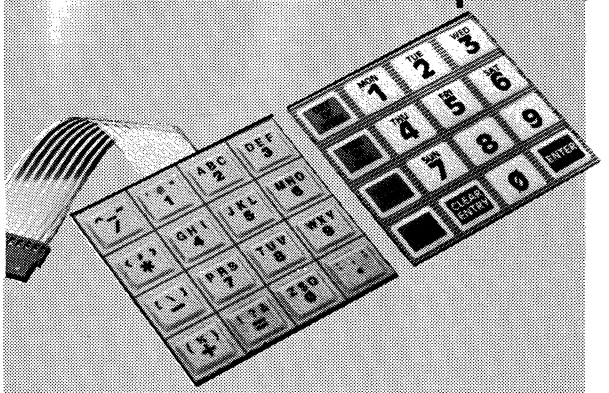


CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

FLEX-KEY

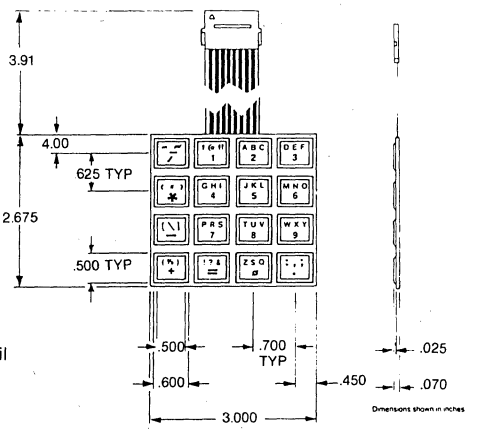
FLEX-KEY EAST, 18 Sargent Street, Gloucester, MA 01930 (617) 281-2040 • FLEX-KEY WEST, P .O. Box 700, Chandler, AZ 85224 (602) 963-4584

Standard Low Profile Touch Panels with Tactile Snap Action

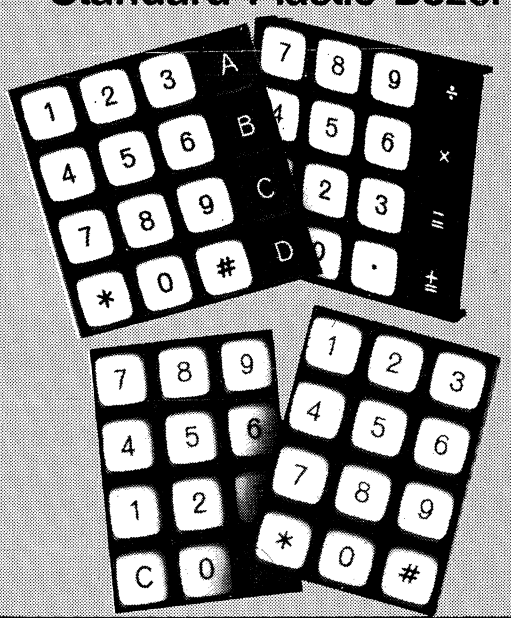


Customizing options include:

- special legends
- special circuits
- EMI/ RFI shielding
- static discharge protection.
- choice of colors
- choice of connectors
- interconnection tail length
- overlay size and shape



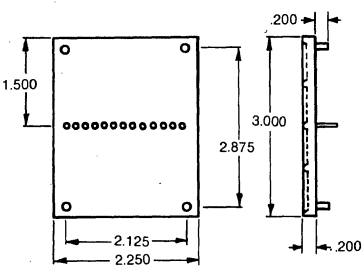
Standard Plastic Bezel Keyboards



Customizing options on Flex-Key's plastic bezel keyboards include:

- key size, shape and arrangement
- legend and background colors
- terminal type and location
- switch matrices

12 KEY KEYBOARDS

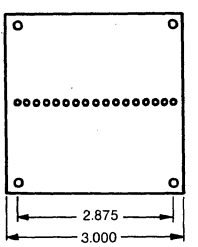


12DK-1B 12DK-2B

12DK-1B: FORM A SWITCHES, TERMINAL SEQUENCE: Com, 6, 3, 9, ., 8, 5, 2, 0, C, 7, 1, 4

12DK-2B: FORM A SWITCHES, TERMINAL SEQUENCE: Com, 6, 9, 3, #, 2, 5, 8, 0, *, 1, 7, 4

16 KEY KEYBOARDS



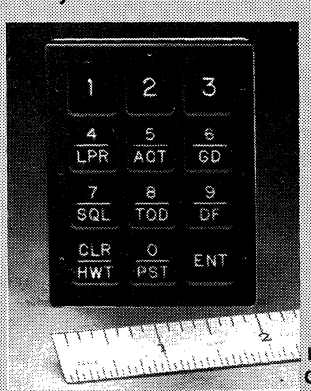
16DK-1B 16DK-2B

16DK-1B: FORM A SWITCHES, TERMINAL SEQUENCE: Com, X, =, ÷, ±, 9, 6, 3, *, 8, 2, 5, 0, C, 7, 1, 4

16DK-2B:FORM A SWITCHES, TERMINAL SEQUENCE: Com, B, C, A, D, 3, 6, 9, #, 2, 8, 5, 0, *, 1, 7, 4

Custom Backlighted Keyboards for Hostile Environments

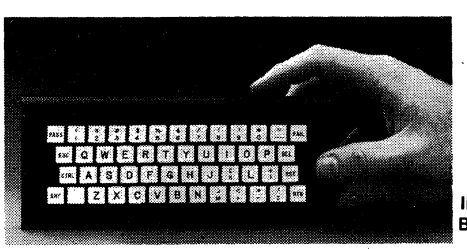
Flex-Key offers advanced electroluminescent (EL) backlighting in custom keyboard assemblies.



ILLUMINATED CHARACTERS

Low profile backlighted keyboards have custom options available including:

- special legends
- special circuits
- EMI/ RFI shielding
- static discharge protection.
- tempest protection
- encoding
- choice of colors

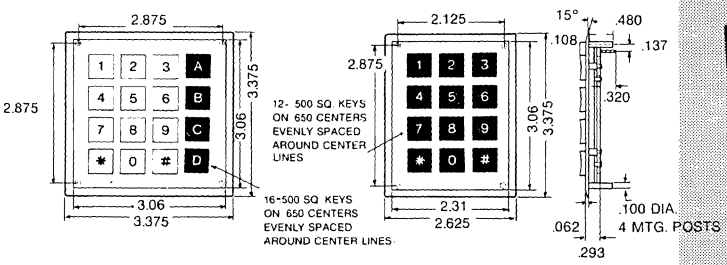


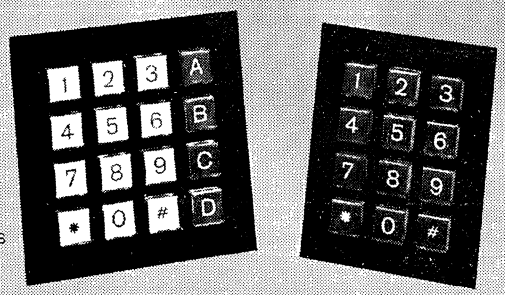
ILLUMINATED BACKGROUND

FLEX-KEY

A Division of Rogers Corp.

Standard Medium Travel Keyboards with Clear Key Caps





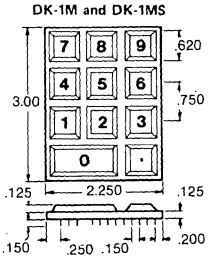
TERMINAL SEQUENCE:
12SK-72:3, 6, 9, #, 0, 8, 5, 2, *, 7, 4, 1, Com.
16SK-62:A, B, C, D, #, 9, 3, 6, 0, 8, 5, 2, *, 7, 4, 1, Com.

Standard Rubber Covered Keyboards

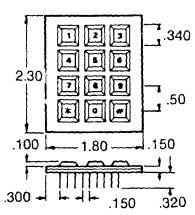
Customizing options include:

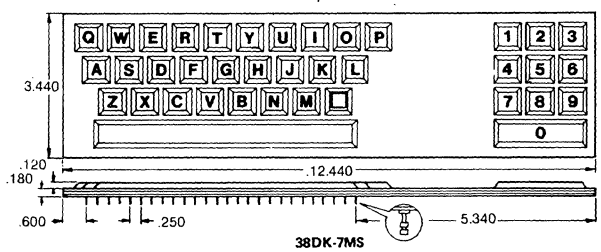
- number of keys
- key and key legend colors
- key spacing
- special matrix
- termination

DK-1M and DK-1MS

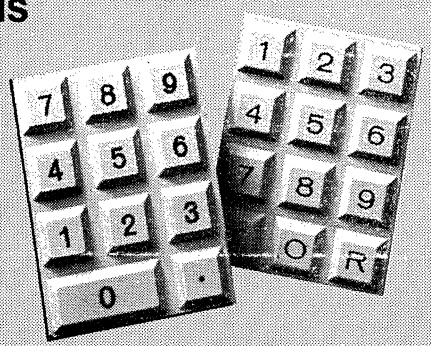


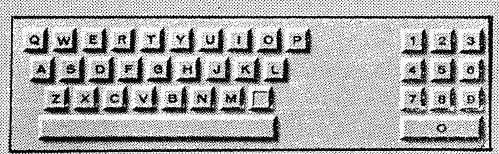
12DK-5M





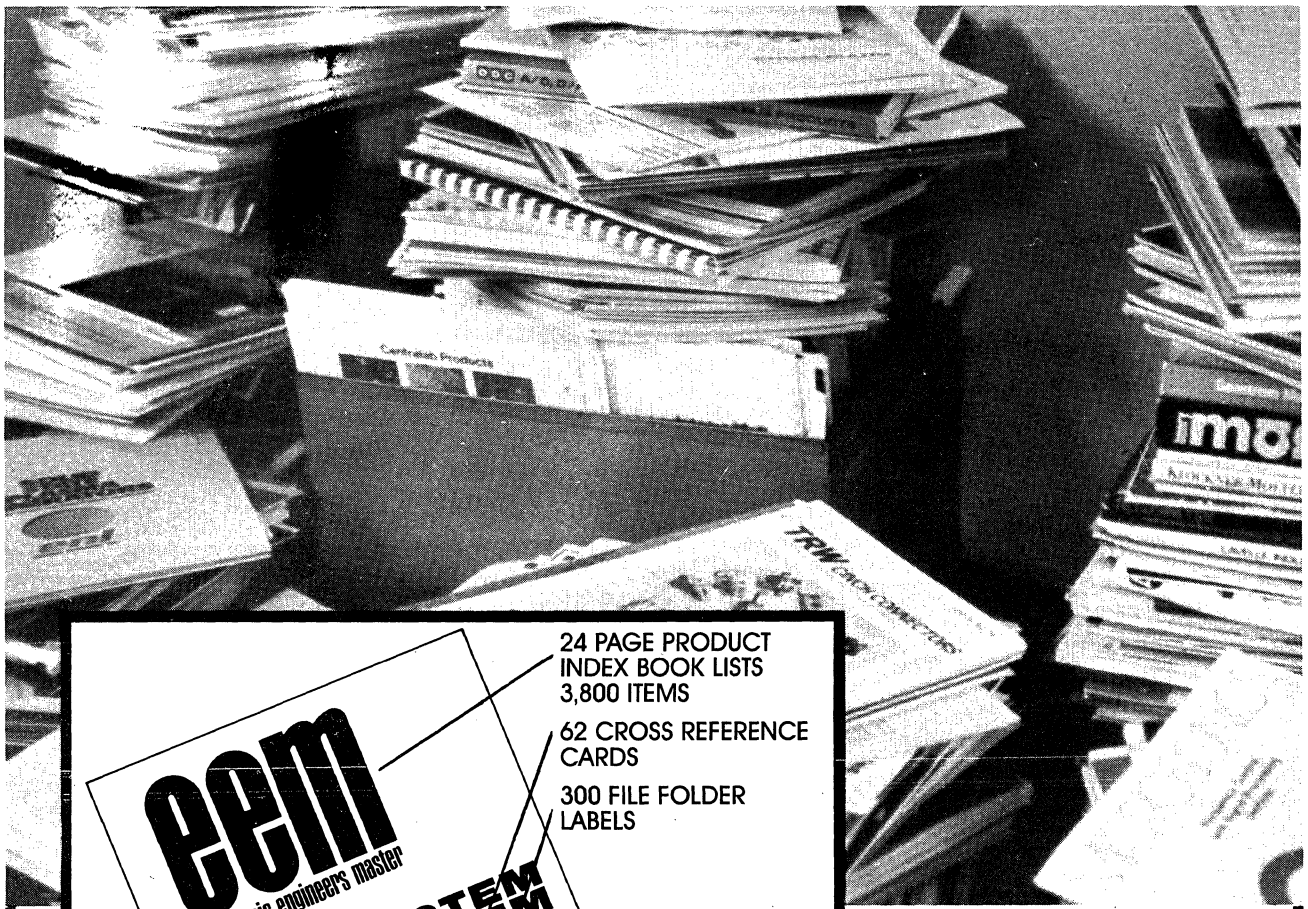
38DK-7MS

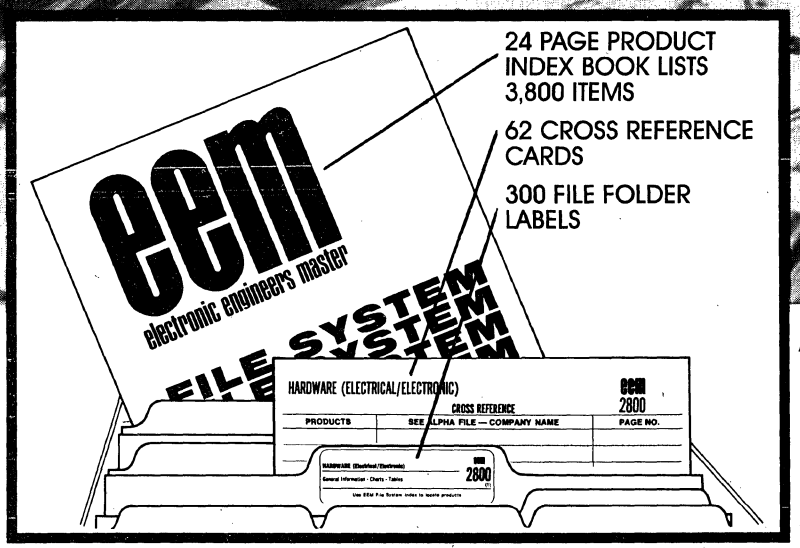




Militarized Full Travel Keyboards

These rugged custom units meet military requirements for vibration, shock, fungus, water, dust, salt spray,EMI/ RFI, thermal, blast, EMP, high/low temperature, and key cycle life. Full tempest shielding is available.
Flex-Key engineers its militarized full-travel keyboards for optimum reliability and continuous operation while meeting all human factor requirements. These conductive elastomer keyboard assemblies provide command, control, communications, and data entry functions and have proven themselves in many demanding applications.





24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS

62 CROSS REFERENCE CARDS

300 FILE FOLDER LABELS

ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

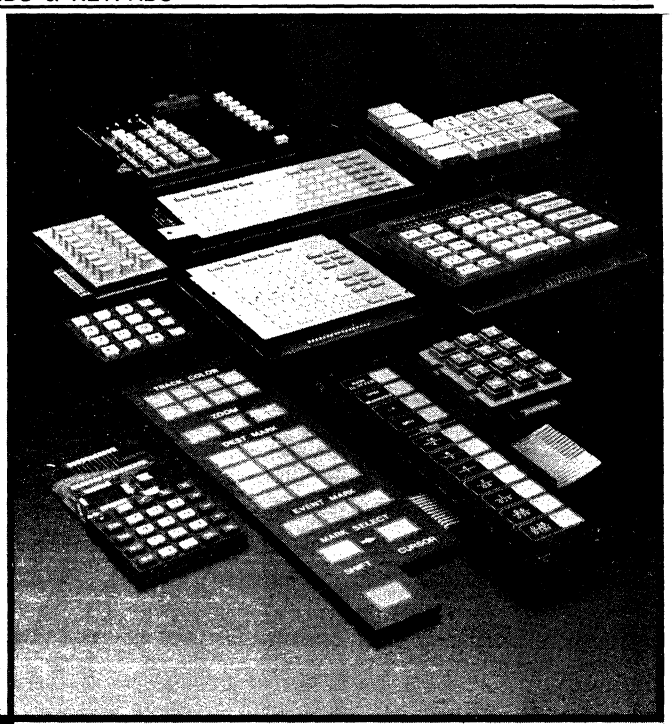
There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

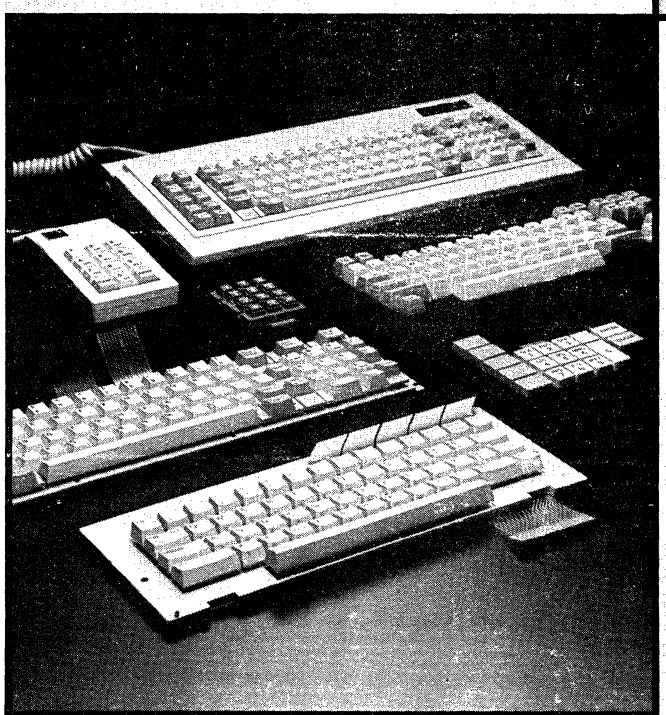
The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

CUSTOM KEYBOARDS & KEYPADS from FCI





FCI offers a complete line of low cost keyboards and keypads . . .

- custom or standard
- with or without frame housing
- contacts: conductive rubber, mechanical and membrane types
- low profile
- lightweight
- high performance
- versatile
- high reliability
- applications: computer, telephones, electronic scales, printing calculators, electronic typewriters and copy machines
- superior quality
- excellent delivery.

By utilizing the latest in keyboard and keypad technology, our engineering staff can design your next project to meet all of your specifications. Give FCI a call today!

FCI Frederick Components International

A Corton Group Member

20806 Plummer Street
Chatsworth, California 91311
(818) 882-0868

Toll Free
Outside California
(800) 354-0660

Grayhill INC.

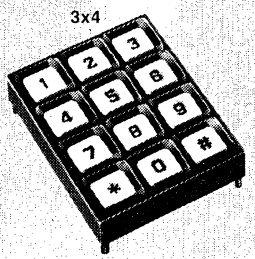
12, 16, and 20 Button Keyboards

Series 83

1/2" Button Centers—Post Mount

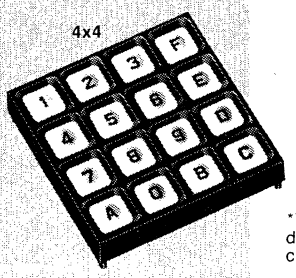
Circuitry: 2 Out Of 7 (8); Matrix; or Single Pole/Common Bus *

3x4

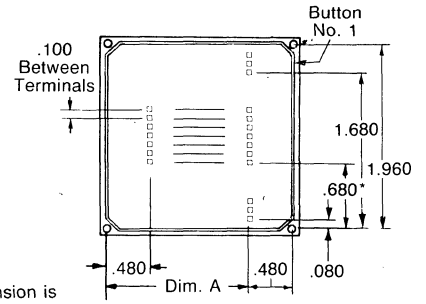


1.58" x 2.08"

4x4



2.08" sq.



*This dimension is dependent on circuitry code.

Height above board = .350"

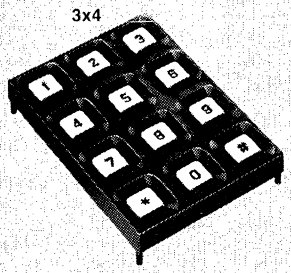
Dim.	3x4	4x4
A	.980	1.480

Series 84

3/4" Button Centers—Post Mount

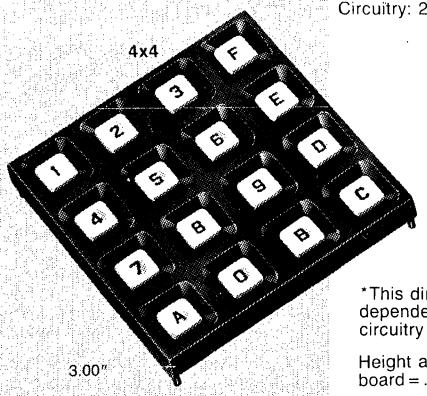
Circuitry: 2 Out Of 7 (8); Matrix; or Single Pole/Common Bus *

3x4

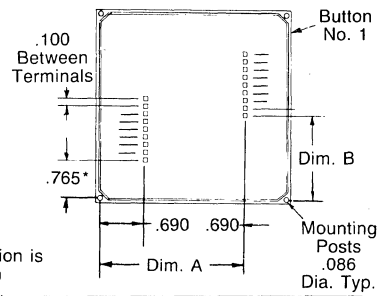


2.25" x 3.00"

4x4



3.00"



*This dimension is dependent on circuitry code.

Height above board = .350"

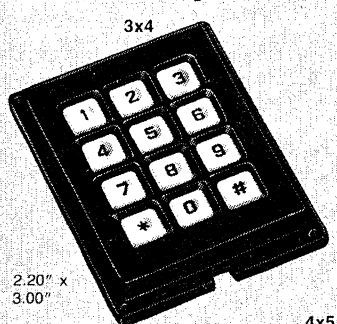
Dim.	3x4	4x4
A	1.438	2.190
B	1.513	1.313

Series 86

1/2" Button Centers—Flange Mount

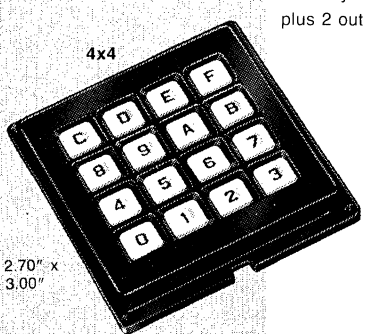
Circuitry: Matrix or Single Pole/Common Bus in all formats; plus 2 out of 7 (in 3x4), and 2 out of 8 (in 4x4) *

3x4



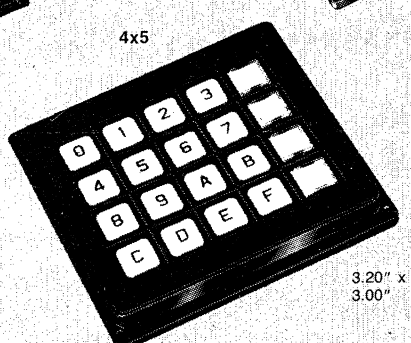
2.20" x 3.00"

4x4

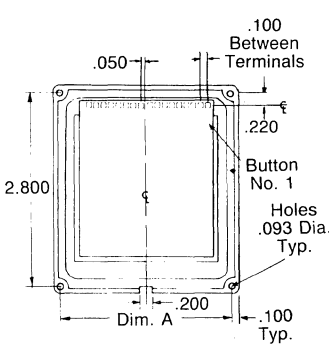


2.70" x 3.00"

4x5



3.20" x 3.00"



For legend number -202, terminal pins are located along the "3, 7, B, F" edge

Height above board = .360"

Dim.	3x4	4x4	4x5
A	2.000	2.500	3.000

* Views show maximum terminals (SP/Common Bus) in the 4x4 format; for other circuitry, see GRAYHILL Catalog Number One.

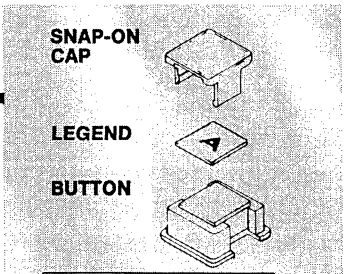
Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

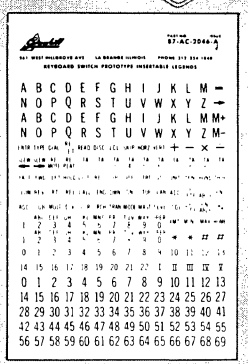
Legends, Specifications, Prices

Standard Legends

All legended buttons shown here are two-shot molded. Blank areas are self-legend style buttons with snap-on caps as shown at right. The legend card with adhesive backed, printed inserts has additional blank inserts for dry transfer lettering. Inserts are 0.275" square. Snap-on cap projects 0.015" above keyboard.

Special—contact GRAYHILL.





PART NO. 87AC2046

—001

—002

0	1	2	3
4	5	6	7
8	9	A	B
C	D	E	F

—003

C	D	E	F
8	9	A	B
4	5	6	7
0	1	2	3

—004

1	2	3	C
4	5	6	D
7	8	9	E
A	0	B	F

—005

1	2	3	F
4	5	6	E
7	8	9	D
A	0	B	C

—006

1	ABC 2	DEF 3	A
GHI 4	JKL 5	MNO 6	B
PRS 7	TUV 8	WXY 9	C
*	OPER 0	#	D

—101

—102

1	2	3
4	5	6
7	8	9
*	0	#

—103

1	ABC 2	DEF 3
GHI 4	JKL 5	MNO 6
PRS 7	TUV 8	WXY 9
*	OPER 0	#

—201

—202

0	1	2	3
4	5	6	7
8	9	A	B
C	D	E	F

—203

0	1	2	3
4	5	6	7
8	9	A	B
C	D	E	F

Specifications

Rating Criteria

Rating At 24 VDC: 10 milliamps, resistive.

Contact Resistance: Compatible with MOS, TTL and DTL

Voltage Breakdown: 250 VAC between mutually insulated parts.

Life Expectancy: 3,000,000 operations per button.

Contact Bounce: Less than 4 milliseconds at make, 10 milliseconds at break.

Operating Temperature: -40°C to +80°C.

Materials and Finishes

Housing: ABS Plastic (Black).

Button: ABS Plastic (White with Molded-in Black Legend; White Self-Legend Style.

Snap-On-Cap: Clear Polycarbonate.

Terminals: Copper Alloy, CDA No. 725.

Operating Features

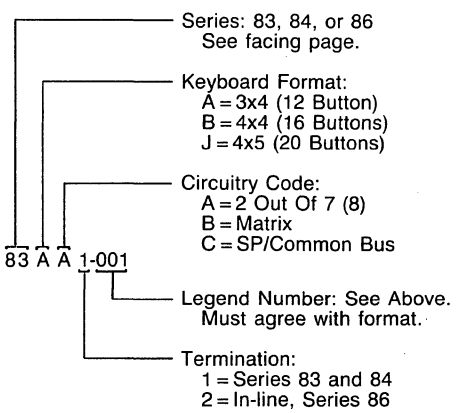
Button Travel: 0.015" nominal total travel.

Typical Operating Force: 350 grams.

Note:

The 2 out of 7 (8) "Telephone Code" was developed primarily for audio tone generation. To discuss critical data input applications, please contact Grayhill.

Ordering Information and Prices



Number of Buttons	Partial Part Number	Circuitry Code	Quantity 1-49	50-99	100-499
12	83AA1-	2 of 7	$10.60	$9.01	$7.95
	83AB1-	Matrix	9.54	8.11	7.16
	83AC1-	SP/Common	10.07	8.56	7.55
	84AA1-	2 of 7	11.66	9.91	8.75
	84AB1-	Matrix	10.60	9.01	7.95
	84AC1-	SP/Common	11.13	9.46	8.35
	86AA2-	2 of 7	10.60	9.01	7.95
	86AB2-	Matrix	9.54	8.11	7.16
	86AC2-	SP/Common	10.07	8.56	7.55
16	83BA1-	2 of 8	11.66	9.91	8.75
	83BB1-	Matrix	10.60	9.01	7.95
	83BC1-	SP/Common	11.13	9.46	8.35
	84BA1-	2 of 8	13.25	11.26	9.94
	84BB1-	Matrix	11.13	9.46	8.35
	84BC1-	SP/Common	12.19	10.36	9.14
	86BA2-	2 of 8	11.66	9.91	8.75
	86BB2-	Matrix	10.60	9.01	7.95
	86BC2-	SP/Common	11.13	9.46	8.35
20	86JB2-	Matrix	12.50	10.63	9.38
	86JC2-	SP/Common	13.25	11.26	9.94
Insertable Legend Card, Part No. 87AC2046			1.06	.90	.80
Dry Transfer—Small, Part No. 87-DT-2096-088			2.00	1.70	1.50
Dry Transfer—Medium, Part No. 87-DT-2096-125			2.00	1.70	1.50
Dry Transfer—Large, Part No. 87-DT-2096-187			2.00	1.70	1.50

Discount Schedule

1-49 . . . . . Unit Price 500-999 . . . . Less 36%
50-99 . . . . . Less 15% 1000 UP
100-499 . . . . Less 25%

Contact your local Distributor or Grayhill

Available Locally Through Your Grayhill Distributor

Grayhill INC.

Sealed And Lighted Keyboards

1/2 Inch Button Centers— Flange Mounted Keyboards 12, 16, Or 20 Buttons

Features

- Colorful
- Sealed Contacts
- Panel Seal Option
- Lighted
- Audible Contact
- Tactile Response

Code and Truth Tables—See GRAYHILL Catalog Number One.

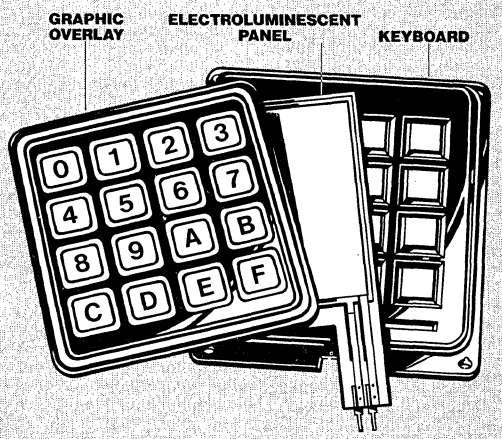
Specifications—See the Specifications listed for the Series 83, 84 and 86 Keyboards.

Dimensions

See also Series 86 on previous page.

Dim. / No. Buttons	Outside	Thru Panel	Hole Centers
12	2.20 x 3.00	1.99 x 2.69	2.00 x 2.80
16	2.70 x 3.00	2.49 x 2.69	2.50 x 2.80
20	3.20 x 3.00	2.99 x 2.69	3.00 x 2.80
All	Ht. = .360*	Corner .150R	.093 Dia.

*Height above PC Board. Height above board for flange is .128". Terminals are .025" square, .280" long, spaced on .100" center, in line across top of keyboard, .220" below center line of mounting holes.



Sealed Contact System

The snap-dome contact system is sealed by a polyester graphic overlay in the lighted, as well as unlighted, keyboards. The overlay is second surface printed and is colorful yet waterproof and washable with most cleaning solutions.

Panel Seal

Lighted as well as unlighted keyboards can be sealed to the panel using an optional panel seal gasket. A gasket is available for either topside or sub-panel mounting. The first is .094" thick and the second is .062" thick. Both are made of cellulose fiber, foam, nitrile rubber.

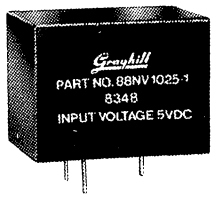
Light

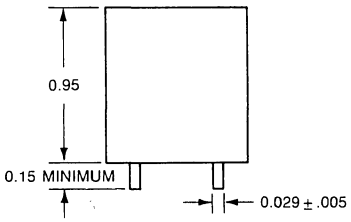
Lighted keyboards contain a thin electroluminescent panel located beneath the graphic overlay. The panel is terminated in a 3 inch flexible tail with flat solder tab pins measuring .150" x .025" x .010". The phosphor particles in the panel are excited by alternating current of sufficient voltage and frequency: approximately 130 Vac, 400-1000 Hz.

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

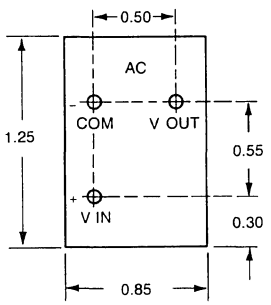
Series 88 Keyboards

DC To AC Inverters For Lighted Keyboards





To achieve the 130 Vac, 400-1000 Hz input for the electroluminescent panel using a DC source requires an inverter. It is a three terminal device: DC voltage input, AC voltage output, and common. For your convenience GRAYHILL carries small quantities of 3 inverters, designed for the 3 keyboard sizes using a 5 Vdc source. For input voltages of other than 5 Vdc or for inverter source recommendations, contact GRAYHILL.



Prices

Sealed Keyboards

To complete part number, add legend dash number.

Size	Partial Part No.	Circuitry or Description	Quantity 1-49	50-99	100-499
12	88AA2- 88AB2- 88AC2-	2 of 7 Matrix SP/Common	$10.60 10.07 10.60	$9.01 8.56 9.01	$7.95 7.55 7.95
16	88BA2- 88BB2- 88BC2-	2 of 8 Matrix SP/Common	11.93 11.66 12.46	10.14 9.91 10.59	8.95 8.75 9.35
20	88JB2- 88JC2-	Matrix SP/Common	15.25 16.00	12.96 13.60	11.44 12.00

Lighted Keyboards

To complete part number, add legend number. See margin note.

Size	Partial Part No.	Circuitry or Description	Quantity 1-49	50-99	100-499
12	88AA2-E01- 88AB2-E01- 88AC2-E01-	2 of 7 Matrix SP/Common	$24.00 23.50 24.50	$20.40 19.98 20.83	$18.00 17.63 18.38
16	88BA2-E01- 88BB2-E01- 88BC2-E01-	2 of 8 Matrix SP/Common	29.00 28.50 29.50	24.65 24.23 25.08	21.75 21.38 22.13
20	88JB2-E01- 88JC2-E01-	Matrix SP/Common	34.00 34.75	28.90 29.54	25.50 26.06

Inverters

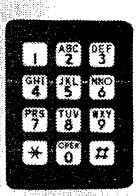
Description	Part No. (Complete)	Quantity 1-49	50-99	100-499
For 12 Button Keyboard	88NV1025-1	$21.00	$17.85	$15.75
For 16 Button Keyboard	88NV1025-2	21.00	17.85	15.75
For 20 Button Keyboard	88NV1025-3	21.00	17.85	15.75

Panel Seal Gaskets

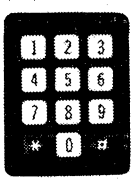
Size	Part No. (Complete)	Description	Quantity 1-49	50-99	100-499
12	88M2001-2 88M2012-1	Sub Panel Topside	$0.37	$0.31	$0.28
16	88M2009-2 88M2015-1	Sub Panel Topside	0.42 0.42	0.36 0.36	0.32 0.32
20	88M2019-1 88M2018-1	Sub Panel Topside	0.47	0.40	0.35

Prices and Discounts Subject to Change Without Notice.

STANDARD KEYBOARD LEGENDS



-143
White

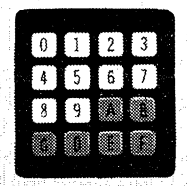


-152
Blue

-162
Orange

-172
Blue

-182
Orange

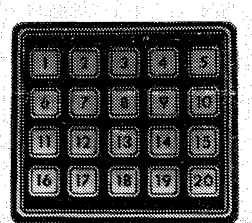


-052, (-053*)
Blue

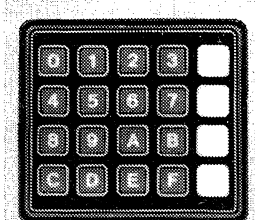
-062 (-063*)
Orange

-072
Blue

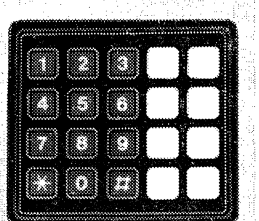
-082
Orange



-292, Silver (-293* White)



-252
Orange



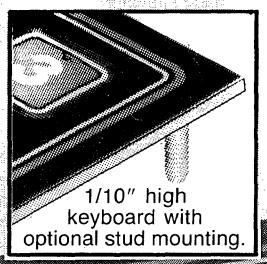
-262
Blue

*For lighted keyboards substitute -053 for -052, -063 for -062, and -293 for -292.

Available Locally Through Your Grayhill Distributor

Grayhill INC.

Low Profile Keyboards

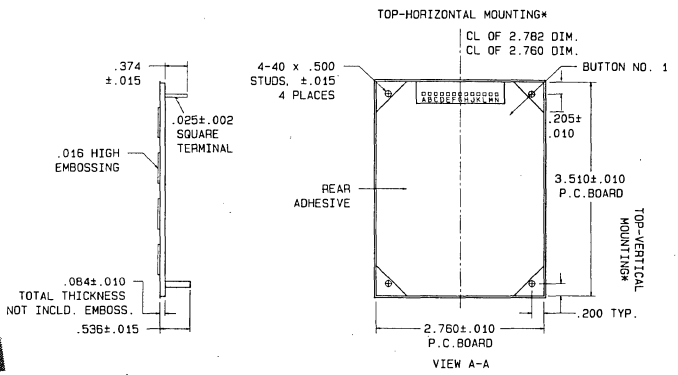

1/10″ high keyboard with optional stud mounting.

- Space-saving, low profile keyboard only 1/10″ high from the panel
- Hear and feel key actuation with snap dome contact system
- Durable, second surface printed graphic overlay resists dirt and grime, wipes clean
- Easy custom graphics available. Contact Grayhill for more information
- Choice of mounting: stud, adhesive or combination stud and adhesive

Dimensions

The charted measurements are for the graphic overlay which extends slightly over the printed circuit board. Drawings indicate dimensions for a 12-button keyboard from which dimensions for other keyboards may be derived. Terminals are on .100 inch centers in line with mounting studs.

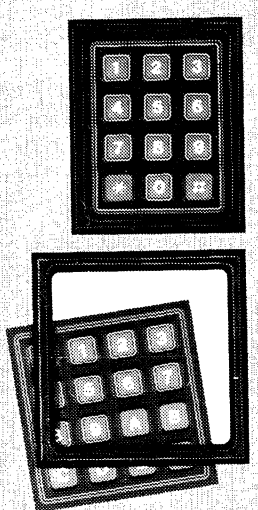
Keyboard Size	Inches Width	Inches Length
3x4 12 Button	2.782	3.532
4x4 16 Button	3.532	3.532
5x4 20 Button	4.282	3.532



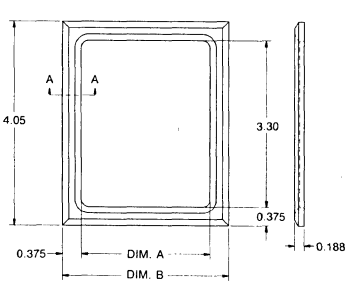
*When ordering custom legends, specify "Horizontal Mounting" or "Vertical Mounting" of legends with respect to the line of terminals.

Accent Thin Series 89 Keyboards With Beveled Keyboard Frames

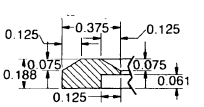
Make thin keyboards stand out with black matte finish frames. Beveled, .188″ thick frames with permanent self-adhesive strip fit over Series 89 3x4, 4x4 and 5x4 keyboards. Just peel off adhesive backing strip and apply frame over keyboard.



Front View



Cross Section A-A



For Keyboard Size	Dim. A	Dim. B	Frame Part No.
12 Button	2.55	3.30	89ZZ3001
16 Button	3.30	4.05	89ZZ3002
20 Button	4.05	4.80	89ZZ3003

Series 89

Graphic Overlay Characteristics

The graphic overlay has a second surface printed legend for maximum protection and is made of a polyester material to withstand high humidity and resist solvents. Fingernails, wiping cloths and cleaning materials won't dull, scratch or mar the tough overlay surface.

Solvent Resistance: The graphic overlay is resistant to attack from the following substances: water; petroleum oil; alcohols; aliphatic hydrocarbons; 5% acetic acid; 5% citric acid; 2% detergent solution; soapy water; 30% hydrogen peroxide; wine; beer; whiskey; coffee; cocoa; milk; tomato juice; lemon juice; and other materials of similar nature.

Although the overlay may not be affected by hydrocarbons, ketones, and freon, it is not recommended that keyboards be immersed or subjected to prolonged contact with these solvents. Depending on how the keyboard is mounted, extensive contact by these chemicals with the edges of the keyboard may affect the adhesive beneath the overlay.

Graphics: The graphic legend is applied by a printing process which makes custom legends and color combinations an easy option. Contact Grayhill for more information.

Specifications

Rating Criteria

Rating At 24 VDC: 10 milliamps, resistive.
Contact Resistance: Compatible with MOS, CMOS,TTL and DTL.
Voltage Breakdown: 250 VAC between mutually insulated parts.
Life Expectancy: 3,000,000 operations per button.
Contact Bounce: Less than 4 milliseconds at make, 10 milliseconds at break.
Operating Temperature: −40°C to +80°C.

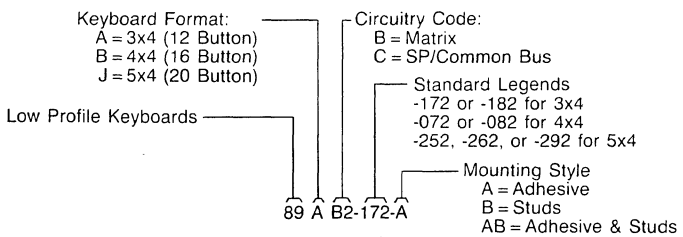
Materials and Finishes

Base (PC Board): FR-4 glass epoxy.
Graphic Overlay: Polyester.
Spacer (beneath overlay): Polyester.
Terminal Pins: Copper alloy, CDA No. 725.
Adhesive Mounting Sheet: 3 mil Polyester, coated on 2 sides with acrylic adhesive.
Mounting Studs: Phosphor Bronze, Tin plated.

Operating Features

Button Travel: 0.015″ nominal total travel.
Typical Operating Force: 260 grams nominal.

Ordering Information



Sample part number orders a 12 button, low profile, adhesive mount keyboard with matrix circuitry, and blue buttons with white telephone legend.

Keyboard Prices

To complete the part number, add appropriate legend dash number and the dash and character(s) for the mounting.

Button No.	Circuitry	Partial Part No.	*Unit Price
12	Matrix	89AB2-	$15.00
	SP/Common	89AC2-	16.00
16	Matrix	89BB2-	18.50
	SP/Common	89BC2-	19.50
20	Matrix	89JB2-	21.00
	SP/Common	89JC2-	22.50

*Unit price for adhesive or stud mount. For combination adhesive/stud mounting, indicated by suffix "AB", add $1.25 to unit price and discount accordingly.

Frame Prices

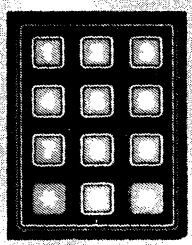
Description	Part Number	Unit Price
For 12 Button Keyboard	89ZZ3001	$1.50
For 16 Button Keyboard	89ZZ3002	
For 20 Button Keyboard	89ZZ3003	

Keyboards can also be purchased with frames assembled, contact Grayhill.

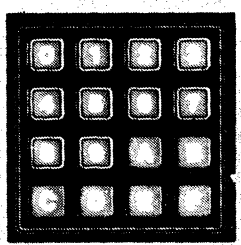
Discount Schedule

1-49	Unit Price
50-99	Less 15%
100-499	Less 25%
500-999	Less 36%
1000 UP	Contact your local Distributor or Grayhill

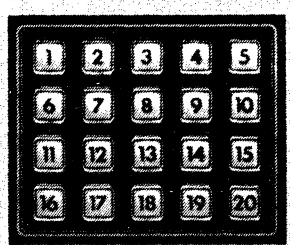
STANDARD LEGENDS



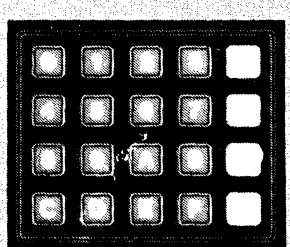
-172 Blue
-182 Orange



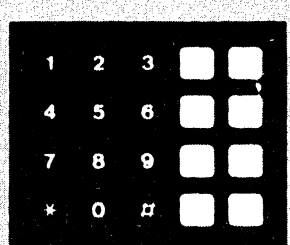
-072 Blue
-082 Orange



-292 Silver



-262 Blue



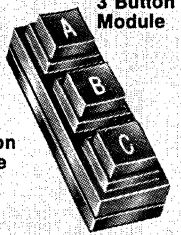
-252 Orange

Available Locally Through Your Grayhill Distributor

Grayhill INC

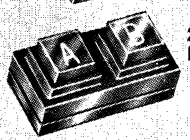
Modular Keyboards
Series 82—Long Stroke, PC Mountable

6 Button Module



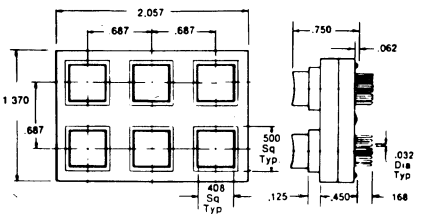
3 Button Module

1 Button Module



2 Button Module

- **Create Your Own Keyboard Configuration**
- **Modules Retain 0.687 Centers When Placed Side By Side**
- **SPST To 4PST Under Each Button**



Specifications

OPERATING FEATURES:

Button Travel: 0.130" total travel.

Overtravel: 0.080" nominal.

Operating Force: 8 ± 3 ounces (dependent upon number of poles).

MOUNTING:

Modules are designed to plug into any printed circuit board from 1/16" to 1/8" thick.

Modules can be stacked horizontally or vertically for any combination of button array and still maintain 11/16" button centers.

RATING:

Rating at 5 VDC: 100 milliamps.

Contact Resistance: 25 milliohms or less on a new switch.

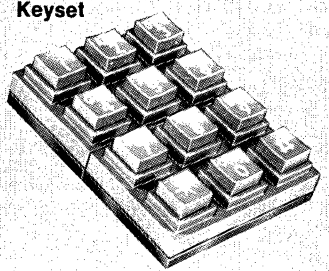
Voltage Breakdown: 250 VAC between mutually insulated parts.

Insulation Resistance: 1,000 megohms minimum.

Life Expectancy: 1,000,000 operations.

Contact Bounce: 10 milliseconds or less for the life of the switch.

Telephone Keyset



Telephone Keysets

- Permanent Molded-In Legends
- 2 Modules Create the Phone Set

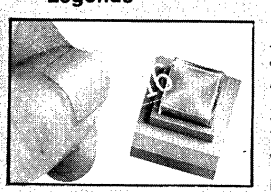
Legend Type	Circuitry Each Button	Part No.	Unit Price
Top Six Buttons Two-Shot Molded	SPST	82-601-85	$7.78
	2PST	82-601-86	8.70
	3PST	82-601-87	9.63
	4PST	82-601-88	10.56
Bottom Six Buttons Two-Shot Molded	SPST	82-601-89	$7.78
	2PST	82-601-90	8.70
	3PST	82-601-91	9.63
	4PST	82-601-92	10.56

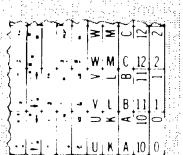
Discount Schedule

1-49 . . . . . Unit Price
50-99 . . . . . Less 15%
100-499 . . . . Less 25%
500-999 . . . . Less 36%
1000 UP Contact your local Distributor or Grayhill

Prices and Discounts subject to change without notice

Self Insertable Legends





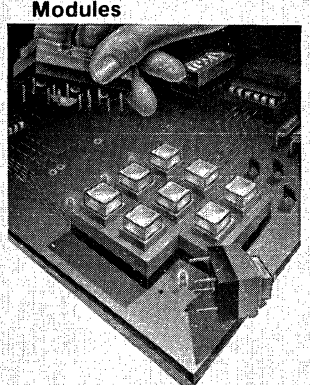
Portion Of Legend Sheet 82AC2017

Self Insertable Legend Modules

- Slotted Cap Permits Insertion Of A Clear Plastic Tab Imprinted With Legend
- Reduces Legending Problems For Prototype Or Small Production Quantities
- Available Legend Sheet Contains White Legends, 0-19, A-Z, Common Symbols

Part No.	No. Of Buttons	Circuitry Each Button	Unit Price
82-101-71	1	SPST	$2.11
82-101-74	1	4PST	2.58
82-201-41	2	SPST	3.40
82-201-44	2	4PST	4.33
82-301-61	3	SPST	4.69
82-301-64	3	4PST	6.08
82-601-81	6	SPST	8.55
82-601-84	6	4PST	11.33
82AC2017	Legend Sheet for Self Legend Modules		$1.29

Lightable Modules



Lightable Modules

- Bottom Holes Accommodate PC Mounted Incandescent Or LED Lamp
- Choice of Insertable Legend Or Non-Insertable Legend Modules
- Each Button Will Accommodate A T-1 Size LED Or Incandescent Lamp.*

Insertable Legend Modules

No. Of Buttons	Circuitry Each Button	Part No.	Unit Price
1	SPST	82-150-38	$2.47
1	2PST	82-150-16	2.58
3	SPST	82-350-12	5.46
3	2PST	82-350-9	5.77
6	SPST	82-650-19	9.89
6	2PST	82-650-9	10.51
Legend Sheet		82AC2050-1	$1.29

Unlegended Non-Insertable Modules

No. Of Buttons	Circuitry Each Button	Part No.	Unit Price
1	SPST	82-150-17	$2.27
1	2PST	82-150-15	2.37
3	SPST	82-350-10	4.84
3	2PST	82-350-8	5.15
6	SPST	82-650-10	8.65
6	2PST	82-650-8	9.27

Contact Grayhill to order printed legends.

*Lamps not available from GRAYHILL.

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

Keyboard Modules
The Stackable SYSTEM 87

- Low profile
- Long life — 3,000,000 operations
- Positive audible and tactile feedback

Select the modules you require to build your own keyboard design. The modules can be stacked side by side on your prototype PC board in any configuration that is required. ½-inch button centers will be maintained.

Circuitry is single pole/common bus in the single row switches and single pole/common bus or matrix code in the 3 x 4 and 4 x 4 keyboard pads.

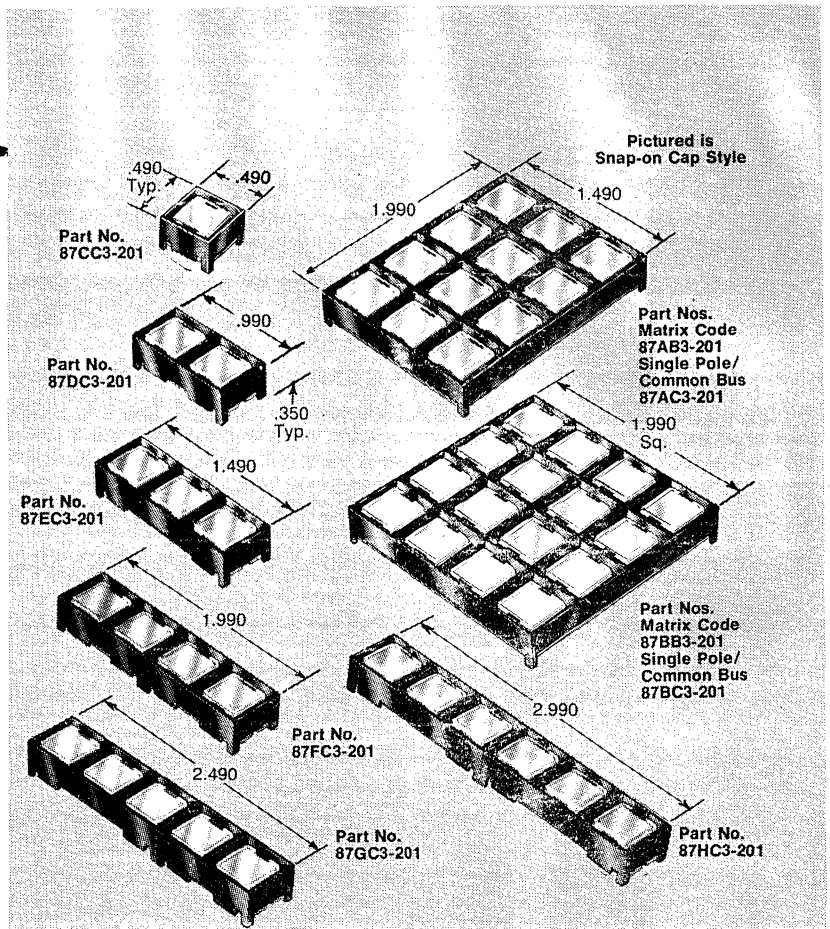
Prototype and Short Run Production

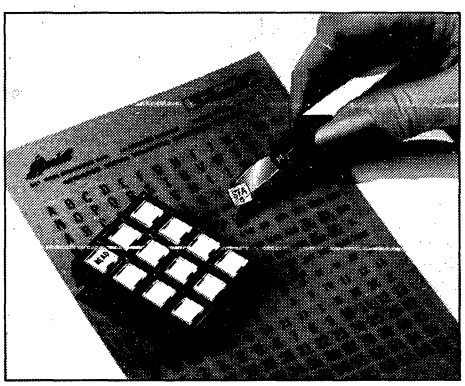
Arrange the modules in the required array on your PC board. Snap-on cap allows user to legend button with inserts from legend card and/or dry transfer lettering. For moderate quantities legends can be printed on the button by Grayhill. Printed legends will closely duplicate your prototype legend.

High Volume Production

Grayhill will provide a custom keyboard. The modules will be arranged and the board terminated to your specifications.

Legends — your choice of printed or molded-in legends; button color and legend color.





Prototype Legends

GIVE THEM A PROFESSIONAL APPEARANCE

The System 87 modules described can be easily legended by you. The clear, protective, snap-on cap removes readily without special tools. To assist you, GRAYHILL has a legend card (Part No. 87AC2046) which includes all the popular legends and symbols on a clear insert, die-cut to fit the button. Type style is News Gothic Condensed.

Or, create your own legends. The GRAYHILL card contains blank inserts for your special needs. For this purpose, sheets of dry transfer lettering are also available in a typestyle similar to New Gothic Condensed. A sheet of small type is part number 87-DT2096-088; medium is 87-DT2096-125; and large is 87-DT2096-187. You can also prepare and cut your own legend inserts. They should be cut to fit a 0.275" square surface.

ORDERING INFORMATION

All numbers describe self-legend style. Contact Grayhill for other legends.

Type of Module	Part Numbers	Unit Price	Type of Module or Item	Part Number	Unit Price
1 Button	87CC3-201	$1.54	12 Button—SP/Com Bus	87AC3-201	$9.54
2 Button	87DC3-201	2.23	16 Button—Matrix Code	87BB3-201	11.66
3 Button	87EC3-201	2.86	16 Button—SP/Com Bus	87BC3-201	12.19
4 Button	87FC3-201	3.82	Insertable Legend Card	87AC2046	1.06
5 Button	87GC3-201	4.77	Dry Transfer—Small	87-DT2096-088	2.00
6 Button	87HC3-201	5.30	Dry Transfer—Medium	87-DT2096-125	2.00
12 Button Matrix Code	87AB3-201	9.01	Dry Transfer—Large	87-DT2096-187	2.00

Discount Schedule

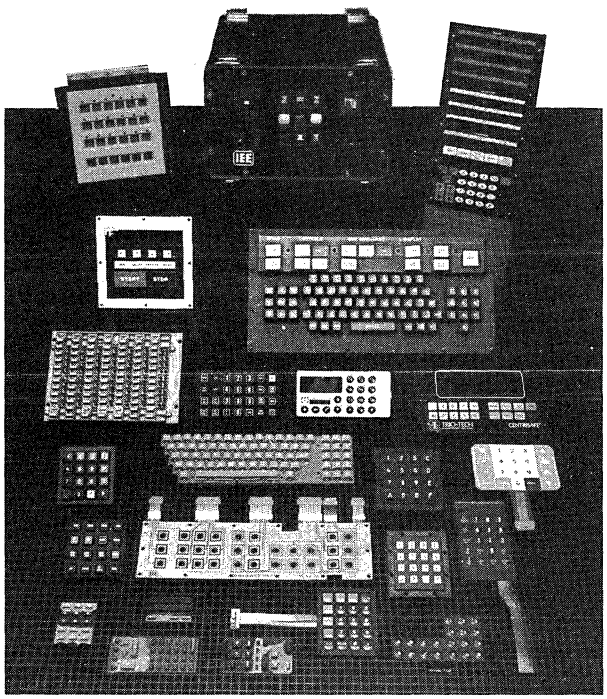
1-49 . . . . . Unit Price
50-99 . . . . . Less 15%
100-499 . . . . Less 25%
500-999 . . . . Less 36%
1000 UP Contact your local Distributor or Grayhill

Prices and Discounts subject to change without notice.

Available Locally Through Your Grayhill Distributor

Planar Products Division

TOUGH KEYBOARDS AND DISPLAYS FOR TOUGH CUSTOMERS



Keyboards:
- Full-Travel
- Snap Action
- Standard
- Custom
- Industrial
- Commercial
- Military
- Tempest/Rad-Hard
- Hi-Rel

Displays:
- Standard
- Custom
- Plasma
- Thin Film EL
- Hi-Rel LCD
- Touch Entry
- Military
- Commercial
- Hi-Rel

Projection Display/Switches:
- 15 Standard Models
- Custom Designs
- Low Cost Human Interface
- 11 to 48 Messages
- Any Image
- Any Color(s)
- Commercial
- Military
- Hi-Rel

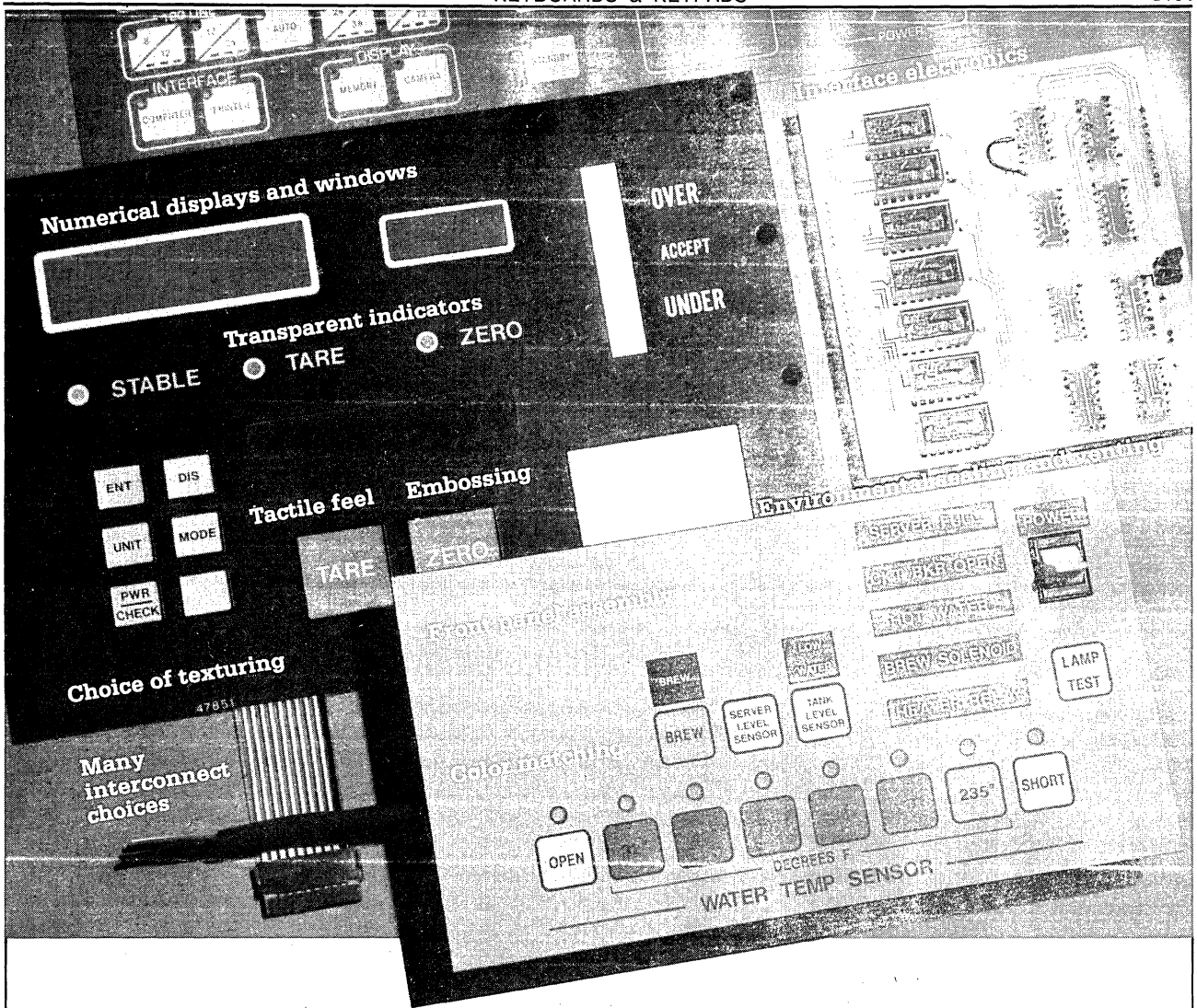
IEE's Planar Products Division specializes in tough keyboards, displays and other front-panel sub-assemblies for both commercial and military customers. Inquires are encouraged regarding prototypes, new products and second sourcing requirements.

Commercial inquiries should be directed to Ivan Minarik (extension 283). Military requirements should be discussed with John Mason in our Military Products Group. John can be reached at extension 236. We also have local sales representatives world-wide.

Tough Products for Tough Customers

For manufacturer's sales offices, see yellow pages

IEE • 7740 Lemona Avenue, Van Nuys, CA 91405 • Telephone (818) 787-0311 • TWX: 910-495-1707 IEE VAN NUYS



Mantex membrane switches and keypads offer differences you can feel, hear and see.

Differences you can feel include touch variations, surface finishes and embossed outlines. Hear the keystroke with audible feedback. See the difference that top quality color matching, texturing, graphics and mar-resistant surfaces can make to your finished product. Mantex offers all these differences plus price, fast turnaround, reliability and quality advantages made possible by vertical integration.

Switch products

Tactile feel membrane
Plastic bubble or stainless steel dome types
PC board membrane
Soft touch membrane
Fold-over or stacked membranes
Copper etched membranes
Electroluminescent backlit panels
Front panel assemblies
PC board assemblies
Peripheral plastic products or components
Microprocessor assemblies

In-house capabilities

Graphic/electronic design
Engineering • Layout
Photography • Screen making
Graphics • Material selection
Color matching • Ink blending
Screen printing • Laminating
Die cutting • Stamping
Embossing • Molding
UV cure top coatings
Hot stamping
Testing • Packaging
Interface electronics (hardware and software)
Assembly

mantex corporation

P.O. Box 15
1800 Metamora Rd.
Oxford, MI. 48051
(313) 628-9711

Call for the name of your nearest representative.

T-15S KEYBOARD SWITCH SEALED CONTACT SERIES

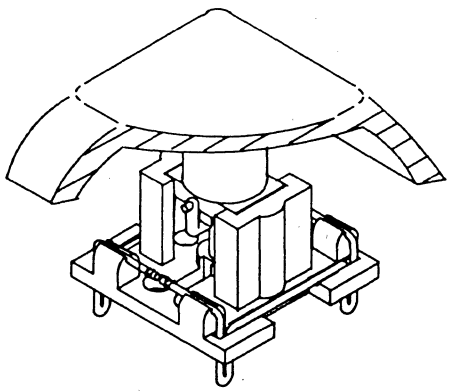
Preliminary April, 1985

FEATURES

The T-15S Keyboard Switch meets a growing industry requirement for a very low profile full travel unit easily handled in a production wave soldering operation. Its unique sealed contact* insures long reliable life. Primary features are:

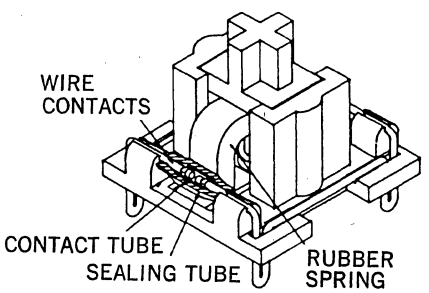
- SEALED LOW RESISTANCE LOW BOUNCE CONTACTS
- VERY LOW COST—COMPETES WITH CONDUCTIVE RUBBER
- LOWEST PROFILE (12.7 mm) WITH FULL TRAVEL (3.8 mm)
- BUILT-IN WIDE JUMPERS ALLOW SINGLE SIDED MATRIX
- TACTILE RESPONSE WITH OR WITHOUT AUDIBLE CLICK
- SPRING-LIKE TERMINALS HOLD SWITCH WHILE SOLDERING
- INDUSTRY STANDARD CRUCIFORM KEYTOP MOUNT
- STABLE MOUNTING WITHOUT METAL SUB-PANEL
- EXCELLENT PLUNGER TRACKING HANDLES ECCENTRIC OPERATION
- CENTER-TO-CENTER MOUNTING AS CLOSE AS 12.7 mm

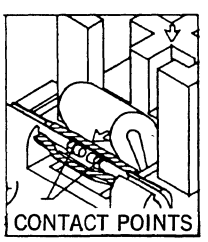
* Patent Pending



DESCRIPTION OF CONTACTS

During operation rubber spring collapses into an inverted 'U' position providing a 'break-away' tactile sensation. Its lateral deflection forces the contact tube to bridge between points on the wire terminals. The silicone rubber tube maintains a seal throughout and its resiliency restores contact to normally open condition.





OPTIONS

A unique OPTIONS BLOCK inserted in the switch body opposite the contacts will provide either an audible click for momentary switches or will convert a momentary switch to alternate action.

The optional HINGE COVER (available August 1985) will allow sub-panel mounting and provide a hinge for leveling bars which are required for very wide keytops.

KEYTOPS

The T-15 keytop mount is the most frequently used cruciform style (equivalent to Cherry MX and others). Therefore several keytop manufacturers in the U.S. and abroad are able to supply, without a tooling charge sculptured and conventional keytop sets for the T-15. Legends are available either double-shot molded or sublimation printed. MEI stocks a limited selection of keytops for prototyping and low volume applications.

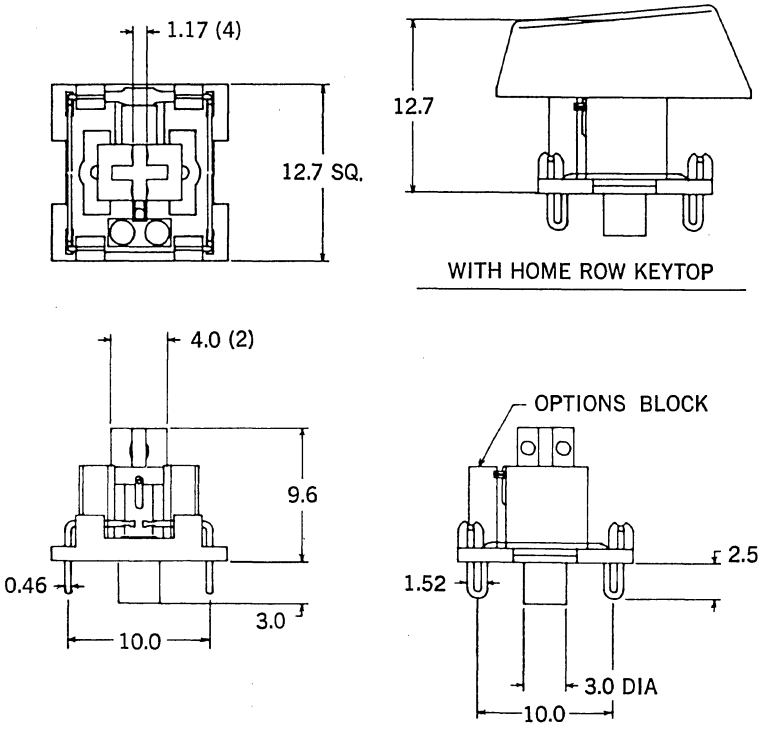
MECHANICAL ENTERPRISES INC.

461 CARLISLE DRIVE
HERNDON, VA 22070
(703) 435-9496
TWX 710-832-0942

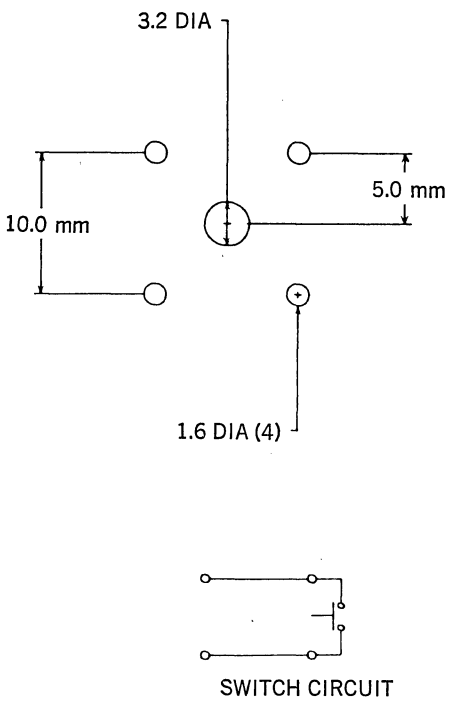
MEI T-15S KEYBOARD SWITCH SEALED CONTACT SERIES

SPECIFICATIONS	Momentary	Alt. Action
CONTACT RATING, DC RESISTIVE	1W Max	1W Max
VOLTAGE	24V Max	24V Max
INITIAL CONTACT RESISTANCE	100 m ohm Max	100 m ohm Max
PLUNGER TRAVEL	3.8 mm	3.8 mm
PRE-TRAVEL	1.9±0.6 mm	1.9±0.6 mm
OPERATING FORCE TO MAKE	65±20 gm	65±25 gm
TEMPERATURE RANGE, OPERATING	—20°C to 65°C	—20°C to 65°C
TEMPERATURE RANGE, STORAGE	—40°C to 85°C	—40°C to 85°C
CONTACT BOUNCE	5 ms MAX	5 ms MAX
UL FLAMMABILITY RATING	94-HB	94-HB
LIFE, ACTUATIONS	20×10^6	10×10^4

OUTLINE DRAWING



PCB HOLE PATTERN



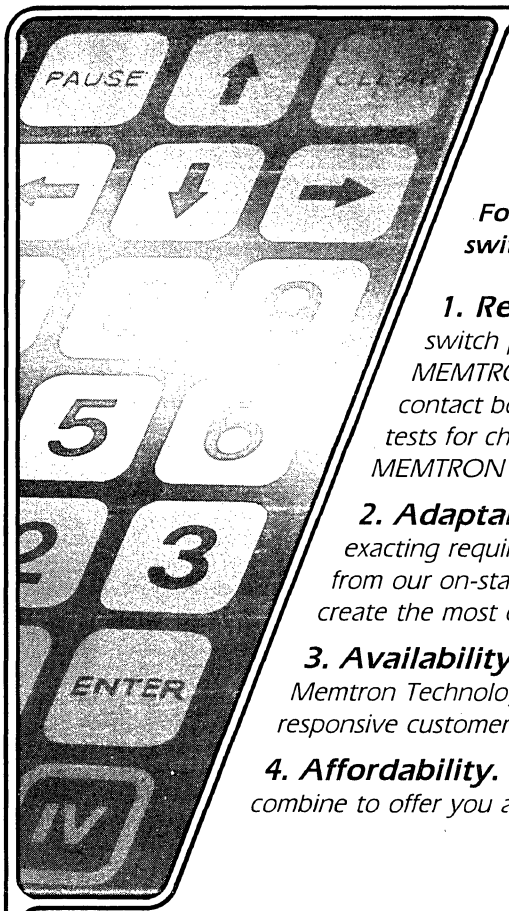
MODEL NUMBERS
T-15SB = Basic Momentary
T-15SC = Momentary with Click
T-15SA = Alternate Action

MOUNTING AND SOLDERING
Layout to pattern shown above. Switching should be snug in PCB. Hand or wave solder using water soluble flux or flux that requires no cleaning. Water wash. USE NO SOLVENTS.

MECHANICAL ENTERPRISES INC.
461 CARLISLE DRIVE
HERNDON, VA 22070
(703) 435-9496
TWX 710-832-0942

EEM PRODUCT SELECTION GUIDES

Use the EEM Product Selection Guides. There are 34 Guides in this edition of EEM. See page 2 (A•2, B•2, C•2, D•2) of each volume to locate the Product Selection Guides that pertain to your needs.



MEMTRON®
MEMBRANE SWITCHES
IN TOUCH WITH **YOUR** TECHNOLOGY.

Four intelligent reasons for buying MEMTRON® membrane switch panels:

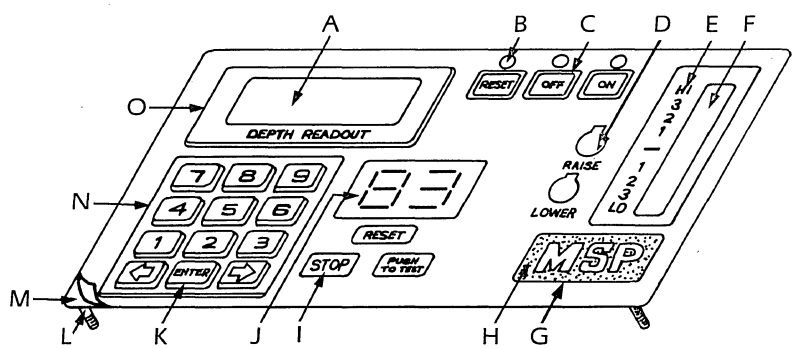
1. Reliability. *The design and construction integrity of a membrane switch panel is something that shouldn't be taken lightly. That's why MEMTRON switch panels must pass rigorous tests for activation force, contact bounce, circuit integrity and life expectancy. They must also survive tests for chemical, solvent and abrasion resistance. So **you're** assured when MEMTRON switch panels are delivered to your door, they're ready to be used.*

2. Adaptability. *Memtron Technologies takes pride in meeting your most exacting requirements with functional yet flexible custom designs. You'll benefit from our on-staff design engineers and graphic artists – experts who team up to create the most efficient and attractive switch panel for your needs.*

3. Availability. *Whether you require a single prototype or a production run, Memtron Technologies is ready to serve you with efficient assembly techniques and responsive customer service.*

4. Affordability. *Appealing, contemporary designs and engineered endurance combine to offer you an affordable product at a competitive price.*

DESIGN OPTIONS



A. Transparent lens for LCD display (UV-hardcoated – clear glossy)
B. Frosted windows for LED's
C. Membrane switch contact with embossed locating ring
D. Die-cut keyways for push buttons
E. Electroluminescent lighting
F. Printed gas discharge display window (UV-hardcoated – transparent green)
G. Hot-stamped bright chrome border for decorative effect
H. UV-textured velvet finish
I. Membrane switch contact flat keypad surface
J. Printed deadfront legend for seven segment display, visible only when illuminated. A variety of colors is available
K. Membrane switch contact with embossed keypad and stainless steel domes
L. Threaded studs and fasteners
M. Aluminum or glass epoxy subplate
N. Polycarbonate face with UV-printed hardcoat finish
O. Embossed surface for decorative effect

A MEMTRON membrane switch consists of a decorative and functional graphic overlay combined with conductive inks on a polyester carrier which, when assembled, form a low-voltage switching device.

MEMTRON membrane switches are completely sealed from the environment, making them extremely impervious to chemical and solvent attack. With no mechanical parts to fail, the panel is highly reliable and efficient.

SPECIFICATIONS OF SNAP DOMES

Life Expectancy, cycles	3,000,000
Total Travel, nominal inches	0.015
Pretravel, nominal inches	0.012
Overtravel, nominal inches	0.003
Trip Force at Operating Point, grams	220
Tactile Feel	medium

STANDARD OPERATING CHARACTERISTICS:

Operating Voltage, volts dc	30
Operating Current, milliamps	30
Contact Resistance, ohms	2 to 10
Circuit Resistance, ohms*	20 to 100
Life Expectancy, cycles	5,000,000
Activation Force, ounces[1]	5 to 8
Travel, inches	0.006
Bounce, milliseconds	1 to 10
Operating Temperature, °F (°C)**	0 to 150 (-18 to 65)

*Depending on size and configuration of circuit
[1]Normal range. Any force can be obtained to meet your specifications
**Special laminations and materials are available for high-temperature applications.

For the name of our nearest representative or for literature and details, call collect 1-517-652-2656.

Or write Memtron Technologies, 1400 Weiss Street, Frankenmuth, MI 48734.

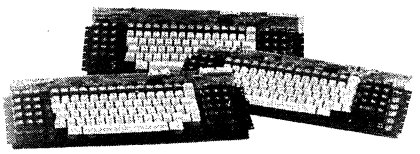
MEMTRON TECHNOLOGIES
*In touch with **your** technology.*

MICRO SWITCH KEYBOARDS...

Quality and Reliability, each carries a 1% Acceptable Quality Level and a 2-year Warranty*

Until now getting a keyboard at the price you needed could have meant giving up the kind of performance you wanted. Not anymore. Now, in addition to our time-proven solid state Hall effect offerings, you can specify full travel capacitance or contact membrane keyboards in low profile (DIN standards) or touch panel membrane keyboards.

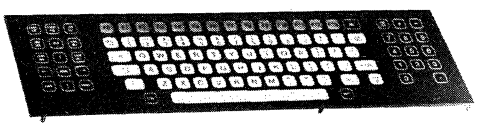
And you get them all — custom or off-the-shelf — backed with the experience and full application support that's been a MICRO SWITCH tradition.



SD Series Hall Effect Keyboard (104SD30)

FEATURES

- Solid state Hall effect keys with a single chip microcomputer
- 4-mode 8-bit USASCII code assignment . . . Key array in 4-language configurations
- Parallel data 8-bits and strobe . . . 50 microseconds nominal strobe pulse
- Serial output . . . 1-start, 8-data, even parity, 1-stop (TTL compatible) with choice of 4 baud rates
- Electronic shift lock with LED indicator
- Choice of 4-tones for audio feedback
- Manual/Auto repeat for designated keys . . . Repeat key controls repeat for other selected keys
- 1-function key . . . positive or negative logic
- 1-shift lock key, 2-shift keys, 1 control key, 1 alternate action caps lock key
- 121 possible coded keys, 6 mode keys, 1 function key
- 14 LED's in top row with current limit resistors
- 8-byte FIFO (first-in first-out) character storage
- N-key rollover
- Operates on a single 5 VDC supply
- MCBF . . . 20 billion operations

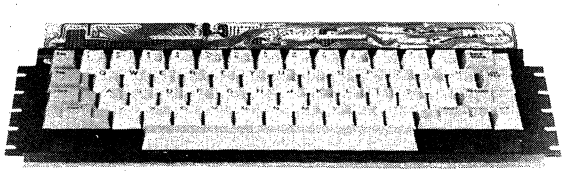


TC Series Touch Panel Keyboard (TC 454)

FEATURES

- Customized design. Graphics, colors, styles, and formats can be selected to achieve optimum clarity of operating functions
- Advanced construction and manufacturing processes. Reflects the MICRO SWITCH commitment to quality, reliability and performance
- Tactile feedback. Snap-disc provides positive feel of switching action; embossed touch surface enables positive finger positioning
- Micro-travel (.016 in. nominal)
- Environmentally sealed. Protects against contamination of switch contacts
- Provides both serial and parallel data outputs
- Pin-for-pin compatible EPROM capability
- Operates on a single 5 VDC supply
- Ultra-low profile membrane easily adapts to styling and package size requirements
- Channel venting. Prevents temperature/altitude changes from affecting operating characteristics

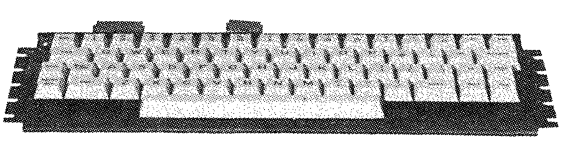
* One year warranty



Low Profile Capacitance-membrane Keyboard (58ST13-1)

FEATURES

- European ergonomic standards compliance
- Only 19,05 mm (.750″) nominal profile
- 3,2 mm (.125″) nominal key travel
- N-key rollover
- Parallel/serial data outputs
- Environmentally sealed membrane protects against liquid spills, airborne dust and moisture
- Internal venting protects from the effects of ambient temperature and pressure changes
- Operator preferred silent-tactile feel
- Electronic shielding reduces problems caused by electrical noise, cross coupling and stray capacitances
- Low power consumption



Contact-membrane Keyboard

FEATURES

- European ergonomic standards compliance
- Only 19,05 mm (.750″) nominal profile
- 3,2 mm (.125″) nominal key travel
- Environmentally sealed membrane protects the contacts from contamination
- Internal venting protects membrane from effects of ambient temperature/pressure changes
- Operator preferred silent-tactile feel
- Adherence to good human factor principles promotes maximum throughput

MICRO SWITCH, a Honeywell division

MICRO SWITCH

GENERAL SALES ORDER GUIDE

*Catalog Listings Hall Effect	Typical Applications	Power Requirements	Output Termination	Modes/Code Assignment	Keytops
12SD3-1	High Speed Numeric Entry	+5 VDC @ 50 mA	Solder Pad	Wired-only (Level)	Standard
16SD1-1	High Speed Numeric Entry	+5 VDC @ 132 mA	Card Edge	(1) BCD (Binary Coded Decimal)	Standard
16SD1-2	High Speed Numeric Entry	+5 VDC @ 132 mA	Card Edge	(1) BCD	Standard
16SD3-4	High Speed Numeric Entry	+5 VDC @ 80 mA	Solder Pad	Wired-only (Level)	Standard
16SD3-5	High Speed Numeric Entry	+5 VDC @ 80 mA	Solder Pad	Wired-only (Level)	Relengendable
16SD3-6	High Speed Numeric Entry	+5 VDC @ 130 mA	Solder Pad	Wired-only (Level)	Standard/LED
16SD3-7	High Speed Numeric Entry	+5 VDC @ 80 mA	Solder Pad	Wired-only (Level)	None
16SD3-12	High Speed Numeric Entry	+5 VDC @ 80 mA	40-Pin Header	Wired-only (Level)	Standard
16SD17-1	Adding Machine Format	+5 VDC @ 80 mA	Solder Pad	Wired-only (Scan)	Relegendable
16SD17-2	Telephone Format	+5 VDC @ 80 mA	Solder Pad	Wired-only (Scan)	None
26SD1-2	Point of Sale	+5 VDC @ 250 mA	Card Edge	(1) Six Bit Address	Standard/ Relegendable
64SD30-9	Communications (Model 33 Array)	+5 VDC @ 156 mA	Rt. Angle Header	(4) USASCII	Stepped
66SD6-6	Interactive Visual Display (IBM 3790)	+5 VDC @ 0.5A −12 VDC @ 5 mA	Card Edge	(2) EBCDIC	Stepped
66SD12-10	Interactive Visual Display (IBM 3790)	+5 VDC @ 0.5A −12 VDC @ 5 mA	Card Edge	(2) EBCDIC	Stepped
66SD6-7	Interactive Visual Display (IBM 3270)	+5 VDC @ 0.5A −12 VDC @ 5 mA	Card Edge	(2) EBCDIC	Stepped
78SD6-5	Interactive Visual Display (IBM 3270)	+5 VDC @ 0.5A −12 VDC @ 5 mA	Card Edge	(2) EBCDIC	Stepped
83SD30-2	Interactive Visual Display (DEC's VT 100)	+5 VDC @ 350 mA	Rt. Angle Header	(4) USASCII	Sculptured
87SD30-8	Interactive Visual Display (IBM 3278)	+5 VDC @ 300 mA	Rt. Angle Header	(1) USASCII	Front Stamped/ Standard
87SD30-9	Interactive Visual Display (IBM 3278)	+5 VDC @ 300 mA	Rt. Angle Header	(1) USASCII	Front Stamped/ Standard
63SD30-4	General Purpose Visual Display	+5 VDC @ 156 mA	Rt. Angle Header	(4) USASCII	Stepped
103SD24-2	Intelligent Terminals	+5 VDC @ 500 mA	Rt. Angle Header	(4) USASCII	Stepped
103SD30-2	Intelligent Terminals	+5 VDC @ 125 mA	Rt. Angle Header	(4) USASCII	Stepped
104SD30-Series	European Arrays	+5 VDC @ 350 mA	Rt. Angle Header	(4) USASCII	Stepped
Capacitance-membrane (Low Profile DIN Standards)					
58ST13-1	Typewriter Array	+5 VDC @ 250 mA	Rt. Angle Header	(1) USASCII	Sculptured
63ST13-2	Interactive Display Terminal	+5 VDC @ 250 mA	Rt. Angle Header	(4) USASCII	Stepped
83ST13-5	Interactive Display Terminal (DEC's VT 100)	+5 VDC @ 350 mA	Rt. Angle Header	(4) USASCII	Sculptured
87ST13-1	Interactive Display Terminal (IBM 3278)	+8 VDC @ 250 mA	Telephone Type Header	(1) Eight Bit Address	Sculptured / Front Stamped
103ST13-1	General Purpose	+5 VDC @ 350 mA	Rt. Angle Header	(4) USASCII	Sculptured
83ST13-1	Personal Comp. (IBM P.C.)	+5 VDC @ 350 mA	Telephone Type Header	Eight Bit Address	Sculptured
90ST13-1	General Purpose	+5 VDC @ 350 mA	Telephone Type Header	USASCII	Sculptured
105ST13-1	General Purpose	+5 VDC @ 350 mA	Telephone Type Header	USASCII	Sculptured
Contact-membrane (Low Profile DIN Standards)					
63ST22-1	Communications	–	Pigtail with Connector	Wired-only-X-Y matrix	Stepped
16ST22-1	Adding Machine Format		Pigtail with Connector	Wired-only X-Y matrix	Stepped
103ST22-1	General Purpose	–	Pigtail with Connector	Wired-only-X-Y matrix	Sculptured
Touch Panel					
TCA431-2 (12 Stations)	Numeric Entry	0.5 to 30 VAC/DC @ 10 μA to 100 mA	Pigtail	(1) Wired-only	Embossment
TCA431-4 (16 Stations)	Numeric Entry	0.5 to 30 VAC/DC @ 10 μA to 100 mA	Pigtail	(1) Wired-only	Embossment
TCM454-1 (103 Stations)	General Purpose	+5 VDC @ 500 mA	Rt. Angle Header	(4) USASCII	Embossment
TCA454-1 (103 Stations)	General Purpose	0.5 to 30 VAC/DC @ 10 μA to 100 mA	Pigtail	Wired-only	Embossment

WORLDWIDE SALES AND SERVICE

For technical literature on any of the general sale listings shown, application assistance, pricing and delivery scheduling; contact your nearest MICRO SWITCH Sales Office, write or call MICRO SWITCH, Freeport, IL 61032, Tel. 815/235-6600.

* First 2 digits indicate number of keys on keyboard.

If your application calls for keyboards "sealed for hostile environments" NEMA 2, 3, 3R, 12 and 13, and military specifications MIL-STD-202 contact MICRO SWITCH, Freeport, IL 61032 for off-the-shelf listings.

moxness products, inc.

a versa\tek company

MOX-TouchKeys©

Description:
MOX-TouchKeys are custom produced silicone rubber keypads that can be molded in a wide variety of configurations to fit product requirements. They can be produced either with or without a conductive rubber button for making contact with a printed circuit. They can be used alone as a keyboard or as a switching unit under plastic keys. MOX-TouchKeys are available in various colors with multi-colored graphics on the keytops. Let our silicone experts aid your design engineers achieve the rigid specifications your product demands.

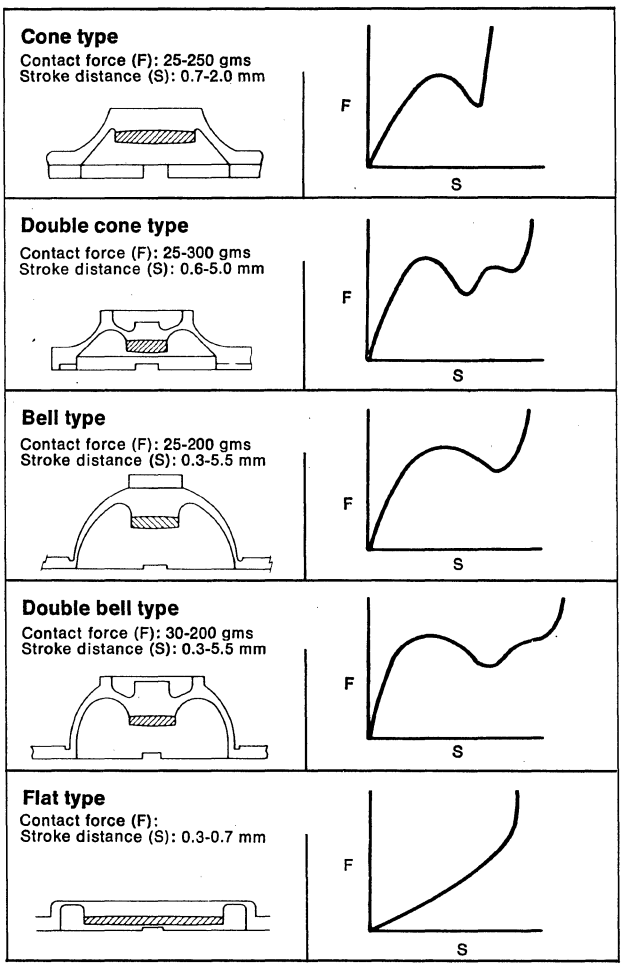
Features:
MOX-TouchKeys are made of silicone rubber which has outstanding properties for use in keyboards and conductive switching pads. Besides its remarkable tactility, flexibility, resiliency and durability it will withstand a wide range of temperature and atmospheric extremes, in particular, ozone. This not only makes it a long lasting product in both indoor and outdoor applications but also provides a superior environment sealing unit. Keypads made of silicone rubber can be produced in a variety of tactile shapes for proper operator finger response.

Advantages:
One-piece molded construction provides exceptional environmental seal against dust, liquids, gases and temperature extremes. Key life is in the millions of cycles depending upon overall design. Custom designs are practically unlimited. Conductive contact pad eliminates springs and other metal assemblies . . . provides low chatter and bounce. Assembly costs are greatly minimized.

General Properties:
Conductive button: volume resistivity as low as 5 ohm/cms.
Silicone keypads: volume resistivity; 10^{15} ohm/cms.
Temperature resistance: +400°F to −40°F.
Color: optional.

Applications:
Communications equipment • Calculators • Home appliances • Computer terminals • Electrical controls • Electronic games • Industrial equipment • Gasoline dispensing equipment • Typewriters • Security control equipment • TV and stereo tuners • Heating & air conditioning controls • Game controls and terminals • Military instruments and equipment • Command modules • Banking equipment • Sound and voice generators.

Styles and characteristics:
Cross section views show individual key-pads. Conductive buttons (striped area) are optional. Height of key above pad is optional and does not effect force (F) or stroke distance (S).



MOX-TAPE®

Description:
MOX-Tapes are produced from specially formulated silicone rubber so that, when wrapped upon itself, will provide a self-fusing, inseparable, cohesive insulating barrier that is resistant to moisture, oxygen, ozone and corona over a range of temperatures from −150°F up to +500°F. Wrap MOX-Tape around your product, or a splice, or a winding, or a terminal and you effectively insulate it with a dielectric strength of 300 VPM minimum at 180°C (Class H).

MOX-Tapes are available in four series: 600-R tape has a flat (rectangular) shape for general purpose use; 600-T tape has a triangular cross section and a colored guide line; SN tape has a woven glass yarn encapsulated for non-stretch purposes; SA & SB tapes have a sinusoidal glass yarn web encapsulated for controlled stretch. The S Series tapes are for use where high mechanical strength is required.

600-R Series MOX-TAPE
Unsupported Flat Tape
The 600-R Series tape is a flat (rectangular) silicone rubber tape that is useful for the insulation and protection of complex forms and parts.

600-T Series MOX-TAPE
Unsupported Triangular Tape
The triangular cross section and the colored guide line on the 600-T series make it possible to apply the total thickness of silicone rubber requirements quickly and neatly in a single layer.

SA & SB Series MOX-TAPE
Controlled Stretch Tape
The SA series self-bonding silicone rubber tape has a sinusoidal glass yarn web encapsulated inside to provide a tape with a controlled elongation of 25% maximum. The SB series has a 15% maximum elongation.

SN Series MOX-TAPE
Non-Stretch Tape
The SN series self-bonding silicone rubber tape has a glass yarn webbing encapsulated inside that keeps the tape from stretching in either direction.

Silicone Rubber Tubing and Extrusions

Description:
Moxness tubing and extrusions are made of silicone rubber which has outstanding properties for use in a wide variety of applications. Tubing can be made with various ID-OD combinations up to 4 inches outside diameter, with wall thicknesses from .006 inches up to 1 inch. Extrusions made of silicone rubber can be produced in a wide variety of profiles.

Tubing Tolerances on ID & OD			Tubing Tolerances on Wall Thickness		
Inside Dia. Outside Dia.	Class A ±	Class B ±	Wall	Class A ±	Class B ±
.015- .030	—	.004	.006- .010	.002	—
.031- .061	.003	.006	.011- .020	.003	.005
.062- .124	.005	.010	.021- .040	.005	.007
.125- .249	.010	.020	.041- .080	.007	.010
.250- .499	.020	.040	.081- .160	.010	.020
.500- .749	.030	.060	.161- .320	.020	.005
.750- .999	.040	.080	.321- .640	.030	.055
1.000-1.249	.050	.100	.641-1.000	.040	.080
1.250-1.499	.060	.120	(Max.)		
1.500-1.749	.070	.140			
1.750-1.999	.080	.160			
2.000-2.249	.090	.180			
2.250-2.499	.100	.200			
2.500-2.749	—	.210			
2.750-2.999	—	.230			
3.000-3.249	—	.250			
3.250-3.499	—	.270			
3.500-3.749	—	.290			
3.750-4.000 (Max. OD)	—	.310			

General Properties: Temperature resistance: +400°F to −40°F
Chemical resistance: Excellent
Durometer Range: 35-80
Colors: Unlimited

NOTE: Smaller ID and tighter tolerances may be quoted on special request. Tubing or extrusions can be cut to unlimited lengths—quoted as requested.

P.O. BOX 1174, 1914 INDIANA ST., RACINE WI 53405-1174 PH: (414) 554-5050 or 1-800-558-5706 (OUTSIDE WISCONSIN ONLY)

RUGGEDIZED SWITCH PANEL DESIGNS

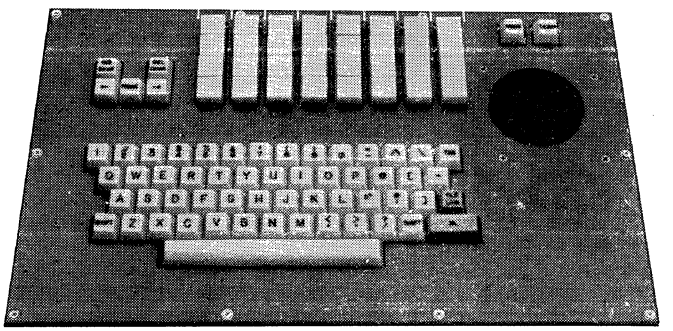
ORBIT INSTRUMENT CORP.
CORPORATE FACILITIES: 80 CABOT COURT, HAUPPAUGE, L.I., NY 11788, TELEPHONE: (516) 435-8300
6431 GLOBAL DRIVE, CYPRESS, CA 90630, TELEPHONE: (714) 527-0561

MILITARIZED KEYBOARD/BALL TRACKER ASSEMBLIES

INSTALLED IN CONSOLES AS A REMOVABLE ASSEMBLY FOR EASY ACCESS

INCLUDES

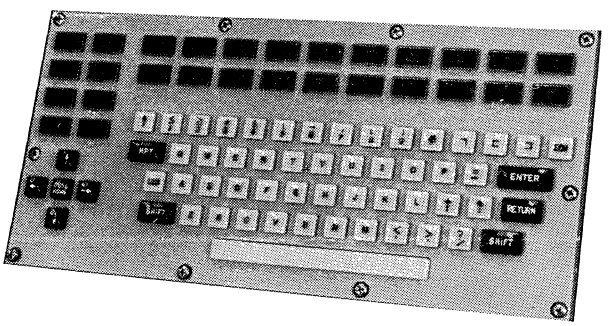
- 32 Function switches for fast control action
- Orbit Instrument 2" Diameter Ball Tracker with 256 output pulses per revolution of the ball
- Bi-directional data bus
- Qualified to MIL-STD-810 for humidity, salt fog, shock, vibration, dust and fungus
- Ball Tracker can be quickly detached from the keyboard



BACK LIGHTED KEYBOARDS

These Custom Keyboards Feature

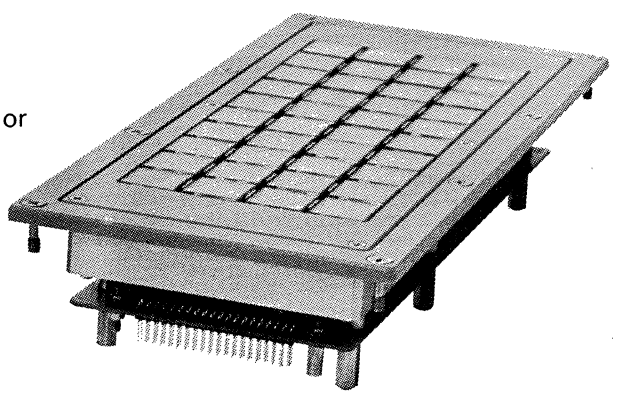
- Low profile design
- Sealed for drip-proof environments
- Relegendable function keys for added flexibility
- Any key can be backlit
- Custom Encoding
- Tactile feel

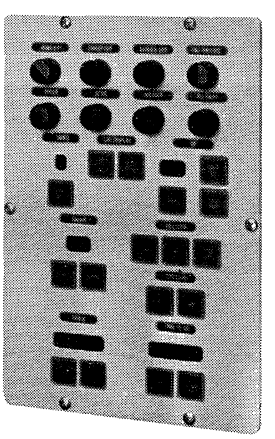


CUSTOM PANEL DESIGNS

USING

- Orbit low profile snap action switch technology
- Switches can be split legend or TRI split
- Rugged design construction
- Relegendable keycaps





Send us your specifications. Telephone (516) 435-8300 or TWX (510) 221-2122

PREH ELECTRONIC INDUSTRIES, INC.
5665 WEST HOWARD ST., NILES, IL 60648
(312) 647-8338 TELEX: 297112 PEIUR.

REMOTE CONTROLS KEYBOARDS

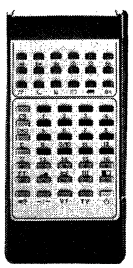
REMOTE CONTROLS

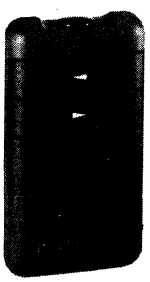
Remote controls available from Preh Electronics include both standard and completely customized products. Customizing possibilities include a full range of programmable functions, key arrangements, key legends, key and case colors and single or multi color bezels. This flexibility allows wide design possibilities in the fields of commercial and satellite television systems, video tape recorders and monitors, and industrial controls.

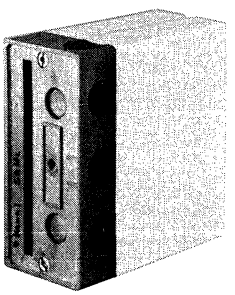
KEYBOARDS

Superior technology and materials are used in Preh keyboards to furnish products that are reliable and completely versatile. In addition, Preh Commander keyboards are IBM compatible. Standard units and graphic displays can be combined to create expanded, customized keyboards at reasonable cost.

REMOTE CONTROLS







Transmitter, 53 Button Model S88/53

TECHNICAL DATA:

Transmitting Mode:	PCM (Pulse Coded Modulation)
Clock Frequency:	4 MHz (Quartz)
Programmable Functions:	16 x 64 (Max. 53 Buttons)
Usable Functions:	36
Available TV Channels:	16
Analog Functions:	4
Additional Functions:	8
Supply Voltage:	9 Volt (to IEC 6F22)
Quiescent/Operating Current:	1.0 μA/6 mA typical
Transmitting Elements:	2 Infrared Diodes

Transmitter, 2 Channel Model S11-07

TECHNICAL DATA:

Transmitting Mode:	PCM (Pulse Control Modulation)
Supply Voltage:	9 Volt (to IEC 6F22)
Quiescent/Operating Current:	10 μA/15 mA Typical
Transmitting Elements:	3 Infrared Diodes

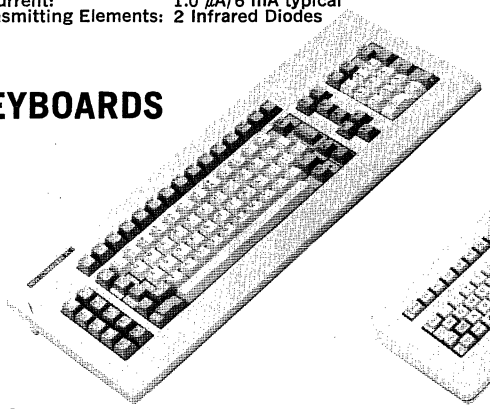
Receivers Model S12-07

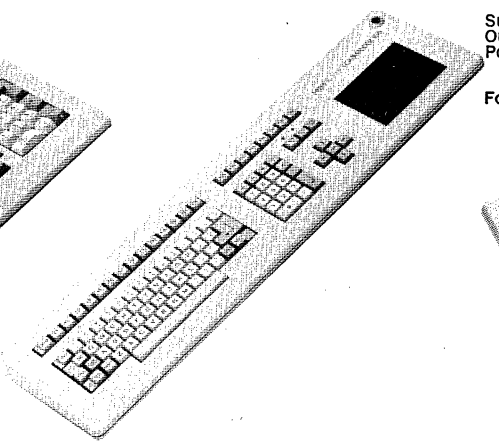
TECHNICAL DATA:

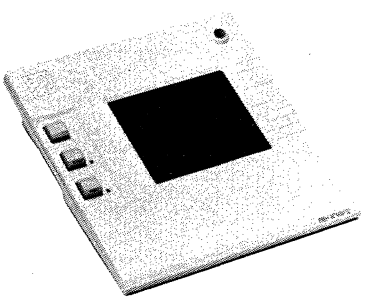
Plastic Enclosure-Dim:	4″ x 2″ x 4″
Components:	Electronic Decoder, Power Supply for Receiver and Pre-Amplifier and Switching Relay as Output Component
Electronic Systems:	PCM Decoder w/ Power Supply and 4 Relay Outputs
Supply Voltage:	220 VAC
Outputs:	4 Separate Outputs
Power Ratings:	250 VAC, 2000 VA, 200 VDC, 30W, 24 VDC, 100W

For Both SPST and SPDT Applications

KEYBOARDS







Preh Commander

IBM-PC compatible. An extremely flat, full travel membrane keyboard with glare-free surface for operator comfort and "Crisp" tactile feedback. Additional standard units can be combined and spaced to customer requirements to provide up to 15 additional keys in the alphanumeric field. Standard unit measures 17.5″L x 7.5″W x 1.5″H Height to center key row is 1.18″.

Preh Graphic Commander

A graphic tablet is incorporated into the Preh Commander for added visual capabilities. The graphic tablet permits absolute positioning through conformal mapping. The unit is adaptable to various graphic systems and provides a reasonable cost solution for applications in CAD/CAE, office communications, home computers, process control, etc.

Preh Bitmap

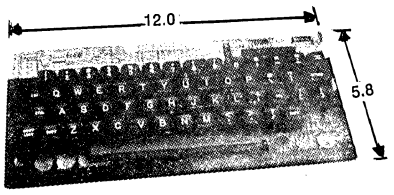
The Bitmap series features graphic tablets with resolution reduced to 10 bits. Active areas are 4.5″ x 3.74″ (Bitmap 12) or 9″ x 7.5″ (Bitmap 23). Units are provided with series and parallel interfaces and are coupled directly to existing interfaces of the graphic systems, Zoom features are incorporated.

PEI is a wholly owned subsidiary of Preh Elektrofeinmechanische Werke, Bad Neustadt a/d Saale, West Germany with offices and plants in Germany, Austria, Portugal, and Singapore.

GEORGE RISK INDUSTRIES, INC.

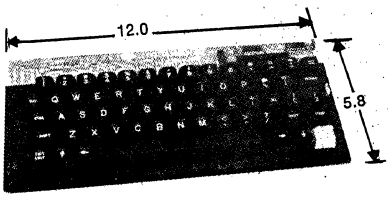
G.R.I. PLAZA / KIMBALL, NEBRASKA 69145 / TELEPHONE (308) 235-4645 / TWX 910-620-9040

STANDARD KEYBOARDS



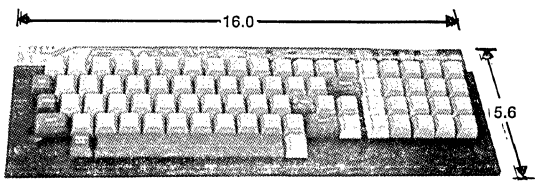
MODEL 7056

• 56 keys—full 128 character ASCII encoding • Two-key rollover • Buffered parallel output • TTL/CMOS compatible • Easy mounting provisions • Non-glare double-shot molded keycaps • Expandable for additional features.



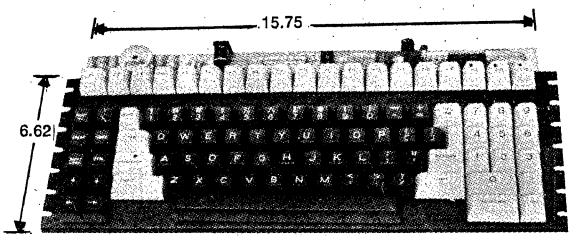
MODEL 7062

• 62 keys—same features as 7056 PLUS separate cursor control keys • User defined key with relegendable keycap or custom engraved • Auto-repeat on all keys • Four mode operating including CAPS LOCK.



MODEL 7078

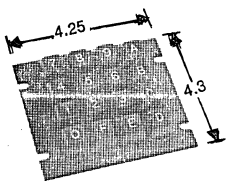
• 78 keys—full 128 character ASCII encoding • Integral 15 key numeric and cursor pad • Four mode operation including ALPHA LOCK • User selectable data and strobe signals • Buffered parallel output • Interface with APPLE II (with slight modifications) special instructions included.



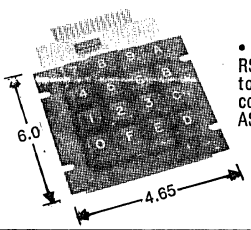
MODEL 8000

• State-of-the-art microcomputer controlled keyboard, 95 keys, including 19 special function keys • High reliability performance • Four-wire serial interface, 300 or 1200 baud • Unique variable key rollover with phantom key lockout • High speed operation with NO input errors • Ergonomics design.

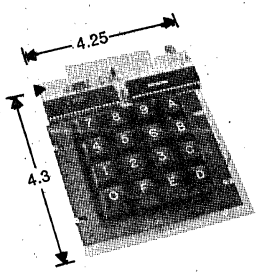
KEYPAD MODELS 10, 12 or 16 Keys



• 4 bit hex encoded
• Full CMOS design
• Outputs compatible with LS and standard TTL logic.



• Parallel or serial RS232 output • Custom keyboard encoder • Full 7-bit ASCII characters.



• Unencoded wiring, 1 of 16 or X-Y matrix
• One side of each keyswitch is common
• Design to be used with custom-supplied encoding.

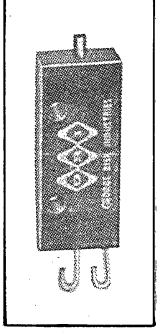
CUSTOM KEYBOARDS

GRI builds custom keyboards per your exact specifications and drawings for virtually all types of applications—air traffic control, process control, military, TEMPEST, etc. Our illuminated (or backlighted) keyboards are especially attractive due to their high reliability. We offer both the dry reed switch technology and the mechanical contact technology. We have manufactured custom keyboards for companies such as Burroughs, Eaton-AIL, FAA, Gulf & Western, Lockheed, Nuclear Data, Raytheon, Rockwell, Texas Instruments, and many others. Send us your specifications and drawings for a quotation today.

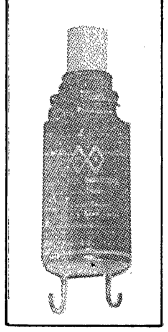
PUSHBUTTON SWITCHES

DRY CIRCUIT & LOGIC SWITCHING

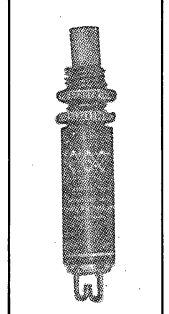
"B" SWITCH
1.125 H x .420 W



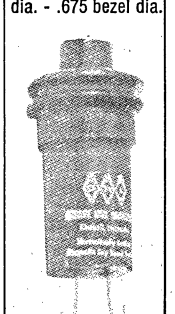
"G" SWITCH
1.745 H x .625 dia.



"D" SWITCH
1.470 H x .350 dia.

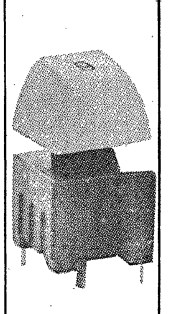


"V" SWITCH
1.320 H x .590 case dia. - .675 bezel dia.



"KB" SERIES
1.550 H x .705 dia.

"KBLP" SERIES
1.125 H x .750 sq.



SPST - NO, NC; DPST - NO, NC — Available in 4 form A or B — Illuminated and non-illuminated
Hi-rel - 50 million — Mounting collars and buttons available — Mercury wetted reed switches available

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C
CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J
JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K
kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L
LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P
PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

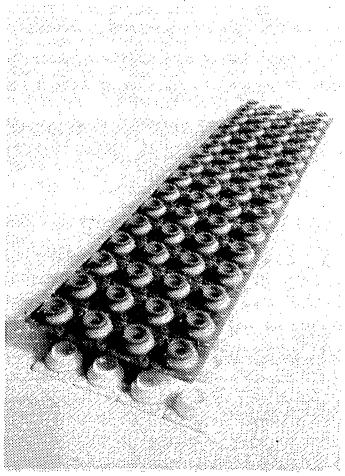
Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

KLIK-KEY®

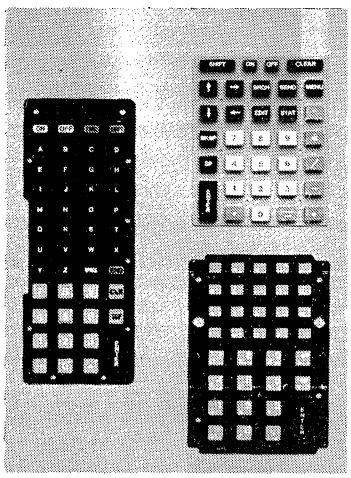
Shin-Etsu Polymer Rubber Switches

SP America, Inc.
1181 North Fourth Street, San Jose, CA 95112
(408) 947-0311 TWX 910-338-2220



SPECIFICATIONS

Operating temperature	−40° to 300°F
Operating temperature (assembled)	−5° to 160°F
Storage Temperature	−70° to 450°F
Storage Temperature (assembled)	−40° to 185°F
Operating force	10 to 250 grams
Life cycle	500,000 to 20 million
Contact resistance	Less than 200 ohms
Contact rating	5mA
	at 12 VDC/0.5 sec/20 million cycles
Contact bounce	Less than 12msec
Insulation resistance	More than 10^{12} ohms at 500 VDC
Break voltage	25–30 KV/mm



KLIK-KEY

Klik-Key rubber switches are a family of molded silicone rubber pads with collapsible protrusions or domes. Each dome contains a conductive carbon silicone contact, which provides the bridging when used in PCB switch panels. Klik-Keys can have a variety of stroke length, actuation force, tactile feedback, shapes and sizes.

The rubber switches reduce assembly costs while increasing the reliability of your keyboards. They operate in extreme temperature ranges as well as in harsh environments. Klik-Keys offer a longer life than mechanical switches at a fraction of the cost.

Shin-Etsu produces a family of standard switches that are available off-the-shelf, in addition to custom molded Klik-Keys.

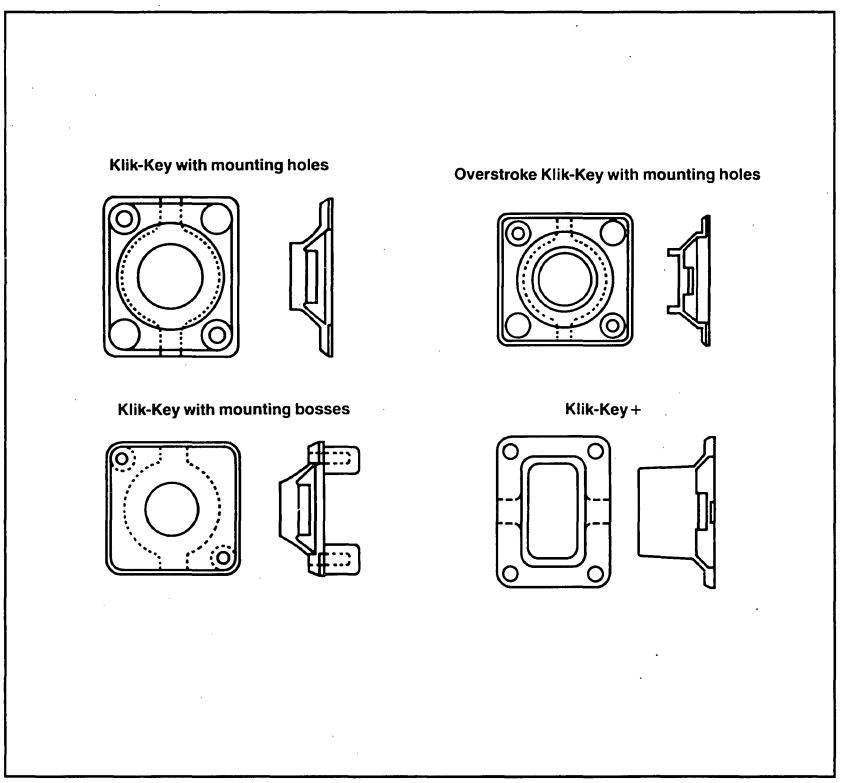
KLIK-KEY +

Klik-Key + rubber switches have all the features of our Klik-Key family of switches with the added advantage of legends imprinted on integrally-molded key tops. Separate key tops are not required, so you reduce inventory and assembly costs.

The imprinting is very durable, outlasting the life of the switch. Both pad and the imprinting are available in custom colors, as well as a wide variety of sizes and configurations.

In addition, rubber switches can be molded in translucent silicone for LED back-lighting or edge-lighting.

Shin-Etsu produces a line of standard switches that are available off-the-shelf, in addition to custom molded Klik-Keys.



FEATURES

Single-piece construction includes resilient dome and conductive rubber contact

Moisture, dust and impact-proof

Silicone is chemically inert

Will not discolor

Withstands temperatures from −70° to 450°F

Momentary switching

UL 94HB or UL 94VO silicone elastomer

Low chatter and bounce

Can be produced to meet your rigid color and design specifications

THERMISTOR APPLICATION INDEX

APPLICATION	MIDWEST'S PRODUCT NO.	For Details See Vol. B, Sec. 5300 PAGE NUMBER
NTC'S		
Inrush Limiter	D204CS, D304CS, D504CS, ETC.	1765
Thermal Sensor	All H-Series	1758
Temperature Compensation	All H-Series	1758
Air Flow Sensing	H-Series, Bead Probes	1758 & 1765
Probes	Tuff Sensors	1759
PTC'S		
Overcurrent Protection	CCL020.01, CCL450.01, ETC.	1763
Air Flow	160D10116, 180D10113	1763
LC D Heating	CDH001, CDH002, CDH003	1762
Overtemp Protection	All OTP'S	1762
Liquid Level Sensing	160D10116, 180D10113	1763
Temperature Compensation	All Tempsistors	1764
Component Heaters	150Q80112, 180Q20216, 195Q80115	1763
SWITCHES		
Single Set-Point Sensing	All Temp. Switches	1759 & 1760
Over Temp. Protection	All Temp. Switches	1759 & 1760
Probes	All PMS Series	1760
Freeze Sensing	TS5B1	1759
VARISTORS		
Transient Voltage Protection	All Varistors	1764

As one of the largest manaufacturers of temperature and current sensitive components, we have available a wide selection of standard products in stock, available for immediate delivery.

Should one of our many standard products not meet your needs, call us at (616) 777-2602 and one of our engineers will be pleased to custom-design a component to your specifications.

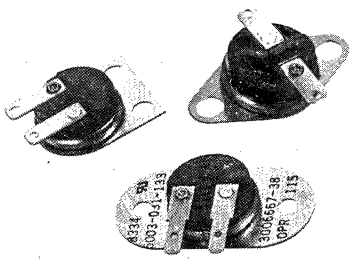
MIDWEST COMPONENTS INC.

P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443
(616) 777-2602/TWX: 510-394-4130

THERMAL COMPONENTS

Manufacturer	EEM Page No.	Thermostats						Thermocouples	Thermistors								Switches, Temperature Sensing	Sensors, Temperature	Inrush Current Suppressors	Other Features
		Low Profile	Grounded	Sealed (Immersion)	Isolated Contact	Isolated Case	Hermetic Seal		NTC	PTC	Leaded Chip	Bar	Cube	Disc	Hybrid Chip	Interchangeable				
Airpax Corp.	B•1742	●	●	●	●	●	●													
Best Electrics	B•1743							●												Vacuo-junction, True RMS
Cal-R, Inc.	B•1745 B•1746 B•1747								● ●	●	● ●	● ●	● ●	● ●	●	●			●	
Dale Electronics	B•1748								●						●	●				
Elmwood Sensors	B•1750	●					●													
Fenwal Electronics	B•1751								●					●		●				Linear Thermistor Probes
Keystone Carbon Co.	B•1752 B•1753 B•1754 B•1755								● ●	 ● ●						● ● ●			●	Glass Bead, Glass Encapsulated, Rod Type PTC Fuses & Heaters Surface Mount; Probes
Micro Switch	B•1757																	●		
Midwest Components	B•1758 B•1759 B•1760 B•1761 B•1763 B•1764 B•1765								● ●	 ● 						● ● ● ●	 ● ●	●(Freeze)	 ● ● ●	Molded Probes Varistor
Omega Engineering	B•1766							●												
Piezo Electric	B•1768 B•1769								● ●					● ●	● ●	●				Wafer, Bead, Bead-in-Glass Rods Encapsulated; Probe Assemblies
Precision Resistor	B•1770 B•1771									● ●								● ●		
Sohio Engineered Materials	B•1772								●											Rods
Sylvania Control	B•1773									●										
Therm-O-Disc, Inc.	B•1775																●			

Thermostats

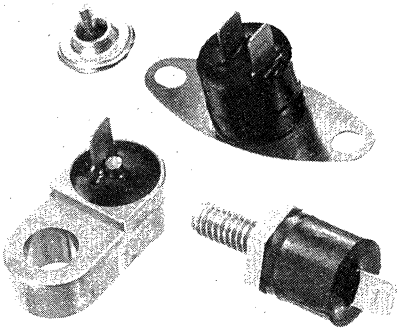


Series 5003 – Low-Profile Thermostat

Extremely thin, lightweight, wafer-type thermal switch that provides fast, positive response, excellent repeat reliability, good shock and vibration resistance over a wide operating range.

Features:

- Overall depth is only .250".
- Operating temperature range from 15°F to 355°F.
- OPR or CLR contacts are available.
- 120Vac 5 amp, 240Vac 3 amp.
- Weight 2.3 grams.
- Variety of mountings and terminations available.
- Enviromental sealing available.
- Approval: 𝕽𝖑 Ⓒ

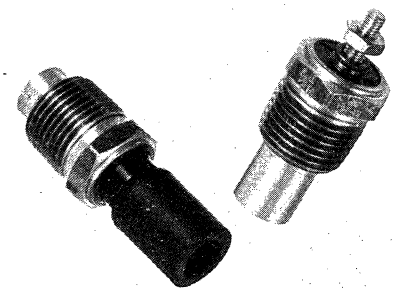


Series 5011 – Low-Cost, Grounded Thermostat

A very low-cost thermostat that will meet a number of exacting requirements for shock and vibration resistance. It is hermetically sealed and offers fast response. The only surface-sensing grounded device offered today. Plug, wire-lead, and isolated-base mountings are available. 1/4-20 boss-mounted and 3/8-16 UNC-2A sizes.

Features:

- Low-cost, grounded unit.
- Operating temperature range from 15°F to 550°F.
- Many mounting packages available: 120Vac, 32Vdc, 3 amp.
- Stud-mounted version available.

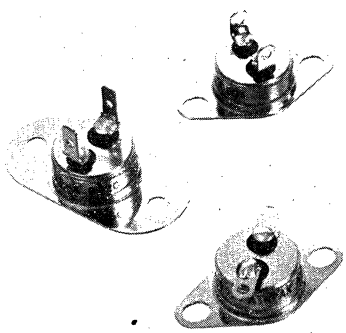


Series 5021 – Sealed Immersion-Type Thermostats

A single throw, snap-action, sealed temperature control. Snap action disc located in the very tip of the probe. Ideally suited to protect engines from overheating damage by accurately sensing high water and oil temperatures.

Features:

- Solid one piece body construction.
- Operating temperature 15°F to 325°F.
- High vibration resistance.
- Conforms to MIL-12285/2.

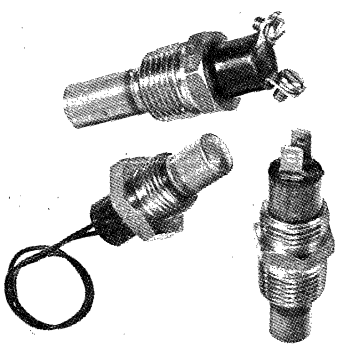


Series 5200 – Isolated Contact Thermostat

This hermetically sealed thermostat is perfect for applications requiring isolated contacts. The laser-welded construction withstands vibration and shock, and is designed to meet MIL-Spec requirements. Its size and reliability make it highly suitable for products such as business machines, hot glue-melt systems and other industrial-environment products.

Features:

- Hermetically sealed.
- Designed to meet military standards.
- Operating temperature range from 15°F to 500°F.
- 𝕽𝖑 Certified for regulating.

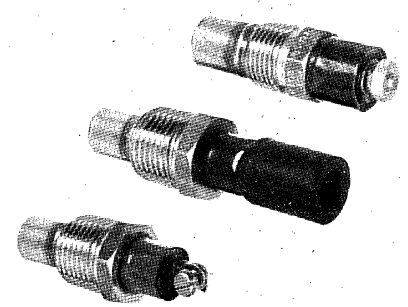


Series 5100 – Isolated Case Thermostat

This two-terminal, immersion-type hermetically sealed thermostat can be used on water-cooled engines, hydraulic systems, degreasers, industrial air compressors and tanks where liquids are heated. Its isolated contact is designed to switch 110Vac within your control circuitry. It offers rapid response to liquid or air temperature.

Features:

- Hermetically sealed.
- All stainless T.I.G. construction.
- Operating temperature range from 15°F to 550°F.
- 120Vac 3 amp and 240Vac 1.5 amp. models available.
- Approval: 𝕽𝖑 Ⓒ



Series 5020 – Hermetically Sealed Thermostat

This snap-action hermetically sealed temperature control is designed for use wherever a sealed unit and high vibration resistance are required. Protects engines from damage from overheating by sensing high water or oil temperatures. Snap-action disc located in the very tip of the probe assures rapid and true response to liquid temperature. The all-welded construction (and grounded case) of this sealed thermostat insures meeting Thermal Shock Specifications of MIL-STD-202, Method 107, Test Condition B. The tube will withstand a Pressure Exposure Limit of 1500 PSI. Insulation Resistance of 50 megohms minimum at 500 Vdc.

Features:

- Hermetically sealed.
- Grounded case.
- Operating temperature range from 15°F to 525°F.
- 32Vdc, 3 amp.
- 5020 – 13 Conforms to MIL-12285/1.

AIRPAX®
We give you control.

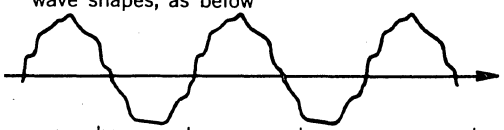
Airpax Corporation
a North American Philips Company
Frederick Division
Husky Park,
Frederick, MD 21701

Guide to types, models and applications of BEST vacuo-junction THERMOCOUPLES

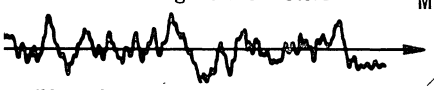
as used by leading instrument manufacturers for:

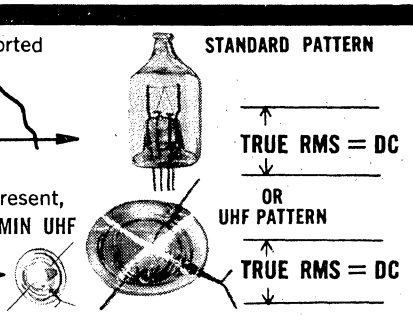
TRUE RMS MEASUREMENT

—where the signal is periodic with distorted wave shapes, as below



—or where random wave shapes are present, even with high crest factors

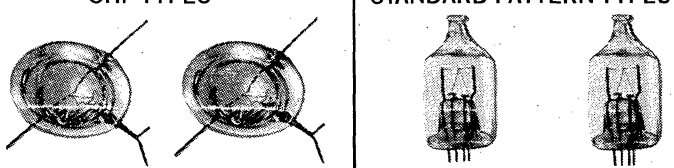




(Use either standard or UHF pattern, depending upon frequency)

LINEAR TRUE RMS MEASUREMENT

MATCHED PAIRS



	Model MPU 1	Model MP1S7	Model MP219
Tracking accuracy	0.5%	0.5%	0.2%
Time constant	1 sec	1 sec	200ms
Nominal current	5mA	5mA	6.67mA

Tracking accuracy applies over full 25°C temperature range.

Single standard patterns for 5mA and higher, useable to −65MHz; for less than 5mA, usable to 10MHz.
Single UHF types usable to 500MHz
Temperature coefficient of output available from −0.2% per °C down to 0.005% per °C on special order.
Reversal error, standard 0.2%. Most models available with R/E down to 0.02%, some models to 0.005%.
Optional special features: short time constants to 50 ms; double heater devices, ultra miniature sizes.

PHYSICAL DATA, STANDARD PATTERNS

Height of envelope	0.900 inch
Diameter of envelope	0.437
Length of lead from envelope	2 ± ¼ inches
Length of sleeve from envelope	1¾ ± ¼ inches
Heater leads:	
Up to 400 milliamps	0.012 ± 0.002 inch diameter
500 milliamps and over	0.020 ± 0.002 inch diameter
Couple leads—all ranges	0.012 ± 0.002 inch diameter

PHYSICAL DATA, U.H.F.

	MIN	REGULAR
Height of envelopes	.43	.75
Diameter of envelope	.47	.80
Width across heater leads	1.42	1.50
Diameter of heater and couple wires	.02	.02

Positive indicated by spot of red lacquer.
Specifications subject to change without notice.

Write on company letterhead for application notes and full line catalog

BEST ELECTRICS DIVISION
HARRY LEVINSON COMPANY
400 BOREN AVENUE N. • SEATTLE, WA 98109 • Tel. (206) 382-1300 • TWX 910-444-2154

Partial list of BEST STANDARD PATTERNS, INSULATED

*Preferred units, available from stock.

Model No.	Range mA	Heater ohms Resistance ±10%	Couple ohms Resistance ±10%
Following models have O/C E.M.F. of 7mV ±12%. Maximum permissible load, 250% of nominal.			
*S1	1.0	1750	13
S2	1.25	1600	13
S3	1.5	1000	13
*S4	2.0	800	12
*S5	2.5	400	8
S6	3.0	200	8
*S7	5.0	90	8
*S8	7.5	45	8
*S9	10.0	25	8
S10	15.0	20	4
S11	20.0	15	4
S12 thru S23	25.0 thru 1000.0	10.0 thru 0.15	4
Following have O/C E.M.F. of 20mV ±12%. Maximum permissible load, 200% of nominal.			
S45	2.0	2000	13
S46	2.5	1600	13
S47	3.0	800	13
*S48	5.0	250	8
S49	7.5	180	8
*S50	10.0	125	8
S51	15.0	50	4
S52	20.0	30	4
S53 thru S64	25.0 thru 1000.0	25.0 thru 0.25	4
Following models have O/C E.M.F. of 10mV ±12%. Maximum permissible load, 200% of nominal.			
S98	1.25	1600	13
S99	2.0	800	13
S100	2.5	400	8
S101	3.0	300	8
*S102	5.0	125	8
S103	7.5	70	8
*S104	10.0	40	8
S105	15.0	25	4
S106	20.0	20	4
S107 thru S118	25.0 thru 1000.0	15.0 thru 0.15	4

For Miniature UHF version add MIN as prefix to part number. Ex: MIN U.1

BEST U.H.F. UNITS, INSULATED

*Preferred units, available from stock.

Capacitance	0.3 mfd
Inductance, approx.	0.02 uH

Maximum permissible load		250% of nominal.	
Following models have O/C E.M.F. of 7 mv ±12%.			
*U1	5	90	8
*U2	10	25	8
U3	15	20	4
U4	20	15	4
U5	25	10	4
U6	50	3	4
U7	100	1.5	4
U8	150	1.0	4
U9	200	0.7	4
U10	250	0.6	4
U11	500	0.3	4
U12	1000	0.15	4
U27	2.5	200	8

(Max. Perm. Load, Model U27, 150% of nominal)

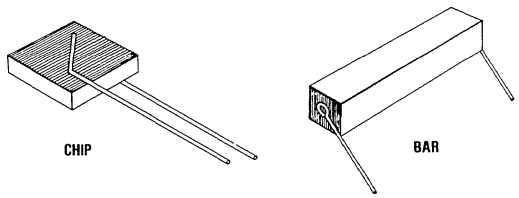
THERMAL CONDUCTIVITY OF DIELECTRICS AT ROOM TEMPERATURE

Material	Thermal Conductivity, J/ (m.K)
Diamond	658
BeO	167
Graphite	117-200
Bonded SiC	42
MgO	42
Al_2O_3	33
TiC	33
BN	28
Mullite	6.3
Titania	3.3-4.2
Porcelain	1.7
Fused silica glass	1.5
Soda-lime glass	0.8
Cast epoxies	0.17-1.3
Wood	0.5-2.5
Melamines	0.3-0.7
Mica	0.3-0.7
Phenolics (molded)	0.17-0.67
Polyethylenes	0.33
Nylons	0.17-0.25
TFE fluorocarbons	0.25
Elastomers	0.08-0.17
Foams	0.003-0.04

CAL-R, INC. THERMISTORS

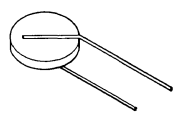
LEADED CHIP, BAR & CUBE

Cal-R Leaded chip and bar thermistors are produced from metal oxide ceramic materials utilizing a unique process which affords the highest degree of manufacturing control.



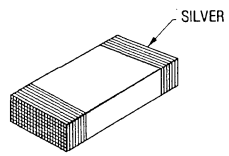
NTC DISCS

Maximum operating temperature 150°C (higher temperatures available).



HYBRID CHIP

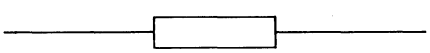
Cal-R Hybrid Chip Thermistors are produced by the same exacting manufacturing process as the Leaded Chip Thermistor and demonstrate the same electrical characteristics. Only the configuration is changed in order that they may be mounted in hybrid circuits utilizing the same equipment and techniques employed in the installation of other hybrid components. Cal-R hybrid chip thermistors are available with either silver or palladium-silver terminations to meet your process requirements.



LINEAR PTC DEVICES

Temperature Coefficient: +.45%/°C & ±.02%/°C (+0.6%°C available).

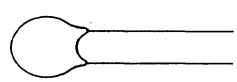
EPOXY COATED — RESISTANCE TOLERANCE ±1, 3, 5 & 10%



INTERCHANGEABLE THERMISTORS

Thermistors designed for interchangeability over a temperature range of 0°C to 80°C without the necessity of recalibrating the system.

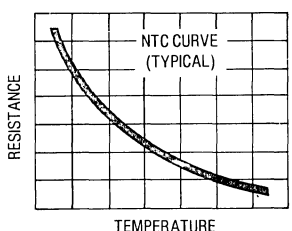
EPOXY COATED

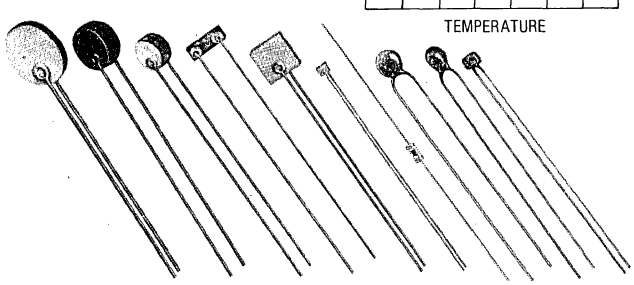


NTC (Negative Temperature Coefficient)

Thermistors offer inexpensive solutions to:

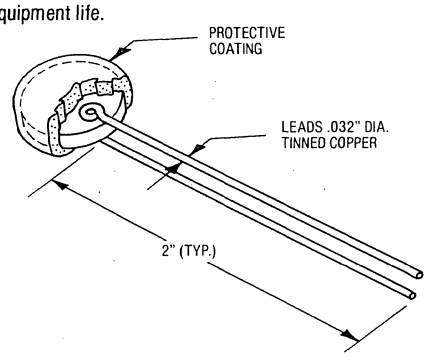
- Temperature Compensation
- Time Delay
- Soft Start
- Gas and Liquid Level Sensing
- Temperature Sensing and Control





SOFT START "INRUSH CURRENT" SUPPRESSING DEVICES

Cal-R Soft Start devices, made from rugged metal oxide ceramic materials, protect against high inrush currents in either AC or DC circuits. Soft Start affords protection for circuit components and assures longer equipment life.

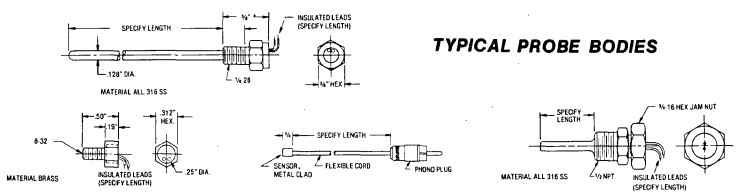


TEMPERATURE SENSING PROBES

NTC, PTC & NETWORKS
(TEMPERATURE RANGE —60 TO +400°C)

Resistance (@ 25°C) range 50 ohm to 1 megohm — tolerance 10% to 0.5% or better.

TYPICAL PROBE BODIES



CAL-R probes are designed for air, surface, and liquid temperature measurement and control applications. Special industrial probes can be produced to customer specifications.

CAL-R engineers will design Temperature Sensing Probes for your special application. Outline your problem or specifications and send them to: CAL-R Applications Engineering Department.

CAL-R, INC. *1601 Olympic Blvd., Santa Monica, California 90404 • (213) 450-1761 • TWX 910-343-6966*

WIREWOUND RESISTORS • THICK FILM • THERMISTORS

CAL-R INC. THERMONETICS DIVISION

THERMISTORS — Negative Temperature Coefficient

THERMISTOR SPECIFICATIONS

R@ 25°C Ω ±10%	Part Number	NTC %/°C @ 25°C	Nominal D.C.*	Nominal T.C.**	Max. Dimensions A	Max. Dimensions B	Leads AWG#	Type
100,000	2J05	−4.4	3	10	.06	.26	30	Bar
75,000	2J06	−4.4	3	8	.06	.20	30	Bar
50,000	2J07	−4.4	3	7	.06	.15	30	Bar
30,000	2J08	−4.4	2	6	.06	.08	30	Bar
25,000	2J09	−4.4	2	5	.06	.07	30	Bar
20,000	2J10	−4.4	2	5	.06	.06	30	Chip
15,000	2J11	−4.4	2	4	.06	.05	30	Chip
10,000	2J12	−4.4	2	4	.06	.04	30	Chip
10,000	1J112	−4.4	2	4	.08	.05	30	Disc
10,000	1J13	−4.4	4	12	.11	.10	28	Disc
8,000	1J14	−4.4	4	10	.11	.08	28	Disc
7,000	1J145	−4.4	4	10	.11	.07	28	Disc
6,000	1J147	−4.4	3	9	.11	.06	28	Disc
5,000	1J15	−4.4	3	8	.11	.05	28	Disc
5,000	2J15	−4.4	3	8	.10	.04	28	Chip
4,000	1J154	−4.4	5	23	.16	.10	28	Disc
4,000	2J165	−4.4	3	8	.10	.04	28	Chip
3,000	2J16	−4.4	3	—	.12	.04	28	Chip
3,000	1J155	−4.4	6	20	.16	.08	28	Disc
2,500	1J158	−4.4	5	19	.16	.07	28	Disc
2,000	2J17	−4.4	3	5	.10	.03	28	Chip
2,000	1J20	−4.4	7	25	.22	.09	24	Disc
2,000	1D10	−3.9	2	3	.06	.04	30	Disc
2,000	2D10	−3.9	2	4	.06	.04	30	Chip
1,500	1D111	−3.9	2	3	.08	.06	30	Disc
1,000	2J21	−4.4	6	15	.18	.04	24	Chip
1,000	1J24	−4.4	9	48	.32	.09	24	Disc
1,000	1D112	−3.9	2	4	.08	.04	30	Disc
1,000	1D13	−3.9	4	10	.11	.08	28	Disc
1,000	2D13	−3.9	2	3	.08	.04	28	Chip
800	1D14	−3.9	3	8	.11	.06	28	Disc
700	1D145	−3.9	3	7	.11	.05	28	Disc
600	1D147	−3.9	3	7	.11	.04	28	Disc
500	1D15	−3.9	3	6	.11	.04	28	Disc
500	2D15	−3.9	2	4	.10	.04	28	Chip
500	1D153	−3.9	7	20	.16	.08	28	Disc
400	2D165	−3.9	2	4	.11	.04	28	Chip
300	2D16	−3.9	3	5	.10	.03	28	Chip
300	1D19	−3.9	7	25	.22	.09	24	Disc
200	2D20	−3.9	6	—	.15	.04	—	Chip
100	2D21	−3.9	6	—	.18	.04	24	Chip
100	2B13	−3.3	2	4	.07	.04	28	Chip
80	2B14	−3.3	2	4	.08	.04	28	Chip
80	2D211	−3.9	5	—	.20	.04	24	Chip
50	2D24	−3.9	6	—	.32	.04	24	Chip
50	2B15	−3.3	2	4	.10	.04	28	Chip
30	2D31	−3.9	7	—	.35	.04	24	Chip
30	2B16	−3.3	2	4	.10	.03	28	Chip
25	2D33	−3.9	7	—	.36	.04	24	Chip
20	2D34	−3.9	7	—	.36	.04	24	Chip
20	2B17	−3.3	3	4	.16	.04	28	Chip
10	2B21	−3.3	5	—	.18	.04	28	Chip
5	2B24	−3.3	6	—	.30	.04	24	Chip

"INTERCHANGEABLE (±0.2°C 0° To 80°C) THERMISTORS"***

EPOXY COATED

2,000	5J102	−4.4	3	10	.125	.125	30	Spherical
3,000	5J103	−4.4	3	10	.125	.125	30	Spherical
5,000	5J105	−4.4	2	8	.100	.100	30	Spherical
10,000	5J110	−4.4	2	8	.100	.100	30	Spherical
20,000	5J120	−4.4	2	8	.100	.100	30	Spherical

***INTERCHANGEABLE THERMISTORS

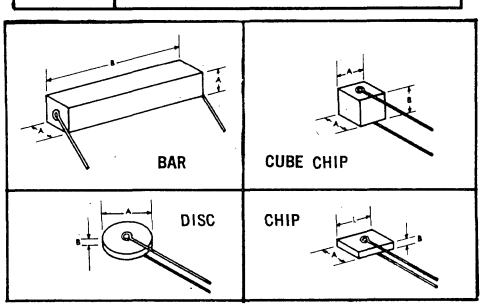
Thermistors designed for interchangability over narrower temperature ranges are available to your specifications at lower cost.

R/T CONVERSION TABLE

TEMPERATURE °C	TEMPERATURE °F	CURVE B R_T/R_{25}	CURVE D R_T/R_{25}	CURVE J R_T/R_{25}
−60	−76	43.0	73.04	140.5
−50	−58	24.3	38.95	67.0
−40	−40	14.4	21.51	33.7
−30	−22	8.93	12.33	17.7
−21.5	−6.7	6.09	—	10.6
−20	− 4	5.69	7.307	9.71
−10	+14	3.68	4.476	5.53
0	32	2.45	2.825	3.27
10	50	1.68	1.830	1.99
20	68	1.18	1.216	1.25
25	77	1.00	1.000	1.00
30	86	.854	.8267	.806
37.8	100	.671	—	.583
40	104	.628	.5742	.533
50	122	.464	.4067	.360
60	140	.350	.2937	.249
70	158	.267	.2160	.175
75	167	.236	—	.148
80	176	.208	.1615	.126
90	194	.163	.1229	.0916
100	212	.130	.0946	.0679
104.4	220	.118	—	.0598
110	230	.105	.0739	.0511
120	248	.0852	.0584	.0389
125	257	.0771	—	.0342
130	266	.0700	.0470	.0301
140	284	.0579	.0382	.0235
150	302	.0483	.0313	.0185

The alphabetical letter in the part number indicates the curve. To determine the approximate resistance of a thermistor at a specified temperature, multiply the thermistor resistance at 25°C by the ratio factor opposite that temperature on the R/T conversion table.

CURVE B	Ratio $\frac{R@\ 25°C}{R@\ 125°C} = 12.95 \pm 10\%$
CURVE D	Ratio $\frac{R@\ 25°C}{R@\ 125°C} = 19.8 \pm 10\%$
CURVE J	Ratio $\frac{R@\ 25°C}{R@\ 125°C} = 29.85 \pm 10\%$



**DISSIPATION CONSTANT

Dissipation Constant, expressed in mw/°C, represents the amount of power required to raise the temperature of a thermistor 1°C.

**TIME CONSTANT

Time Constant, expressed in seconds, is the time required for a thermistor dissipating zero power to change 63% of the difference between its initial temperature value and that of a new temperature environment.

CAL-R thermistors conform to AQL and confidence levels specified in MIL-T-23648, tables V and VI.

Coatings, marking, special leads, probes, resistor/thermistor networks, resistance values from 1 ohm to 150 KΩ, and other product variations are produced to meet your design requirements.

Resistance tolerances of ±1% through ±20% are available and may be specified at 25°C or any temperature within the operating range. Maximum operating temperature with leads 150°C.

CAL-R INC. / THERMISTORS • RESISTORS • MICROELECTRONICS
1601 OLYMPIC BOULEVARD, SANTA MONICA, CALIFORNIA 90404 (213) 450-1761 • TWX 910-343-6966

CAL-R, INC.
THERMISTOR DIVISION

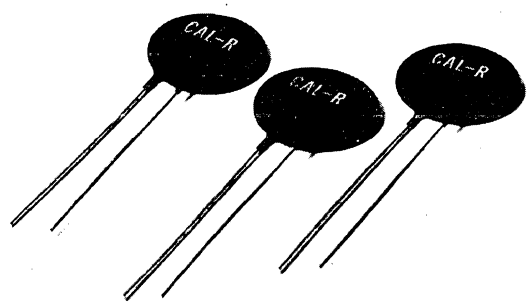
"SOFT-START"
INRUSH CURRENT SUPPRESSING DEVICES

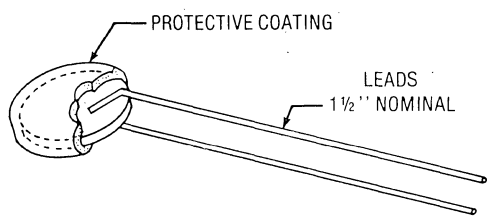
"Soft-Start" devices display relatively high resistance to starting currents in a variety of electronic circuits. Having a negative temperature coefficient of resistance, these devices exhibit a large decrease in resistance when an AC or DC current is applied.

Unlike circuit breakers and fuses, "Soft-Starts" prevent dangerous, short-duration, peak inrush currents present at turn-on. Especially useful in power supplies where charging capacitors initially present extremely low impedance, "Soft-Starts" actually limit inrush currents thereby extending the life of other critical components.

Part Number	$I_{Max.}$ (Amperes)	R_0 25°C (Ohms)	R@$I_{Max.}$ (Ohms)	Maximum Diameter (Inches)	Maximum Thickness (Inches)	Lead Diameter (Inches)
25SS25	25	1	.01	1.10	.35	.040
20SS20	20	1	.015	.90	.30	.040
18SS36	18	2	.03	.90	.35	.040
15SS38	15	2.5	.03	.90	.30	.040
14SS56	14	4	.05	.90	.35	.040
12SS60	12	5	.06	.90	.50	.040
12SS30	12	2.5	.04	.90	.35	.040
10SS50	10	5	.06	.90	.35	.040
10SS25	10	2.5	.04	.90	.25	.040
9SS45	9	5	.06	.90	.25	.040
9SS23	9	2.5	.04	.60	.25	.032
8SS40	8	5	.05	.60	.25	.040
8SS32	8	4	.07	.60	.25	.040
7SS35	7	5	.07	.60	.25	.032
7SS18	7	2.5	.05	.60	.25	.032
6SS60	6	10	.15	.60	.35	.040
6SS42	6	7	.15	.60	.30	.040
6SS30	6	5	.07	.60	.25	.032
5SS50	5	10	.20	.60	.35	.040
5SS35	5	7	.15	.60	.30	.040
5SS20	5	4	.15	.60	.25	.032
4SS48	4	12	.22	.50	.35	.040
4SS28	4	7	.15	.60	.30	.040
4SS20	4	5	.15	.60	.25	.032
3SS30	3	10	.20	.50	.30	.032
3SS21	3	7	.14	.60	.25	.032
3SS15	3	5	.17	.60	.25	.032
3SS08	3	2.5	.15	.60	.25	.032
2SS80	2	40	.60	.70	.25	.032
2SS40	2	20	.28	.60	.25	.032
2SS20	2	10	.20	.60	.25	.032
2SS10	2	5	.40	.60	.25	.032
1.5SS90	1.5	60	1.00	.60	.25	.032
1.5SS60	1.5	40	.80	.60	.25	.032
1.5SS38	1.5	25	.60	.50	.30	.032
1.5SS15	1.5	10	.25	.50	.25	.032

- Standard $R_0$25°C tolerance is ±20%. Closer tolerances are available upon request.
- Protective silicone coating is standard and has a nominal thickness of .02 inches. Other coatings are available upon request.
- Standard lead material is tinned copper-clad steel. Nickel or copper leads are available upon request.
- Special marking is available upon request.





DEFINITIONS

I_{max}
Represents the maximum rated steady state DC or RMS current and is expressed in amperes.

$R_0$25°C
Represents the zero power resistance of the device at +25°C and is expressed in ohms.

R@I_{max}
Represents the approximate resistance at maximum steady state current conditions and is expressed in ohms.

Ambient Temp.
Full rated current may be applied in the ambient temperature range of +25°C to +65°C and must be derated in accordance with I_{max} derating curve.

I_{op}
Represents the actual operating current applied.

Cool-Down Time
Is the amount of time needed for a "Soft-Start" device to cool enough to cause the necessary amount of resistance to limit inrush current.

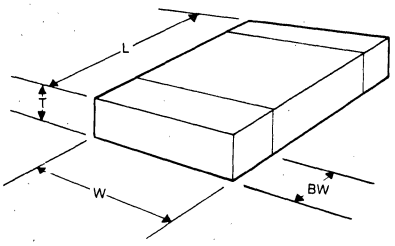
DALE®

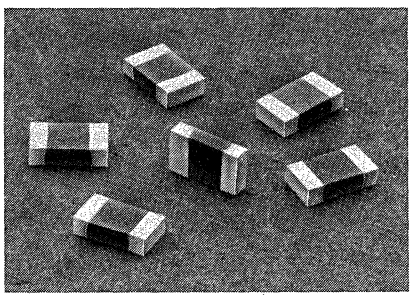
SURFACE MOUNTED HYBRID CHIP THERMISTORS

H Style Thermistors—Hybrid Chip

FEATURES

- Wraparound terminations
- Allows design flexibility for use with hybrid circuitry
- High-density monolithic ceramic construction





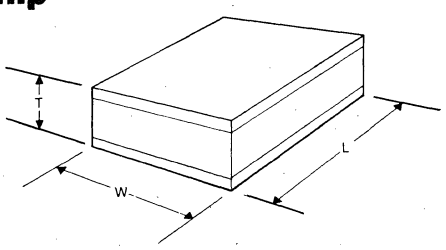
H Style chips are thermistor dies with wraparound terminations of fired on silver for mounting directly to the bonding pads of a hybrid substrate. The use of low temperature 2% to 5% silver bearing solder paste, or a suitable conductive epoxy is suggested for mounting.

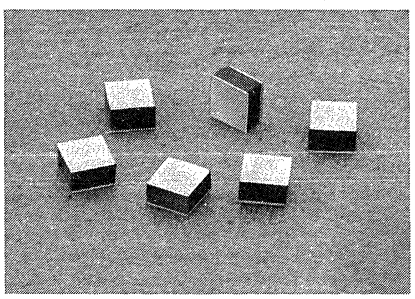
H STYLE 10%, 5% R_{25} tolerance Value range is 5K to 1Meg Ω

W Style Thermistors—Chip

FEATURES

- Top and bottom surface terminations
- High-density monolithic ceramic construction
- Allows design flexibility for use with hybrid circuitry





W style is a thermistor die with silver conductors fired on the top and bottom surfaces. The bottom surface can be reflow soldered or conductive epoxied directly to a substrate bonding pad, and the top surface wire bonded to complete the circuit connection.

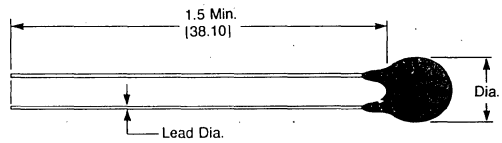
W STYLE ±10%, ±5% R_{25} tolerance Value range is 50 Ω to 1Meg Ω

RESISTANCE vs. TEMPERATURE CONVERSION TABLES (Ratio = $R_T \div R_{25}$)

TEMP. °C	CURVE 1			CURVE 2			CURVE 4			CURVE 7			CURVE 9		
	Ratio	MT±%	NTC	Ratio	MT±%	NTC	Ratio	MT±%	NTC	Ratio	MT±%	NTC	Ratio	MT±%	NTC
−55	96.44	4.5	7.4	53.40	6.3					132.15	6.0				
−50	67.06	3.9	7.2	38.99	6.1	6.2				90.49	5.0	7.5	44.13	3.9	
−40	33.66	3.3	6.7	21.45	5.5	5.8	40.16	5.3		43.92	4.2	7.0	23.98	3.3	5.9
−30	17.70	2.6	6.2	12.27	4.8	5.4	20.64	4.3	6.5	22.26	2.9	6.7	13.52	2.6	5.6
−20	9.712	2.1	5.8	7.278	4.0	5.1	11.03	3.5	6.1	11.73	2.7	6.2	7.891	2.1	5.2
−10	5.534	1.5	5.5	4.459	3.2	4.7	6.119	2.6	5.7	6.418	2.1	5.9	4.754	1.5	4.9
0	3.266	1.1	5.1	2.815	2.3	4.5	3.510	1.8	5.4	3.632	1.4	5.5	2.949	1.1	4.6
10	1.990	0.6	4.8	1.826	1.4	4.2	2.078	1.0	5.1	2.121	0.9	5.2	1.879	0.6	4.4
20	1.249	0.1	4.5	1.215	0.5	4.0	1.267	0.2	4.8	1.276	0.2	5.0	1.226	0.1	4.2
25	1.000	0.0	4.4	1.000	0.0	3.8	1.000	0.0	4.7	1.000	0.0	4.8	1.000	0.0	4.0
30	.8058	0.2	4.3	.8276	0.5	3.7	.7942	0.4	4.6	.7889	0.4	4.7	.8194	0.2	3.9
37	.6016	0.6	4.1				.5814	1.0	4.4				.6258	0.6	3.8
40	.5326	0.7	4.0	.5758	1.4	3.5	.5105	1.1	4.3	.5003	0.9	4.4	.5592	0.7	3.7
50	.3602	1.1	3.8	.4086	2.3	3.3	.3359	1.8	4.1	.3249	1.5	4.2	.3893	1.1	3.5
60	.2488	1.3	3.6	.2954	3.1	3.2	.2259	2.4	3.9	.2147	1.9	4.1	.2760	1.3	3.4
70	.1751	1.8	3.4	.2172	4.1	3.0	.1550	2.9	3.7	.1447	2.4	3.8	.1990	1.8	3.2
80	.1256	2.1	3.3	.1622	5.1	2.8	.1084	3.4	3.5	.09941	2.7	3.7	.1458	2.1	3.1
90	.09164	2.3	3.1	.1229	5.5	2.7	.0771	3.9	3.3	.06949	3.2	3.5	.1084	2.3	2.9
100	.06792	2.6	2.9	.09446	6.7	2.6	.0557	4.4	3.2	.04938	3.6	3.3	.08168	2.6	2.8
110	.05108	2.7	2.8	.07350	7.4	2.4	.0408	4.9	3.0	.03564	4.0	3.2	.06235	2.7	2.6
120	.03894	3.2	2.7	.05788	8.5	2.3	.0303	5.3	2.9	.02610	4.4	3.0	.04818	3.2	2.5
125	.03416	3.3	2.6	.05158	8.7	2.3	.0263	5.5	2.9	.02246	4.5	3.0	.04253	3.3	
130	.03006	3.4	2.5	.04609	8.9	2.2	.0228	5.7	2.8	.01939	4.7	2.9	.03764	3.4	2.4
140	.02348	3.7	2.4	.03708	9.7	2.1	.0173	6.0	2.7	.01459	5.0	2.8	.02972	3.7	2.3
150	.01854			.03012			.0133			.01112			.02370		

For complete information, write or phone
DALE ELECTRONICS, INC., Box 26728, El Paso, TX 79926 • Phone 915-592-3253

DALE® NEGATIVE TEMPERATURE COEFFICIENT (NTC)



NTC Thermistors are the most sensitive temperature sensors known to exist for temperature measurement and control between −50°C and +150°C. Dale Thermistors are rugged, reliable, predictable and are easily assembled in small housings to meet a multitude of temperature measurement and control requirements. The effects of "noise", which may be a factor with other sensors, and conductor resistance resulting from the installation of thermistors in remote locations, has minimal effect on system accuracy.

Interchangeable Thermistors provide greater temperature measurement and control accuracy over wider temperature ranges. In addition, they allow the use of multiple thermistor sensors with a single readout or control system and save money by eliminating costly calibration procedures. Dale Thermistors are backed by more than a decade's experience in manufacturing smaller, low-cost NTC styles which are used in a variety of temperature measurement and control equipment worldwide.

Resistance values and tolerances. The following charts list "standard" thermistor resistance values and tolerances. Contact us for additional information and assistance in developing custom thermistors and sensor assemblies to meet your application requirements.

SPECIFICATIONS

Point-Matched Tolerance: NTC Thermistors may be ordered with a temperature or a resistance tolerance at a temperature point. Parts listed are specified at 25°C.

Ω TOLERANCE		TEMPERATURE TOLERANCE
±10% — no suffix	± 3% — -3	±1.0°C — .A
± 5% — -5	± 1% — -1	±0.5°C — .B
		±0.2°C — .C

Interchangeable Tolerance: To simplify specification in ordering interchangeable Thermistors, they are specified to a temperature tolerance over a temperature range. The temperature tolerance corresponds to a resistance tolerance based on the temperature coefficient at each temperature point within the specified range (see definition of NTC).

INTERCHANGEABLE TOLERANCES AVAILABLE, 0° to 70°C

TOLERANCE		SUFFIX
±1.0°C	—	A3
±0.5°C	—	B3
±0.2°C	—	C3

To specify, add the appropriate suffix to the part number selected from the "Most Specified NTC Thermistors" chart. *Example:* 1M1002-B3, Curve 1, 10KΩ @ 25°C, *interchangeable to* ±.5°C from 0° to 70°C. Asterisk (*) indicates ±0.2°C tolerance available for Interchangeable Thermistors.

R_{25} Values ±10% listed are typical. 40Ω to 40 megohm @ 25°C available. Add -5 for ±5%, -2 for ±2%, etc. to part number for closer tolerance at temperature T.

Leads: T series thermistors have Teflon insulated leads 3" [76.20] ± .25 [6.35]. All others are solid tinned copper 1.5 [38.10] ± .2 [5.08] long unless otherwise specified.

Coating: "Baked-on phenolic" for durability and improved long term stability. Other coatings are available.

DEFINITIONS

$R_T \div R_{25}$ ratio is Resistance at temperature T divided by resistance at 25°C. To determine the resistance of a NTC thermistor at temperatures other than 25°C, multiply the ratio selected from the appropriate curve column above by resistance at 25°C, e.g., Curve 1, 10KΩ @ 25°C, 1256Ω @ 80°C. Call us for 1°C ratio tables.

NTC (−%/°C) is negative temperature coefficient of resistance at temperature (T) expressed in % resistance change per °C. Since one NTC resistance change is approximately equivalent to a 1°C temperature change, NTC is useful in developing Interchangeable Thermistor specifications, e.g., Curve 1, 10,000Ω ± 4.4% @ 25°C, 32,660Ω ± 5.1% @ 0°C, 1751Ω ± 3.4% @ 70°C results in a ±1°C Interchangeable Thermistor 0° to 70°C, .5 NTC = ±.5°C, etc.

Maximum Temperature for thermistors listed is 150°C; however, continuous operation or cycling above 125°C, or above specified temperature range for Interchangeable Thermistors, may cause thermistors to exceed originally specified tolerances.

MT±% is manufacturing tolerance at temperature. Add to resistance tolerance specified at 25°C, e.g., Curve 1 10K ± 10% @ 25°C, 1256Ω ± 12.1% @ 80°C. Not applicable to Interchangeable Thermistors.

Dissipation Constant (D.C.) is the amount of power, in milliwatts, which will raise the thermistor 1°C above its environment while suspended by its leads in still air at 25°C.

Time Constant (T.C.) is the time, in seconds, required for the thermistor dissipating zero power to change 63% of the difference between its initial temperature value and that of a new temperature environment, while supported by its leads in still air.

Thermistor Resistance Measurements must be made at precisely controlled temperature while applying essentially zero power to assure measurement accuracy.

Most Specified NTC THERMISTORS

R_{25} Ω	P/N	CURVE	NOMINAL D.C.	NOMINAL T.C.	MAX. DIA.	LEAD DIA.
100,000	7C1003	7	3	12	.095	.0125
50,000	7C5002	7	3	12	.095	.0125
30,000	4C3002	4	2.5	12	.095	.0125
20,000	4C2002	4	3	12	.095	.0125
10,000	1C1002*	1	3	12	.095	.0125
8,000	1C8001	1	3	12	.095	.0125
5,000	1C5001	1	3	12	.095	.0125
3,000	1C3001*	1	3	12	.095	.0125
2,000	1C2001	1	3.5	16	.095	.0125
1,000	2C1001	2	3	12	.095	.0125
500	2C5000	2	3	12	.100	.0125
200	2C2000	2	3.5	18	.150	.0125
100	2C1000	2	4	20	.195	.0125
30,000	9F3002*	9	.8	5	.072	.008
15,000	1F1502*	1	.8	5	.072	.008
10,000	1F1002*	1	.8	5	.072	.008
5,000	1F5001*	1	.8	7	.072	.008

R_{25} Ω	P/N	CURVE	NOMINAL D.C.	NOMINAL T.C.	MAX. DIA.	LEAD DIA.
200,000	7M2003	7	2	12	.095	.010
100,000	4M1003*	4	2	12	.095	.010
50,000	4M5002*	4	2	10	.085	.010
30,000	4M3002*	4	2	10	.085	.010
20,000	9M2002*	9	2	10	.085	.010
10,000	9M1002*	9	2	12	.095	.010
10,000	1M1002*	1	2	10	.085	.010
6,000	1M6001	1	2	10	.085	.010
5,000	1M5001*	1	2	10	.085	.010
2,252	1M2251*	1	3	12	.095	.010
1,000	2M1001	2	3	12	.085	.010
30,000	4T3002*	4	2	12	.095	.010
20,000	9T2002*	9	2	12	.095	.010
10,000	9T1002*	9	2	14	.095	.010
10,000	1T1002*	1	2	12	.095	.010
5,000	1T5001*	1	2	12	.095	.010
2,252	1T2251*	1	2	14	.095	.010

.03937 in. = 1 mm.

*Indicates ±0.2°C tolerance available for interchangeable thermistors. *Contact factory for information on resistance values not listed.*

SENSOR ASSEMBLIES AVAILABLE TO MEET STANDARD AND CUSTOM REQUIREMENTS

For complete information, write or phone

DALE ELECTRONICS, INC., Box 26728, El Paso, TX 79926 • Phone 915-592-3253

Elmwood Sensors Inc.

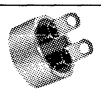
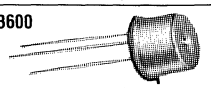
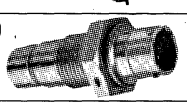
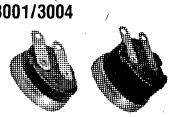
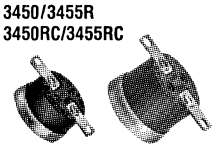
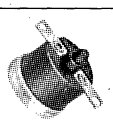
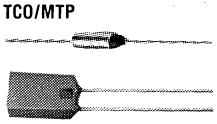
Subsidiary of Fasco®

Main Office and Plant:
500 Narragansett Park Drive, Pawtucket, RI 02861
Tel. (401) 727-1300
TOLL FREE: 1-800-ELMWOOD. Telex: 681-4066
European Office and Plant:
Elmwood Sensors, LTD.
North Shields, Tyne & Wear NE29 8SA England
Phone: (063) 25-82821. Telex: 53284

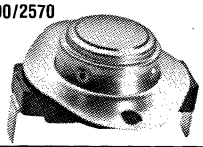
Elmwood thermostats are precision-engineered for quick, reliable response in high limit or control applications. Many meet military specifications, as well as U.L., C.S.A. and European requirements. Exposures are from–65°F to+550 °F, ratings to 25 Amps, with narrow or wide differentials as required. A variety of brackets and terminals are available, as well as custom packaging. Write or phone for complete catalog.

For fast service on prototypes and thermocouples call our precision sales department at (401) 727-1300.

SUB-MINIATURE SNAP-ACTION THERMOSTATS

DESCRIPTION	ELECTRICAL RESISTIVE RATING	SET POINT RANGE INCLUDING TOL.	NARROWEST TOLERANCE ALLOWABLE	NARROWEST DIFFERENTIAL AVAILABLE	AGENCY LISTINGS	TYPICAL APPLICATIONS
3100/3106 Welded hermetic construction.	3100 7A–30VDC 3A–240VAC 3106 .5A–50VDC .1A–120VAC	–20° to 500°F –28.89° to 260°C	±3°F ±1.7°F	6°F Max 3.3°C Max	UL CSA	High-temp control for copy machines, computers, aircraft, electronic controls. 3106 for "Dry Circuit" applications.
3150/3156 Similar to 3100 except low silhouette .301" max. design	3150 6A–120VAC 1.5A–240VAC 3156 .5A–50VDC .1A–120VAC	–20° to 350°F –28.89° to 177°C	±3°F ±1.7°F	6°F Max 3.3°C Max	UL CSA	Copy machines, computers, aircraft, electronic controls. where space is critical. 3156 for "Dry Circuit" applications.
3800  Hermetically sealed, all welded construction. Long life.	125VA–24VAC 360VA–600VAC	20°F to 480°F –5°C to 250°C	±9°F ±5°C	18°F 10°C	UL CSA	Running overtemperature protection for AC & DC motors. Onwinding mount.
3600  Hermetically sealed, TO–5 case, with contacts for logic level.	1Amp 28V AC/DC 5MA 5VDC	35°C to 105°C	±5°C	5°F Stand.		PC board mounted protection for power supply boards, logic boards, etc.
3000  Custom package housings	Consult Factory	0°F to 400°F –18°C to 204°C	±4°F ±2.2°C	10°F Max 5.6°C Max		Aircraft bleed air duct sensing, hydraulic oil temp control, liquid bath control, heater control.
3001/3004  Non-hermetic phenolic and metal housing	3001 6A–120VAC 3A–240VAC 3004 8A–120VAC 4A–250VAC	0° to 335°F 17.8° to 168.3°C	±4°F ±2.2°C	8°F Max 4.4°C Max	UL, CSA UL, CSA Int'l	Computer, copy machines, telecommunications equipment. 3004 meets European spacing requirements.
3450/3455R **3450RC/3455RC**  Non-hermetic "C" models have high temperature base material	15 AMP–120VAC 10 AMP–240VAC 10 AMP–277VAC	32°F to 500°F 0°C to 260°C	±5°F ±3°C	20°F 11°C	UL, CSA Int'l	Power supplies, communication, medical equipment, computers where high amp loads are present. 3455R/RC is used where increased spacing for international req's are needed.
3455RM **3450CM**  Non-hermetic manual reset. Will not recycle automatically at room temperature. CM model for high temp.	15 AMP–120VAC 10 AMP–240VAC	125° to 500°F 0° to 260°C	±8°F ±5°C	Man. reset (auto reset below 40°F 4.44°C)	UL, CSA Int'l national	Where manual reset is required. 3455RM/ 3450CM meet increased spacing for Int'l requirements.
TCO/MTP  Non-eutectic, non-resettable thermal fuse which protects equipment from hazardous temp conditions	TCO 25A–240VAC MTP 5A–120VAC	162° to 464°F 72° to 240°C 162° to 306°F 72° to 152°C	+0°C –4°C	N/A	UL, CSA Int'l UL, CSA	Electric heaters, table-top appliances, small motors and transformers. Special configuration avail.

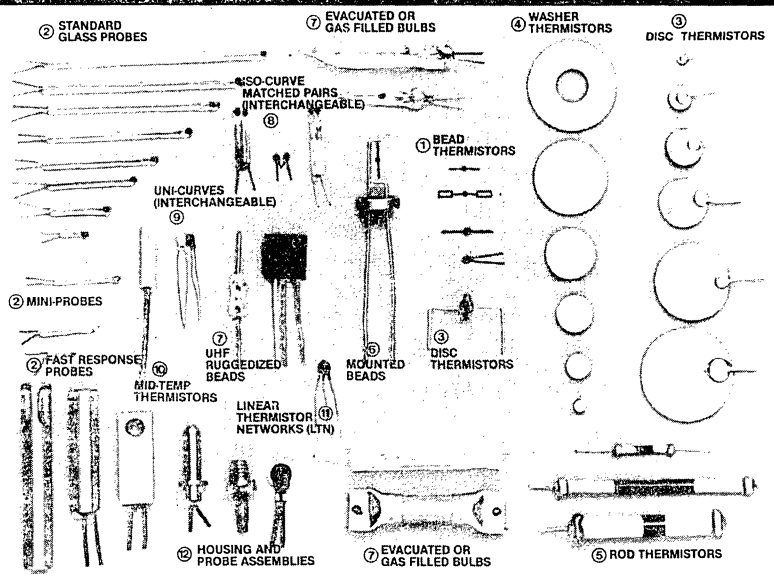
¾" DISC THERMOSTATS

DESCRIPTION	ELECTRICAL RESISTIVE RATING	SET POINT RANGE INCLUDING TOL.	NARROWEST TOLERANCE ALLOWABLE	NARROWEST DIFFERENTIAL AVAILABLE	AGENCY LISTINGS	TYPICAL APPLICATIONS
2500/2570  ¾" Non-hermetic automatic reset device. 2570 series used for Defrost applications.	2500 25A–240VAC 2570 10A–120VAC 5A–240VAC	0°F to 350°F –18°C to 177°C –20°F to 221°F –29°C to 105°C	±5°F ±3°C	10°F 5°C	UL, CSA	Electric heaters, clothes dryers, wood stoves. 2570 Series is designed for refrigerators, freezers, HVAC and food dispensing applications.

THERMISTORS

Fenwal® Electronics

BROADEST THERMISTOR LINE AVAILABLE ANYWHERE



THE MOST COMPLETE LINE OF PRECISION THERMISTORS

THERMISTOR CONFIGURATIONS

1. Glass Coated Beads — used where small size, fast response, high precision, stability, and temperatures to 300°C are required.

2. Glass Probes — medium-small in size. Many of the advantages of beads but rugged, more easily mounted, useful in liquid media.

3. Discs — used where medium power dissipation is a requirement and space not a problem. Useful to 150°C.

4. Washers — used where high power dissipation is a prime requirement.

5. Rods — these units have power dissipation intermediate between discs and washers and are also used where their physical shape is an asset.

6. Mounted Beads — provide ease in using glass beads in such applications as gas chromatography, flow and vacuum measurement, etc.

7. Vacuum and Gas Filled Assemblies — high power sensitivity for specialized circuit applications.

INTERCHANGEABLE THERMISTORS

8. Iso-Curve® Interchangeable Thermistors — these units available in bead or glass probe configurations, follow standard L-2B curves over wide temperature range, and are completely interchangeable. Units match standard curves as close as ± ¼ % of resistance or as required. Bulletin L-2B.

9. Uni-Curve® Interchangeable Thermistors — completely interchangeable units having an accuracy of + 0.2%C over a temperature range of 0°C to 70°C and available on special order to other tolerances and ranges. Bulletin L-6B

LINEAR THERMISTOR NETWORKS(LTN)

10. Linear Thermistor Networks (LTN™) — precision resistors and thermistors which are designed to produce a resistance change or voltage output that varies linearly with temperature over the selected temperature range. Ask for Bulletin L-9A.

THERMISTOR PROBES

11. Probe Assemblies — standard catalog types or built to specific military or commercial requirements. We are experienced in design of probe assemblies for all fields of application including industrial control and indication, aerospace — specializing in telemetry applications, and oceanographic — featuring fast response, very high pressure, and interchangeability using our Iso-Curve and Uni-Curve Thermistors. Ask for Catalog L-5A.

FREE... technical THERMISTOR LITERATURE

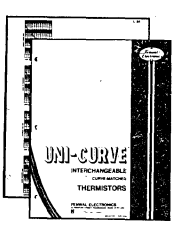
THERMISTOR MANUAL (EMC-6B) Most complete up-to-date listing of thermistors available. Theory, engineering data, complete specifications.

THERMISTOR HOUSING MANUAL (L-5A). Detailed information on how Fenwal Electronics can build thermistor sensor assemblies to fit your requirements.

THERMISTOR APPLICATION AND TECHNICAL DATA NOTES: "Designing Linear Temperature Read-Out Circuits" AN-1A; "Using Thermistors to Compensate for Transistor Temperature Sensitivity" AN-2A; "Stability & Reliability Characteristics" TD-1A; "Considerations in Testing of Thermistors" TD-2A.

LINEAR THERMISTOR NETWORKS (LTN™) precision resistors and thermistors which are designed to produce a resistance change or voltage output that varies linearly with temperature over the selected temperature range. Ask for Bulletin L-9A.

INTERCHANGEABLE THERMISTORS: ISO-CURVE manual (L-2B) and UNI-CURVE manual (L-6B) provide in-depth data pertaining to precision and low-cost RT, curve-matched interchangeable thermistors.



IN THE U.S.A.
FENWAL ELECTRONICS
Division of Kidde, Inc.
KIDDE
63 Fountain Street, Framingham, Massachusetts 01701 U.S.A.

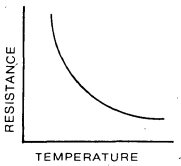
Fenwal® Electronics

OUTSIDE THE U.S.A.
FENWAL ELECTRONICS LIMITED
LYONS HOUSE, 2A STATION ROAD
FRIMLEY, CAMBERLEY, SURREY, GU16 5HF
ENGLAND
TELEPHONE: CAMBERLEY 26838 TELEX: 858840

• (617) 872-8841 • TELEX 299550 •

Keystone CARBON COMPANY

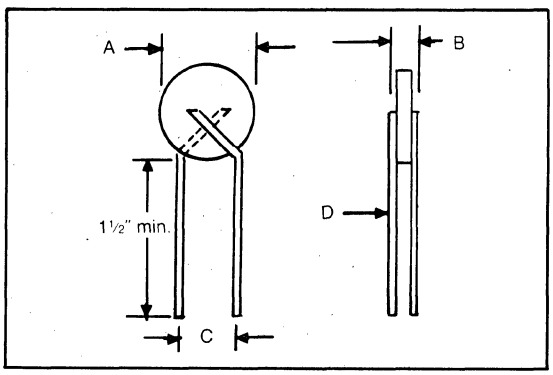
DISC TYPE THERMISTORS WITH CROSSED LEADS



NTC (Negative Temperature Coefficient) thermistors decrease in resistance as temperature increases. Their maximum operating temperature is 125° C. Zero-power resistance values at 25° C range from 10 Ω to 250K Ω ; other values upon request. Disc thermistors are available with various coatings, lead styles, and resistance tolerances. Contact Keystone Thermistor Engineering or write for catalog T384.

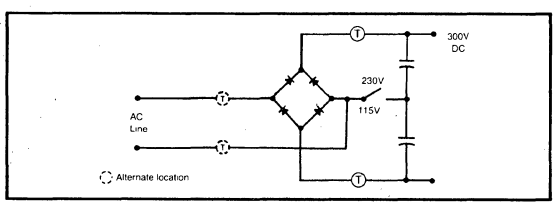
KCC TYPE	R_o@ 25°C (Ω)	Tol. ±%	A (in.)	B (in.)	C (in.)	D (AWG)	Dissipation Constant (mW/°C)	Resist.† Ratio	Temp. Coef. @ 25°C (%/°C)
RL1004-65.6-59-D1	100	20	0.110	0.120	0.100	26	2.5	5.6	-3.42
RL1003-312-73-D1	500	10	0.110	0.110	0.100	26	2.5	6.9	-3.83
RL1007-624-73-D1	1,000	10	0.110	0.150	0.100	26	2.8	6.9	-3.83
RL1003-1157-95-D1	2,000	10	0.110	0.150	0.100	26	2.8	9.2	-4.43
RL1003-1746-97-D1	3,000	10	0.110	0.110	0.100	26	2.5	9.1	-4.40
RL1004-2910-97-D1	5,000	10	0.110	0.120	0.100	26	2.5	9.1	-4.40
RL1009-5820-97-D1	10,000	10	0.110	0.170	0.100	26	3.0	9.1	-4.40
RL1005-5744-103-D1	10,000	10	0.110	0.130	0.100	26	2.5	9.6	-4.49
RL1007-13.8K-120-D1	25,000	10	0.110	0.150	0.100	26	2.8	11.4	-4.84
RL1003-26.7K-140-D1	50,000	10	0.110	0.110	0.100	26	2.5	12.9	-5.08
RL1006-53.4K-140-D1	100,000	10	0.110	0.140	0.100	26	2.7	12.9	-5.08
RL1004-104.7K-155-D1	200,000	10	0.110	0.120	0.100	26	2.5	13.8	-5.23
RL1006-135.2K-138-D1	250,000	10	0.110	0.140	0.100	26	2.7	12.1	-4.96
RL2004-16.4-59-D1	25	20	0.220	0.130	0.156	24	6.5	5.6	-3.42
RL2007-32.8-59-D1	50	20	0.220	0.160	0.156	24	6.5	5.6	-3.42
RL2003-62.4-73-D1	100	10	0.220	0.120	0.156	24	6.5	6.9	-3.83
RL2006-125-73-D1	200	10	0.220	0.150	0.156	24	6.5	6.9	-3.83
RL2008-187-73-D1	300	10	0.220	0.170	0.156	24	6.5	6.9	-3.83
RL2003-289-95-D1	500	10	0.220	0.120	0.156	24	6.0	9.2	-4.43
RL2004-582-97-D1	1,000	10	0.220	0.130	0.156	24	6.5	9.1	-4.40
RL2007-1164-97-D1	2,000	10	0.220	0.160	0.156	24	6.5	9.1	-4.40
RL2006-1600-103-D1	2,786	10	0.220	0.150	0.156	24	6.5	9.6	-4.49
RL2005-2203-120-D1	4,000	10	0.220	0.140	0.156	24	6.5	11.4	-4.84
RL2006-2753-120-D1	5,000	10	0.220	0.150	0.156	24	6.5	11.4	-4.84
RL2012-5506-120-D1	10,000	10	0.220	0.210	0.156	24	7.2	11.4	-4.84
RL2006-13.3K-140-D1	25,000	10	0.220	0.150	0.156	24	6.5	12.9	-5.08
RL2005-27K-138-D1	50,000	10	0.220	0.140	0.156	24	6.5	12.1	-4.96
RL2008-52.3K-155-D1	100,000	10	0.220	0.170	0.156	24	6.5	13.8	-5.23
RL3004-6.56-59-D1	10	20	0.320	0.130	0.250	24	7.0	5.6	-3.42
RL3504-31.2-73-D1	50	10	0.370	0.130	0.250	24	7.0	6.9	-3.83
RL3006-59.4-85-D1	100	10	0.320	0.150	0.250	24	7.2	8.4	-4.23
RL3004-144-95-D1	250	10	0.320	0.130	0.250	24	7.0	9.2	-4.43
RL3004-291-97-D1	500	10	0.320	0.130	0.250	24	7.0	9.1	-4.40
RL3005-574-103-D1	1,000	10	0.320	0.130	0.250	24	7.0	9.6	-4.49

†Resistance Ratio: Ratio of zero-power resistance @ 0°C to zero-power resistance @ 50°C.



Distributed by:
ALLIED ELECTRONICS
401 E. Eighth St., Ft. Worth, TX 76102 (817) 336-5401
NEWARK ELECTRONICS
500 N. Pulaski Rd., Chicago, IL 60624 (312) 638-4411
HI-COR (West Coast)
1530 Main St., Redwood City, CA 94063 (415) 365-5087

INRUSH CURRENT LIMITERS



The circuit diagram above displays a typical way to limit inrush current.

Protection against extremely high peak inrush current, especially in AC/DC switching power supplies, is now available with Keystone Inrush Current Limiters. These special NTC thermistors effectively control surge currents because the thermal time constant of the current limiter is longer than the electrical time constant (RC) of the thermistor and the capacitor.

All inrush current limiters are insulated with a protective coating. Caution must be taken when parts are cleaned in solvents.

Type	R_o @ 25°C ± 25% (Ω)	Max.* Steady State Current (amps)	Nominal Resistance @ I_{max} (Ω)	A max. (in.)	B max. (in.)	C ref. (in.)	D (AWG)
CL-10	0.7	12	0.03	0.740	0.200	0.328	18
CL-20	1.3	8	0.04	0.525	0.150	0.328	18
CL-30	2.5	8	0.06	0.740	0.200	0.328	18
CL-40	5	6	0.11	0.740	0.200	0.328	18
CL-50	7	5	0.16	0.740	0.220	0.328	18
CL-60	10	5	0.18	0.740	0.200	0.328	18
CL-70	16	4	0.27	0.740	0.200	0.328	18
CL-80	47	3	0.49	0.740	0.200	0.328	18
CL-90	120	2	1.18	0.910	0.200	0.328	18
CL-100	0.5	16	0.02	0.910	0.200	0.328	18
CL-110	10	3.2	0.18	0.360	0.140	0.250	24
CL-120	10	1.7	0.34	0.360	0.140	0.250	24
CL-130	50	1.6	0.76	0.420	0.150	0.250	24
CL-140	50	1.1	0.89	0.420	0.150	0.250	24
CL-150	5	4.7	0.11	0.530	0.150	0.328	22
CL-160	5	2.8	0.20	0.530	0.150	0.328	22
CL-170	16	2.7	0.33	0.530	0.150	0.328	22
CL-180	16	1.7	0.49	0.530	0.150	0.328	22
CL-190	25	2.4	0.41	0.530	0.150	0.328	22
CL-200	25	1.7	0.49	0.530	0.150	0.328	22

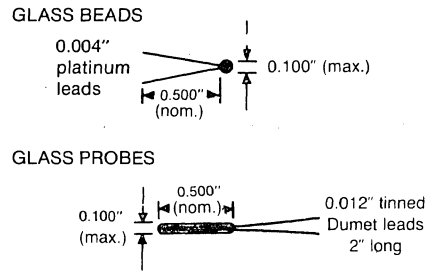
*These values are *suggested* maximums based upon a 25° C ambient, no air flow environment with the thermistor mounted ½" from the circuit board. Contact Keystone Engineering to discuss Iss ratings with air flow.

Keystone CARBON COMPANY
Thermistor Division • St. Marys, Pa. 15857
814-781-1591 • Telex No. 91-4517

Keystone CARBON COMPANY

GLASS BEADS • GLASS PROBES

Glass bead thermistors are exceptionally stable because the glass seal protects the thermistor from hostile environments.



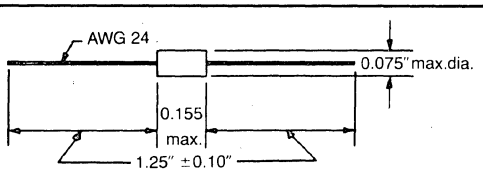
RESISTANCE/TEMPERATURE CHARACTERISTICS

KCC TYPE	RESISTANCE (Ω)								Temp. Coef. @ 25°C (%/°C)
	-25°C	0°C	25°C	50°C	100°C	150°C	200°C	260°C	
RL0504-8783-95-G_*	189.3K	48.48K	15K	5484	1049	290.3	104.0	38.6	-4.33
RL0504-11.64K-97-G_	268.6K	65.76K	20K	7206	1364	370.4	130.3	47.4	-4.39
RL0504-16.92K-112-G_	462.6K	105.3K	30K	10.18K	1735	427.2	115.9	26.9	-4.64
RL0504-27.76K-120-G_	803.5K	182.2K	50K	16.5K	2658	642.5	204.7	67.2	-4.77
RL0504-55.53K-120-G_	1.61M	364.5K	100K	33K	5317	1285	409.4	134.4	-4.77
RL0504-111.3K-125-G_	3.38M	743.4K	200K	65.8K	10.22K	2416	762.2	249.2	-4.82
RL0504-272.6K-142-G_	9.31M	1.97M	500K	158.6K	22.2K	4700	1345	389	-5.00
RL0504-530.5K-148-G_	18.99M	3.94M	1 Meg	301.7K	41.74K	8780	2494	729	-5.11
RL0504-1.294M-176-G_	—	10.34M	2.5 Meg	716.7K	86.77K	15.96K	3955	982.5	-5.31
RL0504-2.588M-176-G_	—	20.68M	5 Meg	1.434M	173.6K	31.92K	7910	1965	-5.31

*Not presently available in Glass Probes.
Tolerance on resistance values ± 20% @ 25°C. Closer tolerances available.
Beads have a maximum operating temperature of 260°C.
—G1 for Glass Beads with platinum leads.
—G15 for Glass Probes.

GLASS ENCAPSULATED THERMISTORS

Keystone glass encapsulated NTC thermistors are tiny pellets of thermistor material hermetically sealed in glass bodies with a controlled amount of selected atmosphere. The hermetic seal makes these parts extremely stable in applications up to 204° C (400° F).



Temperature Range: −50°C to +204°C
Time Constant: 3 sec.
Dissipation Constant: 2.0 mW/°C
Tolerance: ±10% @ 25°C

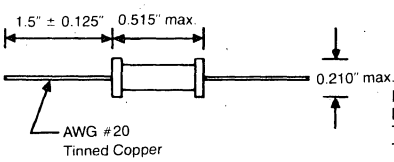
RESISTANCE/TEMPERATURE CHARACTERISTICS

KCC TYPE	RESISTANCE (Ω)								Temp. Coef. @ 25°C (%/°C)
	-25°C	0°C	25°C	50°C	75°C	100°C	150°C	204°C	
AL03006-624-73-G1	10.11K	2888	1K	403.9	185.6	94.4	31.0	12.1	-3.91
AL03006-1248-73-G1	20.22K	5776	2K	807.8	371.2	188.8	62.0	24.2	-3.91
AL03006-5818-97-G1	133.3K	32.96K	10K	3577	1469	671.2	182	59.9	-4.41
AL03006-11.7K-98-G1	253K	64.16K	20K	7234	2966	1356	361.2	115.9	-4.34
AL03006-29.1K-97-G1	625K	160K	50K	18.2K	7510	3431	918.5	293.2	-4.32
AL03006-58.2K-97-G1	1.25M	319.9K	100K	36.4K	15.02K	6862	1837	586.4	-4.32
AL03006-110K-130-G1	3.29M	729K	200K	64.2K	23.66K	9580	2184	595.8	-4.84
AL03006-269.8K-138-G1	8.91M	1.92M	500K	155.7K	55.85K	22.64K	4943	1329	-4.99
AL03006-535K-145-G1	18.72M	3.90M	1 Meg	305.3K	106.9K	42.47K	8946	2329	-5.07
AL03006-2.6M-164-G1	—	20.41M	5 Meg	1.45M	489.3K	185.9K	36.16K	8777	-5.26

ROD-TYPE THERMISTORS

HIGH-TEMPERATURE COEFFICIENT RODS

KCC TYPE	RESISTANCE @°C						Temp. Coef. @ 25°C (%/°C)
	0	25	50	75	100	125	
AL1545-6240-73-R1	28.2K	10K	4100	1890	956	520	-3.83
AL1545-11.6K-97-R1	67.2K	20K	7140	2920	1352	685	-4.46
AL1545-28.9K-97-R1	168K	50K	17.8K	7320	3381	1710	-4.46
AL1545-55K-120-R1	372K	100K	32.4K	12.2K	5270	2080	-4.86
AL1545-109K-125-R1	753K	200K	63.9K	23.9K	10.1K	4720	-4.91
AL1545-268K-137-R1	1.95M	500K	154K	55.6K	22.6K	10.4K	-5.03
AL1545-523K-155-R1	4.06M	1 Meg	294K	100K	39.3K	17.1K	-5.22



Maximum operating temperature: 125°C
Dissipation constant: 9mW/°C
Time constant: 45 sec.
Tolerance: ± 10% @ 25°C

LOW-TEMPERATURE COEFFICIENT RODS

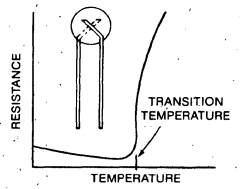
KCC TYPE	RESISTANCE @°C						Temp. Coef. @ 25°C (%/°C)
	0	25	50	75	100	125	
AL1545-40.1-26-R1	80.6	50	32.9	22.6	16.2	11.9	-1.78
AL1545-80.2-26-R1	161	100	65.8	45.3	32.4	23.8	-1.78
AL1545-160-26-R1	322	200	132	90.6	64.8	47.7	-1.78
AL1545-340-26-R1	685	425	280	192	137	101	-1.78
AL1545-391-29-R1	847	500	314	206	142	100	-1.98
AL1545-782-29-R1	1690	1K	628	413	284	201	-1.98
AL1545-1560-30-R1	3430	2K	1240	808	548	387	-2.03
AL1545-3860-31-R1	8680	5K	3060	1980	1327	924	-2.07
AL1545-7730-31-R1	17.4K	10K	6130	3950	2654	1850	-2.07
AL1545-15.3K-33-R1	35.6K	20K	12K	7560	4976	3400	-2.17
AL1545-37.9K-34-R1	90K	50K	29.5K	18.5K	12K	8120	-2.22

Keystone CARBON COMPANY
Thermistor Division • St. Marys, Pa. 15857
814-781-1591 • Telex No. 91-4517

Distributed by:
ALLIED ELECTRONICS
401 E. Eighth St., Ft. Worth, TX 76102 (817) 336-5401
NEWARK ELECTRONICS
500 N. Pulaski Rd., Chicago, IL 60624 (312) 638-4411
HI-COR (West Coast)
1530 Main St., Redwood City, CA 94063 (415) 365-5087

Keystone CARBON COMPANY

PTC — POSITIVE TEMPERATURE COEFFICIENT THERMISTORS



Positive Temperature Coefficient (PTC) thermistors are characterized by an extremely large resistance change in a small temperature span. The figure at left depicts a generalized resistance temperature plot for a PTC. The temperature at which the resistance begins to increase rapidly is referred to as the transition temperature. This point can be changed from below 0° C to above 160° C.

TYPICAL PTC APPLICATIONS

• Automatic Color TV Degaussing • Air Flow Measurement • Non-Destructive Fuse • Single Phase Motor Starting • Liquid Level Sensing • Combination Heater-Thermostat • Arc Suppression • Time Delay Fusing.

For detailed application notes, write for Bulletin P-780.

Operating Voltage V_{OP}	Type Number	R_r @ 25°C ±30% (Ω)	Transition Temperature T_{TR} (°C)	Reference Dimensions (In.) A	B	C	D	E	Dissipation† Constant δ (mW/°C)	Time† Constant τ (Sec.)	Fig. No.*
12	RL5505-1-120-12-PTO	1	120	0.55	0.05	1.5	0.33	0.032	14.0	50	A
	RL5305-2-120-12-PTO	2	120	0.53	0.05	1.5	0.33	0.032	14.0	50	A
	RL3005-10-120-12-PTO	10	120	0.30	0.05	1.5	0.25	0.020	7.0	35	A
	RL3005-25-120-12-PTO	25	120	0.30	0.06	1.5	0.25	0.020	7.0	35	A
25	RL3006-50-30-25-PTO	50	30	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-40-25-PTO	50	40	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-50-25-PTO	50	50	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-60-25-PTO	50	60	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-70-25-PTO	50	70	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-80-25-PTO	50	80	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-90-25-PTO	50	90	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-100-25-PTO	50	100	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-110-25-PTO	50	110	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-120-25-PTO	50	120	0.30	0.06	1.5	0.25	0.020	7.0	35	A
50	RL5506-10-110-50-PTO	10	110	0.55	0.06	1.5	0.33	0.032	14.0	50	A
	RL5510-20-110-50-PTO	20	110	0.55	0.10	1.5	0.33	0.032	15.0	80	A
	RL4010-50-110-50-PTO	50	110	0.40	0.10	1.5	0.33	0.025	12.0	60	A
120	RL7510-10-120-120-PTO	10	120	0.75	0.10	1.5	0.33	0.020	20.0	90	A
	RL6010-20-120-120-PTO	20	120	0.60	0.10	1.5	0.33	0.032	18.0	90	A
	RL5510-25-65-120-PTO	25	65	0.55	0.10	0.5	0.33	0.025	15.0	90	B
	RL4510-50-120-120-PTO	50	120	0.45	0.10	1.5	0.33	0.025	12.0	70	A
240	RL5515-50-65-240-PTO	50	65	0.55	0.15	1.5	0.33	0.032	17.0	80	A
	RL6015-100-120-240-PTO	100	120	0.60	0.15	1.5	0.33	0.032	18.0	90	A
	RL3020-1500-100-240-PTO	1500	100	0.30	0.20	1.5	0.25	0.020	12.0	60	A

†The values for dissipation constant and time constant are for reference only. Actual values are a function of method of mounting, air flow, and other factors which affect the PTCs ability to dissipate heat. Contact Keystone Engineering for further information.
*Represents standard lead configurations. Other lead styles shown are available for custom made thermistors.

Keystone CARBON COMPANY
Thermistor Division • St. Marys, Pa. 15857
814-781-1591 • Telex No. 91-4517

Distributed by:
ALLIED ELECTRONICS
401 E. Eighth St., Ft. Worth, TX 76102 (817) 336-5401
NEWARK ELECTRONICS
500 N. Pulaski Rd., Chicago, IL 60624 (312) 638-4411
HI-COR (West Coast)
1530 Main St., Redwood City, CA 94063 (415) 365-5087

TYPICAL CONFIGURATIONS

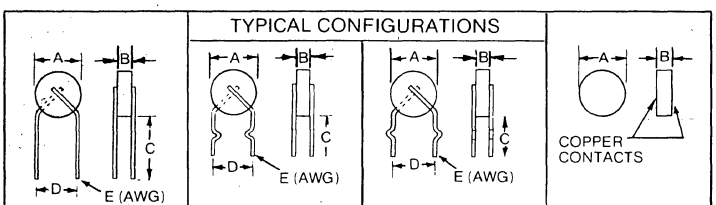


FIG. A (STRAIGHT LEAD) | FIG. B (INSIDE KINK) | FIG. C (OUTSIDE KINK) | FIG. D (NO LEADS)

NOTE: 1. Operating Voltage: D.C. or 60Hz A.C. (for higher voltage req. — contact factory).
2. The specifications and configurations shown above are typical of standard items. Special characteristics, designs and alternate physical sizes are available upon request.

PTC RESETTABLE FUSES

Typical applications for PTC fuses:
- Telephone line fault protection
- Fuse for intermittent solenoids
- Over-current protection for transformers
- Locked rotor protection for FHP motors

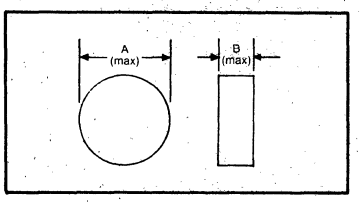
Minimum Limit Current — The minimum amount of current required by the PTC to guarantee switching at the minimum ambient temperature.

Maximum Limit Current — The maximum amount of current the PTC must be able to pass without switching at the maximum ambient temperature.

Operating Voltage V_{op}	No Load Resistance @ 25°C (±20%) (Ω)	Type Number	Minimum Limit† Current (amps) 0°C	20°C	Maximum Limit† Current (amps) 30°C	55°C	T_{TR} (Ref.) (°C)	Heat Capacity (Watt-Sec/°C)	Diss.† Const. (mW/°C)	Max. Dia. (In.)
12	1	RL5305-1-110-12-PTF	1.30	1.20	0.80	0.60	110	0.5	14.0	0.60
	5	RL4005-5-110-12-PTF	0.44	0.37	0.29	0.20	110	0.3	10.0	0.45
	10	RL3005-10-110-12-PTF	0.33	0.30	0.20	0.16	110	0.2	7.0	0.35
	25	RL2505-25-110-12-PTF	0.23	0.19	0.13	0.09	110	0.1	6.0	0.32
50	5	RL5506-5-110-50-PTF	0.55	0.50	0.30	0.25	110	0.7	14.0	0.60
	10	RL4006-10-110-50-PTF	0.30	0.27	0.18	0.16	110	0.4	10.0	0.45
	50	RL5310-50-110-50-PTF	0.23	0.20	0.11	0.10	110	1.1	15.0	0.60
	100	RL3810-100-110-50-PTF	0.10	0.09	0.06	0.05	110	0.5	12.0	0.42
120	10	RL7510-10-110-120-PTF	0.39	0.36	0.25	0.17	110	2.2	20.0	0.80
	50	RL4510-50-110-120-PTF	0.16	0.15	0.09	0.07	110	0.7	14.0	0.50
	100	RL3510-100-110-120-PTF	0.09	0.08	0.06	0.04	110	0.5	11.0	0.40

†The values for minimum and maximum limit current and dissipation constant are for reference only. Actual values are a function of method of mounting, air flow, and other factors which affect the PTCs ability to dissipate heat. Contact Keystone engineering for further information.

PTC HEATERS



Typical applications for PTC heaters:
- Contact lens cleaner kits
- Medical equipment
- In-line diesel fuel heaters
- Temperature stabilization of electronic components

Operating Voltage V_{OP}	Type Number	No Load Resistance @ 25°C (Ref.) (Ω)	Transition Temperature (Ref.) (°C)	A (In.)	B (In.)	Typical Operating Temperature Minimum Heat Sinking† °C
24	6306-200-15-24-PTH	200	15	0.68	0.08	20††
	5506-20-120-24-PTH	20	120	0.60	0.08	160
	5506-20-140-24-PTH	20	140	0.60	0.08	180
	5506-40-110-24-PTH	40	110	0.60	0.08	130
120	5510-100-120-120-PTH	100	120	0.60	0.12	160
	5510-200-110-120-PTH	200	110	0.60	0.12	140
	5510-150-140-120-PTH	150	140	0.60	0.12	180
240	6315-250-120-240-PTH	250	120	0.68	0.18	160
	5520-250-140-240-PTH	250	140	0.60	0.23	180
	6315-500-110-240-PTH	500	110	0.68	0.18	140

†Measured at 25°C ambient, PTC mounted in small spring clip. ††Measured at −40°C ambient.

Keystone CARBON COMPANY

PTC SURFACE-MOUNT OVERTEMPERATURE PROTECTORS

Positive Temperature Coefficient (PTC) thermistors — act as solid-state switches. A typical application of these surface mount units is to prevent destruction of a power transistor.

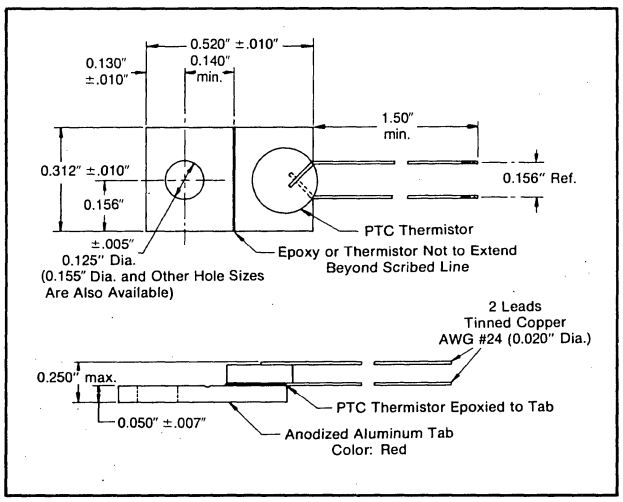
PTCs are bonded to a tab which is mechanically mounted to the power transistor package. The PTC thermistor measures the surface temperature of the transistor. When the temperature of the transistor case reaches a critical point, the PTC switches and turns off the drive circuitry for the transistor. This action prevents its destruction. Then, as the transistor cools, so does the thermistor, automatically resetting itself to once again guard the power transistor.

Specifications:

1. Resistance @ 25° C: 100Ω + 30% (70Ω - 130Ω).
2. Transition temperature per table is defined as the temperature at which the measured resistance is two times the minimum resistance.
3. Maximum voltage that can be applied to the device in DC or 60Hz sinusoidal wave form AC is 30 volts.
4. Maximum operating temperature 140° C.
5. Dielectric withstand between PTC element and aluminum tab is 50 VDC min.
6. Basic construction: .200" dia. x .060" thk. PTC disc with radial leads attached to an anodized aluminum tab.
7. Physical design — as shown.
8. Optional resistance values, switch temperatures and physical designs are available upon request.

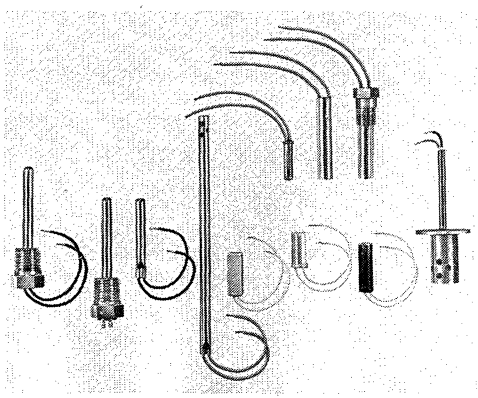
PTC SURFACE TEMPERATURE SENSORS

Type Number	Transition Temp. °C (Ref.)
RL2006-100-30-30-PT1	30
RL2006-100-40-30-PT1	40
RL2006-100-50-30-PT1	50
RL2006-100-60-30-PT1	60
RL2006-100-70-30-PT1	70
RL2006-100-80-30-PT1	80
RL2006-100-90-30-PT1	90
RL2006-100-100-30-PT1	100
RL2006-100-110-30-PT1	110
RL2006-100-120-30-PT1	120



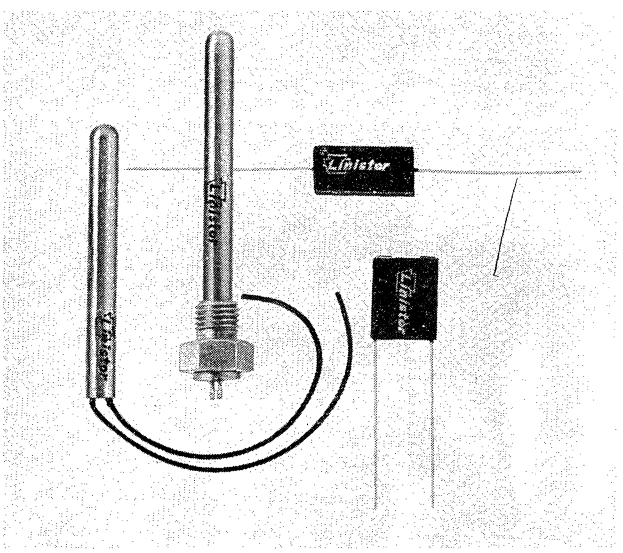
THERMISTOR PROBES

The probes illustrated below include stainless steel, aluminum, and chrome-plated materials in a variety of configurations. In addition, a variety of other designs are available. These probes are used in conjunction with solid state circuitry for liquid level measurement, and for use as sensors to measure the temperature of liquids or surface temperatures.



LINISTOR® ASSEMBLIES

Keystone developed Linistor assemblies to give an accurate resistance response over a temperature span of 0° to 100° C. Because Linistor assemblies have flattened out the thermistor resistance curve to a constant and predictable straight-line plot, they are valuable in a wide range of applications. Four standard encasements are available. Tolerance on resistance of Linistor is ±2% at 25° C.



Keystone CARBON COMPANY
Thermistor Division • St. Marys, Pa. 15857
814-781-1591 • Telex No. 91-4517

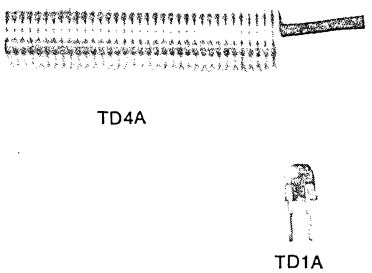
TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

MICRO SWITCH

TD Precision Interchangeable Temperature Sensors



TD4A

TD1A

Actual Size

MICRO SWITCH TD Series are precision-interchangeable temperature sensors that operate on a change in resistance as a function of temperature. Each sensor includes a 0.040" x 0.050" silicon sensing chip. A thin film resistive network containing a sensing resistor and a laser trimmable resistor is patterned on each chip. Individual chips are laser trimmed to provide 2000 ohms nominal resistance at room temperature (20°C). Room temperature trim is accurate to ±0.70°C, and maximum error over the entire operating range of −40°C to +150°C (−40°F to +302°F) is ±2.5°C. This accurate trimming allows true sensor-to-sensor interchangeability without recalibration of the users circuit. During packaging the chip is covered with hard epoxy for environmental protection.

FEATURES

- *Interchangeability*
- *Very small thermal mass for fast response*
- *Air or liquid temperature sensing*
- *Linear temperature sensitivity*
- *Proven thin film processing reliability*
- *Low cost*
- *Long term stability*
- *2000 ohms nominal resistance at 20°C*

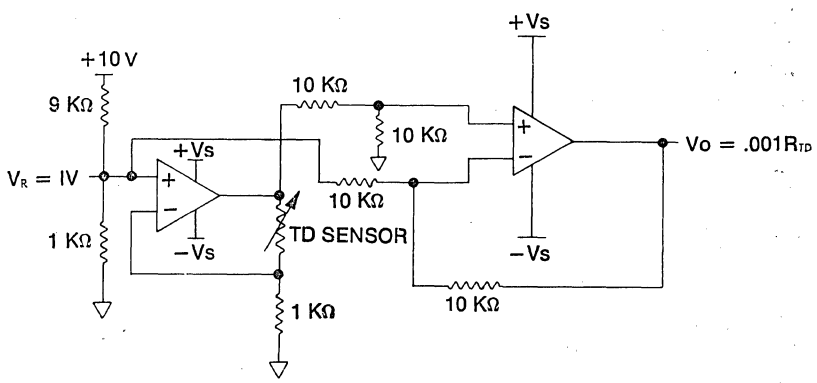
ELECTRICAL INTERFACING

The high nominal resistance, positive temperature coefficient and linear sensitivity characteristics of the TD Series temperature sensors simplifies the task of designing the electrical interface. Shown is an interface for applications requiring a voltage that varies linearly with temperature. In the example shown the current regulator can be affected by temperature, so only the temperature sensor should be exposed to thermal changes.

INTERCHANGEABILITY

(with 1 mA Max. Current)

Temperature	Resistance (Ohms)
−40°C (−40°F)	1584 ±10 (1.5°C)
−30°C (−22°F)	1649 ±9 (1.3°C)
−20°C (−4°F)	1716 ±8 (1.2°C)
−10°C (14°F)	1784 ±7 (1.0°C)
0°C (32°F)	1855 ±6 (0.8°C)
+10°C (50°F)	1926 ±6 (0.8°C)
+20°C (68°F)	2000 ±5 (0.7°C)
+30°C (86°F)	2075 ±6 (0.8°C)
+40°C (104°F)	2153 ±7 (0.9°C)
+50°C (122°F)	2231 ±7 (0.9°C)
+60°C (140°F)	2312 ±9 (1.1°C)
+70°C (158°F)	2394 ±10 (1.2°C)
+80°C (176°F)	2478 ±12 (1.4°C)
+90°C (194°F)	2564 ±14 (1.6°C)
+100°C (212°F)	2651 ±16 (1.8°C)
+110°C (230°F)	2740 ±18 (2.0°C)
+120°C (248°F)	2831 ±20 (2.2°C)
+130°C (266°F)	2924 ±22 (2.3°C)
+140°C (284°F)	3018 ±24 (2.5°C)
+150°C (302°F)	3114 ±25 (2.5°C)



SIMPLE CURRENT REGULATOR INTERFACE

ABSOLUTE MAXIMUM RATINGS

Operating Range	−40°C (−40°F) to 150°C (302°F)
Storage Temperature	−55°C (−67°F) to 170°C (338°F)
Voltage	10 VDC Continuous (24 Hours)

OTHER OPTIONS

MICRO SWITCH has the capability of packaging the TD Series temperature sensors in plastic, aluminum, brass, stainless steel or other materials depending on customer need and volume. By designing the sensing element of the TD Series on a silicon chip, a great deal of versatility is possible. Custom packaging could be for surface, liquid or gas temperature sensing, and signal conditioning electronics circuits are possible.

ORDER GUIDE

Description	Catalog Listing
Fast response temperature sensor, 0.2 inch square ceramic package, 0.1 inch centers.	TD1A
Industry standard TO-92 package temperature sensor, three leads (center lead not connected).	TD2A
Surface temperature sensor, standard TO-220 transistor package, .15" diameter hole for mounting.	TD3A
Liquid temperature sensor, 1.5" threaded (⅜-24 UNF-2A) anodized aluminum housing, 2 six-inch black teflon insulated leads.	TD4A

MICRO SWITCH, a Honeywell division

NTC THERMISTORS

MANUFACTURED BY MIDWEST COMPONENTS, INC.

H-Series Hermetically Sealed Thermistors Manufactured by MIDWEST COMPONENTS INC. are small, rugged, and good for use up to 400°C. The H-Series sensor is a preferred choice for all types of temperature sensing compensation or control circuits. Uniform dimensions make them desirable for automatic insertion in printed circuit boards. Dumet leads are weldable and/or solderable.

TYPICAL CHARACTERISTICS

SPECIFICATIONS	TEST CONDITION	CATALOG NUMBER Fig. 2. 1H	Fig. 2. PIH	Fig. 1. APIH	Fig. 2. UH	Fig. 2. 2H	Fig. 2. 4H
Resistance @ 25°C (OHMS)	Zero Power	±10%	±2%	±2%	±.8%	±10%	±10%
Resistance Ratio $R_{25°C}/R_{125°C}$		29.85	29.85	29.85	29.85	19.80	48.75
Maximum Withstand Temperature: °C		-55-400	-55 to 400	-55 to 400	-55 to 400	-55 to 400	-55 to 400
Operating Temperature Range; °C		-55-400	-55 to 400	-55 to 200	-55 to 200	-55 to 400	-55-400
Interchangeability °C	0-100°C	N/A	1°C	1°C	.2°C	N/A	N/A
Stability (Change in Resistance)	1000 hrs. at 100°C		<.1%	<1%	<.1%		
Resistance Range		3K-100K	3K-100K	3K-100K	3K-100K	2K-5K	200K-1M

SPECIFICATIONS

Time Constant*

1H (3K-9K) — 10 sec. max

1H (10K-100K) — 2H-4H — 8 sec. max

Dissipation Constant*

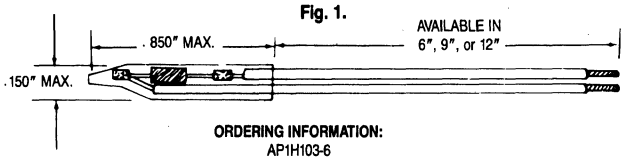
1H (3K-9.K) — 5mw/°c

1H (10K-100K) 2H-4H — 2mw/°c

STANDARD ZERO-POWER RESISTANCE VALUES (Ohms) at 25°C AMBIENT TEMPERATURE

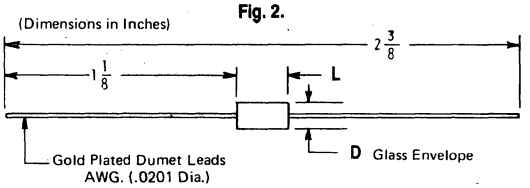
							2000	2200	2400	2700	3000
3300	3600	3900	4300	4700	5100	5600	6200	6800	7500	8200	9100
10000	11000	12000	13000	15000	16000	18000	20000	22000	24000	27000	30000
33000	36000	39000	43000	47000	51000	56000	62000	68000	75000	82000	91000
96000	100000		200000	300000		400000		500000		600000	700000
800000											

Fig. 1.



ORDERING INFORMATION:
AP1H103-6
[BASIC CATALOG NUMBER] [LEAD LENGTH]

Fig. 2.



* The ratio, in a 25°C still air ambient, of the power input to raise, the Thermistor temperature to 125°C and its temperature rise (125°C — 25°C) above ambient.

Temperature °C	Temperature °F	Resistance Ratio Characteristics R_T/R_{25} MULTIPLIER 1H-	2H-	4H-
-55	-67	95	54	131
-40	-40	34	21.7	45.5
-21.5	-6.7	10.5	8.0	13.2
0	32	3.3	2.82	3.71
25	77	1.00	1.00	1.00
37.8	100	.58	.62	.543
50	122	.36	.41	.32
75	167	.148	.182	.114
104.4	220	.0595	.082	.0399
125	257	.0335	.505	.0205
150	302	.0180	.0300	.0101
200	392	.00670	.0116	.00285
250	482	.00280	.00555	.00110
300	572	.00140	.00291	.000454
350	662	.000800	.00178	.000113
400	752	.000450	.00104	.000113

To find the resistance of a particular H-Series Thermistor at any temperature in this table, multiply its 25°C resistance by the multiplier for that temperature.

GRADE	D	L	AWG
1H (3K-10K)	.095	.170	20
1H (10K-100K)	.070	.150	24
2H (2K-5K)	.070	.150	24
4H (200K-1M)	.070	.150	24

** Time required for a Thermistor to change 63.2% of the temperature difference between its initial and final body temperature, when subjected to a step function change in temperature under zero-power conditions.

MIDWEST COMPONENTS INC.

MIDWEST COMPONENTS INC.
P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443/(616) 777-2602/TWX: 510-394-4130

TUFF·SENSORS™

TEMPERATURE SENSORS INCAPSULATED IN THERMOPLASTIC

MANUFACTURED BY MIDWEST COMPONENTS, INC.

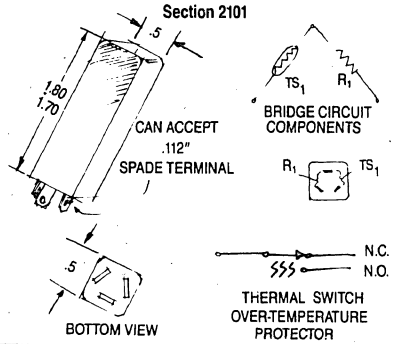
TUFF·SENSORS™, a family of thermoplastic molded probes, provide reliable protection against environmental extremes for our line of temperature sensors and switches. Use of high performance plastics creates a temperature probe that resists temperature variations, humidity, chemicals and rough handling.
Many standard sizes and shapes are available, with selection of type based on conditions of use.
Custom designs available to your specifications.

PLASTICS AND THEIR PROPERTIES

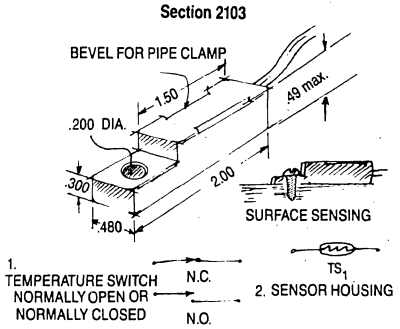
PROPERTIES	UNIT TERMS	ASTM TEST STD	VALOX* 310SEO(GE)	NORYL* N225(GE)	RYTON† R10(PHILLIPS)	POLYPROPYLENE SHELL 5620
1 DIELECTRIC	V/MIL	D149	560	630	324	600
2 MELT TEMP	°F	———	437	520	540	334
3 MOISTURE ABSORPTION @73°F	%/24H	D570	08	07	04	03
4 TENSILE STRENGTH	———	D638	8500	8000	12000	4800
5 COMPRESSIVE STRENGTH	PSI	D695	14500	8000	17500	———
6 FLEXURAL STRENGTH	PSI	D790	14700	1100	18000	1450
7 SHEAR STRENGTH	PSI	D732	7700	8500	11200	60
8 IMPACT RESISTANCE	FT#/IN	D256	07	6.0	80	90
9 HARDNESS (ROCKWELL)	R	D785	120	116	———	84
10 THERMAL CONDUCTIVITY	BTU IN/HR FT °F	———	1.2	1.35	4.3	H.B
11 FLAMMABILITY U.L. RATING	UL94V	———	VO	VO	VO	———
12 ACCEPTABILITY FOR FOOD CONTACT	———	———	YES	———	———	YES

*Registered trademarks of the General Electric Co †Registered trademark of the Phillips Chemical Co

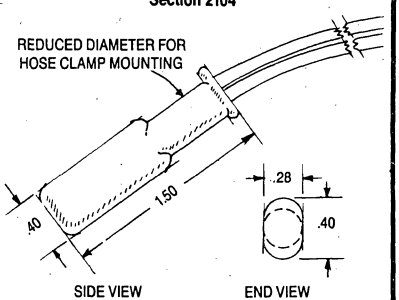
THERMAL SWITCH
Section 2101



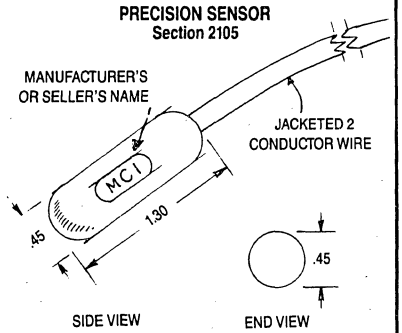
TEMPERATURE SWITCH
Section 2103



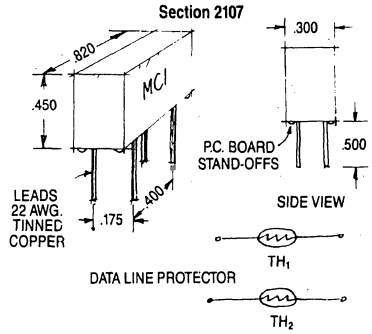
PRECISION SENSOR
Section 2104



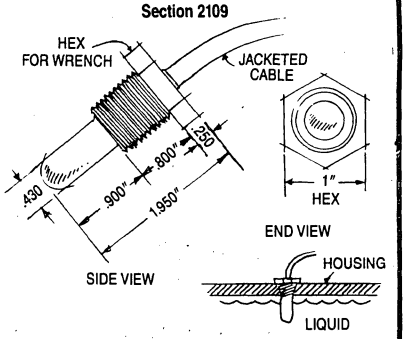
PRECISION SENSOR
Section 2105



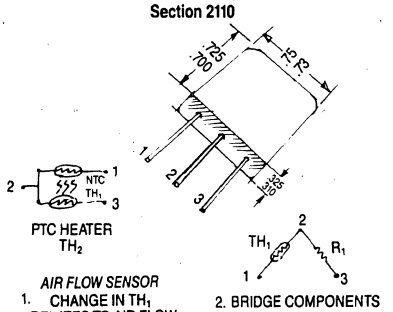
CURRENT LIMITER
Section 2107



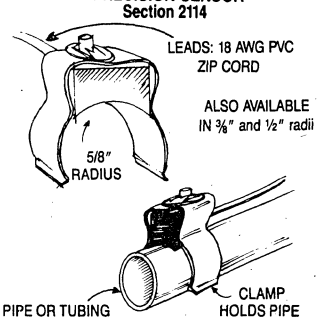
TEMPERATURE SWITCH OR PRECISION SENSOR
Section 2109



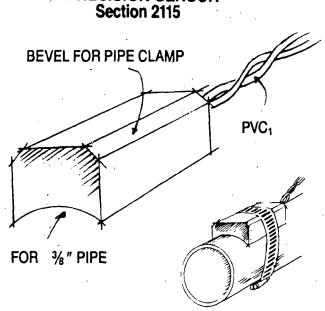
PTC OR NTC
Section 2110



PRECISION SENSOR
Section 2114



PRECISION SENSOR
Section 2115



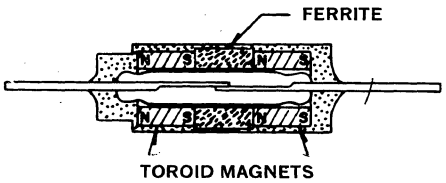
MIDWEST COMPONENTS INC.
P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443/(616) 777-2602/TWX: 510-394-4130

TEMPERATURE SENSING SWITCH

MANUFACTURED BY MIDWEST COMPONENTS, INC.

CONVENIENT AND RELIABLE TEMPERATURE CONTROL

Miniature temperature switches use an electro-ceramic element instead of a bimetallic switch. The Reed Switch Temperature Sensor works on these two principles: a reed switch actuation occurs because of changes in strength of a magnetic field in the vicinity of the contact gap; and certain materials exhibit great changes in magnetic reluctance when the temperature is varied in the vicinity of the material's curie temperature.

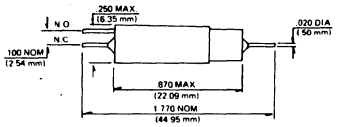


The unit has good response time, and is operable in a variety of atmospheres and solutions. Variations in configurations suitable for installation in automotive engine crankcases and automatic transmissions, or mountings for use in computer cabinets are possible. Other applications include oven over-heat alarms, corrosive liquid temperature control, food freezer thaw warning and cooling fan stop indication. This switch replaces many thermally actuated devices now used where increased life is required or protection of the switching contacts from adverse environments is deemed desirable.

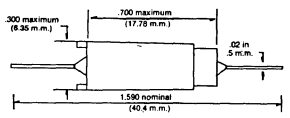
EPOXY PACKAGED SWITCHES

MANUFACTURED BY MIDWEST COMPONENTS, INC.

Switches feature small size for fast response. epoxy package resists most chemicals and is good for use up to 115°C. Standard units from 0° to 115°C are available in five degree nominal increments.



SPDT Form C



SPST Form B (NC)
SPST Form A (NO)

SPECIFICATIONS

	SPST Form B (NC) SPST Form A (NO)	SPDT Form C
CONTACT RATING	Watts — 10W maximum Volt Amps — 12 V.A. maximum	Watts — 10W maximum Volt Amps — 12 V.A. maximum
VOLTAGE	Volts D.C. — 100 VDC maximum Volts A.C. — 120 VAC maximum	Volts D.C. — 100 VDC maximum Volts A.C. — 120 VAC maximum
CURRENT	Carry — 1 amp maximum Break — 1 amp maximum Make — .5 amp maximum	Carry — 1 amp maximum Break — 1 amp maximum Make — .500 amp maximum
OPEN TEMPERATURE — NOMINAL	5° increments starting at 0°C	5° increments starting at 0°C
TOLERANCE	±5°C	±5°C
RESET DIFFERENTIAL	10°C maximum	10°C maximum

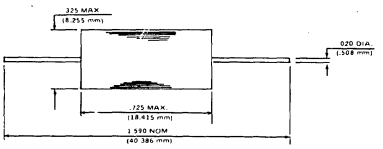
KEY TO ORDERING:
MTS XXX AorB
Temp. Switch Temp. in °C Form
EXAMPLE: MTS50B

FREEZE SENSORS

MANUFACTURED BY MIDWEST COMPONENTS, INC.

The Solar Freeze Sensor, Catalog Number TS-5B1, was developed to provide controller activation before freezing conditions damage collector. This activation will then provide recirculation or drain down to protect system. To meet the needs of high temperature exposure, the switch is packaged to withstand 400°C. Switch has also found application as road surface freeze indicator, refrigerated van warning sensor and is widely used as a frost sensor in the agricultural industry.

CONTACT ARRANGEMENT	SPST Form B (Normally Closed)
CONTACT RATING	Watts — 10W maximum Volt Amps — 12 V.A. maximum
VOLTAGE	Volts D.C. — 100 VDC maximum Volts A.C. — 120 VAC maximum
CURRENT	Carry — 1 amp maximum Break — 1 amp maximum Make — .5 amp maximum
ACTIVATION (TEMPERATURE FALL)	1-7°C
RESET (TEMPERATURE RISE)	10°C maximum
OVERALL LENGTH	1.590" nominal
DIAMETER	.325" maximum
WEIGHT	1.6 grams

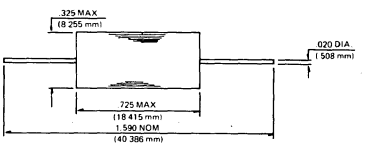


HIGH TEMP. SWITCHES

MANUFACTURED BY MIDWEST COMPONENTS, INC.

In addition to the three standard temperature switches, we now offer a high temperature Form B version. This new high temperature version is available from 0°C to 250°C. Typical applications include sensing temperature increases in temperature chambers, instrumentation, liquids, semi-solids or solids.

CONTACT ARRANGEMENT	SPST Form B (Normally Closed)
CONTACT RATING	Watts — 10W maximum Volt Amps — 12 V.A. maximum
VOLTAGE	Volts D.C. — 100 VDC maximum Volts A.C. — 120 VAC maximum
CURRENT	Carry — 1 amp maximum Break — 1 amp maximum Make — .5 amp maximum
TOLERANCE	±10°C
RESET DIFFERENTIAL	10°C maximum
OVERALL LENGTH	1.590" nominal
DIAMETER	.325" maximum
WEIGHT	1.6 grams



MIDWEST COMPONENTS INC.

MIDWEST COMPONENTS INC.
P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443/(616) 777-2602/TWX: 510-394-4130

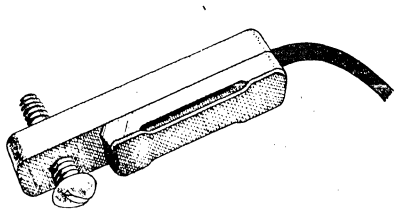
TEMPERATURE SENSING SWITCH

MANUFACTURED BY MIDWEST COMPONENTS, INC.

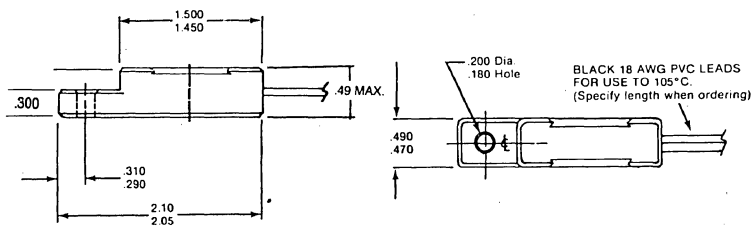
TEMPERATURE SENSING REED SWITCHES PMS SERIES

Midwest Components, Inc. has now packaged the reliable temperature sensing reed switch in a convenient and easy to use housing. The molded plastic body offers the additional advantages of complete moisture and dust protection at an economical price.

This rugged switch can be quickly mounted with a screwdriver. An indentation on the housing also facilitates attachment by ordinary hose clamps or clip hardware supplied by the user. Type A (normally open) or Type B (normally closed) switches may be used in this new package.



CONTACT ARRANGEMENT	SPST Form B (NC)	SPST Form A (NO)
CONTACT RATING	Watts — 10W maximum Volt Amps. — 12 V.A. maximum	Watts — 10W maximum Volt Amps — 12 V.A. maximum
VOLTAGE	Volts D.C. — 100 VDC maximum Volts A.C. — 120 VAC maximum	Volts D.C. — 100 VDC maximum Volts A.C. — 120 VAC maximum
CURRENT	Carry — 1 amp maximum Break — 1 amp maximum Make — .5 amp maximum	Carry — 1 amp maximum Break — 1 amp maximum Make — .5 amp. maximum
SWITCH TEMPERATURE — NOMINAL	5° increments starting at 0°C	5° increments starting at 0°C
TOLERANCE	±5°C	±5°C
RESET DIFFERENTIAL	10°C maximum	10°C maximum



KEY TO ORDERING:

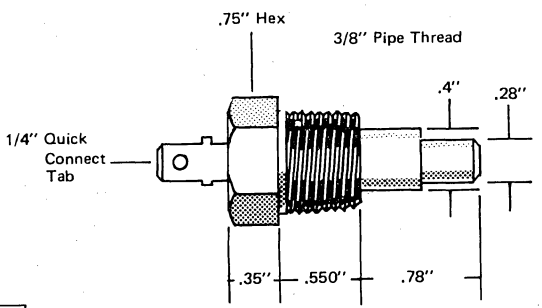
PMS	XXX	A or B	XX
Temp Switch	Temp In °C	Form	Lead Length in Inches

TEMPERATURE SENSING REED SWITCH PROBES

Now Available . . .
The ultra reliable temperature sensing reed switch in a convenient probe assembly. Probe is designed for liquid temperature sensing on auto, truck, compressor, or equipment cooling systems. Rugged brass body is hermetically sealed against harsh environments. Switching temperatures are available from - 10°C to 150°C. 3 million operations are possible at full rated load.

SPECIFICATIONS

CONTACT ARRANGEMENT	SPST Form B (Normally Closed) *
CONTACT RATING	Watts – 10W maximum Volt Amps–12 V.A. maximum
VOLTAGE	Volts D.C. – 100 VDC maximum Volts A.C. – 120 VAC maximum
CURRENT	Carry – 1 amp maximum Break – 1 amp maximum Make – .5 amp maximum
TOLERANCE	±10°C
RESET DIFFERENTIAL	10°C maximum



PHYSICAL DIMENSIONS

KEY TO ORDERING:

TS	XXX	B	P
Temp. Switch	Activation Temp. (°C)	Form	Probe

EXAMPLE: TS100BP

MIDWEST COMPONENTS INC.

MIDWEST COMPONENTS INC.
P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443/(616) 777-2602/TWX: 510-394-4130

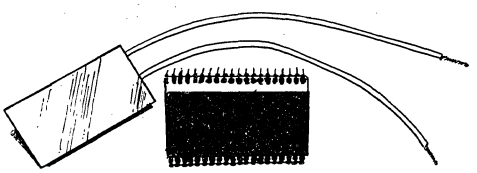
SPECIALTY CERAMICS

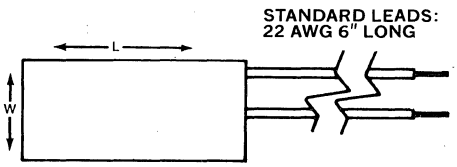
MANUFACTURED BY MIDWEST COMPONENTS, INC.

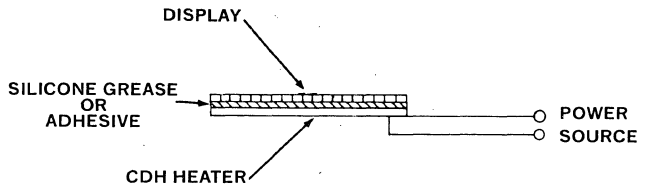
SELF REGULATING DISPLAY HEATER

The unique self-regulating heating effects of specially doped ceramics are utilized to create a new type heater for liquid crystal or other temperature sensitive displays. These devices produce heat at cold temperatures and curtail heating at normal or high temperatures. This feature allows its use in battery operated instruments due to low normal current drain. Use of this heater allows a broader application of displays by removing the adverse effects of temperature.

Heater is attached to reverse side of display with thermally conductive epoxies or silicone adhesives depending upon display's thermal coefficient of expansion or temperature to which it may be subjected. Actual performance of the display will depend upon manufacturers specifications.







ORDER NUMBER	SIZE* L X W	OPERATING VOLTAGE**	NOMINAL RESISTANCES	
			R@ - 35°C	R@ 50°C
CDH001	2.0" x .9"	12-28 AC or DC	5 OHMS	1500 OHMS MIN.
CDH002	3.1" x 1.1"	12-28 AC or DC	3 OHMS	1000 OHMS MIN.
CDH003	3.6" x 1.1"	12-28 AC or DC	2.5 OHMS	750 OHMS MIN.

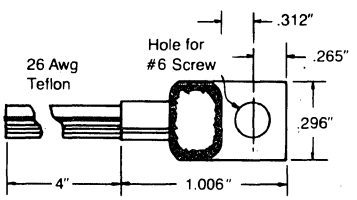
*Other sizes available — consult factory.

OVER TEMPERATURE PROTECTORS

MIDWEST COMPONENTS' Over Temperature Protector provides shutoff or regulation of expensive RF or AF Power Transistors. Protects against over heating that occurs from output stage component failure, antenna breakage, or short conditions.

Unlike fuses or bi-metal elements its action is recyclable and has no hysteresis effect.

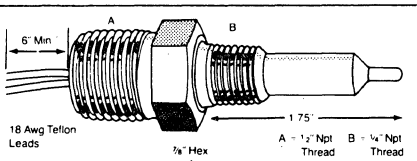
Also available:
- Other switching temperature or resistances compatible with package constraints.
- Special lead types or end terminations.
- Body styles for protection of TRIAC or SCR Rectifiers.

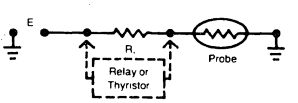


Order Number	Switching Temp. (Nom.)	Resistance at 25°C (Ohms)	Resistance at Switching Temperature	Max. Cont. Oper. Temp.
OTP60.11	60°C	100 ± 40%	250 OHMS (min.)	150°C
OTP70.11	70°C	100 ± 40%	250 OHMS (min.)	150°C
OTP80.11	80°C	100 ± 40%	250 OHMS (min.)	150°C
OTP100.11	100°C	100 ± 40%	250 OHMS (min.)	150°C
OTP120.11	120°C	100 ± 40%	250 OHMS (min.)	150°C
OTP125.11	125°C	100 ± 40%	250 OHMS (min.)	150°C

OVER TEMPERATURE PROBE 9RT1P—SERIES

This rugged Probe is designed for over temperature sensing on compressors, engines, or fluid transfer lines. When over temperatures occur its resistance increases by a factor of five or more. This large increase allows simple interface with relay or Thyristor controls. Probe functions on AC or DC without regard for polarity. Stainless steel is used to minimize corrosion.





Order Number	Resistance at 25°C (Ohms) ± 40%	Activation Temperature ± 5°C	Resistance at Activation Temperature
9RT1P106	2000	100°C	10,000
9RT1P101	2000	113°C	10,000
9RT1P107	2000	120°C	10,000
9RT1P108	2000	125°C	10,000

MIDWEST COMPONENTS INC.

MIDWEST COMPONENTS INC.
P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443/(616) 777-2602/TWX: 510-394-4130

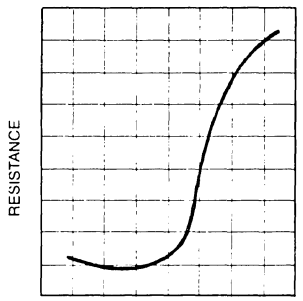
PTC SWITCHING THERMISTORS

MANUFACTURED BY MIDWEST COMPONENTS, INC.

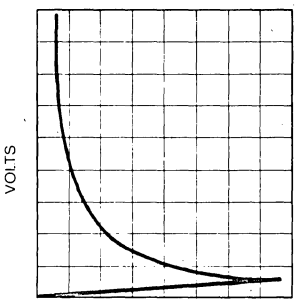
THE POSITIVE WAY TO SENSE, MEASURE, CONTROL, REGULATE AND PROTECT.

MIDWEST COMPONENTS INC. PTC switching thermistors are thermally sensitive resistors which exhibit large positive increases in resistance with temperature. At customer specified temperatures the resistance rises abruptly from a low value to a high value. This resistance shift is infinitely repeatable and has no hysteresis associated with its action.

TYPICAL PTC RESISTANCE VS. TEMPERATURE CURVE



TYPICAL VOLTAGE CURVE VS. CURRENT



• DISCRETE PTCS

Popular styles for current limiting or sensing. Most types come standard with protective coatings

Fig. 1

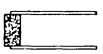


Fig. 2

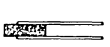


Fig. 3

Fig. 4

Fig. 5

ORDER NUMBER	FIG.	SWITCH TEMPERATURE	BASE RESISTANCE	TEST PARAMETERS	NOMINAL DIMENSIONS	Protective Coating (✓)
100D10112	1	0°C ± 5°C	100 ohms ± 40% @ −35°C	R@ 0°C ± 5°C 500 ohms ± 40%	42" Dia .05" Thk	
108D10001	5	8°C ± 10°C	10 ohms ± 40% @ −35°C	R @ 50°C = 3000 ohms min	65" Dia .05" Thk	
110Q20101	3	10°C ± 5°C	250 ohms ± 40% @ −35°C	R @ 10°C ± 5°C = 1250 ohms ± 40%	30" x .10" x .15"	
130D25000	5	30°C ± 5°C	25 ohms ± 20% @ −5°C	R @ 30°C ± 5°C = 5 x R 25°C ± 20%	.78" Dia .08" Thk	
140D25001	1	40°C ± 5°C	25 ohms ± 50% @ 25°C	R @ 50°C = 125 ohms ± 50%	.38" Dia .065" Thk	
150Q80112	2	50°C ± 5°C	750 ohms ± 33% @ 25°C	R @ 50°C ± 5°C = 3,750 ohms ± 33%	30" x .10" x .15"	
160D10116	1	60°C ± 5°C	100 ohms ± 40% @ 25°C	R @ 60°C ± 5°C = 5 x R 25°C Protective Current Level = 20 ma	3" Dia .20" Thk	✓
165D15001	5	65°C ± 5°C	15 ohms ± 33% @ 25°C	R @ 65°C ± 5°C = 75 ohms ± 33%	.58" Dia .050" Thk	
165Q80113	2	65°C ± 5°C	750 ohms ± 33% @ 25°C	R @ 65°C ± 5°C = 3,750 ohms ± 33%	30" x .10" x .15"	
170D10117	1	70°C ± 5°C	100 ohms ± 40% @ 25°C	R @ 70°C ± 5°C = 5 x R 25°C Protective Current Level = 40 ma	3" Dia .20" Thk	✓
175Q15114	3	75°C ± 5°C	150 ohms ± 30% @ 25°C	R @ 75°C ± 5°C = 750 ohms ± 30%	30" x .10" x .15"	
180D10113	1	80°C ± 5°C	100 ohms ± 40% @ 25°C	R @ 80°C ± 5°C = 5 x R 25°C Protective Current Level = 60 ma	340" Dia .240" Thk	✓
180D15015	5	80°C ± 5°C	15 ohms ± 40% @ 25°C	R @ 80°C ± 5°C = 75 ohms ± 40%	.48" Dia .15" Thk	

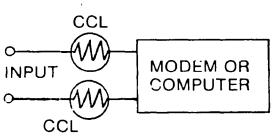
ORDER NUMBER	FIG.	SWITCH TEMPERATURE	BASE RESISTANCE	TEST PARAMETERS	NOMINAL DIMENSIONS	Protective Coating (✓)
180Q20206	2	80°C ± 5°C	2000 ohms ± 40% @ 25°C	R @ 80°C ± 5°C = 10,000 ohms ± 40%	.45" x .12" x .15"	
180W30115	4	80°C ± 5°C	300 ohms ± 50% @ 25°C	R @ 80°C ± 5°C = 1500 ohms ± 50%	6"O D - .4"I D .17" Thk	
185D10102	1	85°C ± 5°C	100 ohms ± 20% @ 25°C	R @ 85°C ± 5°C = 500 ohms ± 20%	.25" Dia .15" Thk	✓
195Q80115	2	95°C ± 5°C	750 ohms ± 33% @ 25°C	R @ 95°C ± 5°C = 3,750 ohms ± 33%	.30" x .10" x .15"	
200D40012	1	100°C ± 5°C	40 ohms ± 40% @ 25°C	R @ 100°C ± 5°C = 200 ohms ± 40%	.30" Dia .20" Thk	✓
200D65011	1	100°C ± 5°C	65 ohms ± 38% @ 25°C	R @ 100°C ± 5°C = 5 x R 25°C Protective Current Level = 80 ma	.4" Dia .275" Thk	✓
220Q32214	2	120°C ± 5°C	3200 ohms ± 25% @ 25°C	R @ 120°C ± 5°C = 16,000 ohms ± 25%	.30" x .10" x .15"	✓
222W75101	4	122°C ± 5°C	750 ohms ± 33% @ 25°C	R @ 122°C ± 5°C = 3,750 ohms ± 33%	6"O D - .38"I D .17" Thk	
223D80011	1	123°C ± 5°C	8 ohms ± 40% @ 25°C	R @ 123°C ± 5°C = 40 ohms ± 40%	.6" Dia .20" Thk	✓
225D10102	1	125°C ± 5°C	100 ohms ± 40% @ 25°C	R @ 125°C ± 5°C = 5 x R 25°C Protective Current Level = 100 ma	.40" Dia .25" Thk	✓
225Q28011	1	125°C ± 5°C	28 ohms ± 27% @ 25°C	R @ 125°C ± 5°C = 140 ohms ± 27%	.28" Dia .23" Thk	
227D11212	1	127°C ± 5°C	1100 ohms ± 40% @ 25°C	R @ 127°C ± 5°C = 5500 ohms ± 40%	.1" Dia .160" Thk	
227D60010	1	127°C ± 5°C	60 ohms ± 40% @ 25°C	R @ 127°C ± 5°C = 5 x R 25°C Protective Current Level = 125 ma	.6" Dia .30" Thk	✓

ALL LEADS TINNED COPPER 1" MINIMUM

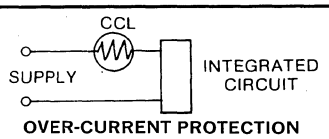
○ CURRENT LIMITERS

The ceramic element protects circuits from destructive overcurrent conditions by switching to a high resistance which trims the current back to a safe level. The unit then recovers automatically when the overcurrent condition is corrected.

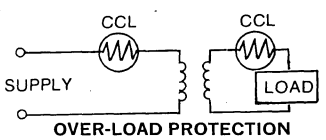
The ceramic current limiter is an inexpensive alternative to fuses and fixed resistors. It has obvious advantages over all of these since it has infinite life, is self resetting which eliminates field servicing and will not "flame out" eliminating the fire hazard of fixed resistors.



DATA COMMUNICATIONS LINE PROTECTOR



OVER-CURRENT PROTECTION



OVER-LOAD PROTECTION

ORDER NUMBER	MAXIMUM Ω @ 25°C	MAXIMUM VOLTS DC	NOMINAL CONTINUOUS CURRENT	RESIDUAL CURRENT @ APPLIED VOLTAGE 50VDC	100VDC	150VDC	NOMINAL DIMENSIONS IN INCHES
CCL020.01	140 Ω	125	20 MA	8 MA	6 MA	N/A	.23 dia. x .1 thk.
CCL060.01	86 Ω	150	60 MA	16 MA	10 MA	8 MA	.4 dia. x .3 thk.
CCL100.01	40 Ω	150	100 MA	19 MA	13 MA	11 MA	.4 dia. x .3 thk.
CCL140.01	80 Ω	150	140 MA	23 MA	15 MA	13 MA	.56 dia. x .25 thk.
CCL150.01	23 Ω	150	150 MA	24 MA	16 MA	14 MA	.65 dia. x .32 thk.
CCL300.01	10 Ω	70	300 MA	31 MA	N/A	N/A	.55 dia. x .14 thk.
CCL450.01	12 Ω	100	450 MA	40 MA	30 MA	N/A	.6 dia. x .07 thk.

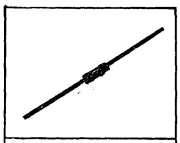
MIDWEST COMPONENTS INC.

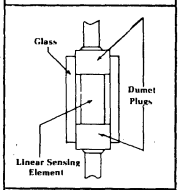
MIDWEST COMPONENTS INC.
P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443/(616) 777-2602/TWX: 510-394-4130

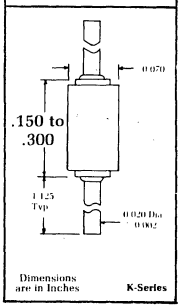
TEMPSISTOR

TEMPSISTOR© TEMPERATURE COMPENSATOR

MANUFACTURED BY MIDWEST COMPONENTS, INC.







The Tempsistor© manufactured by MIDWEST COMPONENTS INC. is a temperature compensator designed to offset the temperature drift of metallic and semi-conductors. Applications include pressure transducers, opto amplifiers, inductive motor controllers, and automatic gain controls. Small size can replace ⅛ watt or large resistors.

The Tempsistor© is available in resistances from 10 to 39,000 ohms at 25°C.

Resistance Ratio Temperature Characteristics					
Temp.		R / R Multiplier			
		RESISTANCE VALUE (Ohms)			
°C	°F	10-56Ω	68-820Ω	1-2.7KΩ	3.3-39KΩ
−25	−13	.73	.65	.65	.61
0	32	.86	.82	.81	.83
25	77	1.00	1.00	1.00	1.00
50	122	1.15	1.21	1.19	1.19
75	167	1.32	1.44	1.39	1.37
100	212	1.49	1.68	1.58	1.52
125	257	1.68	1.94	1.75	
150	302	1.89	2.21		

TEMPSISTOR© SPECIFICATIONS

DISSIPATION CONSTANT -
Style 1K and 2K = 2.5 MW/°C
Style 3K = 5 MW/°C

TIME CONSTANT - *
Style 1K and 2K = 8 sec. in still air, 1 sec in rapidly stirred oil.
Style 3K = 19 sec. in still air, 2.2 sec. in rapidly stirred oil.

STANDARD ZERO-POWER RESISTANCE VALUES (Ohms) at 25°C AMBIENT TEMPERATURE

10	11	12	13	15	16	18	20	22	24	27	30
100	110	120	130	150	160	180	200	220	240	270	300
1000	1100	1200	1300	1500	1600	1800	2000	2200	2400	2700	3000
10000	11000	12000									
33	36	39	43	47	51	56	62	68	75	82	91
330	360	390	430	470	510	560	620	680	750	820	910
3300	3600	3900	4300	4700	5100	5600	6200	6800	7500	8200	9100

PART NUMBER DESIGNATION:
XX — XXX–X

SPECIFY ONE OF THREE CHOICES FOR FIRST 2 DIGITS
1K — Resistance range 10-820 .150" long body Max. Operate Temp. 150°C.
2K — Resistance range 1K-3.0K .150" long body Max. Operate Temp. 125°C.
3K — Resistance range 3.3K-39K .350" long body Max. Operate Temp. 100°C.
ALL STYLES WILL WITHSTAND 400°C. WITHOUT PHYSICAL OR ELECTRICAL DAMAGE.

NEXT 3 DIGITS DENOTE RESISTANCE VALUE AT 25°C.
1st digit denotes 1st significant figure
2nd digit denotes 2nd significant figure
3rd digit denotes multiplier by the power of 10

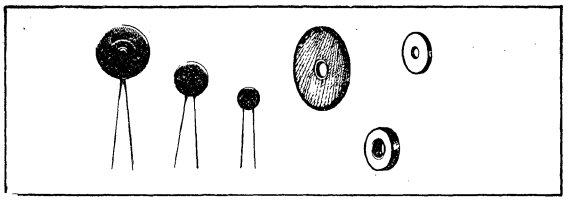
LAST DIGIT OF PART NUMBER DENOTES TOLERANCE AT 25°C.
L — ±20% K — ±10% (standard) J — ±5%

EXAMPLE OF PART NUMBER SPECIFICATION
2K — 272 — K
Part would be a .150" long body, 2.7 K ±10% @25°C.

VARISTORS

MANUFACTURED BY MIDWEST COMPONENTS, INC.

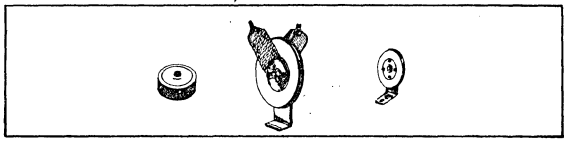
Varistor manufactured by MIDWEST COMPONENTES INC. offer inexpensive answers to problems of transient, surge, and lighting suppression. Energy handling capabilities are limitless depending upon size and construction of devices.



SMALL TYPE DISCS DESIGNED FOR PROTECTION OF CONTACTORS, RELAYS, AND SOLID STATE COMPONENTS

3" (76.2) AND 6" (152.4) DIAMETER DISCS FOR MEDIUM POWER APPLICATIONS ALLOW FOR CUSTOM ASSEMBLIES FOR POWER SUPPLY COMPONENTS

	Maximum Values						Specifications	
	Continuous Operating Voltage (Volts)		Continuous Power Rating (Watts)	Discharge Capacity (Watt-Seconds)	Peak Discharge -Voltage for Given DC Discharge Current		DC Test Voltage & Current	
Catalog Number	(DC)	(AC)			(Amps)	(Volts)	(Volts ±20)%	(Amps)
.5" (12.7) DIA.								
70D5010	150	135	.25	30	.10	400	175	.001
68D5010	60	54	.25	30	.10	200	75	.0025
67D5010	30	27	.25	30	.25	100	35	.005
65D5010	15	13.5	.25	20	.25	60	15	.010
.75" (19.05) DIA.								
71D7000	150	135	.75	50	.125	400	175	.005
68D7000	60	54	.75	50	.25	185	70	.0125
66D7000	30	27	.75	50	.25	185	70	.0125
63D7000	15	13.5	.75	50	.50	100	35	.025
1.0" (25.4) DIA.								
71D10000	300	270	1.5	275	.25	1000	350	.005
68D10000	150	135	1.5	275	.50	575	175	.010
66D10000	60	54	1.5	275	1.0	305	70	.025
63D10000	30	27	1.5	275	1.5	175	35	.050
3" (76.2) DIA.								
71W30100	1500	1350	3.5	9,250	10	7500	1800	0.0025
69W30100	300	270	3.0	5,100	1.5	1350	520	0.050
68W30100	150	135	3.0	5,100	2.5	800	230	0.050
67W30100	60	54	3.0	1,700	5.0	250	85	0.100
66W30100	30	27	3.0	1,700	5.0	150	36	0.100
63W30100	15	13.5	3.0	1,350	10	100	25	0.500
62W30100	7	6.3	3.0	1,100	10	40	9	0.500
6" (152.4) DIA.								
69W60100	275	250	10	22,500	10	1200	550	0.500
68W60200	200	180	10	22,500	12.5	990	400	0.500
68W60100	150	135	10	22,500	15	780	300	0.500



3" (76.2) AND 6" (152.4) ASSEMBLIES FOR HIGH ENERGY USES. ALL UNITS HAVE STANDARD BRACKET MOUNTS AND SOLDERLESS TERMINALS FOR FAST CONNECTION

Type	Catalog Number	Continuous DC Operating Voltage Rating (Volts)	Continuous Power Loss in Operation (Watts)	Discharge Capacity (Watt-Seconds)
BRACKET	9RV3A12	150	3	5,100
	9RV3A14	300	3	5,100
	9RV3A15	600	6	10,200
	9RV6A4	150	40	90,000
	9RV6A5	300	20	45,000
	9RV6A6	275	10	22,500
	9RV6A7	275	20	45,000
	9RV6A8	275	30	67,500
	9RV6A9	275	40	90,000
	9RV6A10	550	20	45,000
BOX	9RV6A65	550	120	270,000
	9RV6A55	550	240	540,000

MIDWEST COMPONENTS INC.

MIDWEST COMPONENTS INC.
P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443/(616) 777-2602/TWX: 510-394-4130

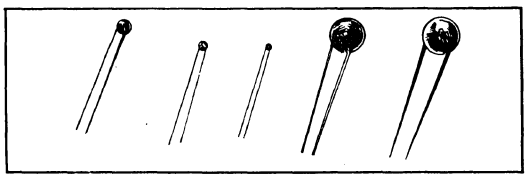
NTC THERMISTORS

MANUFACTURED BY MIDWEST COMPONENTS, INC.

• TEMPERATURE COMPENSATION AND SENSING

Type	Ohms @ 25°C	Res. Ratio 25°C/125°C	Diss. Const. MW/°C	Time Const.	Dia. In.
4D101	100K	48.78	4	12	.1
4D103	50K	48.78	4	8	.1
1D051	20K	29.85	2	4.5	.05
1D101	10K	29.85	4	12	.1
1D103	5K	29.85	4	8	.1
1D201	3K	29.85	8	34	.2
1D501	1K	29.85	19	140	.5
2D054	1K	19.80	2	3	.05
2D102	1K	19.80	4	10	.1
2D104	500	19.80	4	6	.1
2D202	300	19.80	8	24	.2
3D504	5	12.95	15.5	70	.5
4D051	200K	48.78	2	4.5	.05

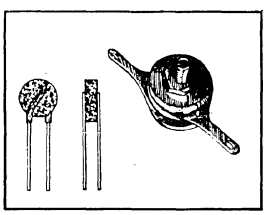
Disc Series Thermistors are small rugged Thermistors with close electrical tolerances. Their small mass gives short thermal time constants, yet they are not so small that it is difficult to handle them. The tinned copper leads are easily soldered into electrical circuits.



SUPPRESSORS

INRUSH CURRENT SUPPRESSORS FOR SWITCHING POWER SUPPLIES.

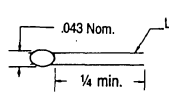
Switching power supplies present high initial currents due to filter capacitor impedance upon turn-on. The use of Midwest's NTC (Negative Temperature Coefficient) devices limits this current to a low valve. After current flow their resistance becomes negligible and offers little voltage drop.



MCI P/N	Description	FIG.	Size	Cold Resistance at 25°C	Maximum Applied Current	Hot Resistance At Specified Current
D204CS	Radial Leaded Disc	A	2" Dia	10 Ohms	1 Amp	75 Ohms
D304CS	Radial Leaded Disc		3" Dia	10 Ohms	2 Amps	50 Ohms
D504CS	Radial Leaded Disc		5" Dia	5 Ohms	3 Amps	24 Ohms
D752CS	Radial Leaded Disc		75" Dia	2 5 Ohms	4 Amps	18 Ohms
E752CS	Radial Leaded Disc		75" Dia	2 5 Ohms	5 Amps	12 Ohms
1A8CS	Assembly	B	75" Dia	3 15 Ohms	7 5 Amps	14 Ohms
1A9CS	Assembly		75" Dia	1 Ohm	10 Amps	055 Ohms
2A0CS	Assembly		75" Dia	1 Ohm	12 Amps	045 Ohms
3A9CS	Assembly		75" Dia	1 Ohm	15 Amps	032 Ohms

BEAD PROBES

Glass coated bead Thermistors feature SMALL SIZE, FAST RESPONSE, and improved HIGH-TEMPERATURE STABILITY. Leads are fired-in platinum-iridium. Bead probes, incorporating the bead in the tip of a glass probe, offer the additional advantages of more rugged construction in an easy to mount package which can be used in liquid media. Tinned Dumet leads are supplied on probes. The maximum operating temperature for beads and bead probes is 400°C.



Outline Drawings (Dim. in inches)

FIGURE 1

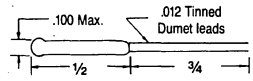


FIGURE 2

Bead probes also available in 2" lengths

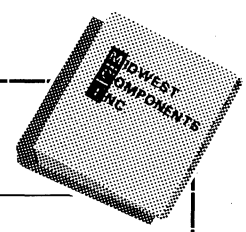
TYPE	Zero Power Resistance at 25°C ohms ± 20%	Catalog Number	Resistance Ratio R25°C/R125°C ± 5%	Dissipation Constant (δ) Milliwatts/°C	Thermal Time Constant (τ) Seconds	Figure Number
Bead Probe	2,000	81G-20250	19 8	1	25	2
	10,000	81G-10350	29 85			
	15,000	81G-15350	29 85			
	50,000	81G-50350	35 0			
	150,000	81G-15450	39 7			
	500,000	81G-50450	46 5			
	1,000,000	81G-10550	51 5			

At Midwest Components, Inc., we develop, design and manufacture the world's most complete line of temperature and voltage sensitive ceramics.

Our engineers and design staff are dedicated to supplying our customers with the highest possible standards of service and products.

Write for your FREE CATALOG or for immediate answers, call one of our application engineering specialists at **616-777-2602.**

Send for your FREE PRODUCT CATALOG.



☐ Send me your FREE Product Catalog.

NAME _____

TITLE _____

COMPANY NAME _____

ADDRESS _____

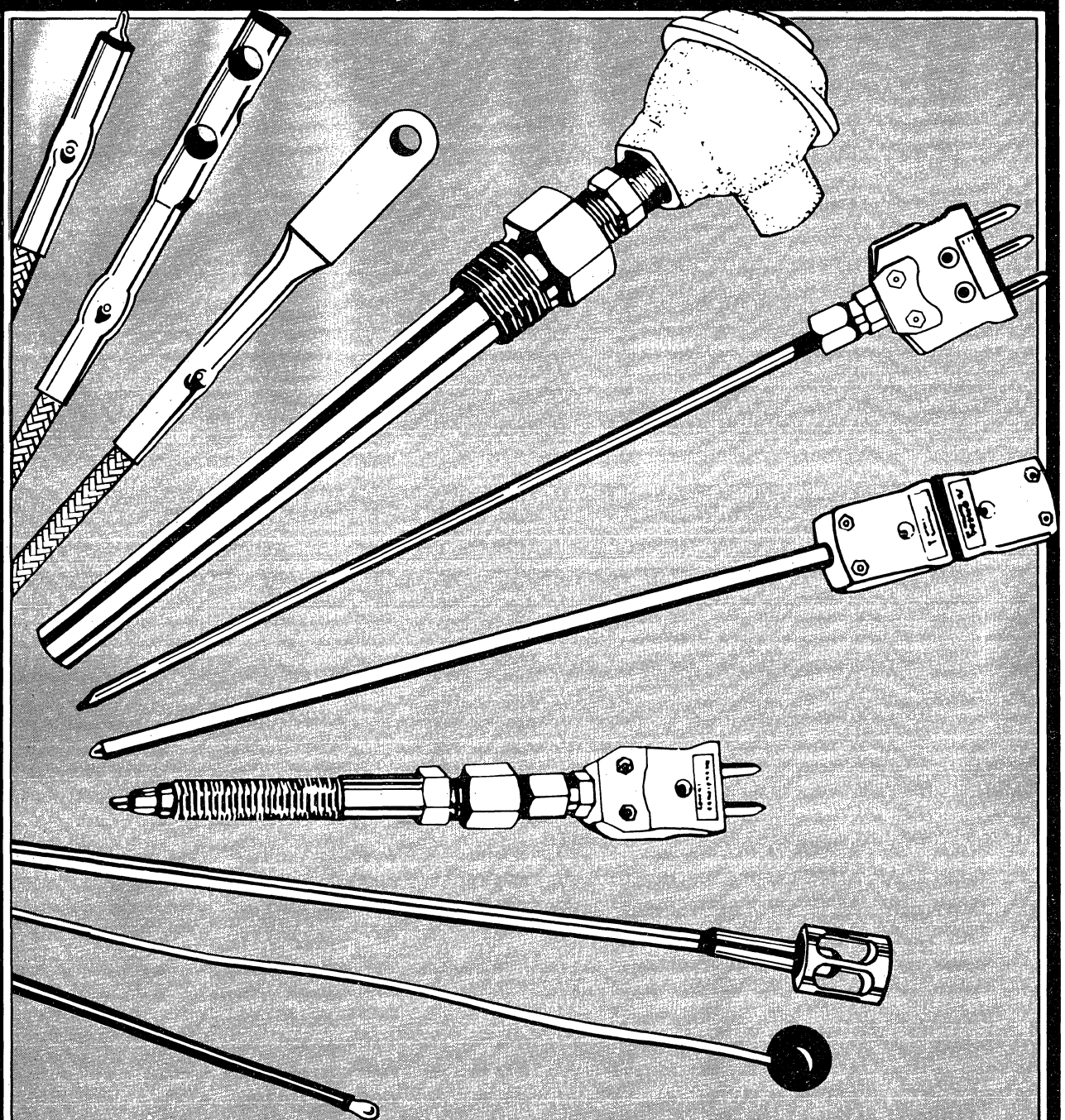
CITY _____ STATE _____ ZIP _____

SEND TO MIDWEST COMPONENTS INC., P.O. BOX 787, MUSKEGON, MI 49443

MIDWEST COMPONENTS INC.

P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443
(616) 777-2602/TWX: 510-394-4130

THERMOCOUPLE, RTD, THERMISTOR PROBES



OMEGA® Manufactures the Finest Quality Thermocouple...Hundreds of Styles Available in Stock for Immediate Delivery! Choose From a Broad Selection of Sub-Miniature Probes (0.0005 Diameter) to ¼" Heavy Duty Quick Disconnect Thermocouple Probes. Available with Stainless Steel or Inconel Sheaths to Meet Every Industrial Application.

OMEGA®
ENGINEERING, INC.

(203) 359-RUSH

One Omega Drive, Box 4047, Stamford, CT 06907
Telex 996404 Cable OMEGA FAX (203) 359-7700

©COPYRIGHT 1985 OMEGA ENGINEERING, INC.

OMEGA®

YOUR SOURCE

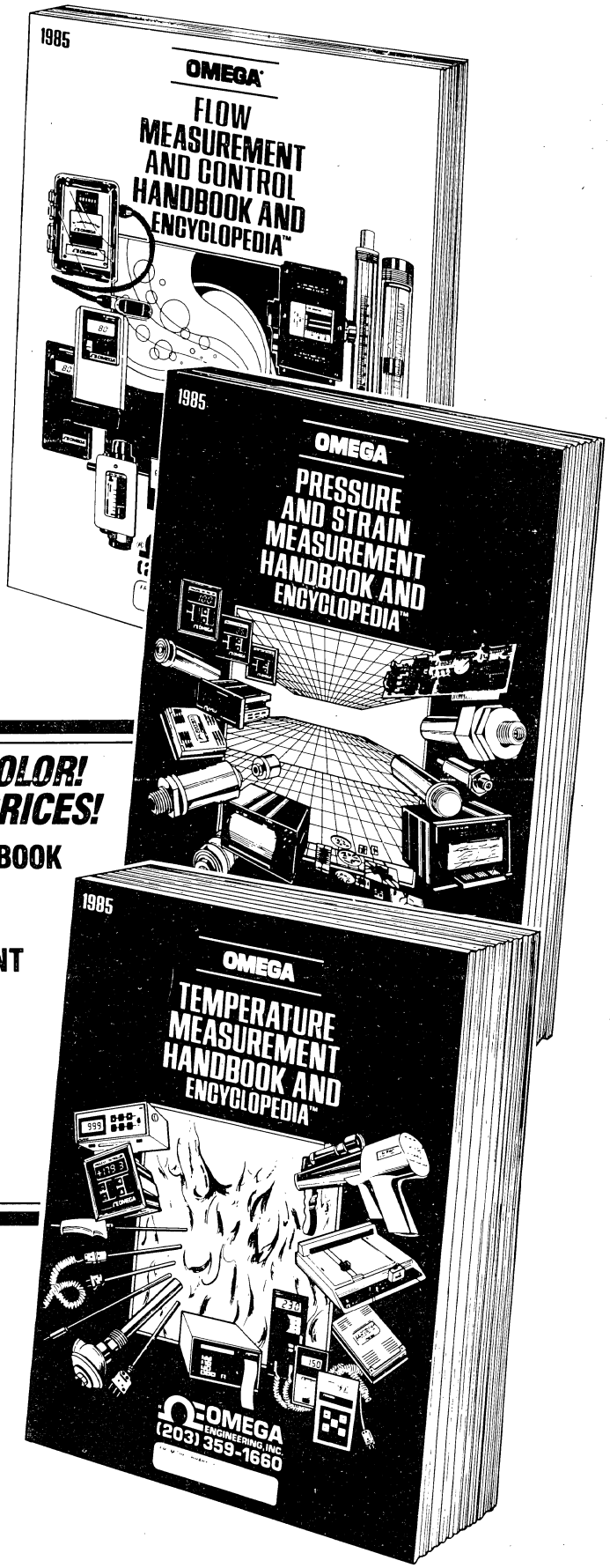
FOR

✓TEMPERATURE

✓PRESSURE AND STRAIN

✓FLOW MEASUREMENT AND CONTROL!

PLUS: INTERFACING TRANSDUCERS TO COMPUTERS



NEW! FREE! *FULL COLOR! WITH PRICES!*

✓ **TEMPERATURE MEASUREMENT HANDBOOK AND ENCYCLOPEDIA™**
Over 690 pages! Over 15,000 products!

✓ **PRESSURE AND STRAIN MEASUREMENT HANDBOOK™**
Over 225 pages of new pressure and strain products.

✓ **FLOW MEASUREMENT HANDBOOK AND ENCYCLOPEDIA™**
Over 230 pages of Flow products, systems, and technical information.

ORDER YOUR FREE COPIES TODAY!

OMEGA® ENGINEERING, INC.

(203) 359-RUSH

One Omega Drive, Box 4047, Stamford, CT 06907
Telex 996404 Cable OMEGA FAX (203) 359-7700

©COPYRIGHT 1985 OMEGA ENGINEERING, INC.

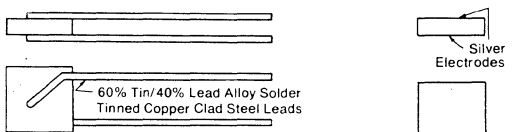
PIEZO THERMISTORS

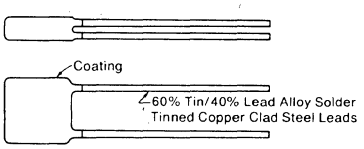
NTC WAFER THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range:
−55°C to +150°C
Resistance Tolerance:
±10% std. Also supplied to within ±1%
Resistance Range: 3 ohms to 10 megohms
Temperature Coefficient: −3.4% to −6.1% per degree C
Thermal Time Constant: 3 to 23 seconds
Dissipation Constant: 1.0 to 7.9 mw per degree C

CONFIGURATIONS





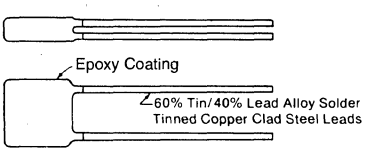
ALSO AVAILABLE: PHENOLIC + WAX COATING OR EPOXY COATING

NTC PRECISION INTERCHANGEABLE WAFER THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range:
−55°C to +150°C
Temperature Tolerance: ±0.2°C (0°C to +70°C)
Resistance Range: 1000 ohms to 100K ohms
Temperature Coefficient: −4.4% & −4.7% per degree C
Thermal Time Constant: 3 to 9 seconds
Dissipation Constant: 1.3 to 3.0 mw per degree C

CONFIGURATIONS



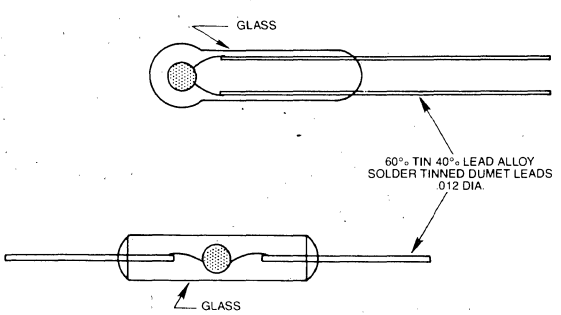
PIEZO ELECTRIC PRODUCTS, INC 800-922-0504

NTC BEAD-IN-GLASS THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range:
−55°C to +300°C
Resistance Tolerance:
±20% std. Also supplied to within ±1%
Resistance Range: 500 ohms to 500K ohms
Temperature Coefficient: −3.6% to −5.1% per degree C
Thermal Time Constant: 20 to 22 seconds
Dissipation Constant: .8 to 1.0 mw per degree C

CONFIGURATIONS

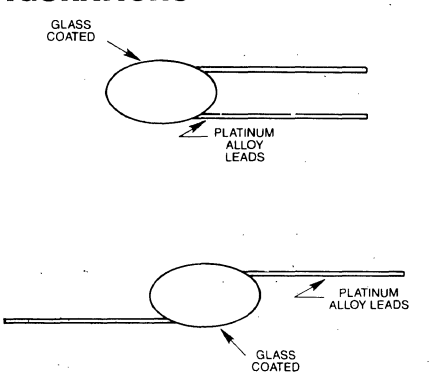


NTC BEAD THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range:
−55°C to +300°C
Resistance Tolerance:
±20% std. Also supplied to within ±1%
Resistance Range: 500 ohms to 5 megohms
Temperature Coefficient: −3.4% to −5.6% per degree C
Thermal Time Constant: 1 to 2 seconds
Dissipation Constant: .1 to .7 mw per degree C

CONFIGURATIONS



Piezo also manufactures Microwave Probes, piezo elements, shapes, CATTS and fans. Our engineering department is prepared to analyze your PTC requirements. As one of the nation's largest manufacturers of thin-sheet piezo and thermistor hardware, we will provide you with the highest quality thermistor products at competitive prices.

from PIEZO ELECTRIC PRODUCTS, INC.

NTC THERMISTOR PROBE ASSEMBLIES

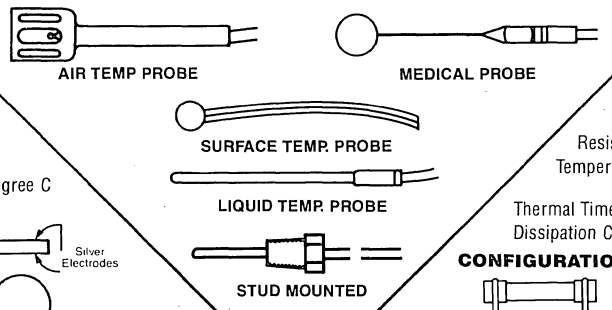
CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +150°C
Temperature Tolerance: Can be supplied to within ±0.2°C
Resistance Range: 1000 ohms to 100K ohms
Temperature Coefficient: −3.4% to −6.1% per degree C
Thermal Time Constant: Housing dependent
Dissipation Constant: Housing dependent

HOUSING MATERIALS

1. Stainless Steel
2. Aluminum
3. Copper
4. Plastic
5. Epoxy
6. Brass
7. Specials

CONFIGURATIONS

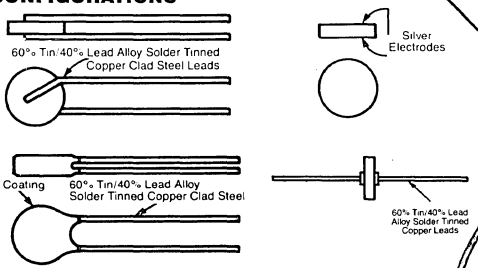


NTC DISC THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +150°C
Resistance Tolerance: ±10% std. Also supplied to within 1%
Resistance Range: 20 ohms to 10K ohms
Temperature Coefficient: −3.8% & −4.4% per degree C
Thermal Time Constant: 9 to 175 seconds
Dissipation Constant: 3 mw to 16 mw per degree C

CONFIGURATIONS



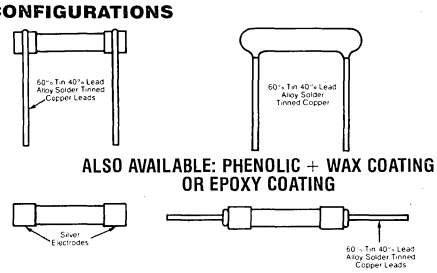
ALSO AVAILABLE: PHENOLIC + WAX COATING OR EPOXY COATING

NTC ROD THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +150°C
Resistance Tolerance: ±10% std. Also supplied to within ±1%
Resistance Range: 3K ohms to 150K ohms
Temperature Coefficient: −3.8% & 4.4% per degree C
Thermal Time Constant: 20 to 95 seconds
Dissipation Constant: 3 to 6 mw per degree C

CONFIGURATIONS



ALSO AVAILABLE: PHENOLIC + WAX COATING OR EPOXY COATING

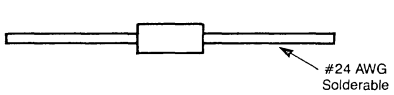
PIEZO ELECTRIC PRODUCTS, INC 800-922-0504

NTC GLASS ENCAPSULATED THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +204°C
Resistance Tolerance: ±10% std. Also supplied to within ±1%
Resistance Range: 1000 ohms to 1 megohm
Temperature Coefficient: −3.8% to −4.7% per degree C
Thermal Time Constant: 8 seconds
Dissipation Constant: 2 mw per degree C

CONFIGURATION

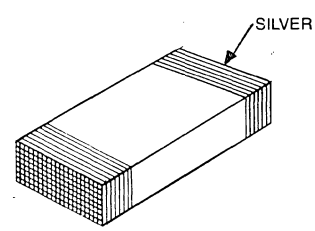


NTC CHIP THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +150°C
Resistance Tolerance: ±10% std. Also supplied to within ±1%
Resistance Range: 500 ohms to 2 megohms
Temperature Coefficient: −3.4% to −4.7% per degree C
Thermal Time Constant: 4 seconds
Dissipation Constant: 2 mw per degree C

CONFIGURATION



PIEZO ELECTRIC PRODUCTS, INC.

Call 800-922-0504 (201)548-2800 (NJ only) • 212 Durham Avenue • Metuchen, N.J. 08840 • TWX 710 998-0592

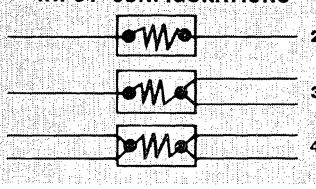
(+) TCR

TEMPERATURE-SENSITIVE RESISTOR/COMPENSATOR

DESCRIPTION AND APPLICATION:

PRECISION'S linear (+) TCR thermal tracing resistors function as **economical temperature sensing** devices in bridge circuit applications for process control systems. These axial lead resistors are also used as **compensators** for voltage stabilization of components with negative (−) TCR drift. Input configurations offer precise 2, 3 and 4 terminal control.

INPUT CONFIGURATIONS



ELECTRICAL AND PHYSICAL SPECIFICATIONS

TEMPERATURE SENSING ALL DRAWINGS ILLUSTRATE ACTUAL SIZE	PRC Types	Power Rating	Body Dimensions ±.787mm (.031") Length mm	Length (ins.)	Diameter mm	Diameter (ins.)	1.5"L Lead Diam. Tinned Copper	Maximum Resistance Values for Partial Listing of Popular +(TCR) Characteristics +400 ppm/°C	+1400 ppm/°C	+3930 ppm/°C	+4500 ppm/°C	+6000 ppm/°C
NEW	PT052	0-.02W	6.86	(.270")	1.78	(.070")	.020"	2K	1500	25	500	100
	PT073	0-.05W	8.43	(.332")	2.54	(.100")	.020"	3K	2500	50	600	200
	PT094	0-.1W	10.03	(.395")	3.18	(.125")	.025"	7K	6K	100	1500	500
	PT146	0-.25W	13.21	(.520")	4.75	(.187")	.028"	27K	20K	500	5K	2K
NEW	PT146-3	0-.25W	13.21	(.520")	4.75	(.187")	.028"	27K	20K	500	5K	2K
NEW	PT146-4	0-.25W	13.21	(.520")	4.75	(.187")	.028"	27K	20K	500	5K	2K

Hundreds of additional physical sizes and TCR combinations are available.

ENGINEERING DATA:

1 RESISTANCE RANGE AND TOLERANCE

Standard: 1 ohm through 50 kilohms (±1% tolerance).

Special: 0.1 ohm through 300 kilohms (to ±0.1% tolerance).

2 TEMPERATURE COEFFICIENT OF RESISTANCE (TCR)

The TCR characteristic is the change in resistance (△R) above or below the reference temperature (25°C).

Standard: (±10% tol. on TCR)
- **+80 ppm/°C** (.008%/°C).
- **+140 ppm/°C** (.014%/°C).
- **+400 ppm/°C** (.04%/°C).
- **+1400 ppm/°C** (.14%/°C).
- **+3930 ppm/°C** (.393%/°C).
- **+4500 ppm/°C** (.45%/°C).
- **+6000 ppm/°C** (.6%/°C).

Example: Type PT146 1000Ω ±1% TCR +4500 ppm/°C. **(Standard part)**

Use formula: TCR × R_o = △R/°C.

Solution: .0045Ω/Ω/°C × 1000Ω = 4.5Ω△/°C above or below reference temperature.

Proof: $\frac{\triangle R \times 10^6}{R_o \times \triangle t}$ = TCR (ppm/°C)

$\frac{4.5 \times 10^6}{1000 \times 1°C} = \frac{4500000}{1000}$ or 4500 ppm/°C.

where:

R_o = Original resistance at reference temperature.

△R = Change in resistance at test temperature from resistance at reference temperature.

△t = Difference between test and reference temperature in degrees.

Cycling Repeatability: △R < 10% of resistance tolerance. (These devices do not require re-calibration. However, care must be taken to minimize external transient thermal effects.)

3 STABILITY VS. TIME (No Load)

Standard: ±0.05%/year at 25°C.

Special: < ±0.01%/year at 25°C.

4 PROTECTIVE COATINGS

Standard: Conformal silicone/epoxy seal.

Special: Thermal conductive insulating coatings, uncoated or thin dip of commercial plastic conformal coating.

5 MARKING

PRC symbol, type, resistance value and tolerance, TCR characteristic, physical size permitting.

COMPENSATOR APPLICATION	PRC Type	Resistance @ 25°C	Tolerance	+ (TCR) Characteristic
	PT146	1KΩ	±1%	3500 ppm/°C

The PT146 1KΩ ±1% TC 3500 ppm/°C (½W) resistor is suggested to develop the desired temperature compensation for true rms measurements and for errors in dB output circuits. Prototypes are readily available for evaluation. In addition to the popular PT146, compensators can be furnished with any (+) TCR from either pure metals, available alloys or composite windings to TC tolerances of ±1% or less. All (+) TCR can be supplied to 1.0 ohm or less and in 0.1 ohm steps and variety of tracking classifications.

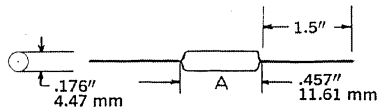
Watts — Input vs. Ambient Temperature: Devices listed are designed for continuous full load compensation applications at any ambient temperature up to and including +125°C (derated to zero power at +150°C).

4 PRC PRECISION RESISTOR CO., INC.
10601 75th STREET NO. • LARGO, FL 33543 U.S.A. • TEL: (813) 541-5771 • TELEX: 821788

BALCO ELEMENT

SENSORS

TYPE PT/TYPE STD



#21 AWG TINNED COPPER LEADS

DESCRIPTION AND APPLICATION:

The BALCO® 1000 ohm (@ 70°F) element is a temperature sensing resistor which changes electrical resistance (2.3 ohms per 1°F) in direct response to a change in temperature. This low cost sensor offers precision control for temperature or humidity controllers with single or multiple sensing applications.

ELECTRICAL AND PHYSICAL SPECIFICATIONS

PRC Type	Resistance @ 70°F	Tolerance	Resistance — Temperature Char.	Temperature Conversion Equivalent
PT156	1000Ω	±1%	2.3Ω△/°F	TCR/°F = TCR/°C ÷ 1.8043 TCR/°C = TCR/°F × 1.8043

RESISTANCE AT SPECIFIC TEMPERATURES:

Degrees F	Resistance in Ohms	Degrees F	Resistance in Ohms	Degrees F	Resistance in Ohms	Degrees F	Resistance in Ohms	Degrees F	Resistance in Ohms
0	847.92	21	891.94	41	935.14	61	979.62	81	1025.28
1	849.98	22	894.06	42	937.34	62	981.88	82	1027.60
2	852.04	23	896.20	43	939.54	63	984.14	83	1029.92
3	854.10	24	898.34	44	941.74	64	986.40	84	1032.24
4	856.18	25	900.48	45	943.94	65	988.66	85	1034.58
5	858.26	26	902.62	46	946.14	66	990.94	86	1036.90
6	860.34	27	904.76	47	948.34	67	993.20	87	1039.24
7	862.42	28	906.92	48	950.56	68	995.46	88	1041.56
8	864.52	29	909.06	49	952.78	69	997.72	89	1043.90
9	866.60	30	911.22	50	955.00	70	1000.00	90	1046.24
10	868.70	31	913.38	51	957.22	71	1002.28	91	1048.58
11	870.80	32	915.54	52	959.44	72	1004.58	92	1050.94
12	872.90	33	917.70	53	961.66	73	1006.86	93	1053.30
13	875.00	34	919.83	54	963.90	74	1009.16	94	1055.68
14	877.10	35	922.04	55	966.14	75	1011.46	95	1058.04
15	879.20	36	924.22	56	968.38	76	1013.76	96	1060.40
16	881.32	37	926.40	57	970.62	77	1016.06	97	1062.76
17	883.44	38	928.58	58	972.86	78	1018.36	98	1065.14
18	885.56	39	930.76	59	975.10	79	1020.66	99	1067.50
19	887.68	40	932.96	60	977.36	80	1022.98	100	1069.88
20	889.80								

ENGINEERING DATA:

1 RESISTANCE AND TOLERANCE

Standard Input: 1000Ω ±1% (990Ω to 1010Ω) @ 70°F.

Special: 0.1Ω thru 5KΩ with tolerances to ±0.1% at desired temperature.

2 RESISTANCE-TEMPERATURE CHARACTERISTICS

The 1000 Balco element changes approximately 2.3 ohms per 1°F.(−40 to +250°F).

3 STABILITY VS. TIME

All Balco elements are artificially aged to assure close interchangeability in calibration. (±0.05%/year @ 77°F)

4 CONSTRUCTION

Balco Wire: 70% nickel, 30% iron.
Substrate: Phenolic form.
Terminals: Hot-tinned copper wire leads.
Protective Coating: Flexible plastic seal.

5 MARKING

PRC symbol type, resistance value and tolerance, TCR. Char. Custom identification if specified.

6 DELIVERY

"Off-the-shelf" availability.

PRC Type	Resistance @ 70°F	Tolerance	TCR Characteristic	Precision Resistor (STD.)
NEW STD156	1KΩ	±1/10%	5 ppm/°C	

The STD156 is a standard precision resistor (substitute for the Balco temperature element equivalent to 70°F).

Also Available: OFFSET KIT of 3 Precision Resistors:
1 — PRC type STD156 1KΩ (−) 1% (low side of nominal)
1 — PRC type STD156 1KΩ (+) 1% (high side of nominal)
1 — PRC type STD156 1KΩ ±0.1% (nominal)

® Registered Trade Mark, Wilbur B. Driver Co.

PRC PRECISION RESISTOR CO., INC.
10601 75th STREET NO. • LARGO, FL 33543 U.S.A. • TEL: (813) 541-5771 • TELEX: 821788

CARBORUNDUM® ROD THERMISTORS

Carborundum thermistors are temperature dependent resistors, offered in a wide variety of resistance-temperature characteristics. They are available with a wide range of negative temperature coefficients at 25°C ranging from −0.3%/°C to −5.4%/°C. These parts are made from ceramic materials, bonded in a high-temperature firing process into rod configurations. They are available in a large range of sizes, thermal characteristics, resistance values, and temperature coefficients to suit the needs of many types of electrical and electronic circuits.

Carborundum offers long experience in the design of special resistance devices. This, together with expertise in the field of ceramic technology, assures a stable and uniform product to meet your thermistor requirements. All materials used in the manufacture of Carborundum thermistors are of the highest quality. Strict quality control is maintained over all stages of manufacture, and a minimum of two calibrations at the specified reference temperature is standard.

DEFINITIONS

Zero Power Resistance... is the resistance of a thermistor at the calibrating temperature, measured in such a manner that the measuring current does not appreciably heat the thermistor. Resistance, as used here, means zero power resistance unless otherwise stated.

Beta (β)... is the number that satisfies the equation:

$$R_1/R_2 = \epsilon^{\beta (1/T_1 - 1/T_2)}$$

Carborundum determines beta from measurements at 25°C and 73.2°C. Beta is proportional to the slope of the resistance-temperature characteristic, and it is also known as the material constant. It is not truly a constant, but it gives a good approximation of resistance over a substantial working range. In the equation, ϵ is 2.718..., the base of natural logarithms, and β, T_1, and T_2 are in Kelvin (K).

Alpha (α)... or temperature coefficient of resistance (TCR) is proportional both to beta and to the square root of the temperature at which it is specified. Very nearly,

$$\alpha = -100\ \beta/T^2$$

In this equation, temperature is in Kelvin (K), and α is in percent per degree C (%/°C). It is evident that alpha becomes much higher as temperatures decrease.

Dissipation Constant (δ)... is the ratio of power dissipated by the thermistor divided by the temperature rise above ambient due to self-heating. Here, it is 20 times the power required, in watts, to bring the thermistor to 75°C in an ambient of 25°C, and it is expressed in milliwatts.

Time Constant (τ)... is the time required for a thermistor which has attained equilibrium after being self-heated to 75°C to cool to 43.4°C in an ambient of 25°C. It is expressed in seconds.

Both δ and τ are necessarily approximate quantities, and they represent complicated concepts. They cannot be fully defined or used unless the conditions under which they are measured are fully defined.

In particular, note that the dissipation of a thermistor is the sum of dissipation due to conduction, convection, and radiation, which are related to temperature by linear, square-law, and fourth-power equations respectively. Only over narrow temperature ranges can dissipation constant be considered constant.

Also note that time constant is defined by a zero-power cooling curve. If the thermistor is attached to a heat sink the effective time constant is changed substantially. The time required for a thermistor to reach equilibrium due to heating from a current passing through it may be dramatically different from the time constant as defined above.

ROD THERMISTORS

Rod thermistors are manufactured by extruding and firing a suitable ceramic mixture. For a given type of thermistor, low-, medium-, or high-sensitivity, a number of mixtures are available: in general, a mixture yielding a higher resistivity product also yields a higher beta or temperature sensitivity.

Standard rod thermistors are shown in the following table. They have a resistance tolerance of ±10% at 25°C, and they are neither coated nor marked. Special rod thermistors may be ordered with intermediate resistance values, other resistance tolerances, other calibration temperatures, coating, marking, special lead preparation, etc. Parts without wire leads are also available.

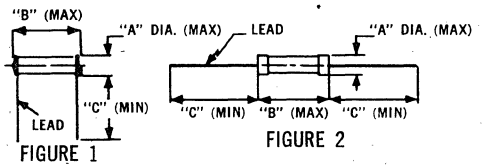


FIGURE 1

FIGURE 2

Style	Figure	Dimensions (inches) A	B	C	AWG	Dissipation Constant (mw/°C)	Time Constant (seconds)
0325F5- 0325H5-	1	0.12	0.30	1.00	24	6.0	10
0540F4- 0550H4-	2 2	0.20 0.20	0.50 0.63	1.25 1.25	20 20	9.5 11.0	22 25
0550F5- 0550H5-	1	0.22	0.63	1.38	20	11.0	25
1099F5-	1	0.38	1.13	1.38	20	24.0	90

Resistance Ohms ±10% @ 25°C	Dash Number	MEDIUM TEMPERATURE COEFFICIENT Type "F" Rods Beta ±10% Style 0325F5	Styles 0540F4- 0550F5-	Style 1099F5-	HIGH TEMPERATURE COEFFICIENT Type "H" Rods Beta ±5% Style 0325H5-	Styles 0550H4- 0550H5-
2.2	-402	—	—	1300	—	—
3.3	-403	—	—	1350	—	—
4.7	-404	—	1300	1400	—	—
6.8	-406	—	1350	1450	—	—
10.0	-410	1300	1400	1500	—	—
15.0	-411	1350	1450	1550	—	—
22.0	-412	1400	1500	1600	—	—
33.0	-413	1450	1550	1600	—	—
47.0	-414	1500	1600	1650	—	—
68.0	-416	1550	1600	1650	—	—
100	-420	1600	1650	1700	—	—
150	-421	1600	1650	1700	—	—
220	-422	1650	1700	1750	—	—
330	-423	1650	1700	1750	—	—
470	-424	1700	1750	1800	—	—
680	-426	1700	1750	1800	—	—
1,000	-430	1750	1800	1850	—	3000
1,500	-431	1750	1800	1850	—	3100
2,200	-432	1800	1850	1900	3000	3150
3,300	-433	1800	1850	1900	3100	3200
4,700	-434	1850	1900	1950	3150	3300
6,800	-436	1850	1900	1950	3200	3400
10,000	-440	1900	1950	2000	3300	3500
15,000	-441	1900	1950	2000	3400	3600
22,000	-442	1950	2000	2050	3500	3700
33,000	-443	1950	2000	2050	3600	3800
47,000	-444	2000	2050	2100	3700	3900
68,000	-446	2000	2050	2100	3800	4000
100,000	-450	2050	2100	2150	3900	4100
150,000	-451	2050	2100	2150	4000	4150
220,000	-452	2100	2150	2200	4100	4200
330,000	-453	2100	2150	2200	4150	4250
470,000	-454	2150	2200	2200	4200	4300
680,000	-456	2150	2200	—	4250	4350
1,000,000	-460	2200	2200	—	4300	4400
1,500,000	-461	2200	—	—	4350	—
2,200,000	-462	2200	—	—	4400	—

Order by the style number followed by the dash number. For example, part number 0540F4-404 is a thermistor of style 0540F4-, of 4.7 ±10% ohms resistance, and with a beta of 1300 ±10% K.

Sohio Engineered Materials Company
Refractories Division, Electric Products Plant
Post Office Box 339, Niagara Falls, NY 14302
Tel: (716) 278-2553 • Telex: 91-555 (CARBO GLO NGF)

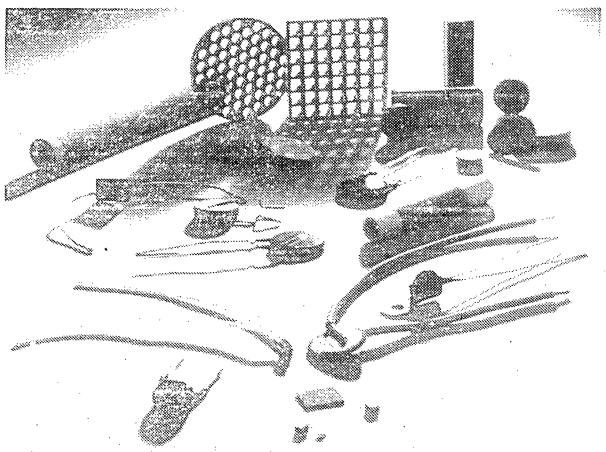
SOHIO CARBORUNDUM

SYLVANIA Control Devices GTE **THERMASTER™**

PTC's (Positive Temperature Coefficient Thermistors) To Heat, Sense and Control

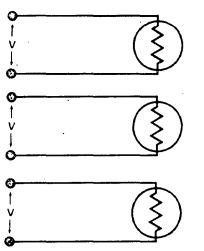
A versatile tool for design engineers

Whatever your product application, there will be problem areas where the unique characteristics of Thermaster™ PTC thermistors can provide a reliable and cost-effective solution. These versatile components can be used as self-regulating heaters, temperature sensors or control elements. Applications occur in all industries, including transportation, consumer products, office data processing equipment, industrial controls, instrumentation and communications. The advantages of Thermaster components include simplicity, solid-state reliability, versatility, stability, sensitivity and resolution. They are producible in a wide range of ratings and package styles. Isn't it time you looked into their capabilities? Ask for literature.



APPLICATIONS

HEATERS

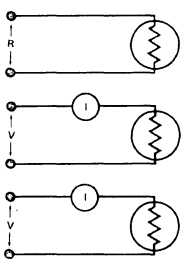


ADVANTAGES

- No overtemperature protection required
- Fixed temperature operation, wide range of temperatures producible
- Stable characteristics over wide voltage range

Cost Effective—The ability of the PTC thermistor to auto-stabilize over wide variety of operating temperature precludes the need for temperature regulators and/or over temperature protectors in most heater applications.
Producible in a number of shapes and packages for heating liquids, solids or gases.

SENSORS

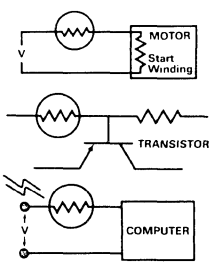


ADVANTAGES

- Small size
- Low power levels required
- Broad resistance range producible

Versatile—PTC's are offered in a wide range of switching temperatures and resistances for maximum design flexibility.
Producible with attached leads for PC board mounting; as discs for surface mounting; as chips for hybrids; and in various other shapes.

CONTROLLERS (Protectors)



ADVANTAGES

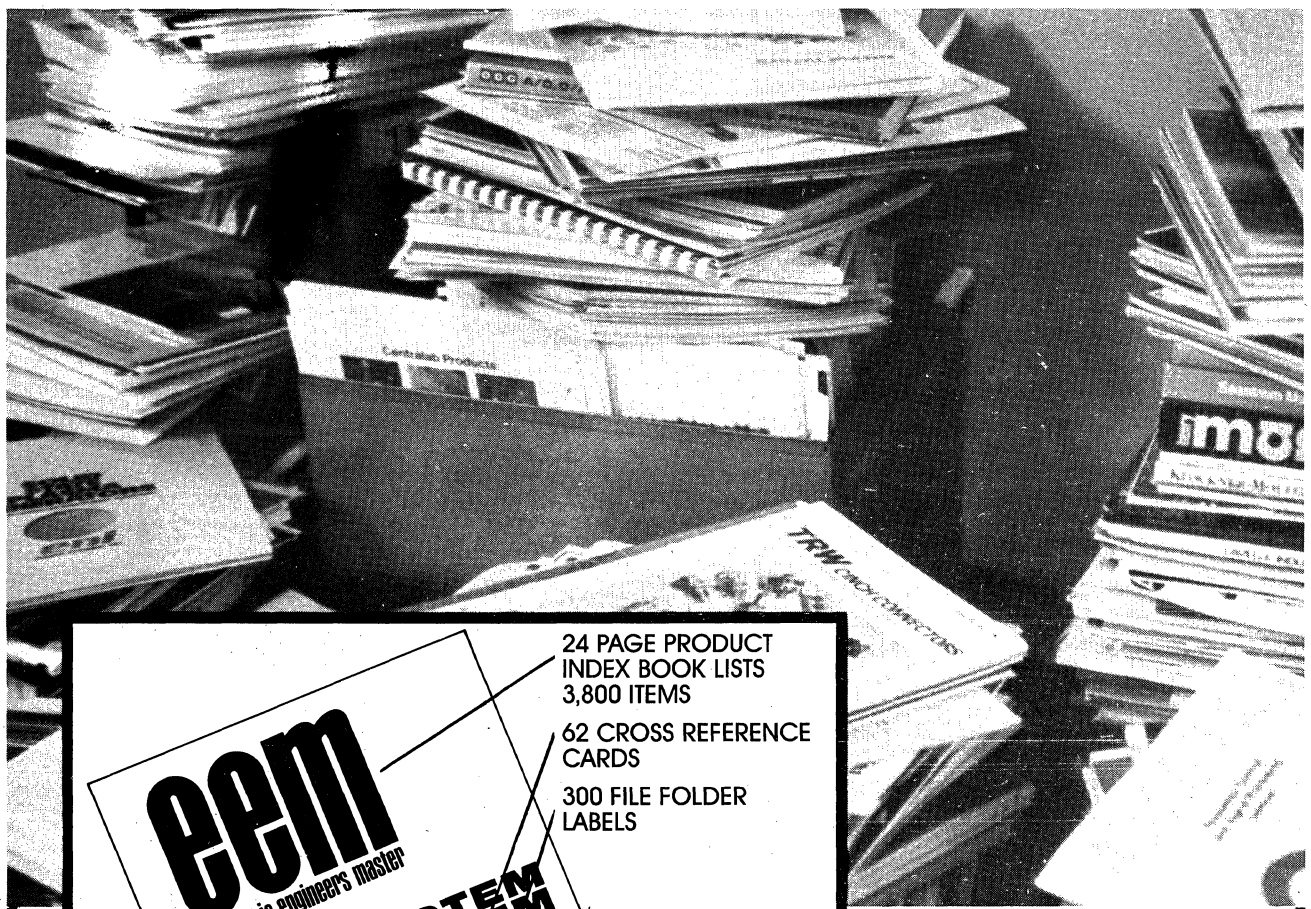
- No moving parts
- Small size
- Wide range of packages
- High reliability

Control PTC thermistors provide a simple means to protect loads against fault conditions; i.e.; voltage surges such as line crosses; undesireable temperature rises; or to protect circuits from excessive current.
They have no moving parts, are rugged, and are available in a number of sizes and resistance ranges for almost any application.

HEADQUARTERS
Sylvania Control Devices, Division of
GTE Products Corporation
Route 35, Standish, ME 04084
(207) 642-4535

SALES OFFICE
MICHIGAN
10800 Ford Road
Dearborn, Michigan 48126
Phone: (313) 582-8754

OHIO
333 West First Street
Dayton, Ohio 45402
Phone: (513) 223-6227



ALL NEW with this edition of EEM

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

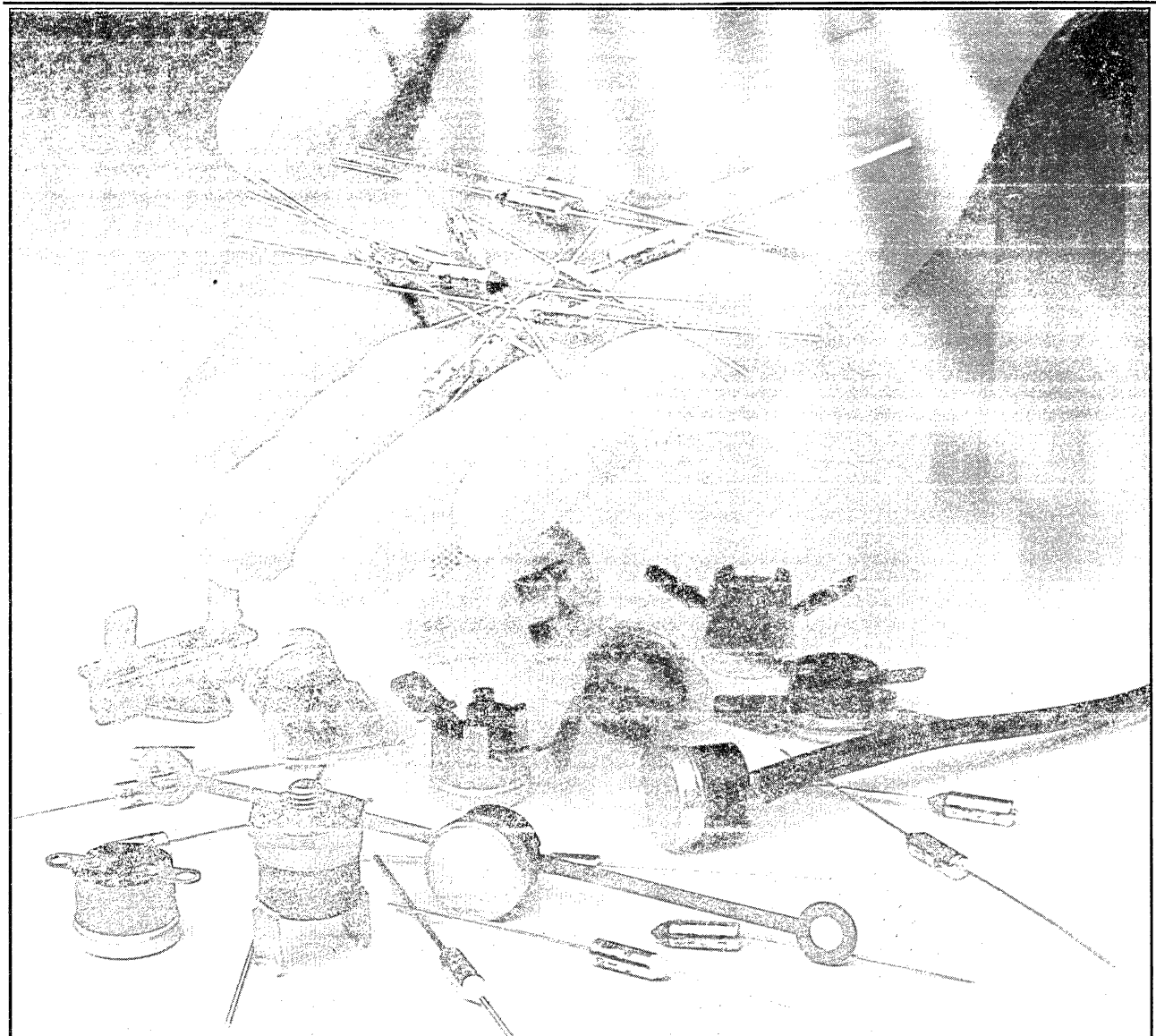
There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,

645 stewart ave., garden city, ny 11530



Micro Devices thermal cutoffs and Therm-O-Disc sensors and controls...

Your reputation for product quality and safety is a valuable asset you need to protect. Therm-O-Disc can help with more than 50 reliable sensors and controls now in production. Everything from general purpose fixed-setting controls to pressure-actuated and temperature/current sensing switches.

Plus MICROTEMP® thermal cutoffs made by our Micro Devices Product Group in many ratings and configurations for positive upper limit temperature protection. We've been meeting the special needs of our customers since 1945. Write or call about your requirements. We'll be glad to help...

protect your product quality and safety.

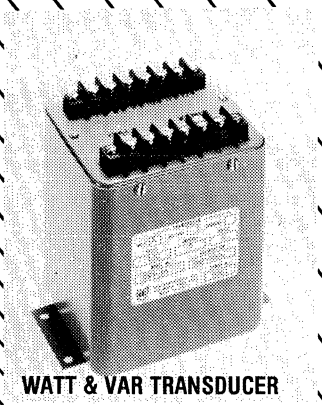
Therm-O-Disc®

THERM-O-DISC, INCORPORATED

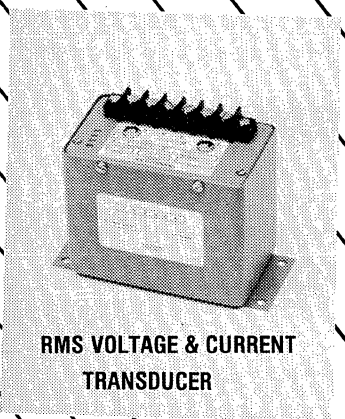
A SUBSIDIARY OF EMERSON ELECTRIC CO.
P.O. Box 3538 • Mansfield, Ohio 44907
T-O-D Controls 419/756-5911 • Micro Devices Products 419/756-5005
Sales Offices World-Wide

PIONEER & LEADER for 22 YEARS

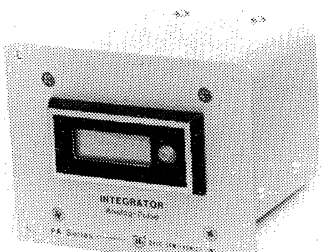
OHIO SEMITRONICS, INC.
OSI
TRANSDUCERS & ENERGY MONITORING EQUIPMENT



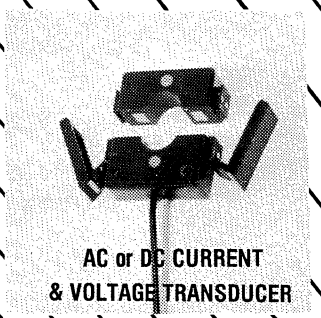
WATT & VAR TRANSDUCER



RMS VOLTAGE & CURRENT TRANSDUCER



PROCESS ACCUMULATOR



AC or DC CURRENT & VOLTAGE TRANSDUCER

OHIO SEMITRONICS, INC.
1205 Chesapeake Avenue
Columbus, Ohio 43212-2287
Phone (614) 486-9561
TWX 810-482-1630

SEE EEM pages B•1806 thru B•1819
Write or call for 32 pg. Catalog

SENSORS/TRANSDUCERS

Manufacturer	EEM Page no.	Current, DC			Current, AC		Power		Power Factor	Phase Angle	Frequency	Voltage		Other
		Magnitude	Level Sensing	Bidirectional	Ampl./RMS	Level Sensing	True (W)	Apparant (VAR)				DC	AC	
American Aerospace	B•1780 B•1781	●	●	●	○	○	○	○					●	
Bell, F.W.	B•1785								●					
Micro Switch	B•1804	●	●		○	●								
Ohio Semitronics	B•1806													
	B•1807						●							
	B•1808							●						
	B•1809						●							
	B•1810						○		○					
	B•1811						○							Converter, Analog-to-Pulse (Integrator)
	B•1813	●		○	○									
	B•1814				○								○	
	B•1815				○								●	
	B•1816											●	●	
	B•1817										○			
	B•1818													Integrator, Analog Current

ENCODERS, SHAFT ANGLE

Manufacturer	EEM Page no.	Optical		Contact		Other
		Abs	Diff.	Abs	Diff.	
BEI Motion Systems	B•1782 B•1783	●	●		●	
Datametrics• Dresser Inds.	B•1791	●	●			
Dynamics Research	B•1793	○	○			
Itek Meas. Sys.	B•1845			○*	○*	
Litton Encoder	B•1797	●	○	○*	○	Trackballs
Micro Mo Elctrns.	B•1801	●	●			
Renco	B•1824 B•1825	●	●			
Transducers and Systems	B•1880					Transformer, Rotary, Variable, Differential
US Digital	B•1829		○			
Vernitech	B•1831	○	○	●		

* Mil. Spec.

TRANSDUCERS

Manufacturer	EEM Page no.	Audio	Force/ Weight	Magnetic Field	Pressure	Temp.	Position		Position/ Velocity	Velocity	Other
							ABS	Displace-ment			
Aeroflex Labs.	B•1779										Magnetic Pickups
Blatek	B•1787	•									Transducers, Ultrasonic
Celesco	B•1788 B•1789				•		•	•	•	•	
Data Instruments	B•1790				•						Depth Sensors
Entran	B•1794				•						
Farrand Controls	B•1796						•	•			
Kavlico	B•1798				•						
Kulite	B•1799				•						
Kurz	B•1800					•				•	
Micro Switch	B•1802 B•1803				•						
NTK Technical	B•1805										Transducers, Ultrasonic
Ohio Semitronics	B•1819			•							
Omega	B•1820 B•1821					•					
Paine	B•1823				•						
Piezo Electric	B•1871	•									Transducers, Piezoelectric
Renco	B•1825						•				
Setra Systems	B•1826				•				•		Digital Barometers
Tedea USA	B•1827		•								
Transducers and Systems	B•1828		•					•		•	Transducer Measurement System, Universal; Inclinometers
Vernitech	B•1830 B•1831				•						
Vibra-Metrics	B•1832										Transducers, Vibration

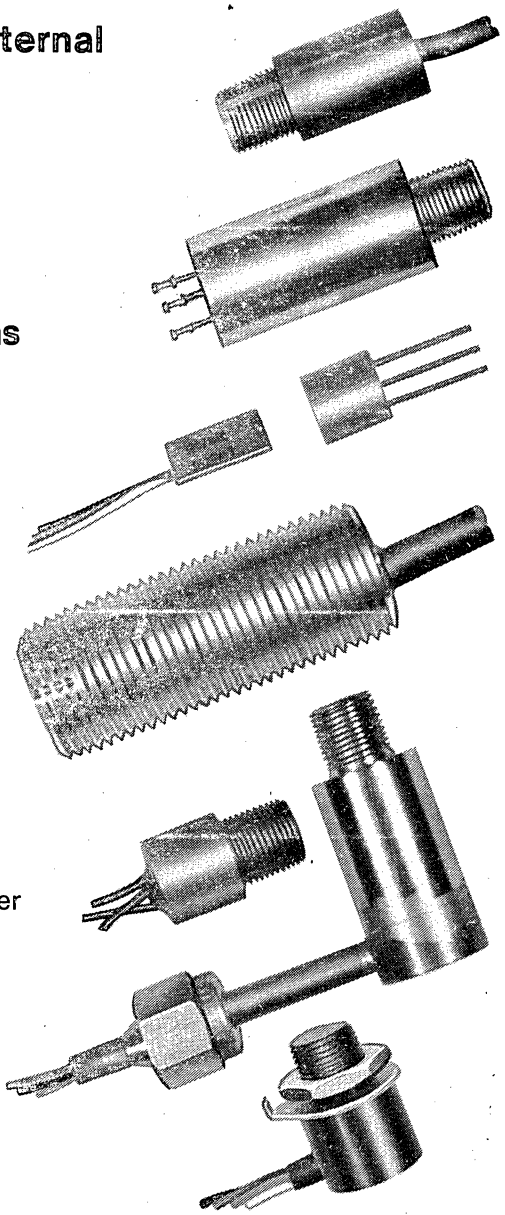
ACCELEROMETERS

Manufacturer	EEM Page no.	Accel-eration	Vibration	Shock
Entran	B•1795	•	•	•
Setra Systems	B•1826	•		
Vibra-Metrics	B•1832	•	•	•

Speed-Independent Magnetic Pick-ups

Their output voltage amplitudes are totally independent of the rate of change to the external magnetic field. They provide

- **True zero speed sensing**
- **Contactless limit switches**
- **Translational and rotational velocity, direction and position sensing**
- **Counting, indexing, and timing functions**



Benefits:

- Simplify designs
- Low power consumption
- Rugged enough for engine environments
- Aerospace reliability
- Operate from logic power bus
- Freedom from EMI (no choppers or oscillators)
- Freedom from actuator mechanisms
- Can replace optical systems

Applications:

Computer peripherals—sensing of indexing marks for drive mechanisms in card readers / magnetic tape memories / paper roll drive, and character selection in printers

Transportation—wheel speed sensing (skid-controlled braking) / ignition system timing / vehicle sensing (traffic control)

Industrial — speed, position and limit sensing

Aerospace — wide applications

Other Products:

Solid state Push Button and Toggle Switches / Solid state current sensors / as well as brushless DC Motors and Torquers.

For Technical "Hotline" Assistance, Ask for Tom Rowan.

MAGNETIC PRODUCTS DIVISION
AEROFLEX LABORATORIES INC.
SOUTH SERVICE ROAD • PLAINVIEW, LONG ISLAND, N. Y. 11803
TEL.: (516) 694-6700 • TWX: 510-224-6417

American Aerospace Controls Inc.
570 SMITH STREET, FARMINGDALE, NEW YORK 11735 □ (516) 694-5100

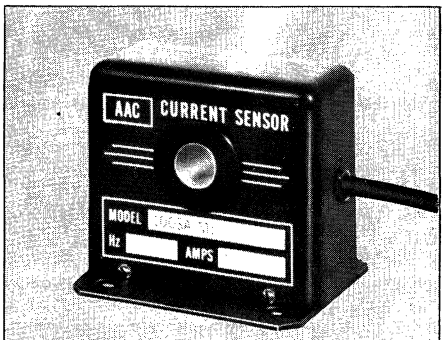


Figure 1 Size: 2 1/16" x 2" x 1 3/4"

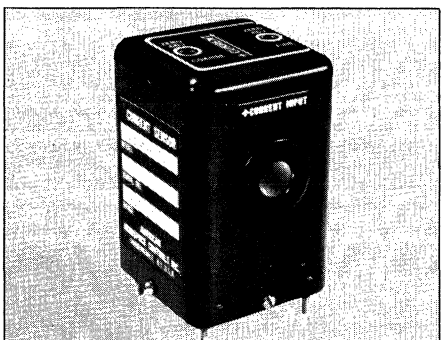


Figure 2 Size: 2 11/16" x 1 5/8" x 1 5/8"

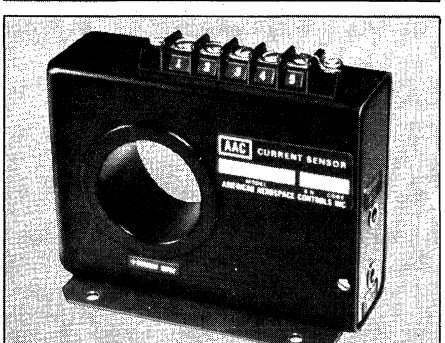


Figure 3 Size: 3 1/2" x 4 1/4" x 2 3/16"

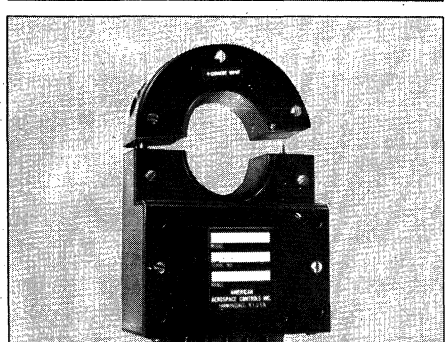


Figure 4 Size: 5" x 3 1/4" x 1 9/16"

AC CURRENT SENSORS

SERIES	FULL SCALE (FS) INPUT CURRENT RANGES	FS OUTPUT	ACCURACY	RESP.	FIG.
C	1, 2, 5, 10, 20A	+1mA DC	0.25%FS	400ms	6
1003AM1	2, 5, 10, 15, 20, 30, 50, 100A	+5VDC	1%FS	150ms	1
1004	2, 5, 10, 20, 50, 100A	+5VDC	1%FS	150ms	5
1002	5, 10, 25, 50, 100A	+5VDC	1%FS	50ms	—
1002M1	5, 10, 25, 50, 100, 150, 200, 250A	+5VDC	1%FS	50ms	5
1003AM2	30, 50, 75, 100, 150, 200, 250A	+5VDC	1%FS	150ms	—
1004M7	100, 150, 200, 250A	+5VDC	1%FS	150ms	5
1003AM3	150, 250, 500, 800, 1000, 1200, 1500A	+5VDC	1%FS	150ms	—
1001	150, 250, 500, 1000, 2000, 2500, 5000A	+5VDC	2%FS	150ms	4

DC CURRENT SENSORS

SERIES	FULL SCALE (FS) INPUT CURRENT RANGES	FS OUTPUT	ACCURACY	RESP.	FIG.
904B	.1, .2, .5, 1, 2, 5mA	+5VDC	1%FS	50ms	—
903B	5, 10, 20, 50, 100, 200, 500mA & 1, 2, 5A	+5VDC	1%FS	50ms	5
903C	5, 10, 20, 50, 100, 200, 500mA & 1, 2, 5A	+5VDC	2%FS	50ms	5
S209-903B	5, 10, 20, 50, 100, 200, 500mA & 1, 2, 5A	+1mA DC	1%FS	50ms	5
S218-903	100, 200, 500mA & 1, 2, 5A	+5VDC	1%FS	50ms	3
936	50 & 500mA	+5VDC	2%FS	100ms	—
937	10, 20, 30, 50, 100A	+5VDC	2%FS	200µs	—
913A	10, 20, 50, 100A	+5VDC	1%FS	1ms	2
913B	10, 20, 50, 100A	+5VDC	1%FS	1ms	5
913C	10, 20, 50, 100A	+5VDC	2%FS	1ms	5
S155-913B	10, 20, 35, 50, 75, 100A	+5VDC	1%FS	1ms	5
946	10, 15, 20, 25, 30, 50A	+5VDC	1%FS	30ms	—
950	10, 20, 30, 40, 50A	+5VDC	0.5%FS	10ms	5
951	10, 20, 30, 40, 50A	+5VDC	0.5%FS	30ms	5
952	100, 250, 400, 500, 1000, 1500, 2000A	+5VDC	0.5%FS	50µs	5
934	100, 200, 250, 300, 500, 750, 1000A	+5VDC	2%FS	200µs	5

BIDIRECTIONAL CURRENT SENSORS

SERIES	FULL SCALE (FS) INPUT CURRENT RANGES	FS OUTPUT	ACCURACY	RESP.	FIG.
905B	±50, 100, 200, 500mA & 1, 2, 5A	±5V	1%FS	50ms	5
905C	±50, 100, 200, 500mA & 1, 2, 5A	±5V	2%FS	50ms	5
925B	±10, 20, 50, 100A	±5V	1%FS	1ms	5
925C	±10, 20, 50, 100A	±5V	2%FS	1ms	5
907	±25, 50, 100, 150, 200, 250, 300A	±5V	2%FS	100µs	—
907A	±25, 50, 100, 150, 200, 250, 300A	±5V	2%FS	40µs	—
908	±25, 50, 100, 150, 200, 300A	±250mV	2.5%FS	5µs	—
910	±25, 50, 100, 150, 200, 250A	±250mV	2%FS	5µs	—
927B	±150, 200, 250, 300, 500, 750, 1000A	±5V	1%FS	100µs	5
927C	±50, 100, 150, 200, 250, 300, 500, 750, 1000A	±5V	2%FS	100µs	5
942A	±100, 200, 300, 500, 800, 1000, 2000A	±5V	1%FS	100µs	3
909	±150, 250, 500, 750, 1000, 1500, 2500, 5000A	±250mV	2.5%FS	200µs	4
909M4	±150, 250, 500, 750, 1000, 1500, 2000, 2500A	±5V	2.5%FS	200µs	4
921	±250, 500, 750, 1000, 2000A	±250mV	2%FS	20µs	5

CURRENT, VOLTAGE AND POWER INSTRUMENTATION

CALL 516-694-5100

AC & DC CURRENT LEVEL DETECTORS

SERIES	FULL SCALE (FS) INPUT CURRENT RANGES	FS OUTPUT	ACCURACY	RESP.	FIG.
850	1, 2, 5, 10, 15, 20, 50, 100, 200, 250A AC	RELAY	2%FS	500ms	—
S212-850	500mA AC (75A AC OVERLOAD)	RELAY	±75mA	200ms	5
901B	20, 50, 100, 250, 500mA & 1, 2, 5A DC	+5V & SW	1%FS	50ms	—
S204-800	100mA DC (10A DC OVERLOAD)	RELAY	N/A	3ms	5
S58-800	200mA DC (10A DC OVERLOAD)	SWITCH	N/A	1ms	5
S201-800	1A DC (100A DC OVERLOAD)	RELAY	±150mA	200ms	5

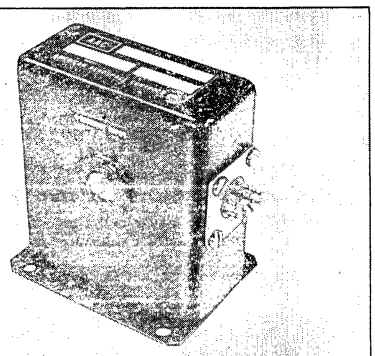


Figure 5 Size: 2⅞" x 2⁹⁄₁₆" x 2"

AC VOLTAGE SENSORS

SERIES	FULL SCALE (FS) INPUT VOLTAGE RANGES	FS OUTPUT	ACCURACY	RESP.	FIG.
109	120, 125, 135, 240, 250, 270VAC	+1mA DC	0.5%V max	300ms	—
110	120, 125, 135, 240, 250, 270VAC	+1mA DC	0.5%V max	300ms	—
108	130, 150, 270, 500, 600VAC (0 to FS)	+5VDC	2%FS	200ms	—
S190-108	130, 150, 270, 300, 600VAC (0 to FS)	+10VDC	2%FS	200ms	—
V	150, 300, 500VAC (0 to FS)	+1mA DC	0.25%FS	400ms	6
101M3	150VAC @ 60Hz (SUPPRESSED ZERO)	+5VDC	2%V max	17ms	—
102M3	175VAC @ 400Hz (SUPPRESSED ZERO)	+5VDC	2%V max	3ms	—
105	465, 490, 505, 540VAC (SUPPRESSED ZERO)	+5VDC	2%V max	17ms	—

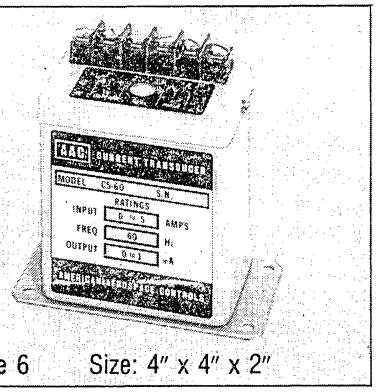


Figure 6 Size: 4" x 4" x 2"

WATT & VAR TRANSDUCERS

SERIES	FULL SCALE (FS) INPUT POWER RANGES	FS OUTPUT	ACCURACY	RESP.	FIG.
415A	1KW-100KW 120 or 220VAC 60Hz	+5VDC	2%FS	400ms	8
416A	4KW-200KW 440VAC 60Hz	+5VDC	2%FS	400ms	8
S217	2KW-80KW 220 & 440VAC 60Hz	+5VDC	2%FS	400ms	8
S73-413	1KW-50KW 120 or 220VAC 60Hz	+5VDC	2%FS	400ms	8
S206-415A	1KW-100KW 120 or 220VAC 400-1KHz	+5VDC	2%FS	150ms	8
W106	0.5KW-2KW (1 ele) 120, 220 or 440VAC	±1mA DC	0.25%FS	400ms	7
W156	1KW-4KW (1½ ele) 120, 220 or 440VAC	±1mA DC	0.25%FS	400ms	7
W206	1KW-4KW (2 ele) 120, 220 or 440VAC	±1mA DC	0.25%FS	400ms	7
W256	1KW-4KW (2½ ele) 120, 220 or 440VAC	±1mA DC	0.25%FS	400ms	7
W306	1KW-4KW (3 ele) 120, 220, or 440VAC	±1mA DC	0.25%FS	400ms	7
Q106	0.5-2KVAR (1 ele) 120, 220 or 440VAC	±1mA DC	0.25%FS	400ms	7
Q156	1-4KVAR (1½ ele) 120, 220 or 440VAC	±1mA DC	0.25%FS	400ms	7
Q206	1-4KVAR (2 ele) 120, 220 or 440VAC	±1mA DC	0.25%FS	400ms	7
Q256	1-4KVAR (2½ ele) 120, 220 or 440VAC	±1mA DC	0.25%FS	400ms	7
Q306	1-4KVAR (3 ele) 120, 220 or 440VAC	±1mA DC	0.25%FS	400ms	7
407	0.3-60KW DC 12-240VDC & 25-250A DC	250mV	2%FS	5μs	—
401	2.7-150KW DC 18-150VDC & 150-1000A DC	250mV	2.5%FS	200μs	4

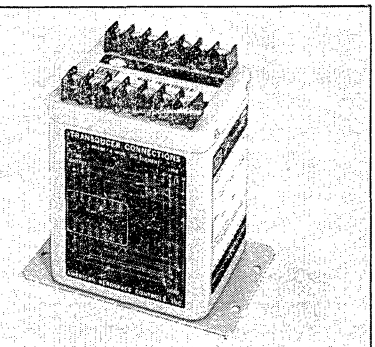


Figure 7 Size: 5⁷⁄₁₆" x 5⅛" x 3⅜"

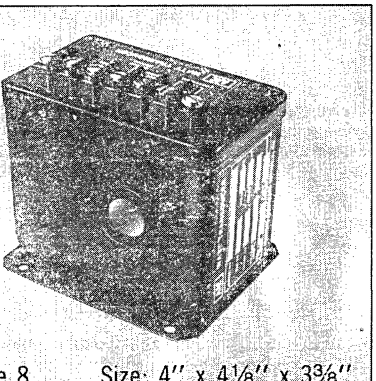
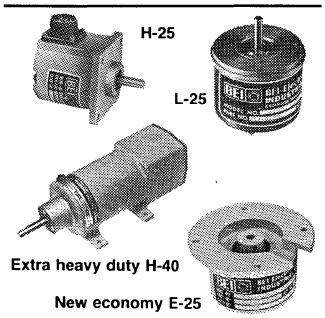


Figure 8 Size: 4" x 4⅛" x 3⅜"

***AAC** manufactures Current, Voltage and Power Sensing Instruments for Industrial, Military and Space Applications. Send for complete catalog. Our Application Engineering Staff is available to assist you.*

WHEN THE QUESTION THE ANSWER

CALL THE DIVISION THAT



OPTICAL ENCODERS, INDUSTRIAL

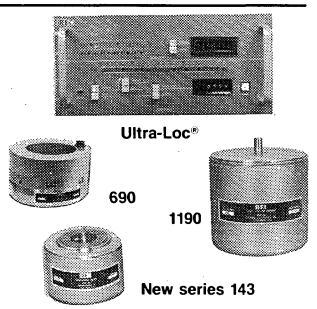
Our INDUSTRIAL ENCODER DIVISION guarantees 30-day delivery on standard model encoders with over 125 resolutions in stock from 1 to 50,000 CPT incremental: a wide choice of mechanical and electrical options.

Designed for the abusive machine tool environment. Rugged cast housing, heavy duty shaft and bearings. Available sealed against liquid entry and for shaft loads up to 200 lbs. and 200G shocks.

Typical applications: Incremental machine tool, process control, instrumentation, incremental motion computer peripheral.

Call for low OEM quotes.

INDUSTRIAL ENCODER DIVISION
7230 Hollister Ave.
Goleta, CA 93117
805-968-0782



OPTICAL ENCODERS POINTING AND TRACKING, MILITARY/AEROSPACE

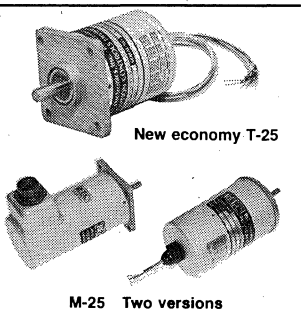
Our DIGITAL PRODUCTS DIVISION offers a wide choice of high accuracy optical rotary, absolute, incremental and tachometer encoders. Standard resolutions to 1,048,576 bits-per-turn. Special resolutions to 16,777,216 (2^{24}) bits per turn.

Also Ultra-Loc® direct drive programmable rate and position digital control servo system.

Typical applications: Space rated, military high reliability, precision servo systems, pointing and tracking.

For assistance with custom military, aerospace and special applications, contact:

DIGITAL PRODUCTS DIVISION
P. O. Box 3838
Little Rock, AR 72203
501-851-4000



OPTICAL ENCODERS, ABSOLUTE, INDUSTRIAL

Our POSITION CONTROLS DIVISION offers 45-day delivery on optical absolute multi-turn encoders using the latest aerospace technologies in the range of 512 to 65,536 bits per turn in a convenient size 25 package.

Features include single light source, heavy duty shaft, housings and bearing assemblies, wide range of output driver options and mounting configurations.

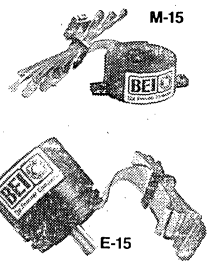
Typical applications: Robotic measurement, drive system components, process control, absolute machine tool, absolute pointing and tracking.

For low industrial prices contact:

POSITION CONTROLS DIVISION
819 Reddick Ave.
Santa Barbara, CA 93103
805-966-1538

IS MOTION CONTROL, IS BEI

MATCHES YOUR APPLICATION



Self-contained, self-aligning

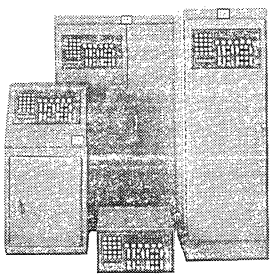
OPTICAL ENCODERS MODULAR INCREMENTAL, COMPUTER PERIPHERAL

Our COMPUTER PRODUCTS DIVISION offers small, high quality optical encoders for the high volume computer peripheral, medical and robotics markets.

Our modular M-15 can be customer installed in 60 seconds. Not a kit! Totally self contained. Needs no alignment. The E-15 is also self-contained, with shaft and bearings. Both models are 1.5″ diam. TTL outputs with resolutions up to 1024 CPT in quadrature with zero reference. Dual inch/metric outputs available.

Typical applications: Computer peripheral, medical electronics, robotics, and general small size applications.

COMPUTER PRODUCTS DIVISION
1755B La Costa Meadows Dr.
San Marcos, CA 92069
619-471-2600



GC-1000 series

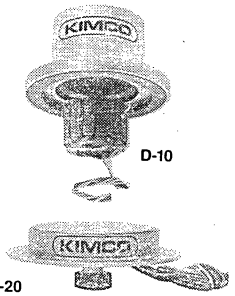
MOTION CONTROL SYSTEMS

Our GENERAL CONTROL SYSTEMS DIVISION offers end users an extremely cost-efficient turn-key programmable electronic motion control drive system for industrial automation applications.

The GC-1000 series is a modular low-cost system that can synchronize up to 16 axes of simultaneous motion and functions from one control panel. Standard drive system capability: ¼-5 HP. Optional: 7¼-300 HP.

Typical applications: Web process industries, winding processes, robotics with passthrough and contour path requirements, multi-axes machine tool, assembly, packaging equipment and transfer lines.

GENERAL CONTROL SYSTEMS DIVISION
564 Alpha Drive
Pittsburgh, PA 15238
412-963-0515



MOTORS AND ACTUATORS, BRUSHLESS DC PM INDUSTRIAL/MILITARY

Our KIMCO DIVISION offers state-of-the-art brushless DC motors and moving coil actuators for the computer peripheral, industrial and aerospace markets.

Brushless DC motors are available from 1″ to 6″ diameter and provide the performance characteristics and advantages associated with PM DC servo motors of these sizes. Linear and rotary moving coil actuators provide high speed strokes up to 4.5 inches.

Typical applications: Disk drive spindle and access motors; tape drive capstan and reel motors; lens and mirror positioners in laser, infrared and other optical systems; vibration control actuators.

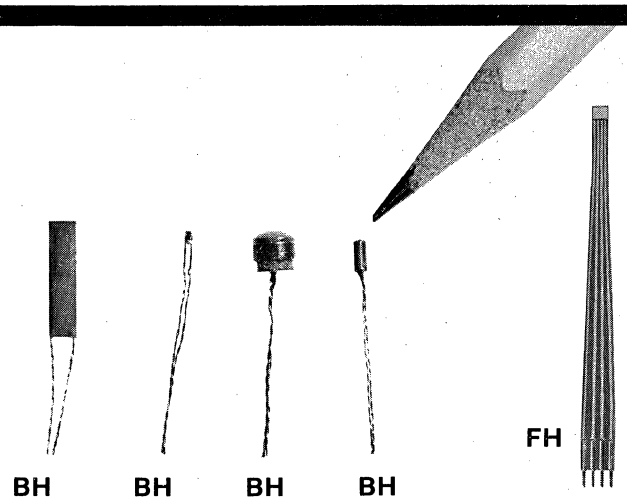
KIMCO DIVISION
150 Vallecitos de Oro
San Marcos, CA 92069
619-744-5671

BEI Motion Systems Company

Corporate Office
166 Geary St., Suite 1400
San Francisco, CA 94108
(415) 788-6840

BEI

Hall Generators



RATED ACCURACY 0.5%:
utility tested and approved

EXCEPTIONAL CHARACTERISTICS:
linearity, stability, temperature

HIGH RELIABILITY:
proven by life testing in process

EXCELLENT WITHSTAND CAPABILITIES:
exceeding proposed IEEE standard

HIGH DENSITY INSTALLATION:
standard case width only 3"

DESCRIPTION

The BH-200 series of Hall effect magnetic field sensors consists of ten models designed to meet the requirements of most magnetic field measurement applications. The sensors are small, solid-state devices. They produce a voltage which is proportional to the product of the control current and the magnetic field component normal to the Hall active area. Each unit has four electrical connections. Two carry the control current (I_C) and the other two supply the Hall voltage.

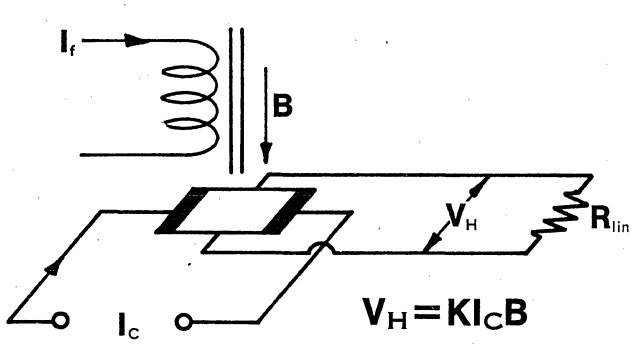
The BH-200 models are built in various configurations to measure axial, transverse, and tangential magnetic field components. The sensitivities range from 6 to 60 mV/kG and the input/output levels are on the order of several ohms.

MODELS

BH-200
General Purpose Transverse
BH-201
Ultra-Thin Transverse
BH-202
Small Axial
BH-203
General Purpose Axial
BH-204
Midget Axial
BH-205
Midget Transverse
BH-206
High Sensitivity Transverse
BH-207
High Resolution Tangential
BH-208
Ultra-Midget Axial
BH-700
Low Cost Transverse
BH-701
High Linearity Transverse
BH-702
Ferrite Imbedded
BH-703
3-Axis
FH-301
Thin Film
FH-302
Thin Film
FH-500
Thin Film

SPECIFICATIONS

	Bulk	Thin Film
Control Current Ic	100-200 mA	15-30 mA
Input Resistance, Rin	1-4 ohms	20-80 ohms
Output Resistance, Rout	1-4 ohms	50-200 ohms
Magnetic Sensitivity, λ_B	6-16 mV/kG, standard 55 mV/kG, high sensitivity	



This schematic representation illustrates both the measuring and multiplying capabilities of a Hall generator. By holding I_C constant, V_H becomes a direct function of B, the magnetic flux density. If both, I_C and B are variable, V_H is proportional to the product of the two functions. Holding B and I_C constant, V_H becomes a function of the angle between B and the plane of the Hall-generator active area.

Special units are available to fit your application.

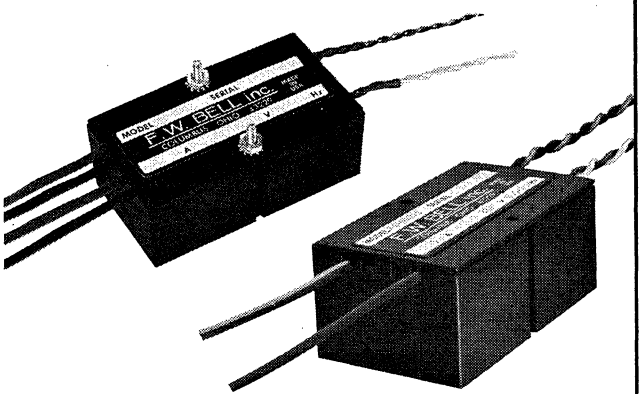
F.W. BELL
An Allegheny International Company
6120 Hanging Moss Rd.
Orlando, FL 32807
Phone: 305-678-6900
TWX: 810-853-3115

Power Transducers

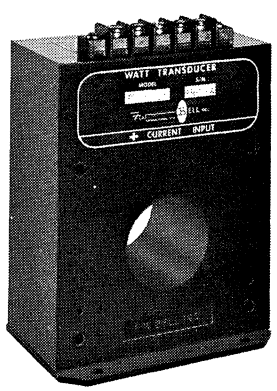
Power transducers provide an accurate, convenient means of monitoring and controlling a broad variety of operations and processes. The unit senses the ac power being drawn, and provides a proportional dc output voltage which is a precise indicator of load peaks and motor efficiency.

Bell transducers are compact, accurate and dependable solid-state modules, utilizing a Hall generator, a Hall multiplier and appropriate circuitry to reduce the influence of low power factor and fluctuations in ambient temperature.

The output circuit is completely isolated from the input circuit, and it easily interfaces with meters, recorders, amplifiers and power control circuitry.



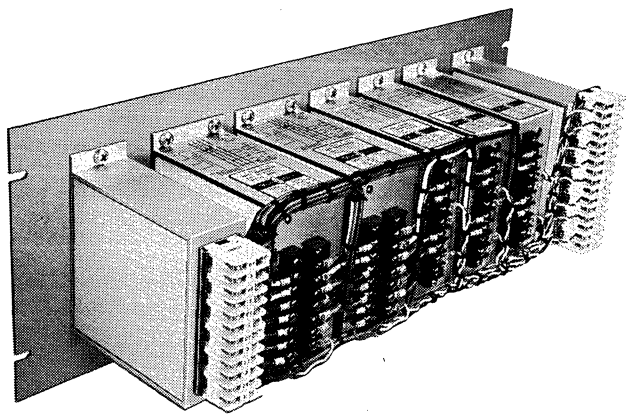
Bell PX 2000 and PX 4000 series transducers are designed for use with single- or three-phase power in a variety of frequency ranges.



The PI 5110 reads single- and three-phase power in the 55-65 Hz range. It is housed in a Noryl case with four mounting holes passing through the body. It is available with optional base mounting flange.

SPECIFICATIONS

	PX 2000 Series	PX 4000 Series	PI 5110
Rated Power Levels	50-20 kW	1 kW-20 kW	0-20 kW
Rated Current Levels	0.5-20 A	5 A	50 A
Rated Voltage	120-220 V	220 V	220-440 Vac



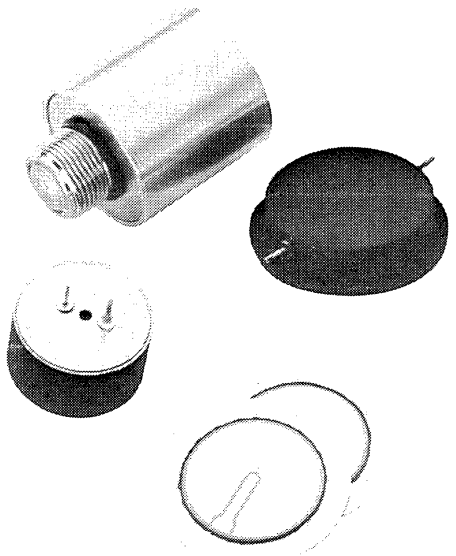
R-2000 power transducers are continuous, direct phasor-multiplication devices. They utilize the Hall effect to provide an isolated, low-ripple dc output that is accurately proportional to active or reactive power. The units are calibrated to within 0.01% of rated output with a low distortion power input at rated level. The 0.05% accurate calibration standards are traceable to the NBS.

The transducers are designed for high accuracy and outstanding reliability. Their high-grade components are submitted to a thorough incoming inspection. The subassemblies and final assemblies are tested in manufacturing and the completed transducers undergo a rigorous quality assurance check. Life testing is continually in process at F.W. Bell, to insure permanent reliability.

F.W. BELL
An Allegheny International Company
6120 Hanging Moss Rd., Orlando, Florida 32807
Phone: 305-678-6900 • TWX: 810-853-3115

EEM PRODUCT SELECTION GUIDES

Use the EEM Product Selection Guides. There are 34 Guides in this edition of EEM. See page 2 (A•2, B•2, C•2, D•2) of each volume to locate the Product Selection Guides that pertain to your needs.



BLATEK ULTRASONIC TRANSDUCERS

Blatek Industries, Inc. offers ultrasonic transducers in several frequencies providing for a wide range of applications.

The 9000 series of transducers are high frequency, but low cost transducers designed for use in industrial controls and level sensing. Available in OEM quantities or custom designs.

The 9350 (pictured above, top center) is a 1Mhz unit designed for use in various liquid media including hydrocarbons. It is in a brass housing with a UHF connector. Minimum order is one piece.

The 8010 and 8020 model transducers, available in either 25 or 40KHz, are ideal for a variety of applications where a low to medium power ultrasonic transducer is required. Operating distance on these units is a minimum of six feet to a maximum of twenty feet.

Both have painted aluminum housings. The 8010 is available with either PC pins or a phono plug; the 8020 with either PC pins or wire lead attachments. Minimum order is five pieces. Available in OEM quantities.

BLATEK SPECIAL PRODUCTS

Blatek provides specific customer design assistance and/or assembles special products for companies that do not have in-house capability.

Some other special product lines include:

— MEDICAL TRANSDUCERS AND SUBASSEMBLIES
— SMALL MILITARY PARTS
— PIEZO CERAMIC BIMORPHS
— **CUSTOM DESIGN AND SUB-ASSEMBLY WORK OF YOUR COMPANY'S PRODUCT OR SYSTEM**

For an estimate on a specific design or project, submit a complete set of prints, drawings, or tentative application of product.

Confidentiality of proprietary project guaranteed. Customer references furnished upon request.

BLATEK INDUSTRIES, INC.
P.O. Box 574
Pine Street & Mill Road
Bellefonte, PA 16823

814-355-4910

BLATEK AUDIO TRANSDUCERS

Blatek piezo ceramic audio transducers are available in three standard sizes, with or without feedback tab. All units can be provided with soldered-on lead wires at additional charge. Units requiring a stud mount or other special treatment will be quoted upon request.

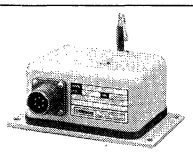
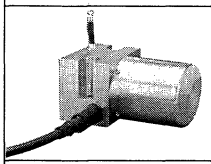
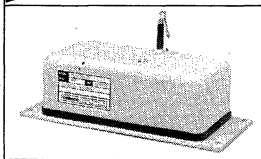
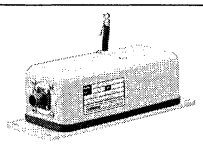
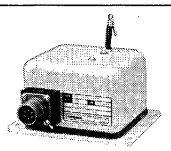
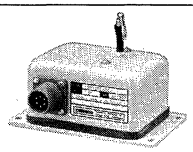
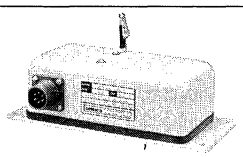
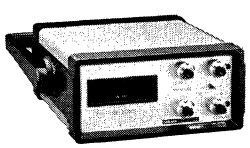
MODEL	O.D.	RES FREQ. (KHz)
6010 (6013)*	1.062"	4.8 ± 500
6020 (6023)	1.250"	3.5 ± 600
6030 (6033)	1.375"	3.0 ± 600

*Units in parenthesis designates feedback pattern. Special electrode patterns and frequency requirements quoted upon request. Small quantities from stock. Minimum order 30 pieces.

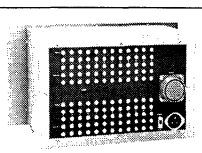
MODEL/FREQ.	*DIMENSIONS*	*BANDWIDTH*	*POWER RATING*	*IMPEDANCE*	*MAX. DRIVING VOLTAGE*
9350-1MHz	1.0"x1.250"	±10%	20 watts	300 ohms	200 (p-p)
8010-25KHz	1.0"x .562"	.4 KHz	.2 watts	325 ohms	35 (p-p)
8010-40KHz	1.0"x .562"	.4 KHz	.2 watts	750 ohms	60 (p-p)
8020-25KHz	1.5"x .375"	.8 KHz	2 watts	1150 ohms	100 (p-p)
8020-40KHz	1.5"x .375"	1.0 KHz	2 watts	525 ohms	100 (p-p)

REV C4-84

CELESCO POSITION TRANSDUCERS

	Model	Ranges	Resolution	Accuracy	Thermal Effects (Zero)	Thermal Effects (Span)
	**PT101 Position/ Displacement Transducer:** Provides an electrical signal proportional to the linear extension of a stainless cable through the use of a precision potentiometer.	0-2 inches to 0-750 inches	essentially infinitesimal (most ranges)	±0.1% full scale (linearity and repeatability)	0.002%/°F full scale	0.002%/°F
	**Model PT801 Underwater Transducer:** A position/displacement transducer useful in underwater or extremely hostile environments. Available in stainless steel or anodized aluminum.	0-2 inches to 0-150 inches	essentially infinitesimal (most ranges)	±0.1% full scale (linearity and repeatability)	0.002%/°F full scale	0.002%/°F
			FOR HAZARDOUS DUTY			
	**PT420 Position Transmitter:** Combines a position transducer with two-wire 4-20 mA electronics. Operates from 12-45 VDC across input.	0-2 inches to 0-750 inches	essentially infinitesimal (most ranges)	±0.15% full scale (linearity and repeatability)	0.01%/°F max full scale	0.01%/°F max
	**Model PT510 Position/ Displacement Transducer:** Provides internal electronics to provide a 3-wire 0-10 VDC output operated from an unregulated 14.5-50 VDC power supply.	0-2 inches to 0-750 inches	essentially infinitesimal (most ranges)	±0.15% full scale	0.01%/°F max full scale	0.01%/°F max
	**Model PT150(E) Digital Position Transducer:** Digital version of PT101, a bi-directional shaft encoder provides a TTL compatible output.	up to 500 inches	.010 inches	±0.05% full scale ±1 count	±0.015%/°F full scale	±0.015%/°F
	**VT201 Velocity Transducer:** Generates a DC signal proportional to the velocity of cable extension or retraction.	0-2 inches to 0-750 inches	essentially infinitesimal	±3% linear to 0.1%	uneffected	0.006%/°F
	**DV301 Position/ Velocity Transducer:** Combines linear tachometer with potentiometer, offering both displacement and velocity outputs.	0-2 inches to 0-750 inches	position and velocity: essentially infinitesimal (most ranges)	position: ±0.1% full scale (linearity and repeatability) velocity: ±3% linear to 0.1%	position: 0.002%/°F full scale velocity: uneffected	position: 0.002%/°F velocity: 0.006%/°F
	**SE2000 Transducer Display System:** The SE2000 is engineered to compliment our line of Position/Velocity Transducer. Designed to provide transducer excitation display in customer units, alarm functions electronic zeroing, peak hold and high-low setpoints with relay output as application requires.	will work with all the above except the PT150(E)	display resolution: up to 4½ digits	linearity: ±.015% F.S. ±1 count	0.005%F.S./°F	0.007%F.S./°F

Thermocouple Reference Junction

	Model	Reference Temperature	Thermocouple Type	Number of Channels	Junction Accuracy	Uniformity and Stability
	**BRJ 14 and BRJ 18:** Provides stable cold junction reference for multi-channel thermocouple systems. Available in rack mount, weatherproof, or cabinet versions.	150°F or 32°F (other temps optional)	any standard material, all same or mixed	up to 100	±0.2°F	±0.1°F

Supporting electronics available for display and signal conditioning. Contact factory for engineering assistance.

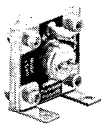
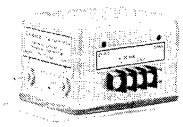
celesco
Transducer Products, Inc.

7800 Deering Ave., P.O. Box 1457
Canoga Park, CA 91304
Toll-Free: 800-423-5483 • In Calif: 818-884-6860
Telex: 499-8137

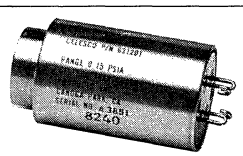
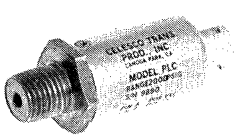
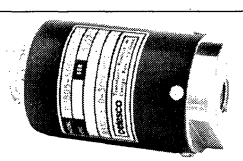
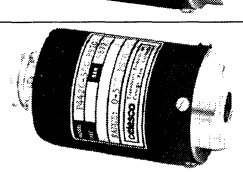
SUBSIDIARY OF hcc INDUSTRIES

CELESCO PRESSURE TRANSDUCERS

Variable Reluctance Pressure Transducer

	Model	Ranges	Linearity	Maximum Line Pressure	Over-Pressure	Working Fluids	Output
	**LCVR Low Cost Differential Pressure Transducer:** Designed to fill the need for a low-cost, ultra-low range, light-weight transducer for medical and industrial markets.	0-2cm H_2O to 0-1000cm H_2O gage or differential	±0.5% full scale, best straight line	30 psia	300% of range with less than 1% full scale zero shift	air, oxygen CO_2 or any non-corrosive gas	25mV/V nominal at 4000 Hz
	**LCDP 2-wire Differential Pressure Transmitter:** Perfect for variable air volume control in HVAC applications and filter pressure drop measurement	0.75 to 400 inch H_2O gage or differential	±1.0% full scale accuracy	30 psia	300% of range with less than 1% full scale zero shift	non-corrosive gases	4 to 20 mA from 12 to 45 VDC input
	P3D Differential Pressure Transducer: For precise measurement of low differential pressure at high line pressures, insensitive to shock and vibration, and suitable for corrosive fluids	±0.1 to ±5000 psi gage or differential	±0.5% full scale best straight line	5000 psi	200% of range of 7500 psi, which-ever is less (either direction)	liquids and gases, both sides	25mV/V nominal full scale at 3000 Hz
	P7D Differential Pressure Transducer: Ideal for low- and medium-pressure measurements of laboratory accuracy. Commonly used in aircraft and missile flight and in ground test and control applications.	±0.1 to ±500 psi, gage or differential	±0.5% full scale best straight line	1000 psi	200% of range in either direction	liquids and gases, both sides	25mV/V nominal full scale at 3000 Hz
	P15D Differential Pressure Transducer: General use medium line pressure transducer is also available in KP15 Kit which includes a selection of diaphragm ranges.	±0.1 to ±2000 psi, gage or differential	±0.5% full scale best straight line	2000 psi	200% of range in either direction	liquids and gases, both sides	25mV/V nominal full scale at 3000 Hz

Strain Gage Pressure Transducer

	Model	Ranges	Accuracy	Resolution	Over-Pressure	Working Fluids	Output
	**PWC Pressure Transducer:** Small all welded hermetic* construction is available with a variety of pressure fittings and several types of electrical connections.	0-15 to 0-5000 psi gage or absolute *case vented on gage ranges less than 1000 psi	±0.5% full scale (linearity, hysteresis and repeatability combined)	infinitesimal	200% of range	liquid and gases compatible with 17-4 pH stainless steel	0-5 VDC (0-10 VDC optional) or two-wire 4-20 mA
	**PLC Pressure Transducer:** General purpose transducer. Low-cost, accurate, rugged, compact. Weather resistant and temperature-compensated.	0-15 to 0-10,000 psi gage or absolute	±0.5% full scale (linearity, hysteresis and repeatability combined)	infinitesimal	200% of range	liquids and gases compatible with 17-4 pH stainless steel	10mV/V ±1%, zero balance ±1% full scale
	**P2805B Pressure Transmitter:** Ideal for most fluids or gases for hydraulic and pneumatic systems, automotive and aircraft instrumentation. 5 VDC output, 12-45 VDC input.	0-15 to 0-5000 psi gage or absolute	±0.5% full scale (linearity, hysteresis and repeatability combined)	infinitesimal	200% of range	liquids and gases compatible with 17-4 pH and 300 series stainless steel	0-5 VDC (0-10 VDC optional) 3-wire circuit allows common input/output connections
	**Model P4420 Pressure Transmitter:** Similar to P2805 except offers 4-20 mA, two-wire output. Compatible with a wide range of electronic receiving, readout equipment. Transmitter requires 12-45 VDC input.	0-15 to 0-5000 psi gage or absolute	±0.75% full scale (linearity, hysteresis and repeatability combined)	infinitesimal	200% of range	liquids and gases compatible with 17-4 pH and 300 series stainless steel	two-wire, 4-20 mA

Supporting electronics available for display and signal conditioning.
Contact factory for engineering assistance.

celesco
Transducer Products, Inc.

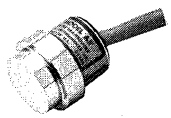
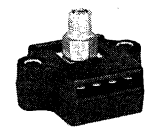
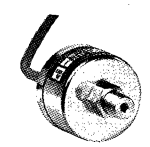
7800 Deering Ave., P.O. Box 1457
Canoga Park, CA 91304
Toll-Free: 800-423-5483 • In Calif: 818-884-6860
Telex: 499-8137

SUBSIDIARY OF hcc INDUSTRIES

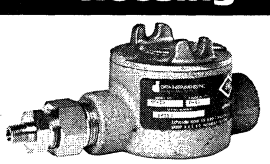
DATA INSTRUMENTS' PRESSURE TRANSDUCERS

Features
- Pressure ranges: 0–5 to 20,000 PSI
- Output: voltage, frequency, or current
- A unique design that puts stainless steel in contact with your pressure media
- 2x rated pressure without damage. 10x rated pressure without bursting
- Full calibration and temperature compensation
- Unit-to-unit interchangeability: ±1%
- Rated intrinsically safe

Options
Optional features can be obtained at additional costs:
1. Absolute pressure version.
2. Improved zero and span temperature compensation to 1%/100°F (55°C) and improved accuracy (combined non-linearity, hysteresis and repeatability) from 1% to 0.5%.
3. Barbed fitting for attaching protective hose around cable.
4. Install longer cable by splicing to existing 3 ft. cable.
5. Install longer continuous cable.
7. Extended operating temperature range to 300°F (148.9°C) 6 and 15 PSI excluded. Includes Bendix PTIH-10-6P electrical connector with an extended case.

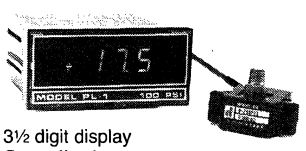
	Model AB PSIG, PSIA	**Model AB** High Performance PSIG, PSIA	**Model BF** PSIG, PSIA	**Model BL** PSIG, PSIA	**Models EA and EAF** PSIG	**Model SA** PSIA, PSIS
						
	General Purpose	High Performance	Amplified Output	Two-Wire Transmitter	Rugged OEM Style	Sealed/Absolute
Pressure Range	0–6, 15, 25, 50, 100, 200, 500, 1000, 2000, 3000, 5000, 10,000, 15,000, 20,000	0–6, 15, 25, 50, 100, 200, 500, 1000, 2000, 3000, 5000, 10,000, 15,000, 20,000	0–5, 15, 25, 50, 100, 200, 500, 1000, 2000, 3000, 5000, 10,000, 20,000	0–5, 15, 25, 50, 100, 200, 500, 1000, 2000, 3000, 5000, 10,000, 20,000	0–6, 15, 25, 50, 100, 200, 300, 500, 1000, 2000, 5000	0–15, 25, 50 PSIA; 0–100, 200, 500, 1000, 3000, 5000 PSIS
Accuracy	Within 1% FSO best fit, including non-linearity, repeatability and hysteresis	Within 0.25% FSO best fit, including non-linearity, repeatability and hysteresis	Within 0.5% FSO best fit, including non-linearity, repeatability and hysteresis 0.25% available	Within 0.5% FSO best fit, including non-linearity, repeatability and hysteresis 0.25% available	Within 0.5% FSO best fit, including non-linearity, repeatability and hysteresis	Within 0.5% FSO best fit, including non-linearity, repeatability and hysteresis
Sensitivity	20 mV/V	20 mV/V				
Signal Output	0 to 100 mV	0 to 100 mV	0 to 5 Vdc	4 to 20 mA	1 to 6 Vdc 1 to 6 kHz	1 to 6 Vdc
Excitation Voltage	5 Vdc or ac; 6 V maximum	5 Vdc or ac; 6V maximum	12 to 20 Vdc or 20 to 32 Vdc	14 to 50 Vdc	8 to 20 Vdc 10 to 20 Vdc	9 to 20 Vdc
Operating Temperature Range	–65°F to 200°F	–65°F to 200°F	–50°F to 200°F	0°F to 200°F	–67°F to 257°F –40°F to 185°F	–67°F to 257°F
Compensated Temperature Range	30°F to 130°F	30°F to 130°F	30°F to 130°F	30°F to 130°F	32°F to 185°F	32°F to 185°F
Thermal Effect on Zero	<5% of full scale over compensated range	<±1% of full scale over compensated range	<1% of full scale over compensated range	<1% of full scale over compensated range	<±0.02% FSO/°C maximum over compensated range	<±0.02% FSO/°C maximum over compensated range
Thermal Effect on Sensitivity	<2% of reading over compensated range	<±1% of reading over compensated range	<1% of reading over compensated range	<1% of reading over compensated range	<±0.02% RDG/°C maximum over compensated range	<±0.02% RDG/°C maximum over compensated range
Options	1, 3, 4, 5, 7	1, 3, 4, 5, 7	1, 2	1, 2		

Series E Explosion-Proof Housing



Series E may contain Models AB, BF, or BL. Consult above chart for specifications.

Model PL-1 Digital Pressure Indicator



- 3½ digit display
- Cost effective
- Pressure ranges 0–6 through 0–5,000 PSI

Transducer Instrumentation

Signal Conditioners/Controllers, Data Acquisition Systems, Meter Indicators, and Power Supplies are available.

Features
• Digital readout • Multi-channel operation • Bridge excitation for transducers • Zero and span controls • Dual set points for controls and alarms • Auxiliary output signal

Talk to us about your special needs in the areas of:
• gaging • specifications • material • mounting

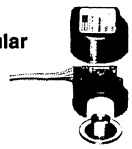
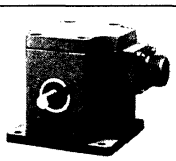
Let us help you find the answers to your pressure measurement problem.

CALL: (617)861-7450

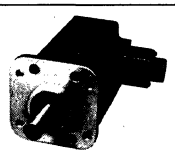
DATA INSTRUMENTS
4 Hartwell Place, Lexington, MA 02173 USA
Telex: 200081

OPTICAL SHAFT ENCODERS

INCREMENTAL ENCODERS

	Pulses Per Revolution	Input Voltage (VDC)	Output Formats	Frequency Range (KHz)	Shaft Diameter (Inches)	Outline Dimension (Inches)
K15 Modular 	50 to 1000	5 or 12	Square Wave	0 to 50	N/A	1 1/2 Dia. x 3/4 L
	Ultra low cost, very small modular encoder for easy installation on servo or stepper motor. Hybrid circuitry minimizes solder connections and improves reliability.					
K3 Modular	50 to 1200	5	Square Wave, Sine Wave	0 to 50	N/A	2 Dia. x 3/4 L
	Low cost modular encoder designed to be integrally mounted on servo or stepper motor having shaft diameter of up to 1/2 inch. Square wave or amplified sine wave output.					
LC-15 Instrument Grade	50 to 1000	5 or 12	Square Wave	0 to 50	1/4	1 1/2 Dia. x 1 1/2 L
	Very low cost shaft encoder for applications where space is at a premium. Unit features a single LED light source, a monolithic sensor array and hybrid circuitry for maximum reliability.					
LC-23 Instrument Grade	. 30 to 2500	5 or 12	Square Wave, Sine Wave, Line Driver	0 to 50	1/4	2 1/4 dia. x 1 7/8L
	Low cost shaft encoder which offers many of the optional features of far more expensive units. Face or servo mount, choice of output formats, cable or terminal connections.					
Tru-Mite Heavy Duty	100 to 5000	5 to 15	Square Wave, Sine Wave, Line Driver	0 to 100	3/8	2 1/2 Dia. x 2 1/2 L
	High performance, industrial duty encoder with 3/8" diameter shaft and sealed bearings. Cast aluminum housing with flange or servo mount. LED light source 100 KHz frequency range and up to 5000 PPR resolution.					
Tru-Tac Heavy Duty 	10 to 1200	5 to 24	Square Wave, Sine Wave, Line Driver	0 to 30	3/8	3L x 3 1/4 W x 3 1/8 H
	Very rugged encoder with double-ended 3/8" diameter shaft and sealed bearings. Cast aluminum housing with foot or face mounting. Built-in voltage regulator permits use over a wide supply voltage range.					

OPTIONAL ENCLOSURES



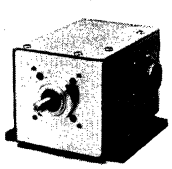
L Series

The L Series consists of a heavy duty sealed, NEMA 4 enclosure within which an encoder is mounted. A flexible coupling connects the encoder shaft to the enclosure's shaft, thus isolating the encoder's bearings from shaft loading effects. Two Datametrics encoder models can be mounted in the L Series — LC-23 and Tru-Mite.

EX Series

The EX Series consists of an explosion-proof enclosure which is FACTORY MUTUAL LISTED for Class I, Divisions 1 and 2, Groups C and D; and Class II, Division 1, Groups E, F and G indoor and outdoor (NEMA 4) hazardous locations. Two Datametrics encoder models can be mounted in the EX Series — LC-23 and Tru-Mite.

ABSOLUTE ENCODERS

	Resolution (Counts)	Input Voltage (VDC)	Output Codes	Output Format	Frequency Range (KHz)	Shaft Diameter (Inches)	Outline Dimensions (Inches)
LR Absolute 	360 or 512	5 to 24	BCD, Gray Natural Binary, Gray	Square Wave	0 to 50	3/8 or 5/8	5 L x 3 1/2 W x 3 5/8 H
	Industrial duty, absolute encoder with BCD, natural binary or Gray code output. 360 or 512 counts per revolutions, 5 to 24 VDC input voltage range, open collector or passive pull-up output.						

DATAMETRICS • DRESSER INDUSTRIES, INC.
340 Fordham Road, Wilmington, MA 01887
Tel: (617) 658-5410 TWX: 710-347-7672

DATAMETRICS®

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C
CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DC direct current
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM electrically programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J
JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K
kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L
LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
μF microforad
MHz megahertz
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOSIGT metal-oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM nuclear instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator

P
PC printed circuit
PCB printed circuit board
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLL phased lock loop
PPI plan position indicator
PROM programmable read only memory
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon controlled switch
SDA source & detector assemblies
SIDAC bidirectional voltage-triggered switch
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

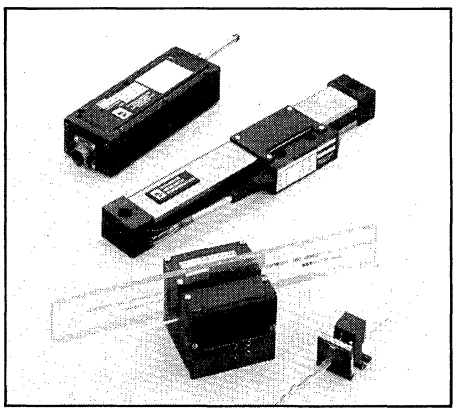
Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

The Industry's Widest Range of Incremental Optical Encoders

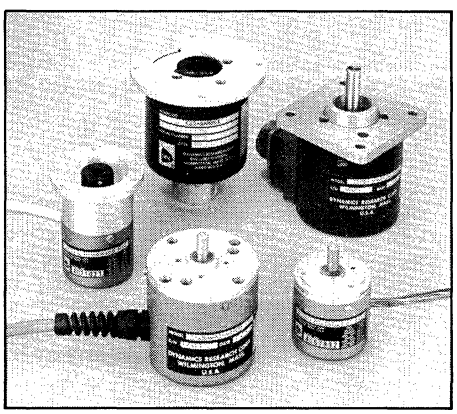
We offer the most extensive line of incremental optical encoders in the industry. If we do not have a standard product that matches your needs, our staff of applications engineers can work with you to develop a custom product.

LINEARS:



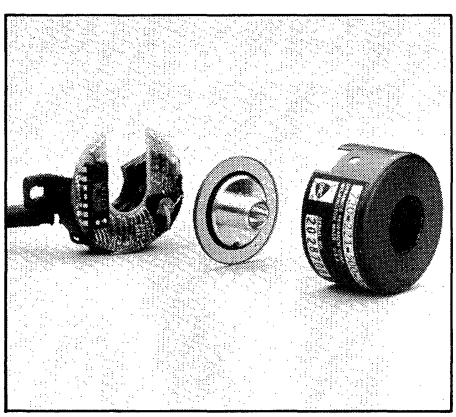
- Complete line of open and enclosed linears.
- Enclosed linear cross-sections of 0.625″ (LT) or 1.200″ (LH) from, 4″ to 48″ travel, with resolutions to 0.5 microns/20 microinches.
- Electronics integral to the encoder readhead.
- Optional Autophase™ electronics error correction capability.
- HR open linear with resolution of 0.1 micron/5 microinches and up to 12″ travel.
- L50 open linear with 1 micron/50 microinches resolution to 48″ travel.
- Probe actuated SST, 2″ or 4″ travel with English resolutions of 50 or 100 microinch and Metric resolutions of 1 or 2 microns.

ENCLOSED ROTARIES:



- Complete line of enclosed rotary encoders in diameters from 1.5″ to 3.5″.
- Up to 360,000 counts per revolution depending upon encoder size and multiplication electronics.
- A range of bearing loads for light duty instrument to heavy duty machinery applications.
- C-series encoders with integral coupling and mounting flange.
- Long-life, high reliability LED light sources.
- 100 KHz count channel frequency response and 50 KHz zero reference frequency response.
- Wide range of electrical outputs.

MODULAR KITS:



- Easy to mount with factory preset disk gapping and shaft positioning for phasing.
- Disk resolution up to 1024 lines per revolution.
- 1.5″ diameter.
- Electrical outputs include amplified analog, TTL, and line driver.

DRC

THE ENCODER PEOPLE

DYNAMICS RESEARCH CORPORATION
60 CONCORD STREET
WILMINGTON, MASSACHUSETTS 01887
TEL. 617/658-6100

The advantages of being tiny.

At Entran, we've solved most of the problems you might encounter with pressure transducers by making them tiny. And nowadays, tiny is the state-of-the-art.

Being tiny means you don't interfere with the integrity of the system being measured.

Being tiny means less measuring surface to bear loads, and a more compact solid state density with no moving parts.

Being tiny means being insensitive to acceleration, vibration and shock, so you get flat pressure readings, both static and dynamic.

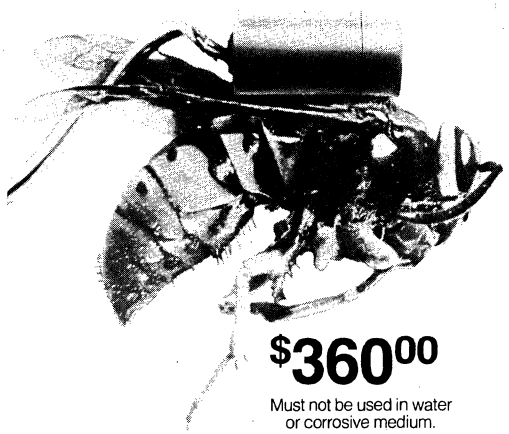
And, being tiny means greater handling ease in hard-to-get-at places. Which adds up to more applications flexibility.

Entran pressure tranducers can usually be interfaced directly with scopes, recorders and milliammeters.

Our transducers come complete and ready to use. All you need supply is the excitation voltage on two leads and read output on the other two leads.

All units give you direct linear output in millivolts/psi and read both static and dynamic pressures. There's no need for charge or voltage amplifiers. Calibrations are traceable to The National Bureau of Standards.

Write Entran Devices, Inc., 10 Washington Ave., Fairfield, N.J. 07006 (201) 227-1002, Telex 130-361.



$360.00

Must not be used in water or corrosive medium.

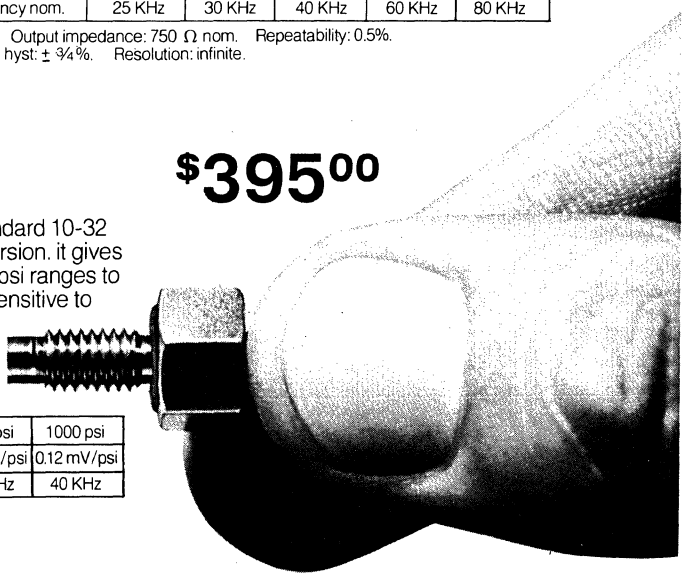
Only 0.080 in diameter (that's tiny), EPI-080.

This solid-state pressure transducer is 0.080" in diameter, 0.25" in length and occupies a volume of only 0.0013 cubic inches. Yet it gives accurate static and dynamic pressure readings like the big ones do. Its atomically bonded, diffused diaphragm with leads attached to the non-active area make this device virtually insensitive to acceleration, vibration and shock.

Typical ranges	25 psi	50 psi	100 psi	250 psi	500 psi
Sensitivity nom.	3 mV/psi	1.8 mV/psi	1.0 mV/psi	0.4 mV/psi	0.2 mV/psi
Useful frequency nom.	25 KHz	30 KHz	40 KHz	60 KHz	80 KHz

Excitation: 5V. Output impedance: 750 Ω nom. Repeatability: 0.5%.
Non-linear and hyst: ± ¾%. Resolution: infinite.

$395.00



Tiny but easy to handle, EPX-10

This easy to install pressure transducer is built with standard 10-32 UNF thread and is available in an optional M5 metric version. it gives flat pressure readings static and dynamic, in 5 to 5,000 psi ranges to as high as 90KHz. Has infinite resolution and is also insensitive to acceleration, vibration and shock. Made of stainless steel, and with its built-in "O" ring seal can be screwed in just about anywhere. However, for corrosive or water usage, order our "welded" version.

Typical ranges	5 psi	50 psi	100 psi	250 psi	1000 psi
Sensitivity nom.	3 mV/psi	1.5mV/psi	1.2 mV/psi	0.5 mV/psi	0.12 mV/psi
Useful frequency nom.	9 KHz	15 KHz	15 KHz	20 KHz	40 KHz

Combined non-linear and hyst: ± 1% below 100psi, ½% above 100 psi.
Excitation: 10V Output impedance: 350 Ω nom
Repeatability: 0.25%. Thread length: 1/16".

Entran® Pressure Transducers.

(Today, miniature makes sense.)

Call (201) 227-1002

The advantages of being tiny.

At Entran we build a line of accelerometers that can best be described as tiny.

Being tiny means you don't interfere with the integrity of the system being measured.

Being tiny gives you greater handling ease in hard-to-get-at places, which adds up to more applications flexibility. And, being tiny means less mass to distort your test scale, more room for other instruments. All at no sacrifice in test data.

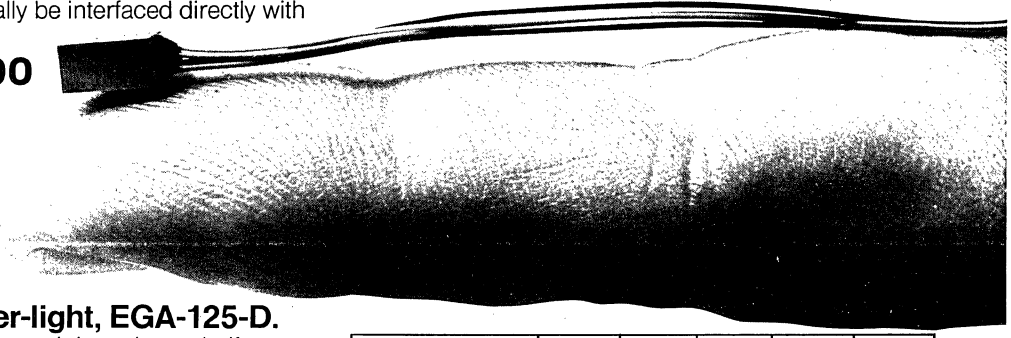
Entran accelerometers give you high output, low impedance readings, both static and dynamic. As a result they can usually be interfaced directly with scopes, recorders and milliammeters.

Entran accelerometers come complete and ready to use. All you supply is the excitation voltage on two leads and read output in millivolts on the other two leads.

All units give you direct linear output in millivolts/g and read both static and dynamic acceleration. There's no need for charge or voltage amplifiers. Calibrations are traceable to The National Bureau of Standards.

Write Entran Devices, Inc., 10 Washington Ave., Fairfield, NJ 07006 Phone 201/227-1002, Telex 130-361.

$349.00

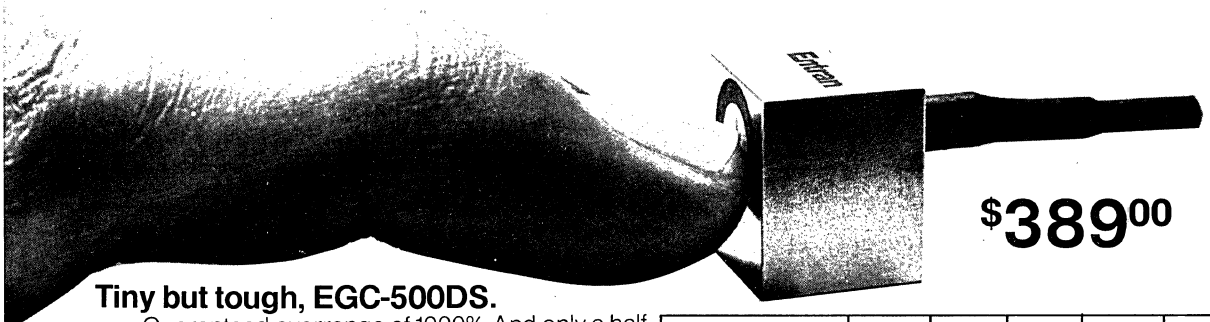


Tiny and feather-light, EGA-125-D.

This accelerometer weighs only one half a gram. Is less than 0.006 cu. inches in volume. Yet gives you static & dynamic readings of acceleration, vibration and shock. And comes with .7 critical damping to eliminate resonance. ("D" is for "damped.")

Typical ranges	± 5g	± 10g	± 50g	± 100g	± 500g
Sensitivity nom.	15 mV/g	12 mV/g	4 mV/g	2.5 mV/g	0.5 mV/g
Useful frequency nom.	150 Hz	200 Hz	500 Hz	600 Hz	1200 Hz

Excitation: 15V, Weight: ½ gram without leads, Linearity: ± 1%,
5 other mounting styles available at no extra charge.



$389.00

Tiny but tough, EGC-500DS.

Guaranteed overrange of 1000%. And only a half inch cube to boot.

Static & dynamic measurements of acceleration, vibration and shock in ranges from 5 to 1,000 g. Fully damped to eliminate resonance and fitted with mechanical stops to impede overload response.

Typical ranges	± 5g	± 10g	± 50g	± 100g	± 500g
Sensitivity nom.	25 mV/g	20 mV/g	4 mV/g	2 mV/g	0.5 mV/g
Useful frequency	150 Hz	200 Hz	600 Hz	1000 Hz	1500 Hz

Excitation: 15V, Damping: 0.7 cr. nom., Linearity: ± 1%
Output impedance: 450 Ω nom., Input impedance: 1000 nom.
Size: 0.5" x 0.5" 0.6" width, 10-32UNF tapped hole

Entran Accelerometers.

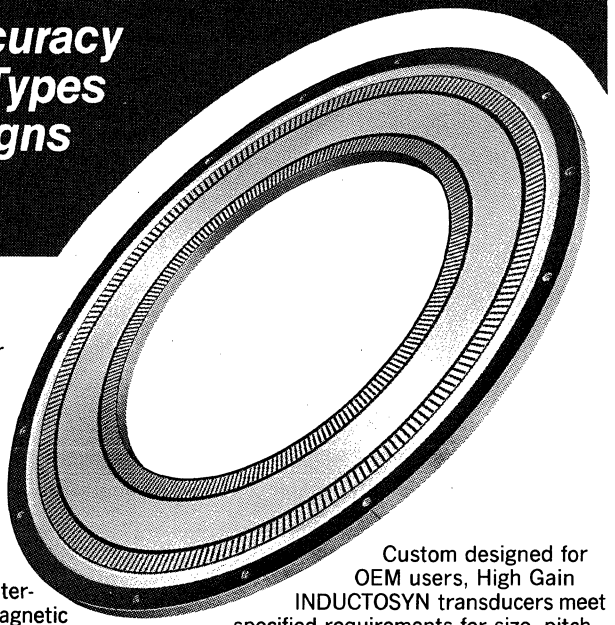
(Today, miniature makes sense.)

Call (201) 227-1002

FARRAND INDUCTOSYN®

Rotary and Linear Position Transducers

- *Extreme Reliability and Accuracy*
- *Absolute and Incremental Types*
- *Standard and Custom Designs*
- *Competitive Cost*



FARRAND INDUCTOSYN® position transducers are extremely rugged and accurate scale elements used for measurement of angular or linear displacement. Inductively or capacitively coupled, their electrical output signals drive readout displays, generate computer input data, or provide servo feedback signals. Proven applications include weapons systems, machine tools, radar and navigational instruments, computer disk drives, and the Space Shuttle.

Noncontacting INDUCTOSYN elements provide zero wear, never need lubrication. Can be designed to withstand dust, oil films, sea water, hard vacuum, light, extreme pressure, temperature from 10°K to 150°C, and other hostile environments. Have operated at full accuracy for extended intervals in space, in strong magnetic fields, immersed in sea water at 600 feet, and immersed in liquid nitrogen.

Standard single and multispeed rotary scales have diameters from 3 to 12 inches, with 360, 512, 720, 1000, and 1024 poles (others available). Standard 10 inch bar scales can be assembled end to end for any length. Continuous tape scales available up to 100 feet long.

Custom designed for OEM users, High Gain INDUCTOSYN transducers meet specified requirements for size, pitch, accuracy, substrate material, and environment. Auxiliary control signals, such as End of Travel or Track Location, can be included. Substrate can be any material from cast aluminum to fiberglass tape, including lamination directly on user parts. Thermal time constant can be adjusted to match user structure, eliminating inaccuracies during warmup.

Individually calibrated standard INDUCTOSYN rotary transducers provide higher accuracy, yet cost less than comparable resolvers. Custom designed High Gain INDUCTOSYN transducers can be delivered at less than $20 each in high volume production quantities.

ACHIEVABLE ACCURACY FOR SELECTED MODELS

Rotary Types	3" dia. 360 pole	±2 arc sec
	4" dia. 512 pole	±1.5 arc sec
	7" dia. 720 pole	±1 arc sec
	12" dia. 720 pole	±0.5 arc sec
	12" dia. 1024 pole	±0.8 arc sec
Linear Types	10" bar scale	±0.000040" (±0.001 mm)
	Tape, to 100 feet or more	0.000100"/foot T.I.R.
	Adjustable Linear INDUCTOSYN Scale, length to 115" of travel	Length errors can be reduced to virtually zero over full length, determined by accuracy of standard and resolution of readout or numerical control system.

TOLL FREE:
(Outside NY) 800-227-1423
(In NY) 800-431-3355
Or send now for technical bulletins

FARRAND CONTROLS
Division of Farrand Industries, Inc.
99 Wall Street, Valhalla, NY 10595
TOLL FREE: (800) 227-1423 In NY (800) 431-3355
Telex: 646640

INDUCTOSYN® is a registered trademark of Farrand Industries, Inc.

ITEK ENCODERS ON TARGET: HIGH PERFORMANCE IN A SMALL PACKAGE

Individual data sheets of any Itek Absolute and Incremental encoder or display are immediately available on request. Modifications to your specific encoder requirements can be accommodated.

MicroSeries® Ultra-Small Absolute Encoders For Military Fire Control

MODEL	SIZE (Inches) O.D.	SHAFT DIAM.	RESOLUTION (QUANTA/REV.) BINARY (2^{xx})					BCD
μS_/16	1.6	.25	12	13	14	15	—	6.4K
μS_/23	2.3	.25	13	14	15	16	17	

Features: Small Size • High Accuracy • Direct Digital Transducer • Absolute Whole Word Output • MIL Environments—Gun, Ship, Aircraft, Spacecraft (Vibration 20g, Shock 1000g, 0.8ms) • LED Illuminators • High Reliability.

Digisec® Encoders—RA series

Rotary Absolute Encoders

	Model	O.D.	Shaft Diam.	Resolution (Quanta/Rev.) Binary (2^{xx})									BCD	
SOLID SHAFT	15	1.5	.187											
	23	2.3	.25	C 11	C 12	C 13	T 16	T 17	T 18	T 19	T 20			
	35	3.5	.375	C 12	C 13	C,S 14	C,S 15	C,S 16	C,S 17	S 18			S 3.6K	S 36K
THRU-HOLE		O.D.	I.D.											
	55	5.5	.75	S 16	S 17	S 18	S 19	S 20						
	60	6.0	2.25	S 16	S 17	S 18	S 19	S 20						
	100	10.0	2.75	S 16	S 17	S 18	S 19	S 20	S 21				S 36K	S 360K
	106	10.0	6.0	S 16	S 17	S 18	S 19	S 20	S 21				S 36K	S 360K
	117	11.0	7.0	S 19	S 20	S 21								
	158	15.0	8.0	S 20	S 21	S 22								

OD—Outside Diameter ID—Inside Diameter C—Self-contained Electronics

Features: • Parallel whole word unambiguous output • TTL/DTL compatible • Resolution to 0.31 arc-seconds (22 bits) • Highest accuracies available anywhere • Operating temperature –40° to +71°C • Military Specification rated • Instant on-the-fly readout • LED light sources • Separate Electronics—no electronics in optical unit (thru-hole systems)

Available Options: • Serial readout • Line driver output • Redundancy • Chrome slit and disc (standard on size 23 and size 158) • Binary lamp display • Subtractor card for electronic zeroing

RI series

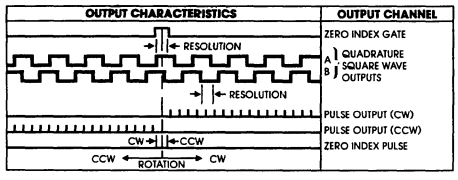
Rotary Incremental Encoders

Resolution (Quanta/Rev.) Binary (2^{xx})							Decimal													
C 8	C 9	C 10	C 11	C 12	C 13		C 0.5K	C 1.0K	C 1.8K	C 2.0K	C 3.6K	C 4.0K	C 5.0K	C 6.4K	C 8.0K					
C 13	C 14	C 15	C 16	C 17	C 18	C 19	C 20K	C 32K	C 36K	C 40K	C 50K	C 64K	C 72K	C 100K	C 128K	C 180K	C 200K	C 320K	C 360K	C 640K
C 16	C 17	C 18	C 19	S 20																
C 17	C 18	C 19	C 20	S 21			C 360K													
C 17	C 18	C 19	C 20	S 21			C 360K													
C 20	C 21	S 22																		

S—Separate electronic enclosure T—2 speed geared paired configurations

Features: • Quadrature square wave or pulse output, zero index • TTL/DTL compatible • Resolution to 0.31 arc-seconds (22 bits) • Self-contained electronics • Operating temperature –40° to +71°C • Military Specification rated • LED light sources

Available Options: • Line driver output • Pigtail cable • Square wave or pulse output



Environmental Ratings. All DIGISEC® encoders are designed to meet rigid military specifications. The following environmental specifications are typical. Temperature, –40° to +71°C Vibration, 10-20g Humidity, 0 to 98% Shock, 50g, 11 milliseconds (higher on solid shaft models)

Spacecraft Encoders: Absolute & Incremental

Model	Type	Diam. (inches)	Resolution (Quanta/Rev.)	Accuracy	Weight (lbs.)	Power (watts)	Features
RA21/1510	Absolute	15.0	2^{21}	2.6 sec	20.0	3.0	10 Inch Thru-hole Electrical Redundancy.
RA18/60	Absolute	6.0	2^{18}	10.0 sec	8.5	3.0	Elect. & Mech. Redundancy.
RI13/35	Incremental	3.5	2^{13}	2.6 min	3.0	2.0	Commutator Outputs.
RI20/63	Incremental	6.3	2^{20}	1.5 sec	1.7	0.5	Unhoused. Commutator Outputs.
RI36K/40	Incremental	4.0	36,000	2.5 sec	3.0	0.3	Electrical Redundancy.
RI14.4K/23	Incremental	2.3	14,000	1.5 min	.75	0.4	Commutator Outputs.

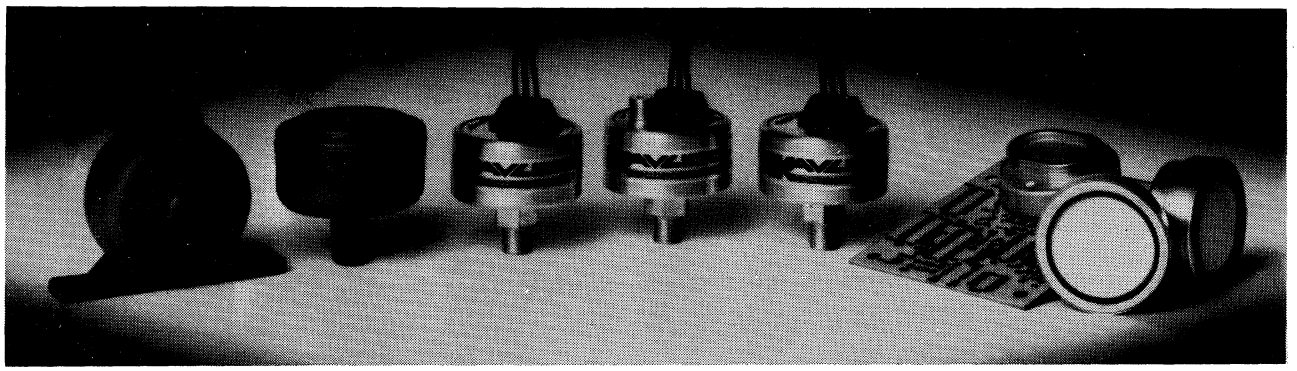
Features: LED Illuminators • Resolution to 0.31 Arc Seconds (22 Bits) • Highest Accuracy Available Anywhere. Available with bearings (housed) or without (unhoused).

Specifications subject to change without notice.

Litton
ITEK MEASUREMENT SYSTEMS
27 Christina Street, Newton, Massachusetts 02161
Telephone: 617-969-7300 TWX: 710-335-6783

Write or call Dept.E

NEW P600 SERIES PRESSURE TRANSDUCERS



Providing excellent performance at minimum cost, the P600 Series is intended for custom, OEM pressure measurement applications. This series features exceptional repeatability, low hysteresis, accurate operation over a broad temperature range, and the ability to perform without zero shift when subjected to high overpressures. These characteristics, combined with long term stability, make the series ideal for microprocessor-based applications.

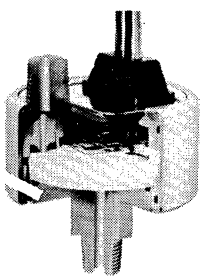
Key to the uniform performance and low cost features of this series is Kavlico's patented ceramic sensing element with its integral signal conditioning that employs a reliable solid state, custom hybrid circuit. Temperature compensation and calibration is provided through use of computer-controlled laser trimming of hybrid circuit components. As a result, uniformity from unit-to-unit is assured and there is no need for adjustment or recalibration by the user. In addition, the P600 Series maintains repeatable performances even after extraordinary overpressure, which has been demonstrated in over five years of automotive service.

The P600 Series provides a high level output voltage, permitting it to interface easily with a variety of circuits, indicators, or alarms. In addition, its ratiometric output is ideal for digital monitoring. By using the supply voltage as the reference for the conversion circuit, measurement accuracy is maintained regardless of supply voltage variations.

The P600 series provides a choice of rugged die cast aluminum or high dielectric strength Valox housings. Seal materials are available to meet a variety of applications.

In electrically noisy environments, reliability and performance are assured with protection against electromagnetic interference (EMI) and line voltage transients as a standard feature on most models.

DIE CAST ALUMINUM

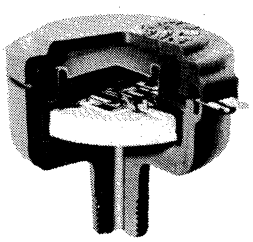


⅛ NPT, ¼ NPT, and tube fitting available

SPECIFICATIONS AT 25°C (77°F)

@ Standard V_S = 9 VDC	P655			P656, P657			P657			
	0-5 thru 0-500 psi			±10"H_2O thru ±15 psid			0-.5, 0-1 psig			
PARAMETER	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Full Scale Output	5.92	5.96-6.04	6.08	5.9	5.95-6.05	6.1	5.9	5.95-6.05	6.1	VDC
Null Offset	1.92	1.96-2.04	2.08	3.9	3.95-4.05	4.1	1.9	1.95-2.05	2.1	VDC
Span*	3.84	3.96-4.04	4.16	1.8	1.9-2.1	2.2	3.8	3.9-4.1	4.2	VDC
Linearity (Best fit)		±0.3	±0.5		±0.3	±0.5		±0.3	±0.5	%SPAN
Hysteresis		±0.003	±0.01		±0.003	±0.01		±0.003	±0.01	%SPAN
Repeatability		±0.005	±0.05		±0.005	±0.05		±0.005	±0.05	%SPAN
Temperature Error Null -30° to +100°C Span -30° to +100°C		±1.6 ±1.0	±3.0 ±1.5							%SPAN
Null -10° to +80°C Span -10° to +80°C					±1.6 ±1.0	±3.0 ±1.5		±1.6 ±1.0	±3.0 ±1.5	
Stability (1 year)		±1.0			±1.0			±1.0		%SPAN
Supply Voltage (V_S)**	7.5		15	7.5		15	7.5		15	VDC
Supply Current (Quiescent) 10K Load		8	15		8	15		8	15	MA
EMI-Standard all models Change in output due to refield of 200V/M 10KHz to 1GHz		±0.2	±1.0		±0.2	±1.0		±0.2	±1.0	VDC

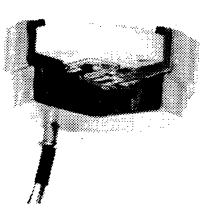
VALOX



SPECIFICATIONS AT 25°C (77°F)

@ Standard V_S = 9 VDC	P650 — P652			P651 — P652			P651			
	0-5 thru 0-150 psi			±10"H_2O thru ±15 psid			0-5 thru 0-15 psid			
PARAMETER	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Full Scale Output	5.9	5.94-6.06	6.1	5.9	5.92-6.08	6.1	5.9	5.92-6.08	6.1	VDC
Null Offset	1.9	1.94-2.06	2.1	3.9	3.92-4.00	4.1	2.35	2.4-2.5	2.7	VDC
Span*	3.8	3.94-4.06	4.2	1.8	1.84-2.16	2.2	3.3	3.32-3.68	3.75	VDC
Linearity (Best fit)		±0.3	±0.5		±0.3	±0.5		±0.3	±0.5	%SPAN
Hysteresis		±0.003	±0.01		±0.003	±0.01		±0.003	±0.01	%SPAN
Repeatability		±0.005	±0.05		±0.005	±0.05		±0.005	±0.05	%SPAN
Temperature Error Null -30° to +100°C Span -30° to +100°C		±1.6 ±1.0	±3.0 ±1.5		±1.6 ±1.0	±3.0 ±1.5		±1.6 ±1.0	±3.0 ±1.5	%SPAN
Null -10° to +60°C Span -10° to +60°C		±1.6 ±1.0	±3.0 ±1.5		±1.6 ±1.0	±3.0 ±1.5				
Stability (1 year)		±1.0			±1.0			±1.0		%SPAN
Supply Voltage (V_S)**	7.5		15	7.5		15	7.5		15	VDC
Supply Current (Quiescent) 10K Load		8	15		8	15		8	15	MA

OEM MODULE



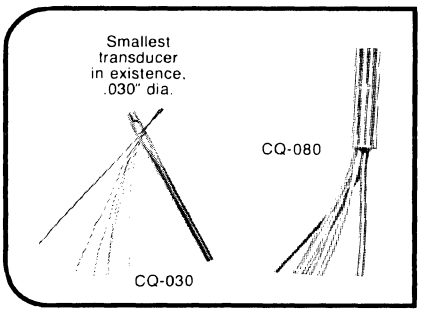
¼ NPT and tube fitting available

SPECIFICATIONS AT 25°C (77°F)

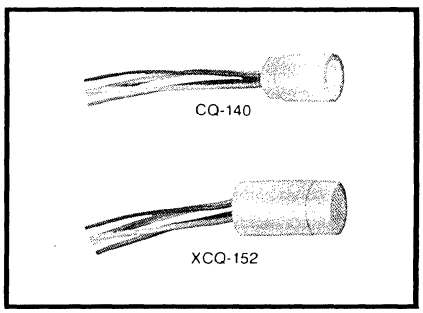
@ Standard V_S = 9 VDC	±1, ±5 psid			0-1, 0-5, 0-15 psid			0-1 psig, 0-5, 0-15			
PARAMETER	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Full Scale Output (Pos. Press)	5.9	5.92-6.08	6.1	5.9	5.92-6.08	6.1	5.9	5.92-6.08	6.1	VDC
Null Offset	3.9	3.92-4.08	4.1	2.35	2.4-2.6	2.7	1.9	1.92-2.08	2.1	VDC
Span*	1.8	1.84-2.16	2.2	3.2	3.32-3.68	3.75	3.8	3.84-4.16	4.2	VDC
Linearity (Best fit)		±0.3	±0.5		±0.3	±0.5		±0.3	±0.5	%SPAN
Hysteresis		±0.003	±0.01		±0.003	±0.01		±0.003	±0.01	%SPAN
Repeatability		±0.005	±0.05		±0.005	±0.05		±0.005	±0.05	%SPAN
Temperature Error Null -30° to +100°C Span -30° to +100°C		±1.6 ±1.0	±3.0 ±1.5		±1.6 ±1.0	±3.0 ±1.5		±1.6 ±1.0	±3.0 ±1.5	%SPAN
Stability (1 year)		±1.0			±1.0			±1.0		%SPAN
Supply Voltage (V_S)**	7.5		15	7.5		15	7.5		15	VDC
Supply Current (Quiescent) 10K Load		8	15		8	15		8	15	MA

KAVLICO CORPORATION
20869 PLUMMER STREET, CHATSWORTH, CA 91311
TELEPHONE (818) 882-2400 • TELEX 65-1481

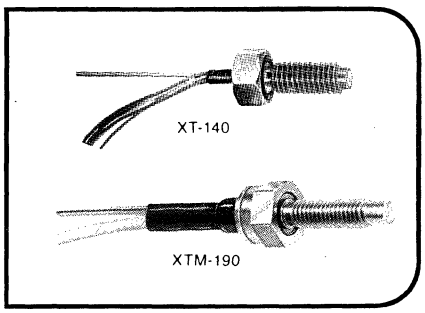
Miniature Pressure Transducers



CQ-030 XCQ-080 Series Smallest available pressure transducers. Diaphragm diameters from .030" to .080" (.76mm to 2mm). High frequency. Bulletin: KU-1000B



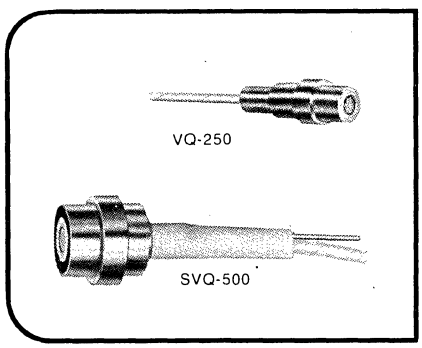
CQ-140 XCQ-152 Series Diaphragm diameter .140" to .155" (3.1mm to 3.5mm). Excellent dynamic and solid-state characteristics. Bulletin: KU-1000B



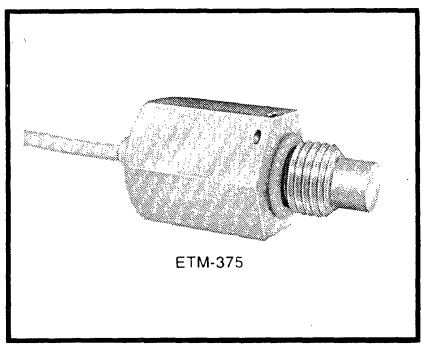
XT XTM Series Thread mount pressure transducers may be supplied with either silicon or metal diaphragms, allow user ease of mounting while retaining high performance of CQ Series. Bulletin: KM-1000C & KS-1000B

MODEL NO.	RANGE PSI (A), (G), (D)	INPUT VDC	OUTPUT FS (NOM) (mV)	NON-LINEARITY AND HYSTERESIS %	EXCITATION	OPERATING TEMPERATURE RANGE (°F)	NATURAL FREQUENCY (APPROX) KHz	UNIT PRICE*
CQ-030 XCQ-062	100-500 G, D 25-500 G, D	5	40 65-75	±1	5VDC/AC	0 to 250	1500 500-1400	$875 $640
XCQ-080	25-500 G, D	5	65-100	±0.25-±0.75	5VDC/AC	−65 to 250	230-940	$495
CQ-140 XCQ-152	5-2000 G, D	10, 20	50-100	±0.5	5VDC/AC	0 to 250	70-650	$430 $425
XT-140	25-500 A, G, D	5	75-100	±0.5	5VDC/AC	0 to 250	125-420	$465
XT-190 XTM-190	5-2000 A, G, D 25-5000 A, G, D	10-20	50-100 75	±0.3 ±0.5	5VDC/AC 10 VDC/AC(XTE)	0 to 250 XTE to 525	70-650 30-400	$395 $425

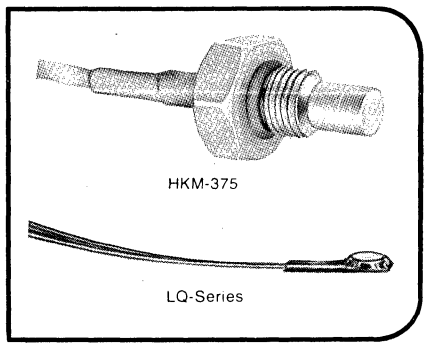
*Quantity discounts available.



VQ SVQ Series Scanivalve compatible pressure transducers for use where steady state accuracy is of prime importance. Bulletin: KPS-VQ-3C



ET ETM Series Smallest available pressure transducer with built-in amplifier and signal conditioning. Flight qualified for use on aircraft and missiles. Available in 3- and 4-wire versions. Bulletin: KM-1000C & KS-1000B



HKM HEM Series High pressure transducers with metal diaphragm compatible with most pressure medias — high temperature operation +500°F (+260°C) Bulletin: KM-1000C

LQ Series Thin-line pressure transducer for use on turbine blade and airfoil applications. Bulletin: LQ-3C

MODEL NO.	RANGE PSI (A), (G), (D)	INPUT VDC	OUTPUT FS (NOM) (mV)	NON-LINEARITY AND HYSTERESIS %	EXCITATION	OPERATING TEMPERATURE RANGE (°F)	NATURAL FREQUENCY (APPROX) KHz	UNIT PRICE*
VQ-250 SVQ-500	5-2000 A, G, D	10, 20	50-100	±0.3	10VDC to 20VDC	0 to 250 VEM to 525	70-200	$450 $410
HKM-375 HEM-375	25-20,000 A, G	10	75	±1	10VDC/AC	0 to 250 −65 to 500	50-395	$425 $595
ET-375 ETM-375	5-200 A, G 25-20,000 A, G	28 ± 4	5,000	±1	28VDC ± 4VDC	−65 to 250	70-200 50-395	$750 $750
LQ-080	25-200 G	5	65-100	±0.5	5VDC/AC	0 to 250	230-590	$440
LQ-125 LE-125	5-500 G 25-500 G	10, 20 10, 15	55-100	±0.5 ±1	5VDC/AC	0 to 250 −65 to 525	70-350 100-350	$395 $700

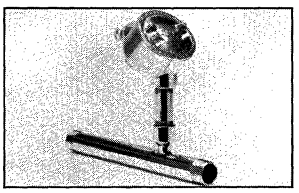
*Quantity discounts available.

kulite

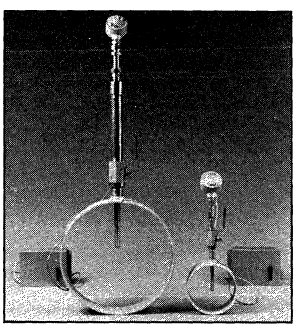
KULITE SEMICONDUCTOR PRODUCTS INC. 1039 Hoyt Avenue, Ridgefield, New Jersey 07657 Telephone: (201) 945-3000

MASS FLOW PRODUCTS

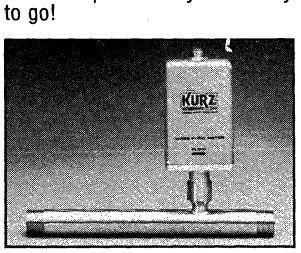
METERS



SERIES 505
In Line Mass Flow Meters
Previously complex measurements are now made simple with Kurz mass flow sensors. Linear outputs, 2-wire hookups, NBS calibrations, corrosive gases.



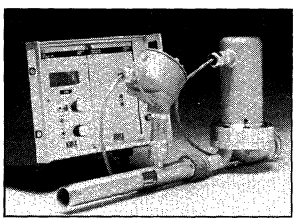
SERIES 515/555
Insertion Mass Flow Meters
For larger pipes, the **515/555** Series includes a ball valve/retractor assembly designed for hot tapping into existing lines. Weld on the fitting, drill a hole in the line, insert the probe and you're ready to go!



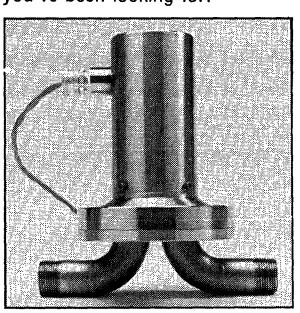
SERIES 565
DC Powered Mass Flow Meters
The compact **565** Series include linear 0-5 VDC outputs and are most often specified for flows from 10 sccm to 50 scfm.

KURZ INSTRUMENTS INC.™

CONTROLLERS

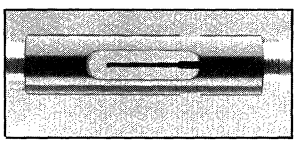


Kurz Mass Flow Control Systems wed precise mass flow sensing technology with a new and unique valve invented at Kurz Instruments to provide accurate metering of true mass (molecular) flow for a wide range of gases including corrosives. Flow ranges are available up to thousands of lbs. per hour. The **7500** systems are composed of a Kurz **505** Series Mass Flow Meter, a Kurz **710** Series Electric Valve P.I.D. Controller and a Kurz **730** Series Electric Rotary Ramp Valve. Kurz **7500** Mass Flow Control Systems are sold in rack module packages which allows the flexibility to configure a system to your specific needs. Popular applications are gas blending systems, automated test stands and flow benches, gas regulator testing, welding machine gas control, molecular sieve test beds, boiler control, utility plants and, above all, in everyday process control requirements. The Kurz **7500's** provide the state-of-the-art turn key mass flow control system you've been looking for.

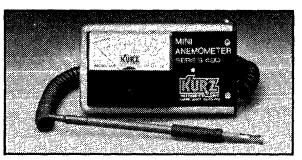


SERIES 730
Electric Rotary Ramp Metering Valve
A major breakthrough in valve technology invented by Dr. Kurz. This exclusive valve features single-turn operation and a linear Cv from 0 to 100% of flow. The **730** Series valves alone allow new achievements in precise mass flow control.

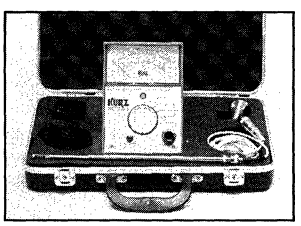
AIR VELOCITY



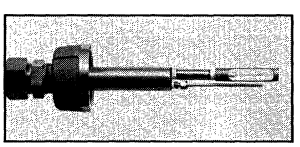
EVA 4000 SYSTEM
The Revolutionary New Electronic Velocity Array System
Automatically corrects for variations in temperature and barometric pressure. For applications in HVAC, factories and facilities automation.



SERIES 490
Mini-Anemometer
This inexpensive shirt pocket size air velocity meter includes dual ranges. The **490** is very popular and widely available.



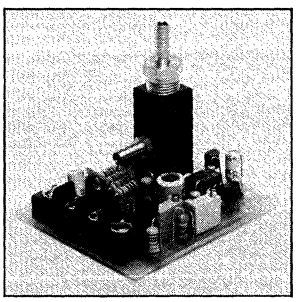
SERIES 440
Portable Air Velocity Meter
The multi-range world standard air velocity meter with NBS traceable calibration.



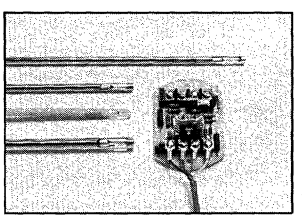
SERIES 455
Stack Velocity Transducer
The **455** is designed for operation in the harshest environments and features Kurz new all metal sensor.

OEM PRODUCTS

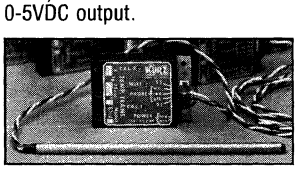
Kurz manufactures a wide line of basic airflow and mass flow transducers and is always eager to work with you on your OEM product requirements.



SERIES 501
Micropower Mass Flow Meter
The **501**, the world's smallest commercial mass flow meter, measures flows up to 5 slpm. The **501** is perfect for biomedical, toxicology and instrumentation applications.



SERIES 435DC
Linear Air Velocity Transducers
Powered by 15VDC, and available in self-contained, bare board with cable and rack mount configurations, the **435DC** features a linear 0-5VDC output.



SERIES 620A
2-Wire Temperature Transmitter
A compact, economical, DC powered temperature transducer with a linear 4-20 ma output signal. Operates on 12-35VDC.

These products are a small sample of the extensive Kurz line of Advanced Air and Mass Flow Products. Kurz has the diversity, flexibility and experience to provide your complete applications solution. Contact a Kurz applications engineer today!

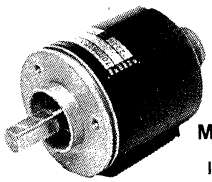
1-800-4-AIRFLO

© 1985 **KURZ INSTRUMENTS, INC.** • P.O. BOX 849 • CARMEL VALLEY, CA 93924 • TLX 172275 • (408) 659-3421 • (IN CA) **1-800-4-AIRFLO**

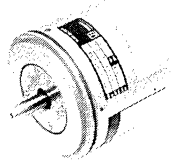
From robotics, computers, and machine tools to aerospace . . .

Use the Litton Encoder lineup to build a better product.

INCREMENTAL

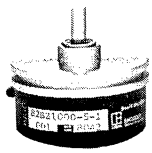


MODEL 70
Optical
Industrial
2.5″ dia.



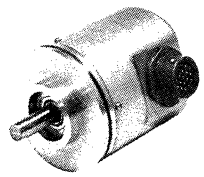
SIZE 23 & 35
Optical
Commercial &
Military

MODEL 81
Low Cost
1.5″ dia.

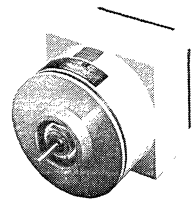


MODEL 82
Low Cost
2.2″ dia.

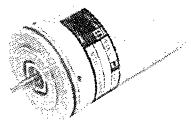
ABSOLUTE



MODEL 76
Low Cost Optical
2.5″ dia.

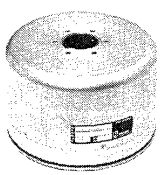


Multi-Turn
Heavy Duty
4.3″ dia.

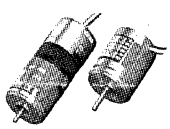


SIZE 23 & 35
Optical
Commercial &
Military

ABSOLUTE / INCREMENTAL

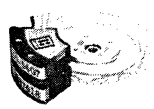


SIZE 60
6″ dia.

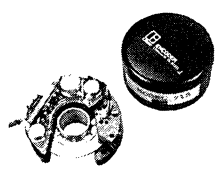


SIZE 11
Pin Contact

MODULAR



Absolute
Optical
2″ dia.



MODEL 715
Incremental
Optical
1.5″ dia.

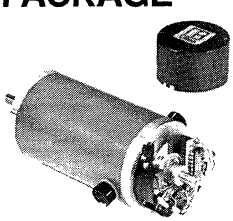
MODEL 720
Incremental
Optical
2″ dia.

New!

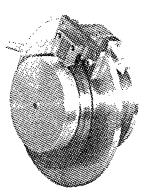
MODEL 820
Incremental
Digital
2.1″ dia.

MODEL 920
Incremental
Analog
2.1″ dia.

MOTOR/ ENCODER PACKAGE

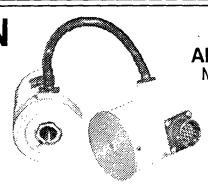


SPECIALS / CUSTOM DESIGN

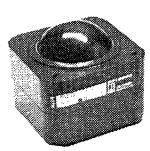


Aerospace

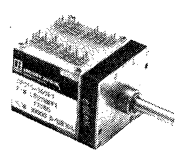
TRACKBALL
Commercial &
Military
4″ sq.



Absolute
Military



New Low Cost
TRACKBALL
Commercial
3″ sq.
RS232 Interface
Option



PIN CONTACT
DETENTED
SWITCH

The Litton Encoder team leads the way with encoders and special products that help you build more reliable, higher quality, cost-effective products with the precision you need.

Our product lineup is the broadest in the industry and meets a wide range of requirements in applications from robotics, computer peripherals, medical equipment, and industrial controls to specialized, high-reliability designs for aerospace and defense.

For anything from simple modular kits to sophisticated custom designs, put Litton Encoder on *your* design team. For complete data and specifications, contact —

Litton **Encoder Division**

The Marketing Department
Litton Encoder Division
20745 Nordhoff Street
Chatsworth, California 91311-5979
Telephone (818) 341-6161 TWX 910-494-1229

MICRO SWITCH

PRESSURE SENSORS

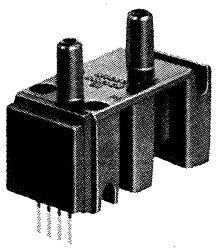
MICRO SWITCH solid state pressure sensors are ideally suited to applications that require exact measurement of pressure. They provide the important benefits of repeatability, low hysteresis, and long term stability.

The sensing element in each sensor is a square silicon chip with integral sensing diaphragm and ion implanted piezoresistors. Pressure applied on the diaphragm causes it to flex, changing the resistance, which results in an output proportional to pressure.

NON-SIGNAL CONDITIONED SENSORS

There are four series of non-signal conditioned sensors. They provide a low level output (typically 40 to 250 mV). Each series includes the basic sensor version, and a version with laser trimmed resistors (for close tolerances on null and sensitivity) and a thermistor for limited temperature compensation.

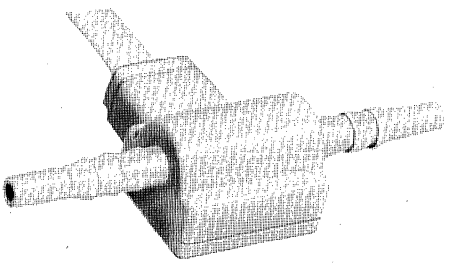
120PC



120PC series are small plastic packages equipped with printed circuit board terminals. 124PC is the basic sensor, and 126PC is trimmed and has limited temperature compensation.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
124PC	0-5	D	115 mV ±35	10 VDC
	0-15	D	250 mV ±75	or 2 mA
	0-30	D	195 mV ±85	
126PC	0-5	D	50 mV ±1.5	16 VDC
	0-15	D	100 mV ±1.5	max.
	0-30	D	79 mV ±4	

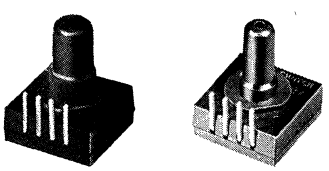
150PC



150PC series are specifically designed to measure flow-thru pressure media. The remote pressure reference is inside the termination cable. 154PC is the basic sensor, while 156PC is trimmed and temperature compensated.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
154PC	0-5	G	115 mV ±35	10 VDC
	0-15	G	99 mV ±41	or 2 mA
	0-30	G	195 mV ±85	
156PC	0-5	G	250 mV ±75	14 VDC
	0-15	G	40 mV ±1.5	max.
	0-30	G	79 mV ±4	

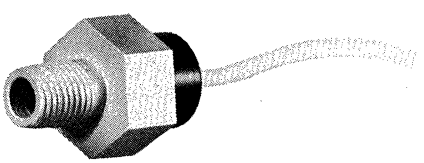
130PC



130PC series are miniature plastic packages, also equipped with printed circuit board terminals. 134PC is the basic sensor version. 136PC and 137PC are trimmed and temperature compensated. 136PC is voltage excited, while 137PC is current excited.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
134PC	0-5	A, G	115 mV ±35	10 VDC
	0-15	A, G	250 mV ±75	or 2 mA
	0-30	A, G	195 mV ±85	
136PC	0-5	A, G	50 mV ±1.5	16 VDC
	0-15	A, G	100 mV ±1.5	max.
	0-30	A, G	79 mV ±4	
137PC	0-5	A, G	50 mV ±1.5	2 mA max.
	0-15	A, G	100 mV ±1.5	
	0-30	A, G	79 mV ±4	

230PC



230PC series are stainless steel housed Gage type sensors, compatible with a wide range of pressure media. The atmospheric pressure reference is inside the termination cable to reduce the chance of contaminants entering the enclosure.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
234PC	0-15	G	250 mV ±75	10 VDC
	0-30	G	195 mV ±85	or 2 mA
	0-60	G	135 mV ±45	
	0-100	G	225 mV ±75	
236PC	0-15	G	100 mV ±1.5	16 VDC
	0-30	G	79 mV ±4	max.
	0-60	G	60 mV ±2	
	0-100	G	100 mV ±2	

* Type: A — Absolute; D — Differential; G — Gage.

** F.S.O. is the algebraic difference between end points (output at minimum and maximum pressure).

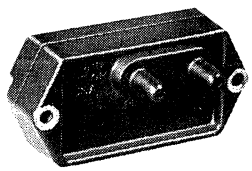
MICRO SWITCH, a Honeywell division

MICRO SWITCH
PRESSURE SENSORS

SIGNAL CONDITIONED SENSORS

The three signal conditioned series provide amplified high-level outputs (5V or ±2.5V). They are hybrid IC devices, with integral temperature compensation circuitry optimized on each unit as part of the calibration procedure. Null and full scale output are similarly controlled.

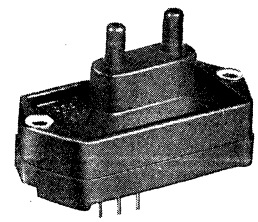
140PC



140PC series are plastic packages, equipped with printed circuit board terminals (color-coded leadwires are optional). They may be used to measure positive pressures, or for positive/negative pressure measurement. This series includes a two-wire pressure-to-current transducer, which senses industry standard 3-15 psi and provides a 4-20 mA output proportional to pressure.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
142PC	0-5 0-15 0-30	D, G A, D, G A, D, G	5 VDC ±.15 1 VDC Null	7-16 VDC
143PC	±2.5 ±5 ±15	D D, G D, G	±2.5 VDC 3.5 VDC Null	7-16 VDC
149PC	3-15	D	4-20 mA	10-40 VDC

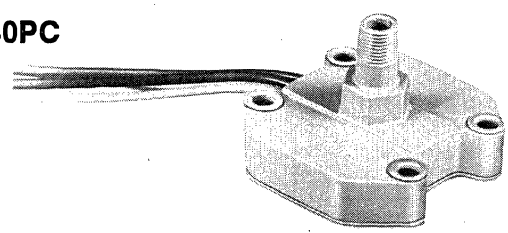
160PC



160PC series pressure sensors measure extremely low pressures, and feature high reliability. The package is similar to the 140PC series.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
162PC	0-1	D, G	5 VDC ±.20 1 VDC Null	4.8-12 VDC
163PC	±5″ H_2O	D, G		
164PC	0-10″ H_2O	D, G		

240PC



240PC series sense positive pressures up to 250 psi, in addition to positive/negative pressures up to ±15 psi. They are protected by die-cast aluminum housings with 0-ring sealing for contamination resistance.

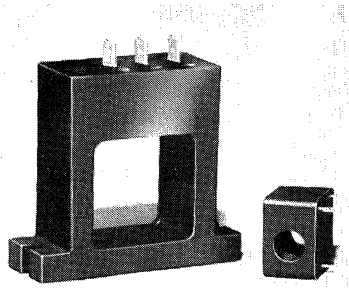
Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
242PC	0-15 0-30 0-60 0-100 0-150 0-250	G G G G G G	5 VDC ±.20 1 VDC Null	7-16 VDC
243PC	±2.5 ±5 ±15	G G G	±2.5 VDC 3.5 VDC Null	7-16 VDC

Request MICRO SWITCH Catalog 15 Pressure sensor for specifications, order guides and application information.

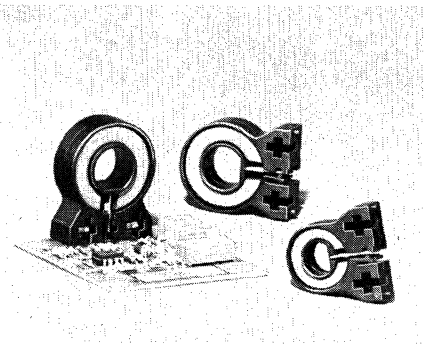
* Type: A — Absolute; D — Differential; G — Gage.
** F.S.O. is the algebraic difference between end points (output at minimum and maximum pressures).

MICRO SWITCH, a Honeywell division

MICRO SWITCH
Current Sensors CS



Digital Sensors



Linear Sensors

FEATURES
- *Digital or linear output*
- *AC or DC current sensing*
- *Through-hole design*
- *Fast response time*
- *Output voltage isolation from input*
- *Maximum current limited only by conductor size*
- *Adjustable performance and built-in temperature compensation assures reliable operation*
- *Accurate, low cost sensing*

GENERAL INFORMATION
MICRO SWITCH CS series solid state current sensors monitor either alternating (AC) or direct (DC) current. This series includes a wide assortment of devices ranging from digital output current detectors capable of sensing a few hundred milliamps to linear sensors capable of monitoring several thousand amps. The entire family of CS current sensors provides a means of accurate low-cost current sensing.

Current sensors monitor current flow. Digital sensors produce a digital output signal. Linear sensors produce a linear output signal. When these signals have reached a predetermined level, the control system logic is instructed to perform a function.

The digital signal with its logic level output may sound an alarm, start a motor, open a valve, or shut down a pump. The linear signal duplicates the waveform of the current being sensed and is ideal for use as a feedback element to control a motor or regulate the amount of work being done by a machine.

DIGITAL CURRENT SENSORS
MICRO SWITCH offers five CS series digital current sensors. Each provides a logic level output that changes from approximately V_{CC} to 0.4 volts when the sensed current exceeds the operate point. All five digital sensors will operate on AC or DC current, but the output will turn off at every zero crossing when sensing AC current.

LINEAR CURRENT SENSORS
MICRO SWITCH CS series linear current sensors incorporate our 91SS linear output Hall effect transducer (LOHET™). The 91SS is centered in the gap of the flux collector and is assembled in a printed circuit board mountable housing. This housing is available in two sizes as shown.

ADJUSTABLE LINEAR CURRENT SENSORS
MICRO SWITCH offers three families of linear current sensors with adjustable offset voltage and sensitivity. All three families utilize the previously described linear current sensors mounted to a small printed circuit board containing additional circuitry. The adjustable feature enables the user to define the exact range of operation. The offset voltage and sensitivity are controlled by two trimpots soldered to the printed circuit board. In addition, all three families will compensate for variations in sensitivity over temperature.

DC/DC
This family is designed to provide a DC output voltage while sensing DC current.

AC/DC
This family is designed to provide a DC output voltage while sensing AC current.

AC/AC
This family is designed to provide an AC output voltage while sensing AC current.

OPERATING PRINCIPLE
Current sensing is accomplished by measuring the magnetic field surrounding a current-carrying conductor. The conductor is passed through the flux collector which concentrates the magnetic field at the sensing element. The magnetic field is directly proportional to the current passing through the conductor. Thus, there is a direct relationship between the output voltage of the current sensor and the level of current. The waveform of this output voltage will track the waveform of the measured current. The through-hole design electrically isolates the sensor and ensures that it will not be damaged by overcurrent or high voltage transients on the sensed conductor.

PRODUCT MODIFICATIONS
MICRO SWITCH is continuously working to modify the characteristics of our sensors. In addition, MICRO SWITCH has an extensive amount of experience in packaging products to meet a wide variety of applications. If your application requires unique specifications or a custom housing, please contact us.

SALES AND SERVICE
MICRO SWITCH serves its customers through a worldwide network of sales offices and distributors. For application assistance, pricing, engineering drawings or name of nearest Authorized Distributor, contact a nearby MICRO SWITCH sales office. Or, contact:

MICRO SWITCH
11 W. Spring St.
Freeport, Illinois 61032
Tel. 815/235-6600

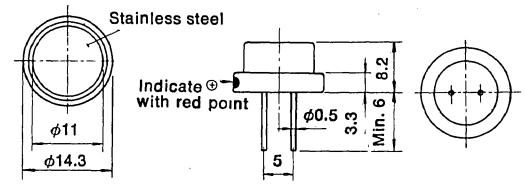
MICRO SWITCH, a Honeywell division

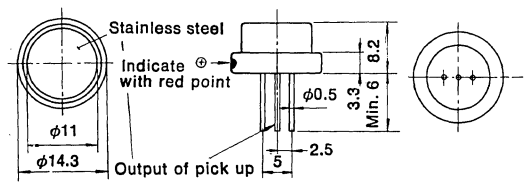
NTK
TECHNICAL CERAMICS
NGK SPARK PLUGS (U.S.A.), INC.
1701 North Greenville Ave., #205 Richardson, TX 75081,
Phone: (214) 235-8332. TELEX: 170547UT

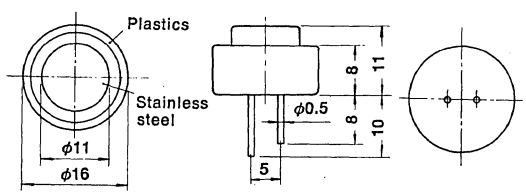
NTK ULTRASONIC SENSOR

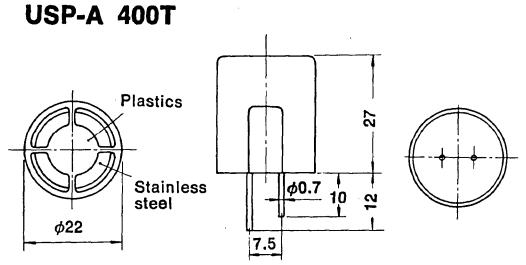
EVERY TYPE IS HERMETIC SEALED AND MOISTURE-PROOFED.

Dimension (Unit: mm)	Model Number	Center Frequency KHz	Transmit Sound Pressure (dB)	Receiving Sensitivity (dB/V/μbar)	Directional Angle (Deg.)	Input Voltage (Vp-p)	Temperature Range (°C)
EDS-A, EDS-B TYPE	A335	33.5 ±0.2	95 Min.	—	40	30	−20 ~ +70
	B335	33.5 ±0.2	—	−72 Min.	40	—	
	C335	33.5 ±0.2	95 Min.	—	40	12	
EDS-C TYPE	A250	25.0 ±0.2	95 Min.	—	45	30	
	B250	25.0 ±0.2	—	−72 Min.	45	—	
	C250	25.0 ±0.2	95 Min.	—	45	12	
UCM-S200	S200T	220 ±5	—	—	8	40	−10 ~ +60
	S200R	210 ±5	—	—	8	—	
	S300	300 ±10	—	—	10	40	
USP-A 400T	A400T	40 ±0.2	105 Min.	—	15	50	−10 ~ +60
	A400R	40 ±0.2	—	−65 Min.	15	—	
	B400T	40 ±0.2	100 Min.	—	25	40	
	B400R	40 ±0.2	—	−65 Min.	25	—	





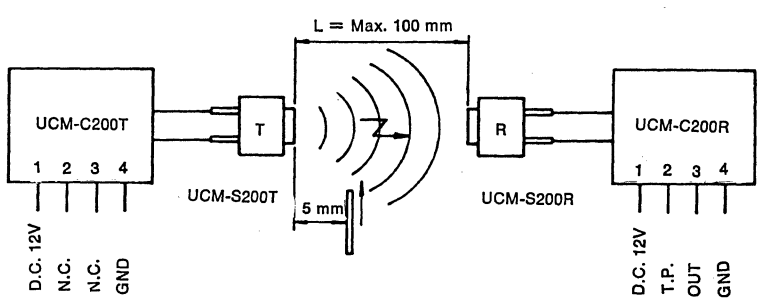




APPLICATIONS

- Proximity Sensor
- Burglar Alarm
- Remote Control
- Level Meter

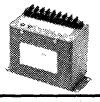
EXAMPLE OF APPLICATION



AC WATT TRANSDUCER PC5 SERIES

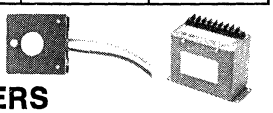
SINGLE PHASE 50/60 Hz MODELS

SUPPLIED WITH INTERNAL SENSOR



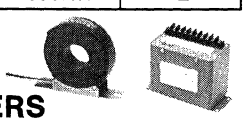
MODEL NUMBER PC5-	EFFECTIVE RANGE		WATTS AT RATED OUTPUT 1mA	CURRENT SENSOR
	VOLTS	AMPS		
1B	0 to 150	0 to 5	500W	Internal
2B	0 to 300	0 to 5	1KW	Internal
3B	0 to 600	0 to 5	2KW	Internal
10B	0 to 150	0 to 10	1KW	Internal
11B	0 to 300	0 to 10	2KW	Internal
12B	0 to 600	0 to 10	4KW	Internal
19B	0 to 150	0 to 15	1.5KW	Internal
20B	0 to 300	0 to 15	3KW	Internal
21B	0 to 600	0 to 15	6KW	Internal
103B	0 to 150	0 to 1	100W	Internal
104B	0 to 300	0 to 1	200W	Internal
105B	0 to 600	0 to 1	500W	Internal
106B	0 to 150	0 to 2.5	250W	Internal
107B	0 to 300	0 to 2.5	500W	Internal
108B	0 to 600	0 to 2.5	1000W	Internal

SUPPLIED WITH CURRENT TRANSDUCERS



28B	0 to 150	0 to 50	5KW	C†
29B	0 to 300	0 to 50	10KW	C†
30B	0 to 600	0 to 50	20KW	C†
31B	0 to 150	0 to 100	10KW	C
32B	0 to 300	0 to 100	20KW	C
33B	0 to 600	0 to 100	40KW	C
34B	0 to 150	0 to 200	20KW	D
35B	0 to 300	0 to 200	40KW	D
36B	0 to 600	0 to 200	80KW	D
37B	0 to 150	0 to 400	40KW	D
38B	0 to 300	0 to 400	80KW	D
39B	0 to 600	0 to 400	160KW	D
40B	0 to 150	0 to 600	60KW	E
41B	0 to 300	0 to 600	120KW	E
42B	0 to 600	0 to 600	240KW	E
43B	0 to 150	0 to 1K	100KW	E
44B	0 to 300	0 to 1K	200KW	E
45B	0 to 600	0 to 1K	400KW	E
46B	0 to 150	0 to 2K	200KW	E
47B	0 to 300	0 to 2K	400KW	E
48B	0 to 600	0 to 2K	800KW	E

SUPPLIED WITH CURRENT TRANSFORMERS



49B	0 to 150	0 to 50	5KW	W†
50B	0 to 300	0 to 50	10KW	W†
51B	0 to 600	0 to 50	20KW	W†
58B	0 to 150	0 to 100	10KW	W
59B	0 to 300	0 to 100	20KW	W
60B	0 to 600	0 to 100	40KW	W
67B	0 to 150	0 to 200	20KW	W
68B	0 to 300	0 to 200	40KW	W
69B	0 to 600	0 to 200	80KW	W
76B	0 to 150	0 to 400	40KW	X
77B	0 to 300	0 to 400	80KW	X
78B	0 to 600	0 to 400	160KW	X
85B	0 to 150	0 to 600	60KW	X
86B	0 to 300	0 to 600	120KW	X
87B	0 to 600	0 to 600	240KW	X
94B	0 to 150	0 to 1K	100KW	Y
95B	0 to 300	0 to 1K	200KW	Y
96B	0 to 600	0 to 1K	400KW	Y

NOTE: † indicates 2 turns thru the external transducer or transformer window.

FOR DIMENSIONS REQUEST CATALOG #983

FEATURES AND APPLICATIONS:

- Accurate measurement of electric power consumed by equipment
- Accurate for any conditions of phase, voltage unbalance, current unbalance and power factor
- Output is proportional to true power delivered to the load
- Transducers using internal sensors or sensors C, D, or E provide excellent current transient response for measuring SCR controls, chopped waveforms or application where harmonics are present
- Highly-accurate, without worrying about the inaccuracies of current transformers and potential transformers
- Split sensors available
- Current sensors are included and are calibrated with the watt transducer (where required)
- For interface with meters, recorders, data loggers, computer or other instrumentation, select options "A" through "E"
- Wide frequency range: 48 to 70 Hz
- Standard 1 mA output, other options available

PC5 SERIES SPECIFICATIONS:

INPUT:

Voltage: See Tables..

Current: See Tables

Frequency Range: 48 to 70 Hz

Power Factor Range: Any

Response (Transient 90%): <100 microseconds with models using internal sensors or sensors C, D, or E
1 millisecond with models using current sensors W, X, and Y

Burden:
Voltage: 1.25 VA
Current: 1.25 VA
Option Amplifier: 2 Watts

Current Overload:
1 thru 15 Ampere models and those using current sensors W, X, and Y
2 times rating (continuous)
6 times rating (10 sec)
Models using external current sensors C, D and E
50 times rating (continuous)

Dielectric Test: (Input/Output/Case): 1500 VAC (RMS)

Surge: Withstands IEEE SWC Test

Specifications continued on next page

OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

SPECIFICATIONS (cont.):

OUTPUT:

Output is proportional to real power delivered to the load. $P = EI \cos \phi$
Standard B: 1 mA DC at Rated Output
(Requires 115 VAC instrument power)
Option A: 1 mA DC at Rated Output (See Note 1)
Option C: 10 VDC at Rated Output (See Note 1)
Option D: 10 VDC at Rated Output (Requires 115 VAC instrument power)
Option E: 4-20 mA DC. 20 mA DC at Rated Output, 4 mA DC at Zero
Millivolt Options Available Consult Factory
Output Ripple: <1% of R.O.
Response Time: 250 milliseconds to 90%
Output Loading:
Standard Model B: 0-10K ohms
Options A: 0-10K ohms
Options C & D: >2K ohms
Option E: 0-1500 ohms
Calibration Adjustment Range: ±10% Min.
Temperature Effect (−10°C to +60°C): ±1% of Reading, ±0.1% R.O.

ACCURACY:

±0.5% at Rated Output
(including power factor, linearity, repeatability, initial set point, and current sensor).

NOTE (1) Self powered input voltage ranges for models with options A and C are limited as follows: 85 to 135V for 0 to 150V models 200 to 280V for 0 to 300V models, and 380 to 550V for 0 to 600V models.

3 PHASE 3 WIRE 50/60 Hz MODELS

SUPPLIED WITH INTERNAL SENSOR

MODEL NUMBER PC5-	EFFECTIVE RANGE VOLTS	EFFECTIVE RANGE AMPS	WATTS AT RATED OUTPUT 1mA	CURRENT SENSOR*
4B‡	0 to 150	0 to 5	1KW	Internal
5B	0 to 300	0 to 5	2KW	Internal
6B	0 to 600	0 to 5	4KW	Internal
13B‡	0 to 150	0 to 10	2KW	Internal
14B	0 to 300	0 to 10	4KW	Internal
15B	0 to 600	0 to 10	8KW	Internal
22B‡	0 to 150	0 to 15	3KW	Internal
23B	0 to 300	0 to 15	6KW	Internal
24B	0 to 600	0 to 15	12KW	Internal

SUPPLIED WITH CURRENT TRANSDUCERS

31-2B‡	0 to 150	0 to 100	20KW	C
32-2B	0 to 300	0 to 100	40KW	C
33-2B	0 to 600	0 to 100	80KW	C
34-2B‡	0 to 150	0 to 200	20KW	D
35-2B	0 to 300	0 to 200	40KW	D
36-2B	0 to 600	0 to 200	80KW	D
37-2B‡	0 to 150	0 to 400	40KW	D
38-2B	0 to 300	0 to 400	80KW	D
39-2B	0 to 600	0 to 400	160KW	D

SUPPLIED WITH CURRENT TRANSFORMERS

52B‡	0 to 150	0 to 50	10KW	W†
53B	0 to 300	0 to 50	20KW	W†
54B	0 to 600	0 to 50	40KW	W†
61B‡	0 to 150	0 to 100	20KW	W
62B	0 to 300	0 to 100	40KW	W
63B	0 to 600	0 to 100	80KW	W
70B‡	0 to 150	0 to 200	40KW	W
71B	0 to 300	0 to 200	80KW	W
72B	0 to 600	0 to 200	160KW	W
79B‡	0 to 150	0 to 400	80KW	X
80B	0 to 300	0 to 400	160KW	X
81B	0 to 600	0 to 400	320KW	X
88B‡	0 to 150	0 to 600	120KW	X
89B	0 to 300	0 to 600	240KW	X
90B	0 to 600	0 to 600	480KW	X
97B‡	0 to 150	0 to 1K	200KW	Y
98B	0 to 300	0 to 1K	400KW	Y
99B	0 to 600	0 to 1K	800KW	Y

* 50 Amps and above, 2 External Sensors supplied.
‡ May be used in 120V, 1ϕ, 3 Wire Edison Systems.
† Indicates 2 turns thru the external transducer or transformer window.

3 PHASE 4 WIRE 50/60 Hz MODELS

SUPPLIED WITH INTERNAL SENSOR

MODEL NUMBER PC5-	EFFECTIVE RANGE VOLTS (Line to Neutral)	EFFECTIVE RANGE AMPS	WATTS AT RATED OUTPUT 1mA	CURRENT SENSOR**
7B	0 to 150	0 to 5	1.5KW	Internal
8B	0 to 300	0 to 5	3KW	Internal
16B	0 to 150	0 to 10	3KW	Internal
17B	0 to 300	0 to 10	6KW	Internal
25B	0 to 150	0 to 15	4.5KW	Internal
26B	0 to 300	0 to 15	9KW	Internal

** 50 Amps and above, 3 External Sensors supplied.
† Indicates 2 turns through external transformer window.

SUPPLIED WITH CURRENT TRANSFORMERS

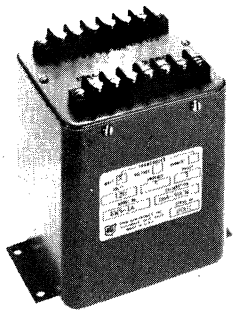
MODEL NUMBER PC5-	EFFECTIVE RANGE VOLTS (Line to Neutral)	EFFECTIVE RANGE AMPS	WATTS AT RATED OUTPUT 1mA	CURRENT SENSOR**
55B	0 to 150	0 to 50	15KW	W†
56B	0 to 300	0 to 50	30KW	W†
64B	0 to 150	0 to 100	30KW	W
65B	0 to 300	0 to 100	60KW	W
73B	0 to 150	0 to 200	60KW	W
74B	0 to 300	0 to 200	120KW	W
82B	0 to 150	0 to 400	120KW	X
83B	0 to 300	0 to 400	240KW	X
91B	0 to 150	0 to 600	180KW	X
92B	0 to 300	0 to 600	360KW	X
100B	0 to 150	0 to 1K	300KW	Y
101B	0 to 300	0 to 1K	600KW	Y

FOR DIMENSIONS REQUEST CATALOG #983

OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

ELECTRONIC PRECISION AC VAR TRANSDUCER EV5 SERIES

ACCURACY ±0.2% OF READING



FEATURES AND APPLICATIONS:

- Provides ±0.2% of reading accuracy and 0 to 1 mA current output proportional to reactive power
- Models available in 1, 2, 2½, and 3 element configurations to meet monitoring and control needs
- Measures forward or reverse reactive power flow
- Each unit is calibrated at the factory to provide 1 mA at the Rated Output (RO) against standards which are traceable to NBS
- Accuracy specifications include influences of variation in voltage, current, power factor and load changes
- Temperature effects are less than ±0.005% per degree C over the range of −20°C to +65°C

SINGLE PHASE 60 Hz MODELS

MODEL NO. EV5-	EFFECTIVE RANGE		VARs AT RATED OUTPUT (1 mA)	CONNECTION	ELEMENTS
	VOLTS	AMPS			
1B	0 to 150	0 to 6.25	500	1φ2W	1
2B	0 to 300	0 to 6.25	1K	1φ2W	1
3B	0 to 600	0 to 6.25	2K	1φ2W	1
10B	0 to 150	0 to 10	1K	1φ2W	1
11B	0 to 300	0 to 10	2K	1φ2W	1
12B	0 to 600	0 to 10	4K	1φ2W	1
19B	0 to 150	0 to 20	2K	1φ2W	1
20B	0 to 300	0 to 20	4K	1φ2W	1
21B	0 to 600	0 to 20	8K	1φ2W	1

3 PHASE 3 WIRE 60 Hz MODELS

4B	0 to 150	0 to 6.25	1K	3φ3W	2
5B	0 to 300	0 to 6.25	2K	3φ3W	2
6B	0 to 600	0 to 6.25	4K	3φ3W	2
13B	0 to 150	0 to 10	2K	3φ3W	2
14B	0 to 300	0 to 10	4K	3φ3W	2
15B	0 to 600	0 to 10	8K	3φ3W	2
22B	0 to 150	0 to 20	4K	3φ3W	2
23B	0 to 300	0 to 20	8K	3φ3W	2
24B	0 to 600	0 to 20	16K	3φ3W	2

3 PHASE 4 WIRE 60 Hz MODELS

7B	0 to 150	0 to 6.25	1.5K	3φ4W	3
8B	0 to 300	0 to 6.25	3K	3φ4W	3
16B	0 to 150	0 to 10	3K	3φ4W	3
17B	0 to 300	0 to 10	6K	3φ4W	3
25B	0 to 150	0 to 20	6K	3φ4W	3
26B	0 to 300	0 to 20	12K	3φ4W	3
7½B	0 to 150	0 to 6.25	1.5K	3φ4W	2½

NOTE: On 3 phase 4 wire models, phase to neutral voltage is specified.
Optional for 50 Hz operation add "X-127" to model number.

EV5 AND EW5 SERIES SPECIFICATIONS:

INPUT:

VOLTAGE

Effective Range: See Tables
Burden: Less than 0.1 VA at 120V, 240V, or 480V
Overload: Max continuous 175V, 350V, or 600V

CURRENT

Effective Range: See Tables
Burden (max.): 0.28 VA per element
Overload: (continuous) 2X rating for 6.25A or 10A, 1X rating for 20A
(Transient) 50A for 10 sec. per hour, 250A for 1 sec. per hour

OUTPUT:

Rated Output (RO): ±1 mA DC
Output Loading: 0 to 10K ohms
Compliance: 12.0 volts DC minimum
Open circuit output voltage limited to ±15 VDC
Response Time (99%): Less than 400 milliseconds

ACCURACY:

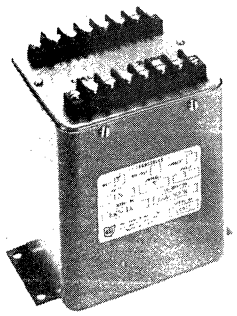
(±0.2% of reading, ±0.05% of RO)
Includes the effects of voltage, current, load and power factor within the effective ranges

Specifications continued on next page

OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

ELECTRONIC PRECISION AC WATT TRANSDUCER EW5 SERIES

ACCURACY ±0.2% OF READING



FEATURES AND APPLICATIONS:

- Provides ±0.2% of reading accuracy and 0 to 1 mA current output proportional to electrical power delivered to a load
- Models available in 1, 2, 2½, and 3 element configurations to meet monitoring and control needs
- Measures forward or reverse power flow
- Each unit is calibrated at the factory to provide 1 mA at the Rated Output (RO) against standards which are traceable to NBS
- Accuracy specifications include influences of variation in voltage, current, power factor and frequency, and load changes
- Temperature effects are less than ±0.005% per degree C over the range of −20°C to +65°C

SPECIFICATONS (cont.):

Frequency, VAR Only: 60 Hz, 50 Hz Models (optional)
Frequency, Watt Only: 58 to 62 Hz, 48 to 52 Hz on 50 Hz Models (optional)
Power Factor: Any
Temperature Range: −20°C to +65°C
Temperature Effect: ±0.005% per degree C
Operating Humidity: 0 to 95% non-condensing
Dielectric Test: Input/Output/Instrument Power/Case — 1500 VAC (RMS)
Surge: Withstands IEEE SWC Test
Calibration Adjustment: ±2% minimum
Instrument Power: 90 to 135 VAC, 50 to 70 Hz Burden less than 2 VA at 115 VAC
Weight: 3.1 lbs. Maximum

FOR DIMENSIONS REQUEST CATALOG #983

SINGLE PHASE 60 Hz MODELS

MODEL NO. EW5	EFFECTIVE RANGE VOLTS	EFFECTIVE RANGE AMPS	WATTS AT OUTPUT RATED (1 mA)	CONNECTION	ELEMENTS
1B	0 to 150	0 to 6.25	500	1φ2W	1
2B	0 to 300	0 to 6.25	1K	1φ2W	1
3B	0 to 600	0 to 6.25	2K	1φ2W	1
10B	0 to 150	0 to 10	1K	1φ2W	1
11B	0 to 300	0 to 10	2K	1φ2W	1
12B	0 to 600	0 to 10	4K	1φ2W	1
19B	0 to 150	0 to 20	2K	1φ2W	1
20B	0 to 300	0 to 20	4K	1φ2W	1
21B	0 to 600	0 to 20	8K	1φ2W	1

3 PHASE 3 WIRE 60 Hz MODELS

4B	0 to 150	0 to 6.25	1K	3φ3W	2
5B	0 to 300	0 to 6.25	2K	3φ3W	2
6B	0 to 600	0 to 6.25	4K	3φ3W	2
13B	0 to 150	0 to 10	2K	3φ3W	2
14B	0 to 300	0 to 10	4K	3φ3W	2
15B	0 to 600	0 to 10	8K	3φ3W	2
22B	0 to 150	0 to 20	4K	3φ3W	2
23B	0 to 300	0 to 20	8K	3φ3W	2
24B	0 to 600	0 to 20	16K	3φ3W	2

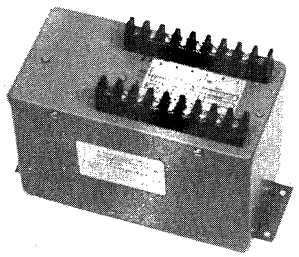
3 PHASE 4 WIRE 60 Hz MODELS

7B	0 to 150	0 to 6.25	1.5K	3φ4W	3
8B	0 to 300	0 to 6.25	3K	3φ4W	3
16B	0 to 150	0 to 10	3K	3φ4W	3
17B	0 to 300	0 to 10	6K	3φ4W	3
25B	0 to 150	0 to 20	6K	3φ4W	3
26B	0 to 300	0 to 20	12K	3φ4W	3
7½B	0 to 150	0 to 6.25	1.5K	3φ4W	2½

NOTE: On 3 phase 4 wire models, phase to neutral voltage is specified.
Optional for 50 Hz operation add "X-127" to model number.

OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

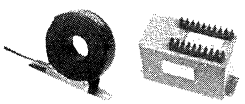
AC POWER FACTOR, AND WATT TRANSDUCER PC11 SERIES



FEATURES:

- True power and power factor measurements for distorted sine wave inputs
- Two separate output signals of 0 to 1 milliampere corresponding to watts and power factor
- Direct reading of power factor, not phase angle for sinusoidal waveforms or distorted waveforms
- Power factor computed by dividing real power by apparent power
- Current sensors are included and are calibrated with the watt transducer (where required)

SPECIFICATIONS:



INPUT:

Voltage: See Tables

Current: See Tables

Frequency Range: 50 to 70 Hz

Power Factor Range: Unity to Lead or Lag 0

Response: 100 microseconds to 90%

Burden: Voltage: 1.25 VA
Current: 1.5 VA

Current Overload:
2 times continuous
6 times for 10 Sec.

Dielectric Test: (Input/Output/Case) 1500 VAC

Instrument Power Required: 115 VAC ±10% 50/60 Hz

OUTPUT:

Watts: 1 mA at Rated Output

Power Factor: +1 mA at Unity PF, 0 mA at Lead or Lag 0

Response Time: 250 mSec. to 90%

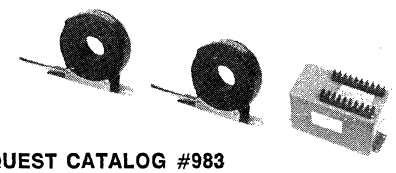
Output Loading: 0 to 10KΩ

Temperature Effects (−10°C to +60°C): ±1%

ACCURACY:

Watts: ±0.5% RO

Power Factor: From 10% to 120% of Rated VA
±0.01 PF



FOR DIMENSIONS REQUEST CATALOG #983

SINGLE PHASE 50/60 Hz

MODEL NO. PC11-	EFFECTIVE RANGE VOLTS	EFFECTIVE RANGE AMPS	WATTS AT RATED OUTPUT	CURRENT SENSOR
1	0 to 150	0 to 5	500	Internal
2	0 to 300	0 to 5	1K	Internal
3	0 to 600	0 to 5	2K	Internal
10	0 to 150	0 to 10	1K	Internal
11	0 to 300	0 to 10	2K	Internal
12	0 to 600	0 to 10	4K	Internal
19	0 to 150	0 to 15	1.5K	Internal
20	0 to 300	0 to 15	3K	Internal
21	0 to 600	0 to 15	6K	Internal
103	0 to 150	0 to 1	100	Internal
104	0 to 300	0 to 1	200	Internal
105	0 to 600	0 to 1	500	Internal
106	0 to 150	0 to 2.5	250	Internal
107	0 to 300	0 to 2.5	500	Internal
108	0 to 600	0 to 2.5	1000	Internal
49	0 to 150	0 to 50	5K	W†
50	0 to 300	0 to 50	10K	W†
51	0 to 600	0 to 50	20K	W†
58	0 to 150	0 to 100	10K	W
59	0 to 300	0 to 100	20K	W
60	0 to 600	0 to 100	40K	W
67	0 to 150	0 to 200	20K	W
68	0 to 300	0 to 200	40K	W
69	0 to 600	0 to 200	80K	W
76	0 to 150	0 to 400	40K	X
77	0 to 300	0 to 400	80K	X
78	0 to 600	0 to 400	160K	X
85	0 to 150	0 to 600	60K	X
86	0 to 300	0 to 600	120K	X
87	0 to 600	0 to 600	240K	X
94	0 to 150	0 to 1K	100K	Y
95	0 to 300	0 to 1K	200K	Y
96	0 to 600	0 to 1K	400K	Y

3 PHASE 3 WIRE

4	0 to 150	0 to 5	1K	Internal
5	0 to 300	0 to 5	2K	Internal
6	0 to 600	0 to 5	4K	Internal
13	0 to 150	0 to 10	2K	Internal
14	0 to 300	0 to 10	4K	Internal
15	0 to 600	0 to 10	8K	Internal
22	0 to 150	0 to 15	3K	Internal
23	0 to 300	0 to 15	6K	Internal
24	0 to 600	0 to 15	12K	Internal
52	0 to 150	0 to 50	10K	W†
53	0 to 300	0 to 50	20K	W†
54	0 to 600	0 to 50	40K	W†
61	0 to 150	0 to 100	20K	W
62	0 to 300	0 to 100	40K	W
63	0 to 600	0 to 100	80K	W
70	0 to 150	0 to 200	40K	W
71	0 to 300	0 to 200	80K	W
72	0 to 600	0 to 200	160K	W
79	0 to 150	0 to 400	80K	X
80	0 to 300	0 to 400	160K	X
81	0 to 600	0 to 400	320K	X
88	0 to 150	0 to 600	120K	X
89	0 to 300	0 to 600	240K	X
90	0 to 600	0 to 600	480K	X
97	0 to 150	0 to 1K	200K	Y
98	0 to 300	0 to 1K	400K	Y
99	0 to 600	0 to 1K	800K	Y

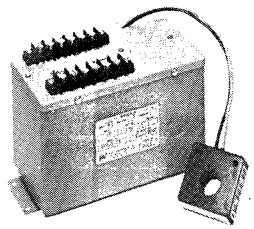
NOTE: 50 Amps and above, External Sensors supplied.
† Indicates 2 turns thru the external transformer window.
Power Factor is determined from the ratio of real power to apparent power, therefore leading or lagging power factor is not indicated.

OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

DC TO 400 Hz WATT TRANSDUCER PC8 SERIES

FEATURES AND APPLICATIONS:

- DC to 400 Hertz
- Ideal for variable frequency applications
- Accurate monitoring of power that contains dc, AC and non-sinusoidal waveforms
- Response less than 50 microseconds
- Ideal for use in SCR and other AC or dc switching circuits
- Output isolated from input



ORDERING INFORMATION:

The part numbers listed in the selection tables are incomplete. The voltage and current designation code must be added.

Part Number PC8- * — △

Example: PC8-3-01, which would be a PC8 transducer with 125VDC @ 100 amperes.

"*" Voltage Designation "△" Current Designation

CODE	FS VOLTS	RANGE
1	25	0 to 30
2	50	0 to 60
3	125	0 to 135
4	250	0 to 275
5	400	0 to 450
6	500	0 to 550
7	600	0 to 650

CODE	FS CURRENT	RANGE	CURRENT SENSOR
01	100	0 to 100	C
02	200	0 to 200	D
03	300	0 to 300	D
04	400	0 to 400	D
05	600	0 to 600	E
06	1000	0 to 1000	E
07	2000	0 to 2000	E

SPECIFICATIONS:

INPUT:

Voltage: Check code designation for FS voltage ranges from 25 to 600 volts (peak AC or dc)
Burden: >1 megohm
Current: Check code designation (specify FS range from 100 ampere to 2000 ampere, lower range uses 100 ampere transducer with ampere turns)
DC Insertion Loss: None
Overrange Without Damage: 10 times rating
Frequency Range: DC to 400 Hz
Response Time: <50 microseconds

OUTPUT:

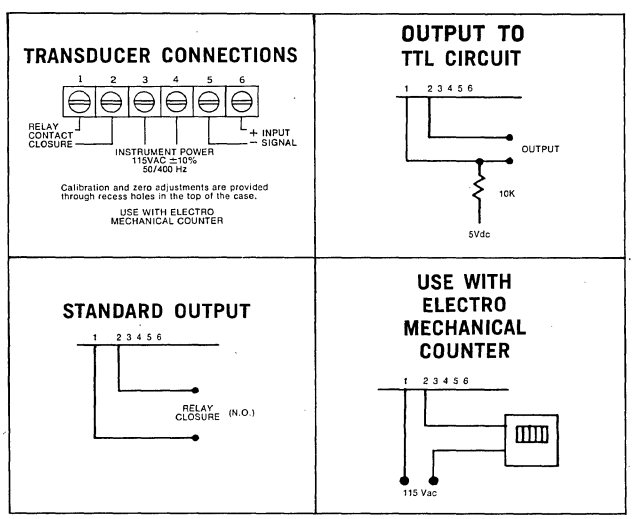
Full Scale Output: 1 mA dc (0 to 10K ohm)
Response: 250 milliseconds
Ripple: <1% Full Scale at 60 Hz
Accuracy: (FS Voltage X FS Current) ±1.0% FS
Temperature Effect: (0 to 40°C) ±0.1% of FS ±1% of Reading
Isolation: Input/Output/Case 1000 Vdc
Instrument Power: 115 VAC ±10% 50/400 Hz

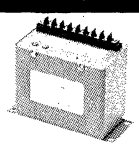
FOR DIMENSIONS REQUEST CATALOG #983

PRECISION INTEGRATOR VFC SERIES ANALOG TO PULSE CONVERTER

FEATURES:

- Output is a switch closure for activating external circuits
- Switch closure can be directly related to a specific integrated quantity
- Output can be preset at the factory





SPECIFICATIONS:
(common to all)

INPUT:

Impedance: >1 megohm except VFC-50, 100 ohms
Usable Range: Up to 1.25 x FS
Frequency: DC with up to 100% ripple at 120 Hz or higher

OUTPUTS:

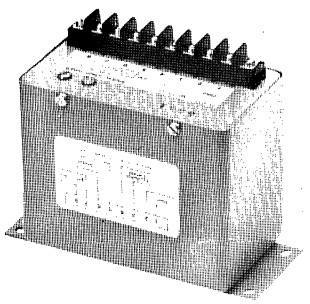
Linearity: ±0.1% FS Accuracy: ±0.25% FS
Relay: Normally open, SPST
Relay Contact Rating: 10 VA Max., 120V Max., 0.3A Max.
Relay Closed Period: 100 milliseconds, typ.
Temperature Effect: (−10°C to +60°C) ±0.5%
Instrument Power: 115 VAC ±10%, 50/400 Hz
Isolation (Input/Output/Case): 1000 Volts dc

MODEL	INPUT	OUTPUT RELAY CLOSURE RATE*
VFC-10	0 to +50 mV	0 to 10,000 per hour
VFC-20	0 to +100 mV	0 to 10,000 per hour
VFC-30	0 to +150 mV	0 to 10,000 per hour
VFC-50	0 to +1 mA	0 to 10,000 per hour
VFC-60	0 to +10V	0 to 10,000 per hour

* NOTE: Output closure rate can be set between 1K and 12K counts per hour at no charge.

OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

DC & RMS SIGNAL CONDITIONERS CTA SERIES



FEATURES AND APPLICATIONS:

- Designed for use with OSI current transducers
- Suitable for monitoring or control purposes
- CTA113 through CTA215E provide an output directly proportional to the true RMS value
- Calibration and zero adjustments provided

SPECIFICATIONS:

AMPLIFIER:

Linearity: 0.1% RO
Frequency Range: DC to 5 KHz
Output Response: to 90% 40 μsec.
(RMS Models) 200 msec.
Ripple: <0.25% RO
Crest Factor: 3 within rating
7 within 1%
Short Circuit Protected: Yes
Isolation: Input/Output isolated from case

EXCITATION CURRENT:

Regulation: Line/Load ±0.01%
Output Voltage at Full Load: 6 VDC

TEMPERATURE EFFECTS:

(0-70°C) ±0.005%/°C

INSTRUMENT POWER:

115 VAC ±10%, 5W, 50-400 Hz
24/28 VDC ±10%, 8W, DC
(Positive to Terminal 8)

FOR DIMENSIONS REQUEST CATALOG #983

NO CHARGE FOR CALIBRATION OF CTA WITH CT-L SERIES TRANSDUCERS

MODEL	RATED INPUT SIGNAL	RATED OUTPUT SIGNAL	EXCITATION CURRENT OUTPUT	CAL ADJUSTMENT		LOAD ON OUTPUT	INSTR. POWER
				AMPLIFIER GAIN	EXCITATION CURRENT		
ANALOG MODELS, AC IN AC OUT, dc IN dc OUT							
CTA101	±50 mV	±10V	100 mA	Fixed	±30%	>2KΩ	115VAC
CTA201	±50 mV	±10V	200 mA	Fixed	±10%	>2KΩ	115VAC
CTA112	±50 mV	4-20 mA	100 mA	±20%	Fixed	0-500Ω	115VAC
CTA212	±50 mV	4-20 mA	200 mA	±20%	Fixed	0-500Ω	115VAC
CTA124	±50 mV	±10V	100 mA	Fixed	±30%	>2KΩ	24VDC‡
CTA224	±50 mV	±10V	200 mA	Fixed	±10%	>2KΩ	24VDC‡
CTA128	±50 mV	±10V	100 mA	Fixed	±30%	>2KΩ	28VDC‡
CTA228	±50 mV	±10V	200 mA	Fixed	±10%	>2KΩ	28VDC‡
CTA1173	±50 mV	±4 mA	200 mA	Fixed	±30%	0-2.5K	115VAC
RMS MODELS, AC AND/OR dc OUT							
CTA113	50 mV RMS	+10VDC	100 mA	±20%	Fixed	>2KΩ	115VAC
CTA213	50 mV RMS	+10VDC	200 mA	±20%	Fixed	>2KΩ	115VAC
CTA114	50 mV RMS	+1 mA DC	100 mA	±20%	Fixed	0-10KΩ	115VAC
CTA214	50 mV RMS	+1 mA DC	200 mA	±20%	Fixed	0-10KΩ	115VAC
CTA115E	50 mV RMS	4-20 mA DC	100 mA	±20%	Fixed	0-500Ω	115VAC
CTA215E	50 mV RMS	4-20 mA DC	200 mA	±20%	Fixed	0-500Ω	115VAC

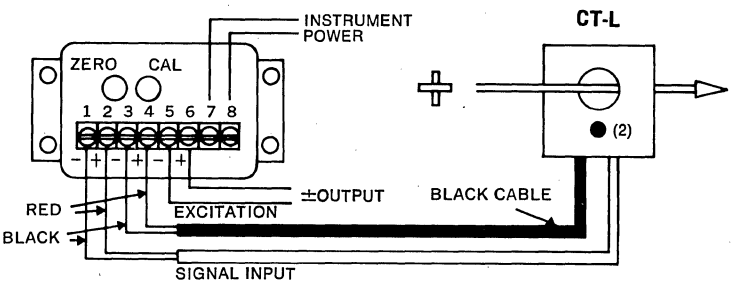
INPUT OPTIONS: (OPTION LETTER INDICATES A NON STANDARD INPUT)

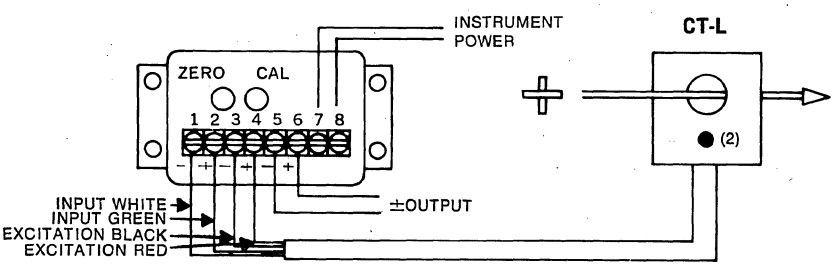
Option (H) 75 mV Input
Option (P) 100 mV Input
Option (K) 150 mV Input

APPLICATION NOTES:

(1) When using an OSI current transducer, the output shield should be tied to terminal 3 on the signal conditioner.
(2) For a positive amplified output, connect the current transducer with the red polarity dot toward the most positive voltage terminal. See connections below.
(3) All RMS models provide a DC output proportional to the true RMS value of the input.
(4) All Analog models provide an output proportional to magnitude and direction.

CONNECTIONS

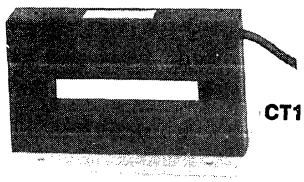




OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

CURRENT TRANSDUCERS CT-L SERIES

DC TO 5 KILOHERTZ RESPONSE


CT1KHT

CT50LT

CT200LT

CT1KLTS SPLIT-CORE OPTION

FEATURES AND APPLICATIONS:

- 5000 Volt line-to-output isolation
- DC to 5 kilohertz response
- Bi-directional operation
- Linearly 0.5%
- ±1% change over temperature range
- Less than 50 microsecond response time
- Output is proportional in direction and magnitude to the current flow through the window
- Sustained overload capability to 50 times rating
- Stable during severe vibration
- Easy installation
- Split-core models available
- Suited for variable frequency AC systems with DC components or chopped waveforms,
- Replace shunts
- No insertion loss

SPECIFICATIONS FOR CIRCULAR WINDOW MODELS

MODEL	ENCLOSED CURRENT AMPS	EXCITATION CURRENT mA (NOM.)	OUTPUT mV (TYP.)	LINEARITY % FS	OUTPUT CHANGE OVER TEMP. RANGE	TEMPERATURE RANGE °C	RESISTANCE TYP. IN Ω	RESISTANCE TYP. OUT Ω	TRANSDUCER DRAWING See Cat. Pg. 27
CT50L	50 RMS	100	30	0.5	−0.15%°/C	−40 +65	4	3	A
CT50LTT	50 RMS	100	20	0.5	±1%	0 +40	4	25	A
CT50LT	50 RMS	100	20	0.5	±1%	−40 +65	4	25	A
CT100L	100 RMS	100	50	0.5	−0.15%°/C	−40 +65	4	3	C
CT100LTT	100 RMS	100	50	0.5	±1%	0 +40	4	25	C
CT100LT	100 RMS	100	50	0.5	±1%	−40 +65	4	25	C
CT200L	200 RMS	100	75	0.5	−0.15%°/C	−40 +65	4	3	D
CT200LTT	200 RMS	100	50	0.5	±1%	0 +40	4	25	D
CT200LT	200 RMS	100	50	0.5	±1%	−40 +65	4	25	D
CT400L	400 RMS	100	50	0.5	−0.15%°/C	−40 +65	4	3	D
CT400LTT	400 RMS	100	50	0.5	±1%	0 +40	4	25	D
CT400LT	400 RMS	100	50	0.5	±1%	−40 +65	4	25	D
CT600L	600 RMS	100	75	0.5	−0.15%°/C	−40 +65	4	3	E
CT600LTT	600 RMS	100	50	0.5	±1%	0 +40	4	25	E
CT600LT	600 RMS	100	50	0.5	±1%	−40 +65	4	25	E
CT1KL	1000 RMS	200	75	0.5	−0.15%°/C	−40 +65	25	6	E
CT1KLTT	1000 RMS	200	50	0.5	±1%	0 +40	25	25	E
CT1KLT	1000 RMS	200	50	0.5	±1%	−40 +65	25	25	E
CT2KL	2000 RMS	200	150	0.5	−0.15%°/C	−40 +65	25	6	E
CT2KLTT	2000 RMS	200	100	0.5	±1%	0 +40	25	25	E
CT2KLT	2000 RMS	200	100	0.5	±1%	−40 +65	25	25	E

TRANSDUCERS FOR BUSS BAR APPLICATIONS (RECTANGULAR WINDOW)

CT4KLT	4000 peak	200	150	1.0	±1%	−40 +65	25	25	G
CT5KLT	5000 peak	200	150	1.0	±1%	−40 +65	25	25	G
CT8KLT	8000 peak	200	75	1.0	±1%	−40 +65	12	25	H
CT1KHT	1KA peak	100	75	1.0	±1%	−40 +65	25	25	Z
CT1.2KHT	1.2KA peak	100	75	1.0	±1%	−40 +65	25	25	Z
CT2KHT	2KA peak	100	100	1.0	±1%	−40 +65	25	25	Z
CT2.2KHT	2.2KA peak	100	100	1.0	±1%	−40 +65	25	25	Z
CT3KHT	3KA peak	100	100	1.0	±1%	−40 +65	25	25	Z
CT4KHT	4KA peak	100	100	1.0	±1%	−40 +65	25	25	Z
CT5KHT	5KA peak	100	75	1.0	±1%	−40 +65	25	25	Z

NOTES: The split core option is available on all Models except the 50 Ampere size. To order, add the letter "S" to the Model Number.
The electrical isolation (line to output) is at least 5000 volts for all Models, except the 50 Ampere size which is rated at 600 volts.

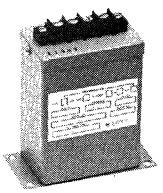
FOR DIMENSIONS REQUEST CATALOG #983

OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

AC VOLTAGE AND CURRENT TRANSDUCERS VT SERIES CT SERIES

FEATURES AND APPLICATIONS:

- Inexpensive
- Accurate
- Self powered
- Wide frequency range
- Isolated Output
- Reliable



VOLTAGE TRANSDUCERS

MODEL	VOLTAGE (VAC) RANGE	OUTPUT CAL
VT120	0 to 150	1 mA @ 150V
VT240	0 to 300	1 mA @ 300V
VT480*	0 to 575	1 mA @575V

* Includes OSI 226-145 Potential Transformer

SPECIFICATIONS (common to all):

Accuracy (Calibration, linearity @ 25°C): ±0.5% FS

Frequency Range: 50 to 500 Hz

Response Time: 400 msec.

Temperature Effect (from calibrated value):
−20°C to +60°C ±1% of Reading

Ripple: <1% FS

Full Scale Output: 1 mA dc

Output Loading: 0-10K ohms

Overload (Continuous):
Voltage: Full Scale Rating
Current: 2X Rating except CT10-1 & CT20-1,
1.25 Rating —
1 Second Transients, 50 X Rated Input

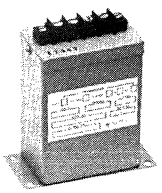
Burden:
Voltage: 2.8 VA FS
Current: 1 VA FS

Operating Range (Extended):
Voltage: Full Scale
Current: 1.2 X Rating

Dielectric Test (Input/Output/Case): 1500 VAC

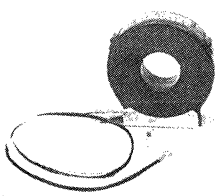
NOTE: For 2 or 3 Transducers in 1 enclosure add the number required to the front of model number. Typical number 3 CTS-1 or 2 VT 120. Multiple input units have separate isolated 0-1 mA outputs corresponding to each input.

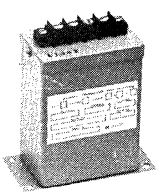
FOR DIMENSIONS REQUEST CATALOG #983



CURRENT TRANSDUCERS DIRECT CONNECTED

MODEL	CURRENT (AMPS AC) RANGE	OUTPUT CAL	CURRENT SENSOR
CT1-1	0 to 1	1 mA @ 1A	Internal
CT5-1	0 to 5	1 mA @ 5A	Internal
CT10-1	0 to 10	1 mA @ 10A	Internal
CT20-1	0 to 20	1 mA @ 20A	Internal

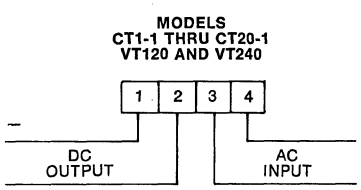


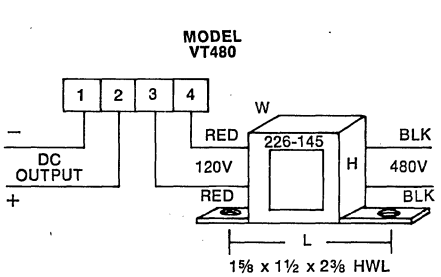


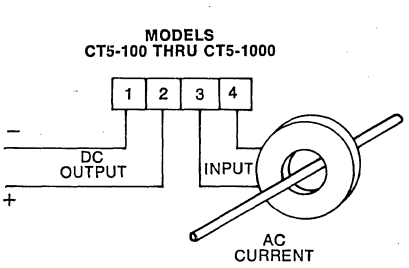
SUPPLIED WITH CURRENT TRANSFORMER

CT5-100	0 to 100	1 mA @ 100A	W
CT5-200	0 to 200	1 mA @ 200A	W
CT5-300	0 to 300	1 mA @ 300A	W
CT5-400	0 to 400	1 mA @ 400A	X
CT5-500	0 to 500	1 mA @ 600A	X
CT5-600	0 to 600	1 mA @ 600A	X
CT5-800	0 to 800	1 mA @ 800A	Y
CT5-1000	0 to 1000	1 mA @1000A	Y

VOLTAGE AND CURRENT TRANSDUCER CONNECTIONS





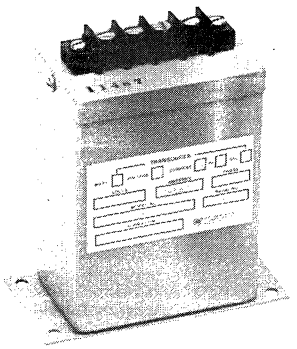


OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

RMS VOLTAGE & CURRENT TRANSDUCERS CT-R SERIES VT-R & CT-RT SERIES

FEATURES AND APPLICATIONS:

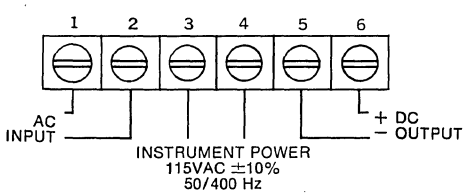
- Accuracy 0.25%
- Output directly proportional to the RMS value of input
- Can be overranged 20% with accuracy
- Current Transducers: 20 to 2000 Hertz range
- Voltage Transducers: 50 to 400 Hertz range
- CT1R and CT1RV, DC to 2 KHz



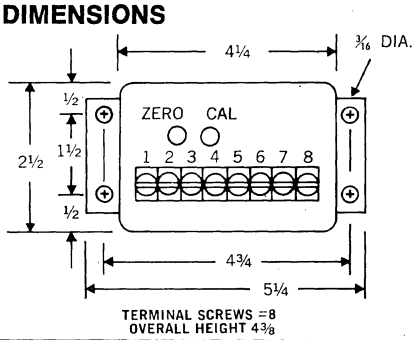
SPECIFICATIONS:

Accuracy and Linearity: ±0.25% FS at 60 Hz
Accuracy & Linearity: ±0.5% over frequency range
Frequency Range: 48 to 420 Hz
CT1R and CT1RV only DC or 20 to 2 KHz
Inputs:
Voltage: See Tables
Current: See Tables
Overload:
Voltage: See Table
Current: (Transient) 50A for 10 Sec. Per Hour, 250 A for 1 Sec. Per Hour, excluding CT1R and CT1RV
Input Signal Burden:
Voltage: 0.12 VA FS
Current: 0.28 VA FS
CT1R and CT1RV: 0.5 VA FS
Dielectric Test (Input/Output/Case): 1500 VAC RMS
Voltage: 1500 VAC RMS
CT1R and CT1RV only not isolated
Output Response: 200 milliseconds to 90%
Ripple: <1% FS
Output Short Circuit Protected
Temperature Effect: ±0.5% (−10°C to +60°C)
External Power: 115 VAC ±10%, 50 to 400 Hz

VOLTAGE AND CURRENT TRANSDUCER CONNECTIONS



CASE DIMENSIONS



VOLTAGE TRANSDUCERS

MODEL	INPUT SIGNAL	CALIBRATION OUTPUT	LOAD OHMS
VT1R	0 to 150V	1 mA DC @ 120V	0-10K
VT2R	0 to 300V	1 mA DC @ 240V	0-10K
VT4R	0 to 600V	1 mA DC @ 480V	0-10K
VT1RV	0 to 150V	10 VDC @ 120V	>2K
VT2RV	0 to 300V	10 VDC @ 240V	>2K
VT4RV	0 to 600V	10 VDC @480V	>2K

CURRENT TRANSDUCERS

CT1TR	0 to 1A	1 mA DC @ 1A	0-10K
CT1TRV	0 to 1A	10 VDC @ 1A	>2K
CT5TR	0 to 5A	1 mA DC @ 5A	0-10K
CT5TRV	0 to 5A	10 VDC @ 5A	>2K
CT10TR	0 to 10A	1 mA DC @ 10A	0-10K
CT10TRV	0 to 10A	10 VDC @ 10A	>2K
CT15TR	0 to 15A	1 mA DC @ 15A	0-10K
CT15TRV	0 to 15A	10 VDC @ 15A	>2K
CT20TR	0 to 20A	1 mA DC @ 20A	0-10K
CT20TRV	0 to 20A	10 VDC @ 20A	>2K

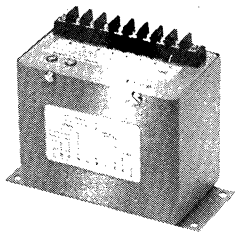
CURRENT TRANSDUCERS NOT ISOLATED

CT1R	0 to 5A	1 mA DC @ 5A	0-10K
CT1RV	0 to 5A	10 VDC @ 5A	>2K

* NOTE:
(1) CTR Series output is NOT isolated from input. Use instrumentation which is isolated from source. Caution is advised when making connections.
(2) All models have been calibrated at the factory to give the correct output at the specified input rating. The "CAL" adjustment is set at the factory and should not be adjusted unless recalibration is required. The "ZERO" adjustment is provided to correct for an output offset "at zero input conditions," without affecting the calibration of the unit.

OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

DC & RMS VOLTAGE TRANSDUCERS VT7 & VT8 SERIES



FEATURES AND APPLICATIONS:

VT7 SERIES:

- DC to 5 KHz Frequency Response
- Provides an output isolated signal proportional to DC input voltage
- 50 or 100 millivolt shunt model available
- 1500 V isolation input to output

ORDERING INFORMATION:

Add the "Code Designation" to the Model Number below for the Type, Rated Voltage, and Rated Output desired.

Example: VT7-01B: DC Input of 0 to 50 MVs and output 0 to 1 mA.

MODEL NO. VT * — O X

*CODE	TYPE
7	DC, Input
8	AC, AC/DC Input

O CODE	RATED VOLTAGE
(1) 01	50 mV
(1) 02	100 mV
1	12V
2	25V
3	50V
4	100V
5	150V
6	200V
7	300V
8	400V
9	500V
10	600V
11	700V
12	800V
13	900V
14	1000V

External multiplier resistance box is supplied.

X CODE	RATED OUTPUT SIGNAL
B	1 mA
D	10 Volts
E	4-20 mA

NOTES:
(1) 50 or 100 millivolt model is available in the VT7 Series only.
(2) Models with the rated input voltage above 600 volts require an external multiplier resistance box, which will be supplied with the unit.

FOR DIMENSIONS REQUEST CATALOG #983

FEATURES AND APPLICATIONS:

VT8 SERIES:

- DC to 5 KHz frequency response
- Output signal proportional to RMS value of AC, or AC/DC input
- 1500 Volt isolation between the input and output

SPECIFICATIONS:

INPUT:

Voltage: (Check code designation for rated input)

Overvoltage: 2 times rated input or 1500V whichever is smaller

Impedance: >100K ohm

Frequency Range: dc to 5 KHz

Response Time (99%): 50 μsec.

Isolation (Input/Output/Case/Instrument Power): 1500 VAC

Instrument Power Required: 115 VAC ±10%, 50-400 Hz

OUTPUT: (Short Circuit Protected)

Output Signal:
For VT7: 0 to ± mA, 0 to ±10 volts or a 4 to 20 mA signal which is directly proportional to the DC input voltage
For VT8: 0 to +1 mA, 0 to +10 volts or 4 to 20 mA DC signal which is directly proportional to the RMS input voltage

Response Time:
VT7 Models: 50 microseconds
VT8 Models: 200 milliseconds

Load on Output:
1 mA, 0 to 10K ohms
10 Volts, >2K ohms
4-20 mA, 0 to 500 ohms

Temperature Effects on Output (−10°C to +60°C): ±1%

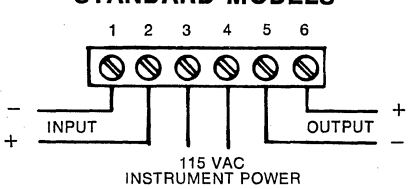
ACCURACY:

±0.5% RO
(including set point, linearity and repeatability)

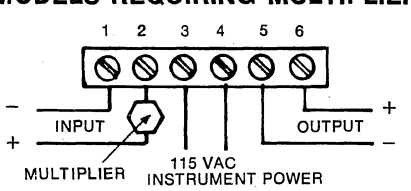
Calibration: Each unit is calibrated at the factory for Rated Input Voltage

CONNECTIONS

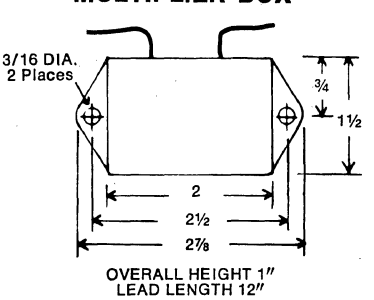
STANDARD MODELS



MODELS REQUIRING MULTIPLIER

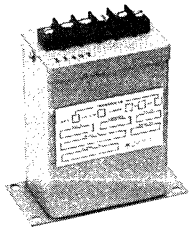


MULTIPLIER BOX



OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

FREQUENCY TRANSDUCERS FT50, FT60 & FT400 SERIES



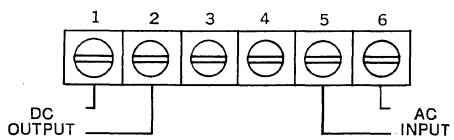
SPECIFICATIONS:

MODEL NUMBER	FT50	FT60	FT400
Input Voltage	95-135V	95-135V	95-135V
Over Voltage	150V	150V	150V
Frequency Range	45-55 Hz	55-65 Hz	375-425 Hz
Output	0-1 mA	0-1 mA	0-1 mA
Load on Output	0-10KΩ	0-10KΩ	0-10KΩ
Accuracy	±0.1 Hz	±0.1 Hz	±0.2 Hz
Temperature Range	−20°C +60°C	−20°C +60°C	−20°C +60°C
Temperature Effect	±0.005% °C	±0.005% °C	±0.005% °C
Response Time	400 mSec.	400 mSec.	400 mSec.
Burden	4 VA	4 VA	4 VA

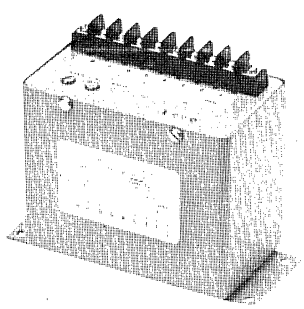
FEATURES AND APPLICATIONS:

- Analog output proportional to narrow frequency range
- Voltage or current output models available
- 50, 60, or 400 Hertz models available
- Rugged for industrial use
- Terminal block connections

TRANSDUCER CONNECTIONS



PRECISION CURRENT CONVERTER SC-E SERIES



SPECIFICATIONS: (common to all):

INPUT:

Range: See Table
Overload (without damage): 10 times input
Isolation: (input is not isolated from output)

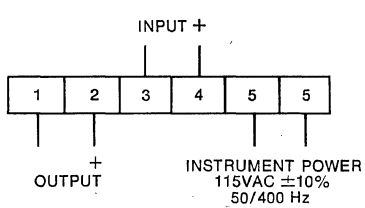
OUTPUT:

Range: 4 to 20 mA DC
Load on Output: 0 to 1500 ohms
Response Time 99%: 100 μSec.
Ripple: <1% FS
Accuracy and Linearity: ±0.1% FS
Calibration:
20 mA DC at rated input
4 mA DC at zero input
Temperature Effect: −20°C to +65°C, ±1%
Instrument Power: 115 VAC ±10%, 50-400 Hz

MODEL	INPUT SIGNAL	BURDEN ON INPUT
SC-E	0-1 mA DC	1KΩ
SC-E100	0-10VDC	10KΩ
SC-E.5	0-50 mV DC	>100KΩ
SC-E1.0	0-100 mV DC	>100KΩ
SC-E1.5	0-150 mV DC	>100KΩ

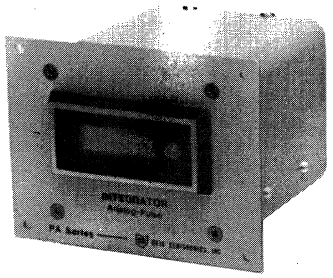
FEATURES AND APPLICATIONS:

- Provides 4 to 20 mA process control signal
- Excellent accuracy ±0.1% FS
- Models available for most common analog inputs
- Rugged for industrial application
- Terminal block connections



OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

PROCESS ACCUMULATOR PA SERIES



FEATURES AND APPLICATIONS

- Accumulate watt hours, ampere hours, VAR hours volume, weight, or distance
- Readout directly related to the time integral of the analog input signal
- 6 digit 0.35″ LCD readout
- Battery backup
- Current or voltage inputs
- Can be set from 200 to 100,000 counts per hour
- Front panel, remote or combination reset
- Panel or rack mount

SPECIFICATIONS:

INPUT:

Rated: See Table Code*
Over-range: 1.25 X Rating
Burden:
Voltage Units > 100K Ohm
1 mA Units < 1K Ohm
20 mA Units < 100 Ohm

OUTPUT:

Counter: 6 digit 0.35″ LCD
Counter Batteries: (2) MN9100 Mallory
Reset — Front Panel Manual: Remote or Combination
Count Rate: 200 to 100K, Counts Per Hour

ACCURACY:

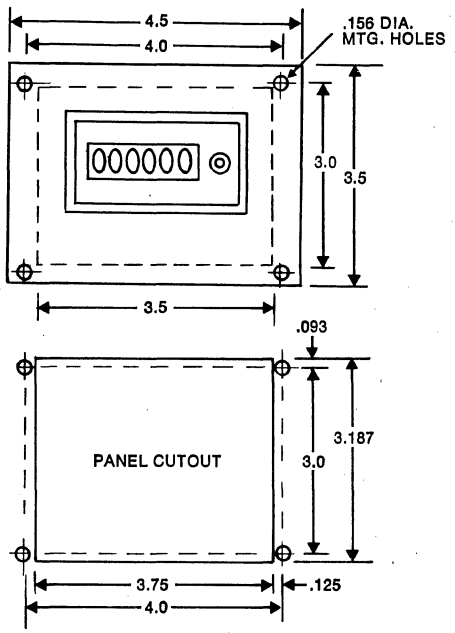
±0.25% RO
Linearity: ±0.1% RO
Temperature Effect: (−20°C to +60°C) ±0.005%/°C
Instrument Power:
115 VAC ±10%, 50 to 400 Hz
220 VAC, 50 Hz, Add Option X22 to Part Number

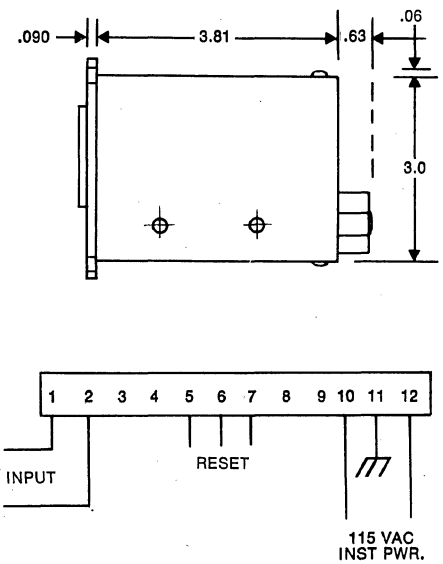
ORDERING INFORMATION:

MODEL NO. PA * Y X

* CODE	RATED INPUT	Y CODE RATED COUNTS PER HOUR	X CODE MOUNTING
1	0-50 mV	Specify the number of counts per hour required at the rated full scale input, output range is from 200-100K counts per hour. Note: Over 999, use 1K, 2.6K etc.	P PANEL
2	0-100 mV		
3	0-150 mV		R RACK 19″ x 3½″
4	0-250 mV		
5	0-1 mA		
6	0-10 Vdc		
7	0-5 Vdc		
8	0-20 mA		
9	1-5 Vdc		
10	4-20 mA		

DIMENSIONS AND CONNECTIONS

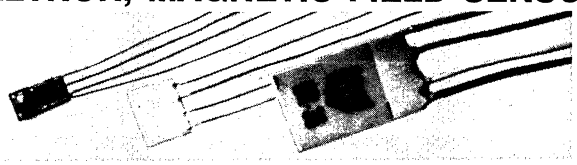




OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

OSI HALL EFFECT SENSORS HR & HP SERIES

HALLTRON, MAGNETIC FIELD SENSORS



FEATURES AND APPLICATIONS:

- For magnetic sensing
- Measuring applications
- High linearity
- Excellent stability
- Rugged and reliable
- Low noise

MODEL NO.	HALL OUTPUT V_H, MILLIVOLTS ±25% B = 10Kg, Ic = (NOMINAL)	NOMINAL CONTROL CURRENT Ic, mA	OHMIC RESIDUAL V_{RO}, MILLIVOLTS (B=0 Ic - 10 mA)	OHMIC RESIDUAL V_{RO}, MILLIVOLTS (B=0 Ic - 100 mA)	INPUT RESISTANCE R/in, OHMS (NOMINAL)	OUTPUT RESISTANCE R/out, OHMS (NOMINAL)	DIMENSIONS L/W/T INCHES (NOMINAL)	LEAD INSULATION	TEMPERATURE COEFFICIENT OF VH IN %/°C (AVG.)
HP316*	100	100	—	0.5	2	1	.125 dia. .250 L	PVC	−0.2
HP318*	250	100	—	0.5	5	4	.250 dia. .5 L	Teflon	−0.2
HP325	200	25	0.5	—	15	10	.187 0.75 .020	Enamel	−0.25
HP330	150	25	0.5	—	15	7.5	.040 .040 .012	Enamel	−0.25
HP340	100	25	0.2	—	3	2	.250 .125 .020	Enamel	−0.2
HP374	200	25	0.5	—	15	10	.300 .150 .030	PVC	−0.25
HR36	350	350	—	0.15	1.5	1.5	.625 .375 .028	PVC	−0.1
HR38	200	25	0.2	—	8	8	.625 .375 .028	PVC	−0.25
HR66	500	200	—	0.5	5	4	.200 .250 .028	Enamel	−0.15
HR67	200	25	0.2	—	9	5	.300 .150 .020	Teflon	−0.25
HR70	340	200	—	0.5	2	2	.200 .250 .028	PVC	−0.1
HR72	700	100	0.2	—	9	6	.200 .250 .028	Enamel	−0.25
HR77	550	100	—	1	10	10	.200 .250 .030	Enamel	−0.25
HR78	80	100	—	0.15	2	1.5	.100 .300 .020	Enamel	−0.10
HR88	400	300	—	4	2.5	2	.340 .375 .023	Enamel	−0.15
HR120	75	100	—	0.5	1.5	1.5	.200 .250 .030	Enamel	−0.05
HR125A	100	100	—	0.5	2.5	2.0	.200 .250 .028	Enamel	−0.05
HR170	10	100	—	0.03	0.7	0.6	.200 .250 .025	Enamel	−0.005
HS55	250	100	—	0.5	1.2	1	.500 .375 .025	PVC	—

* Denotes Axial Type Probes. All others are Transverse.

Operation Temperature Range: −65°C to +85°C

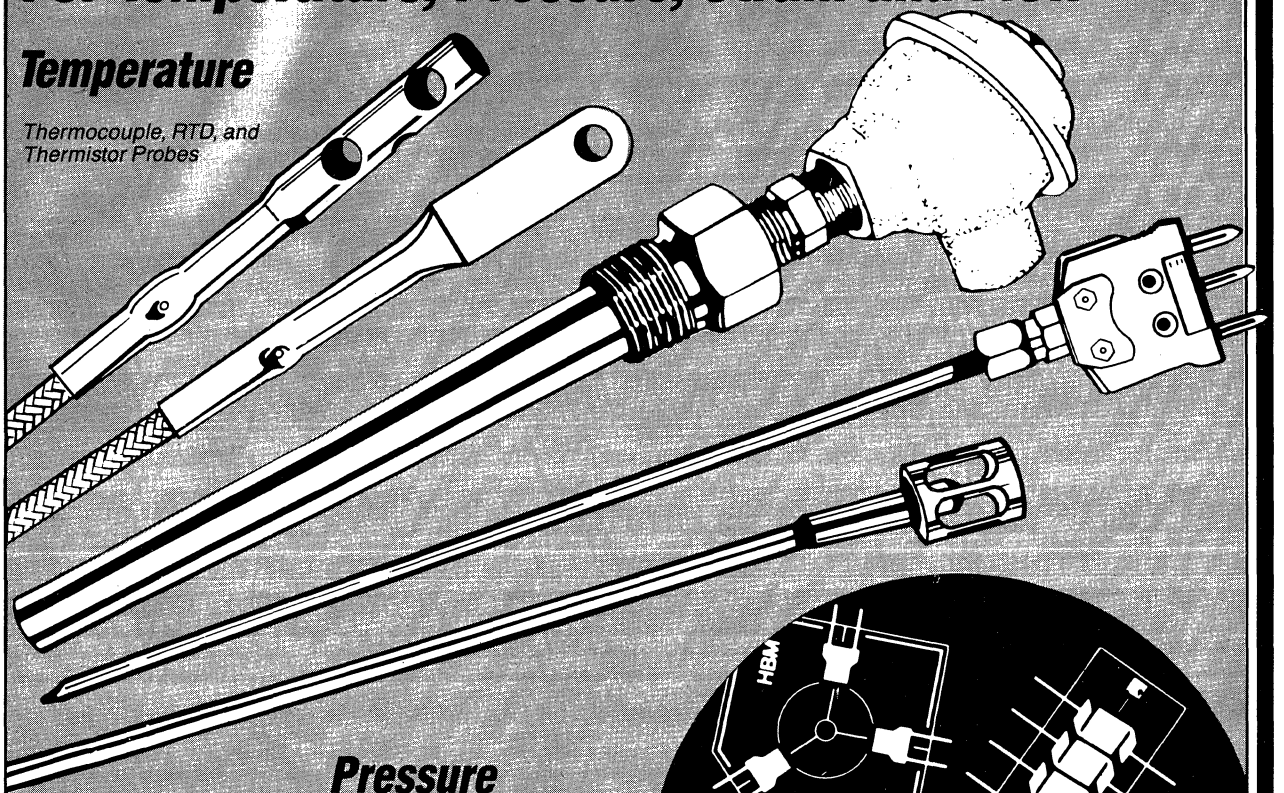
OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

TRANSDUCERS AND ENCODERS

For Temperature, Pressure, Strain and Flow

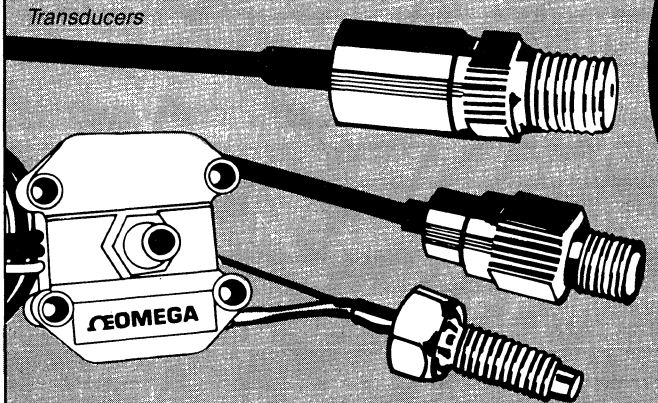
Temperature

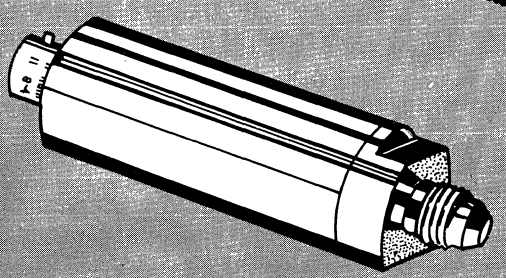
Thermocouple, RTD, and Thermistor Probes

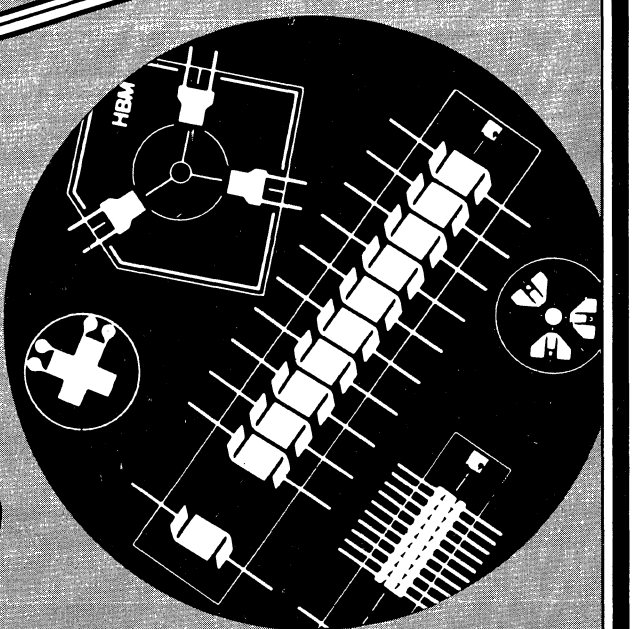


Pressure

Transducers







Strain Gages

AND FLOW INSTRUMENTATION!

Thousands of Products Ready for Immediate Delivery!

OMEGA®
ENGINEERING, INC.
(203) 359-RUSH
One Omega Drive, Box 4047, Stamford, CT 06907
Telex 996404 Cable OMEGA FAX (203) 359-7700
© COPYRIGHT 1985 OMEGA ENGINEERING, INC.

OMEGA®

YOUR SOURCE

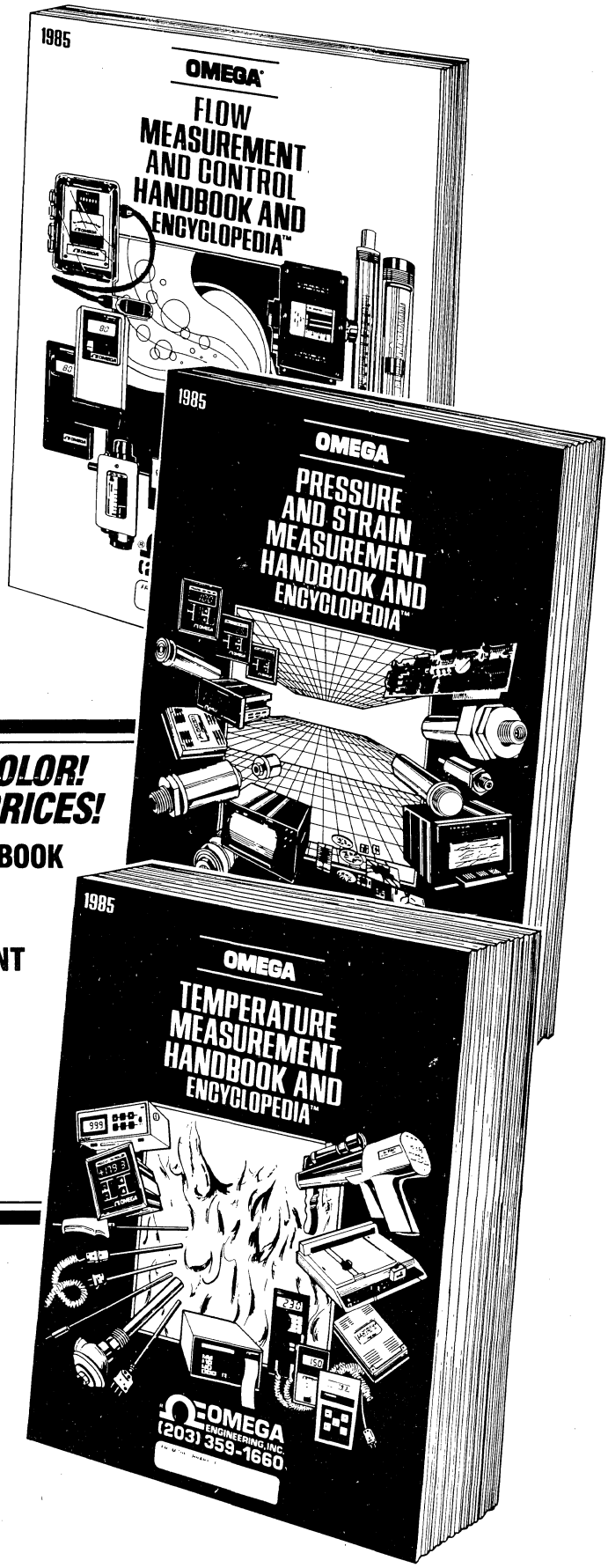
FOR

✓TEMPERATURE

✓PRESSURE AND STRAIN

✓FLOW MEASUREMENT AND CONTROL!

PLUS: INTERFACING TRANSDUCERS TO COMPUTERS



NEW! FREE! *FULL COLOR! WITH PRICES!*

✓ **TEMPERATURE MEASUREMENT HANDBOOK AND ENCYCLOPEDIA™**
Over 690 pages! Over 15,000 products!

✓ **PRESSURE AND STRAIN MEASUREMENT HANDBOOK™**
Over 225 pages of new pressure and strain products.

✓ **FLOW MEASUREMENT HANDBOOK AND ENCYCLOPEDIA™**
Over 230 pages of Flow products, systems, and technical information.

ORDER YOUR FREE COPIES TODAY!

®OMEGA ENGINEERING, INC.

(203) 359-RUSH

One Omega Drive, Box 4047, Stamford, CT 06907
Telex 996404 Cable OMEGA FAX (203) 359-7700

©COPYRIGHT 1985 OMEGA ENGINEERING, INC.

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

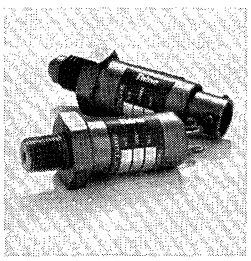
TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 85/86 EDITION OF EEM

Abbreviations/Acronyms ..... **A**•1166, **B**•1012, **C**•1028, **D**•1016
ASCII Code ..... **D**•1087
Batteries, Product Selection Guide ..... **D**•1413
Batteries & Fuel Cells, Characteristics ..... **D**•1430
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide ..... **C**•1003
Capacitors, Basic Formulas ..... **A**•1093
Capacitors, Miniglossary ..... **A**•1066
Capacitors, Product Selection Guide ..... **A**•1003
Circuit Boards (Printed) Product Selection Guide ..... **C**•1099
Coils, Chokes, Inductors, Product Selection Guide ..... **A**•1205
Conductors, Maximum Current Capacity of Copper & Aluminum ..... **C**•1863
Connectors, Miniglossary ..... **C**•1129
Connectors, Terminals, & Sockets, Product Selection Guide ..... **C**•1105
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Gude ..... **A**•1309
Delay Lines, Product Selection Guide ..... **A**•1459
Discrete Semiconductors, Product Selection Guide ..... **A**•2067
Displays, Readouts, Lamps, & Lights, Product Selection Guide ..... **B**•1015
EBCDIC Code ..... **D**•1092
Encapsulation, Miniglossary ..... **C**•1086
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .. **C**•1623
Filters, Product Selection Guide ..... **A**•1583
Instruments, Graphic Recording Product Selection Guide ..... **D**•1401
Instruments, Panel Meters, Product Selection Guide ..... **D**•1329
Instruments, Test & Measuring Product Selection Guide ..... **D**•1175
Interconnection Systems, Product Selection Guide ..... **C**•1699
Keyboards & Keypads, Product Selection Guide ..... **B**•1705
Logofinder & Trademark Directories ..... **B**•901
Microwave Components, Product Selection Guide ..... **A**•1701
Military Qualified Products Lists ..... **B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide ..... **B**•1129
Opto Semiconductors, Miniglossary ..... **B**•1214
Oscilloscopes, Product Selection Guide ..... **D**•1385
Panel Hardware, Product Selection Guide ..... **C**•1589
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide ..... **A**•1991
Power Supplies, Miniglossary ..... **D**•1462
Power Supplies, AC, Product Selection Guide ..... **D**•1877
Power Supplies, DC, Product Selection Guide ..... **D**•1447
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **B**•1225
Relay Contact Forms ..... **B**•1317
Relays, Electromechanical, Miniglossary ..... **B**•1308
Relays, Product Selection Guide ..... **B**•1261
Resistor Color Codes ..... **A**•1828
Resistors, Product Selection Guide ..... **A**•1785
Servo Components, Miniglossary ..... **D**•1985
Solenoids, Product Selection Guide ..... **B**•1463
Switches, Product Selection Guide ..... **B**•1477
Thermal Components, Product Selection Guide ..... **B**•1741
Thermal Conductivity of Dielectrics at Room Temperature ..... **B**•1744
Thyristors/High Power Diodes, Miniglossary ..... **A**•2076
Transducers & Encoders, Product Selection Guide ..... **B**•1777
Transformers, Product Selection Guide ..... **A**•2099
Wire & Cable, Product Selection Guide ..... **C**•1743
Wire Gauges—Diameter, Area, Copper Weight ..... **C**•1844

Paine® BONDED STRAIN GAGE PRESSURE TRANSDUCERS FOR INDUSTRY & AEROSPACE

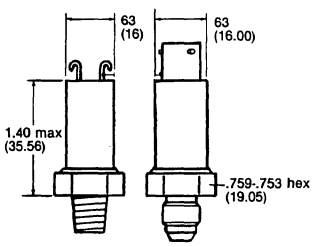
SERIES 210-30



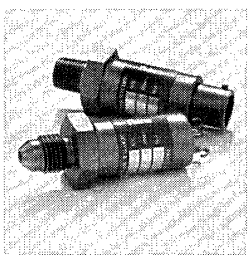
Series 210-30: 0-500 to 0-5000 PSIA and PSIS. When you need a rugged transducer for hydraulic systems with non-corrosive media applications see 210-35.

This series is ideally suited for the rigorous environments found in test stand work and wet industrial applications.

This series is available with either hooked terminals or electrical connectors.



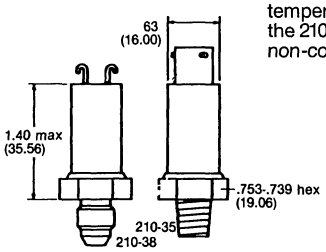
SERIES 210-35 AND 210-38



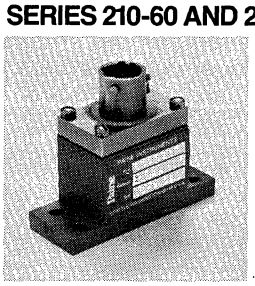
Series 210-35 and 210-38: 0-2000 through 1-10,000 PSI. A very rugged transducer for use in all industrial corrosive materials are present.

This series features all welded, all stainless steel construction to provide a high degree of compatibility and system integrity.

Both series are available with either MS Bayonet lock connectors or hooked terminals. The 210-35 is temperature compensated while the 210-38 is lower in cost and non-compensated.



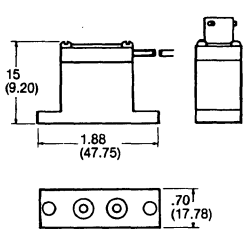
SERIES 210-60 AND 216-65



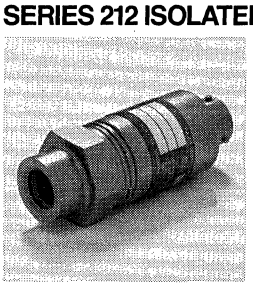
Series 210-60 and 210-65: ±500 to ±10,000 PSI. This is a full line differential pressure transducer designed for hydraulic systems. (Available in an all-welded, all-stainless steel version for corrosive media).

These transducers are unique because of their small size. The units have two separate sensing elements to measure the pressure at the input ports. Each sensor has two strain gage legs. These two sensors are connected to provide a fully balanced bridge. This sensing method provides an output directly proportional to the pressure difference at the two ports.

The series 210-60 is temperature compensated while the lower cost 210-65 is non-compensated. The 210-65 is particularly suited to rate derivation.



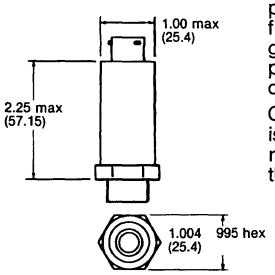
SERIES 212 ISOLATED



Series 212 Isolated: 0-10 through 0-10,000 PSI. When you need input to output isolation for system flexibility.

The Series 212 Isolated is a rugged, lightweight, all stainless steel, welded pressure transducer. It's tough enough to withstand harsh industrial environments. It's an easy transducer to install and features input/output isolation which decouples any interplay between power and signal, allowing flexibility in signal and power grounding connections. This also protects the transducer against output short circuits.

Output is 0 to 5 volts and the series is available in 18 different pressure ranges for incremental coverage of the full pressure spectrum.



Paine® **For more details, call toll free: 800/426-0366.**
Paine Instruments, Inc. 2401 South Bayview St. Seattle, WA 98144

RENCO CORPORATION
DIVISION OF ELECTRO-CRAFT CORPORATION
26 COROMAR DRIVE, GOLETA, CA 93117 • (805) 968-1525 TWX 910-334-1180

RENCO RETURNS TO INDUSTRIAL AUTOMATION.

We have been a major supplier of optical encoders to the machine tool and computer peripheral market since 1968. With the need for cost reductions through industrial automation, Renco supports this emerging industry with its complete line of state-of-the-art encoders.

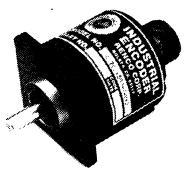
Our research and engineering departments are second to none, and over the years have consistently found and developed innovative ways to apply new technologies to encoder design and manufacturing processes. Today, Renco encoders incorporate solid state electronics, LED light sources, and our own Radial-line sensor array to improve performance and reliability.

Watch us as we expand our product lines to incorporate interface electronics for industrial robotics and other position and velocity control systems to meet the challenges of industrial automation.

CNC + PC COMPATIBLE ENCODERS IMMEDIATE DELIVERY PROGRAM

Renco is meeting the challenge of industrial automation by offering CNC + PC compatible encoders and fast delivery. Various TTL, CMOS, and Line Driver models are available from our 48-hour or maximum of two weeks delivery programs. Consult our order desk or application engineers for availability information or assistance in selecting encoders compatible with your CNC or Programmable Controller.

INCREMENTAL



HEAVY DUTY INDUSTRIAL ENCODER
HDR70

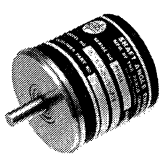
2.5 inch cast aluminum housing
Flange or servo mount
Direction sensing logic
Resolution to 5000 PPR
LED
Radial-line sensor array
Optional gated index
Phase quadrature 90° ± 36°

SPECIFICATIONS

Mechanical
Moment of inertia: 4.0 x 10^{-4} oz-in-sec² maximum
Shaft loading: Radial 35 lbs. max.; axial 40 lbs. max.
Slew speed: 5000 RPM STD. (10,000 special)
Weight: 20 oz.

Electrical
Output: TTL or CMOS
Operating frequency: Data 75 kHz, Index 20 kHz
Input power: 5V, 12V, 15V and 24V @ 125 mA
Light source: LED
Useful life: 100,000 hours min.
MTBF: 41,000 hours

Environmental
Operating temp.: 0°C to +70°C
Storage temp.: −25°C to +90°C
Humidity: 98% relative, noncondensing
Shock: 50 G's for 11 milliseconds
Vibration: 5-2000 Hz @ 20 G's



INCREMENTAL SHAFT ENCODER
R2520

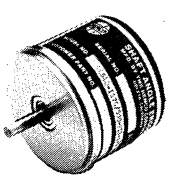
2.5 inch servo housed
LED
Radial-line sensor array
Resolution to 5000 PPR
Phase quadrature 90° ± 36°

SPECIFICATIONS

Mechanical
Shaft size: ¼ or ⅜ inch diameter available
Moment of inertia: 5 x 10^{-4} oz-in-sec² max.
Shaft loading: Radial 15 lbs. max.; axial 15 lbs. max.
Slew speed: 5000 RPM max.
Weight: 7 oz.

Electrical
Type 1. Differential sine wave
Type 2. Amplified sine wave
Type 3. TTL square wave
Type 4. CMOS square wave
Operating frequency: Data to 60 kHz, Index 20 kHz
Input power: 5V, 12V, ±15V and 24V @ 125 mA
Useful life: 100,000 hours
MTBF: 41,000 hours

Environmental
Operating temp.: 0°C to +60°C
Storage temp.: −25°C to +90°C
Shock: 20 G's for 11 milliseconds
Vibration: 5-2000 Hz @ 10 G's
Humidity: 95° relative, noncondensing



DUAL RESOLUTION INCREMENTAL SHAFT ENCODER
R2540

2.5 inch servo housed
Dual resolution count to 2540/2500
Phase quadrature 90° ± 45°

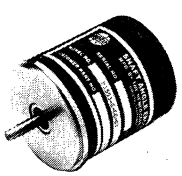
SPECIFICATIONS

Mechanical
Shaft size: ¼ inch O.D.
Moment of inertia: 3.5 x 10^{-4} oz-in-sec²
Shaft loading: Radial 15 lbs. max.; axial 15 lbs. max.
Slew speed: 5000 RPM
Weight: 10 oz.

Electrical
Type 1. Differential sine wave
Type 3. TTL square wave
Operating frequency: 50 kHz
Input power: 5V DC ± 5% @ 150 mA
Useful life: 75,000 hours
MTBF: 25,000 hours

Environmental
Operating temp.: 0°C to +55°C
Storage temp.: −30°C to +90°C
Shock: 20 G's for 11 milliseconds
Vibration: 5-2000 Hz @ 10 G's
Humidity: 95° relative, noncondensing

ABSOLUTE



ABSOLUTE POSITION ENCODER
R2553

2.5 inch housed encoder
Available in Natural Binary, BCD, or grey code
Up to 12 bits standard resolution
Accuracy ±½ bit

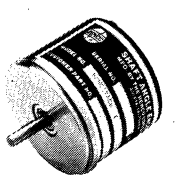
SPECIFICATIONS

Mechanical
Moment of inertia: 4 x 10^{-4} oz-in-sec²
Shaft loading: Radial 5 lbs., axial 5 lbs.
Slew speed: 5000 RPM

Electrical
Input voltage: 5V DC ±5% @ 400 mA ±10 mA per bit
Output is TTL compatible
Frequency response: 50 kHz

Environmental
Operating temp.: 0°C to +50°C
Storage temp.: −30°C to +90°C
Humidity: 95% relative, noncondensing

ANALOG



ENCODER/ANALOG TACHOMETER
RENCOTACH I

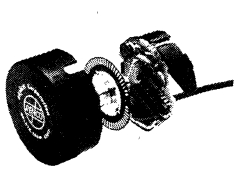
2.5 inch housed encoder
Analog ±10V DC
Up to 1000 count/turn
Bidirectional triangle wave and TTL output

SPECIFICATIONS

Mechanical
Height: 2.5 inches max.
Moment of inertia: 5 x 10^{-4} oz-in-sec²

Electrical
Analog output: ±10V DC max.
Output gradient: 1V/1K RPM to 10V/1K RPM
Ripple: <10 mV to 8 kHz
Linearity: ±1%
Input power: +15V @ 150 mA, −15V @ 30 mA
Encoder output: 2 to 5V P/P triangular waveform and TTL

Environmental
Operating temp.: 0°C to +50°C
Storage temp.: −30°C to +90°C
Humidity: 90% relative, noncondensing



ANALOG/DIGITAL TACHOMETER
RENCOTACH II

2 inch modular kit
Analog tach .05 to 10V DC
Digital tach pulse
Speed range of 500 to 10,000 RPM

SPECIFICATIONS

Mechanical
Height: .84 inches maximum
Moment of inertia: 3.2 x 10^{-5} oz-in-sec² minimum

Electrical
Analog output: 1V DC/1K RPM; .05-10V DC
Digital output: 60 PPR, 15V square wave output @ 4.7K Ohms impedance
Ripple: 20 mV @ 1 kHz
Linearity: ±.1%
Input power: +15V @ 15 mA, −15V @ 10 mA

Environmental
Operating temp.: 0°C to +70°C
Storage temp: −30°C to +90°C
Humidity: 95% relative, noncondensing

RENCO CORPORATION
DIVISION OF ELECTRO-CRAFT CORPORATION
26 COROMAR DRIVE, GOLETA, CA 93117 • (805) 968-1525 TWX 910-334-1180

CNC & PC COMPATIBLE ENCODERS
ORDERING INFORMATION

HDR70-D (RESOLUTION: 100, 200, 250, 360, 500, 800, 1000, 2500(2)) (F = flange mount / S = servo mount) (R = rear connector / S = side connector) (– shaft seal –) (5 = TTL / 12 = CMOS) (LD = line driver(1))
Order mating connector separately

R802 (3 = TTL / 4 = CMOS) – D – (RESOLUTION: 100, 200, 250, 360, 500, 800, 1000, (2500(2))) (HUB SIZE: ¼, ⅜, ½ / 6 mm, 8 mm) (5 = TTL / 12 = CMOS) (LD = line driver / Blank = standard)

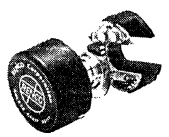
RMC252 (3 = TTL / 4 = CMOS) – D – (RESOLUTION: 100, 200, 250, 360, 500, 800, 1000, (2500(2))) (COUPLING SIZE: ¼, ⅜, ½) (5 = TTL / 12 = CMOS) (LD(1))

RFP15 (RESOLUTION: 100, 256) – 2 – 5

LEGEND:
(1) = Standard option for quick delivery
(2) = Consult factory

NOTES:
HDR70 = Line driver: DS8830 Type
HDR70 = Maximum Frequency Output: 100 kHz
R80 = Line driver: SN75158 Type
R80 = Standard output device: LM339

MODULAR

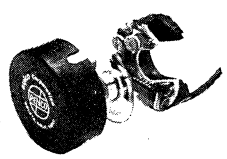


MODULAR OPTICAL ENCODER *R60*

1.5 inch
Modular kit
LED
Radial-line sensor array
Optional index
Synthetic base material
Phase quadature 90° ± 36°

SPECIFICATIONS
Mechanical
Height: .75 inch
Moment of ineria: 1.6 x 10^{-5} oz-in-sec²
Slew speed: 9000 RPM max.
Electrical
Type 1. Differential sine wave
Type 2. Amplified sine wave
Type 3. TTL square wave

Operating frequeny: Data to 50 kHz; Index to 20 kHz
Input power: +5V DC ±5%, ±15V DC @ 125 mA
Environmental
Standard operating temp.: 0°C to +60°C
Storage temp.: −30°C to +90°C
Humidity: 90% relative, noncondensing

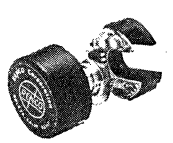


MODULAR OPTICAL ENCODER *R80*

2 inch
Modular kit
Synthetic base material
LED
Radial-line sensor array
Optional index
Phase quadrature: 90° ± 36°

SPECIFICATIONS
Mechanical
Height: .84 inches
Moment of inertia: 1.5 x 10^{-4} oz-in-sec²
Resolution: Up to 5000 counts
Slew speed: 9000 RPM max.
Electrical
Type 1. Differential sine wave
Type 2. Amplified sine wave
Type 3. TTL square wave

Type 4. CMOS square wave
Operating frequency: Data 50 kHz; Index 20 kHz
Input power: 5V DC ±5%, ±15V DC; 10 to 24 V DC @ 125 mA
Environmental
Operating temp.: 0°C to +70°C
Storage temp.: −30°C to +90°C
Humidity: 90% relative, noncondensing

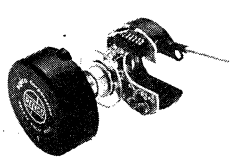


HIGH PERFORMANCE MODULAR ENCODER *R1500*

1.5 inch
Factory aligned modular kit
Metal base
LED
Radial-line sensor array
Phase Quadrature 90° ± 18°; optional ±9° available

SPECIFICATIONS
Mechanical
Height: .75 inches
Moment of inertia: 3.0 x 10^{-5} oz-in-sec²
Resolution: Up to 1250 counts per revolution
Slew speed: 9000 RPM max.
Electrical
Type 1. Differential sine wave

Type 3. TTL square wave
Operating frequency: Data to 75 kHz
Input voltage: 5V DC ±5% @ 125 mA
Environmental
Operating temp.: 0°C to +60°C
Storage temp.: −30°C to +90°C
Humidity: 90% relative, noncondensing



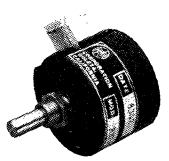
HIGH PERFORMANCE MODULAR ENCODER *R2000*

2 inch
Factory aligned modular kit
Metal base
Radial-line sensor array
LED
Optional gated index
Phase quadrature: 90° ± 18°

SPECIFICATIONS
Mechanical
Height: .80 inches
Moment of inertia: 1.5 x 10^{-4} oz-in-sec²
Resolution: Up to 1500 counts per revolution
Slew speed: 9000 RPM max.
Electrical
Type 1. Differential sine wave
Type 2. Amplified zero crossing sine wave
Type 3. TTL square wave

Type 4. CMOS square wave
Operating frequency: Data 50 kHz; Index 25 kHz
Input Power: 5V DC ±5%; ±15V DC; 10 to 24V DC @ 125 mA
Environmental
Operating temp.: 0°C to +60°C
Storage temp: −30°C to +90°C
Humidity: 90% relative, noncondensing

PANEL



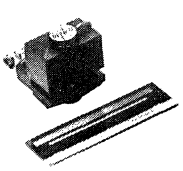
FRONT PANEL ENCODER *RFP*

1.5 inch
Potentiometric mounting
Built-in shaft tension
Phase Quadrature 90° ± 45°
Card-edge, Cable or PC Board Header Interconnect
Designed to replace Potentiometers and A to D Converters

SPECIFICATIONS
Mechanical
Shaft torque: 2 ± 1 oz. in.
Mounting bushing: ⅜ x 32 UNEF
Electrical
Input voltage: 5V, +12V, or +15V @ <40 mA
Output: TTL or CMOS compatible square wave, 2 channel phase quadrature 90° ± 45°

Environmental
Operating temp.: 0°C to +70°C
Storage temp.: −40°C to +70°C
Humidity: 90% relative, noncondensing

LINEAR



LINEAR MODULAR SCALE *RML100*

2 x 2 modular kit
Length: 2 to 6 inches
Choice of resolution: 25 LPI to 500 LPI
TTL compatible
Beginning of trend/end of trend marker
Lower power long life miniature incandescent lamp

SPECIFICATIONS
Mechanical
2″ x 2″ cross section
Slew rate: 70 inches/sec. max.
Linear acceleration: 20 G's max.
MTBF: 80,000 hours
Lamp useful life: 50,000 hours min.
Air gap: .005 inch
Electrical
Output: zero crossing sine wave

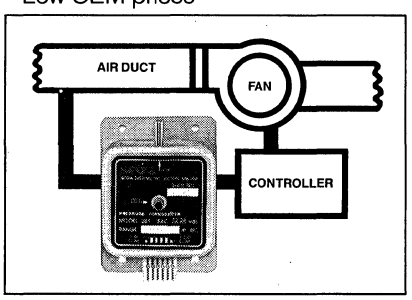
Input power: 5V DC ± 5% @ 200 mA
Environmental
Operating temp.: +10°C to +40°C
Storage temp: −30°C to +90°C
Shock: 100 G's max. for 2 milliseconds duration
Vibration: 60 to 500 Hz 2 G's
Relative humidity: 20% to 90% noncondensing

THE ONE SOURCE FOR PRESSURE TRANSDUCERS AND TRANSMITTERS.

WITH FULL SCALE PRESSURE RANGES FROM 0.1 IN. H_2O TO 10,000 PSI. CALL SETRA: 1-617-263-1400.

SETRA CONTROL
LOW PRESSURE AND AIR FLOW CONTROL
Series 261 Transducers and Transmitters feature:

- Pressure ranges as low as 0.1 in. H_2O FS
- Accuracy: 1% FS
- 12 to 30 VDC excitation
- Low OEM prices



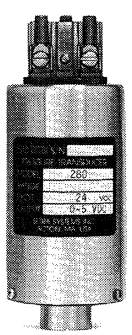
- High level output: 0 to 5 VDC, 4 to 20mA
- High resolution

OEM Applications:

- HVAC and VAV
- Energy Management Systems
- Clean Room Control
- Filter Condition Monitoring
- Medical Instrumentation
- Furnace Controls
- Environmental Pollution Control

SETRA CONTROL
HIGH PRESSURE AND P/I (3-15PSI)
Series 280 Transmitters and Transducers feature:

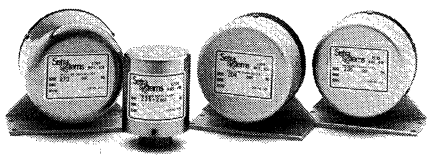
- High accuracy: 0.1% FS
- Absolute and gage pressures
- Ranges up to 10,000 psi
- Small size and weight
- Stainless steel sensor accepts gases and liquids
- Low OEM prices
- High level output 0 to 5 VDC, 4 to 20 mA



Applications:

- Process Control
- Hydraulics & Pneumatics
- Fluid Power Control
- Water and Steam
- Food Processing
- Refrigeration
- Manufacturing
- Automation/Robotics

SETRA TEST AND MEASUREMENT
ABSOLUTE, GAGE, DIFFERENTIAL PRESSURES AND VACUUM



A complete family of Transducers, Transmitters and Digital Pressure Gages featuring:

- High accuracy: 0.1% FS
- Low OEM prices
- Instant warm-up
- High level output: 0 to 5 VDC, 4 to 20 mA
- Temperature compensated
- Fast response
- Stainless steel sensor accepts gases and liquids

High Accuracy Applications:

- Leak Testing
- OEM Systems
- Engine Test Stands
- Level Measurement
- Automotive Component Test Stands
- Cryogenic Controls
- Vehicle Testing
- R&D Scientific
- Tire Manufacturing
- Environmental Tests

ACCELERATION AND POSITION SENSING
Setra Linear Accelerometers feature:

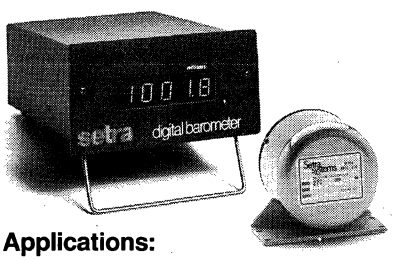
- Accuracy: 1% FS
- Static and dynamic response
- Small size and weight
- High overload capability
- Low transverse sensitivity
- High output signal

Applications:

- Transportation Equipment – trucks, buses, automobiles, ships, aircraft
- Position sensing
- Power cables
- Robotics
- Structures/Buildings
- Shock and Vibration Test

SETRA ENVIRONMENTAL
270 Barometric Transducers and 361B Digital Barometers feature:

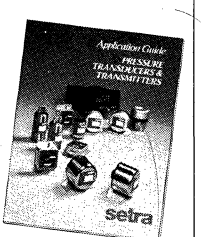
- Ranges to 100 psia
- Exclusive SETRACERAM™ Sensor
- Installations world-wide
- High accuracy: 0.05% FS
- Repeatability: 0.01% FS
- Excellent long term stability
- Low power consumption
- High level output: 0 to 5 VDC
- Low OEM prices



Applications:

- Barometric Pressure Sensing
- Meteorological Observation Stations
- Laser Distance Measurement
- Altimeter Setting Indicators
- High Accuracy Pressure Standards
- Data Buoys
- Engine Test Cells

FREE APPLICATION GUIDE
Specify Setra for pressure measurement and control. Ask for our new application guide.

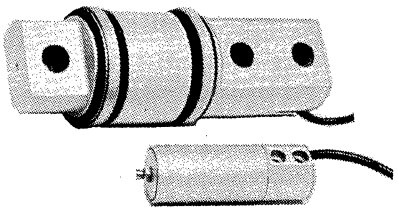


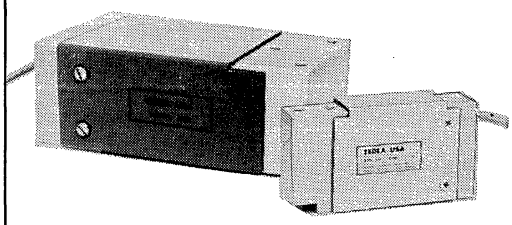
setra
THE TRANSDUCER PEOPLE
Call 1-617-263-1400
Setra Systems, Inc.
45 Nagog Park, Acton, MA 01720
Telex: 948440, Cable: SETRA SYSTEMS

TEDEA USA Load Cells

.02% TOTAL ERROR • 100% TESTING

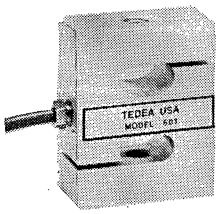
Series 1000
Off-Center-Loading Weigh Cells
- Capacities 4 to 1,000 lbs.
- Simple single-point mounting
- Insensitive to off-center moments
- Integral overload protection

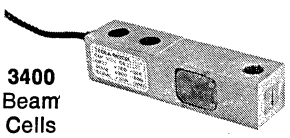




Series 300
Bending-Beam Weigh Cells
- Capacities 10 to 2,000 lbs.
- Low sensitivity to side loads
- Built-in overload protection (Model 300)

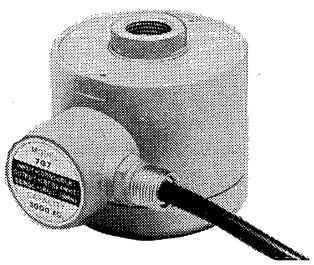
Series 600
S-Type Tension Weight Cells
- Capacities 200 to 1,000 lbs.
- Rugged shear beam construction

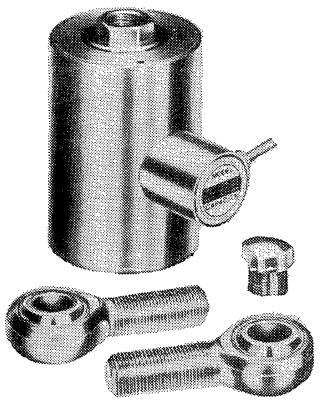




Series 3400
Shear Beam
Weigh Cells
- Capacities 1,000 to 20,000 lbs.
- 3 mV/V output
- .03% total error

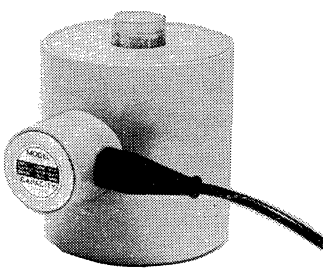
Series 700
Tension-Compression Weigh Cells
- Capacities 2,000 to 10,000 lbs.
- Welded, hermetically sealed configuration
- 400% F.S. Safe compression overload



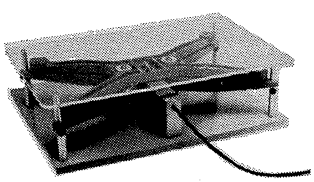


Series 400
Tension-Compression Weigh Cells
- Capacities 100 to 2,000 lbs.
- Splash-proof sealed configuration
- Rugged design

Series 100
Heavy Duty Compression Weigh Cells
- Capacities 20,000 to 100,000 lbs.
- Total error .15%

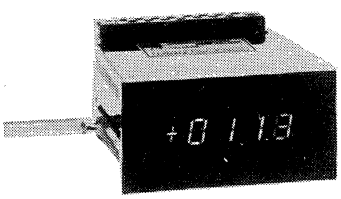


ACCESSORIES



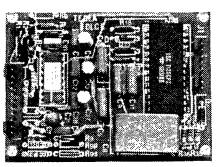
MODEL SM 1010
Shock Mount Assembly

Provides the basis for an extremely rugged high performance scale base. Available in varied configurations in ranges from 10 lbs. through 200 lbs.



MODEL BCR-50
Digital Transducer Indicator

Complete electronics package that provides excitation voltage, output signal conditioning and adjustable digital display for strain gauge load cells. 0-5 VDC analog or buffered BCD output available.



NEW!
TEDEA's DLCC-LSI
Load Cell Digitizer
- Serial and parallel outputs
- 32,000 count resolution
- 12 VDC excitation only required

GENERAL SPECIFICATIONS:

Rated Output	2 mV/V
Total Error	.02% rated output
Safe Overload	150% rated output
Excitation	10-20 V AC or DC

TEDEA USA

7800 Deering Avenue, Canoga Park, CA 91304
(818) 884-8818 • Telex: ITT 4998137 CELESCO CNPK

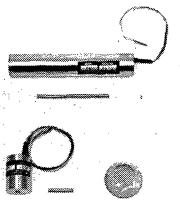
SUBSIDIARY OF hcc INDUSTRIES

TRANSDUCERS & SYSTEMS

for measurement and analysis of force, weight, displacement, linear and angular position, and similar parameters.

A PRIME TECHNOLOGY COMPANY

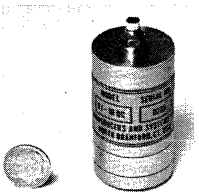
LINEAR VARIABLE DIFFERENTIAL TRANSDUCERS



- *DC in/DC out or AC in/AC out*
- *High accuracy and stability*
- *Low input power:<300mWDC*
- *±0.02" to ±10.00" full scale*

MDP/SD LVDTs provide self-contained signal conditioning. MA/MDP models offer small size, high accuracy, and high sensitivity. SA/SD models allow higher ranges and ruggedized design.

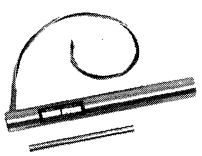
LOW RANGE FORCE/WEIGHT TRANSDUCERS



- *AC and DC models*
- *Tension/compression from ±5 gms full range*
- *20ms full load response*

Applications include laboratory use, biomedical and pharmaceutical measurements, high speed weighing, aero/hydrodynamic modeling, and others where precise determination of low range forces is necessary.

LINEAR VELOCITY TRANSDUCERS



- *0.5" to 20.0" ranges*
- *Single-piece high fluxdensity magnetic core*
- *High Sensitivity*
- *Non-contact measuring*

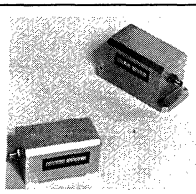
These LVTs provide outputs directly proportional to the rate of change of an object's position. The output also indicates the direction of motion. Rugged construction assures high tolerance to shock and vibration.

ROTARY VARIABLE DIFFERENTIAL TRANSFORMERS

- *AC and DC models*
- *Unlimited rotation*
- *±60° linear range*
- *Infinite resolution*

These angular position LVDTs offer unlimited rotation and non-contact measuring. They are available in two styles — completely self-contained or with an independent stator and core.

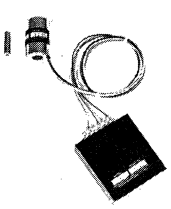
INCLINOMETERS



- *±5° to ±90° full scale*
- *Resolution to 0.1 second of arc*
- *Linearity to ±0.1% full range*
- *AC and DC models available*

These inclinometers provide an output proportional to the sine of the angle of tilt, resolving changes in angle as small as 0.1 second of arc, and changes in tilt as low as 0.000006 inch/foot.

LOW COST MEASURING SYSTEM



- *±0.1" range*
- *0.25% linearity*
- *High sensitivity*
- *High resolution*
- *LVDT reliability*

Convert ANY mechanical output to an electronic output — for measuring displacement, force, weight, pressure, velocity, acceleration, slope, tilt — anything that moves mechanically can be measured electronically. You add only a fixture for your particular application.

SIGNAL CONDITIONING MODULES & CONTROL BOXES

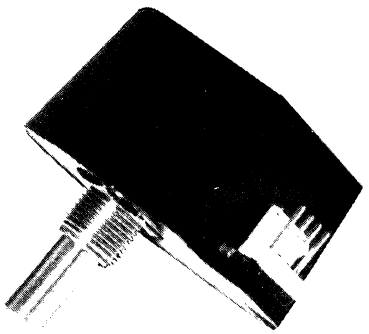
Signal conditioning modules for our AC-LVDTs, and all of our AC transducers, are available for AC or DC inputs/outputs, with options such as zero adjustment ranges to 100%, output currents to 500mA, preset limits, frequency outputs, and a choice of several methods of interconnection. Control boxes, including digital displays, printers, and other output instrumentation are also available.

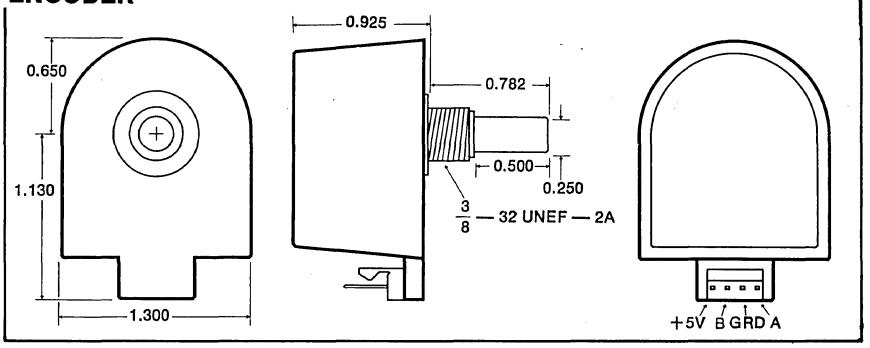
TRANSDUCERS & SYSTEMS INC.
P. O. Box 185, North Branford, Connecticut 06471
TWX 710-452-3092

CALL 203 481-5721

DIGITAL
12371 KENSINGTON RD, LOS ALAMITOS, CA 90720 • (213) 594-0094

SOFTPOT OPTICAL ENCODER





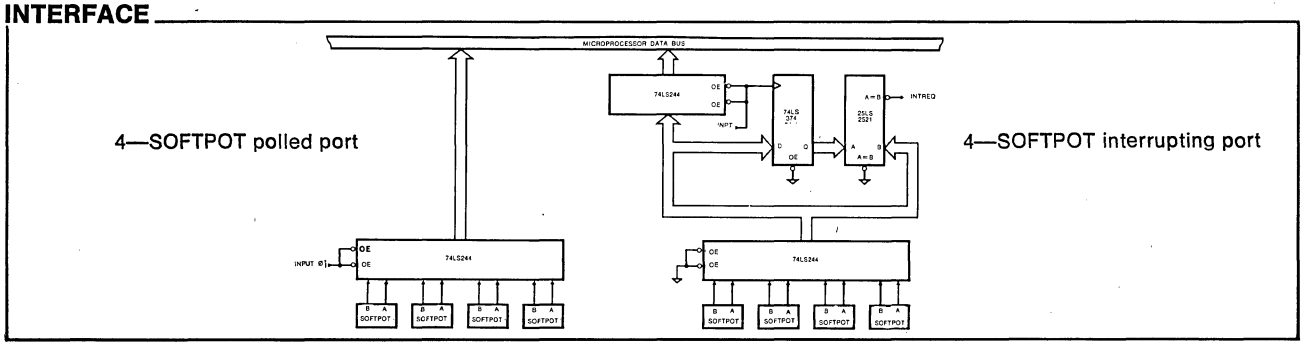
DESCRIPTION

The SOFTPOT is a front panel optical incremental encoder which converts mechanical action directly to digital output. Its low cost has made software programmable performance practical for new applications. Shaft tension provides the feel of a potentiometer but there are no stops. Since the SOFTPOT is an incremental device the absolute value of the controlled parameter may be maintained in memory by your microprocessor providing:

- Software presetable parameters
- Software definable limits
- Software programmable interaction

The two channel outputs are quadrature phase encoded to provide a resolution of 4 quadrants per cycle and 16 cycles per revolution yielding a code change every 5.6 degrees or 64 quadrants per turn. LED light sources assure low power consumption and a long reliable life. One external 74LS244 will interface four SOFTPOTS to standard TTL.

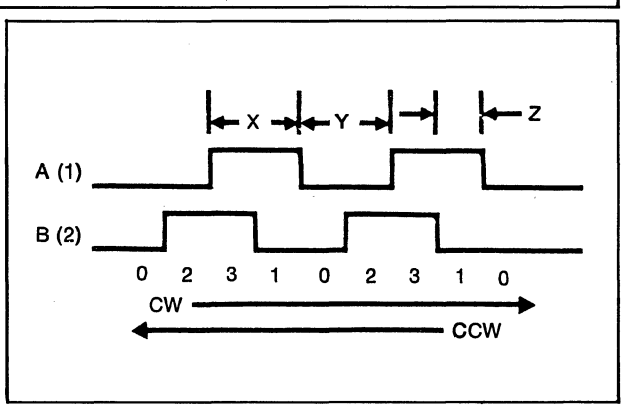
INTERFACE



ELECTRICAL SPECIFICATIONS

PARAMETER	MIN	NOM	MAX	UNITS	NOTE
Supply Voltage	4.75	5.0	5.25	Volts	
Supply Current		22	30	MA	
VoutH	3.5	5.0	5.25	Volts	2
VoutL		0.15	0.4	Volts	2
Iout (Vout=.5v)	0.5	2.0		MA	
Iout Short		8	18	MA	
Symmetry	150	180	210	Degrees	3, 4
Quadrature	60	90	120	Degrees	3, 5

NOTES: 1. A 74LS244 is recommended as the interface to TTL.
2. At 74LS244 input
3. At 74LS244 output
4. Symmetry is a measure of the relationship between (X) and (Y) In electrical degrees.
5. Quadrature is specified by (Z) and is the phase lag or lead between channels A and B in electrical degrees.
6. Channel B leads channel A for clockwise rotation.



MECHANICAL SPECIFICATIONS

Dimensions:	See above
Connectors:	Unit : AMP—640456—4 Mate : AMP—640441—4
Materials:	Housing : ABS# KJB4051 (fire retardant) Shaft : Brass Bushing : Brass
	Torque : 0.5 in. oz. +/−0.20 in. oz. Weight : 1.0 ounces
	Operating Temperature : −20 to 85 degrees C Storage Temperature : −40 to 85 degrees C
	Mounting Hole Size : .380 inch Panel Thickness : .125 inch max.

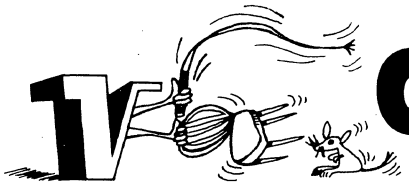
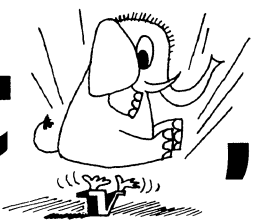
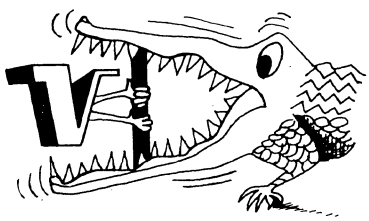
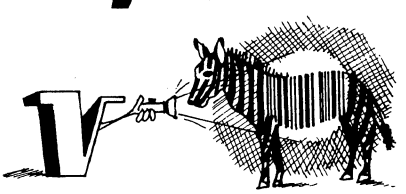
ORDERING INFORMATION

PRICING: $16.00/1000's $20.00/50's
$17.00/500's $22.00/10's
$18.00/100's $25.00/1's

MATING CONNECTORS: $.50

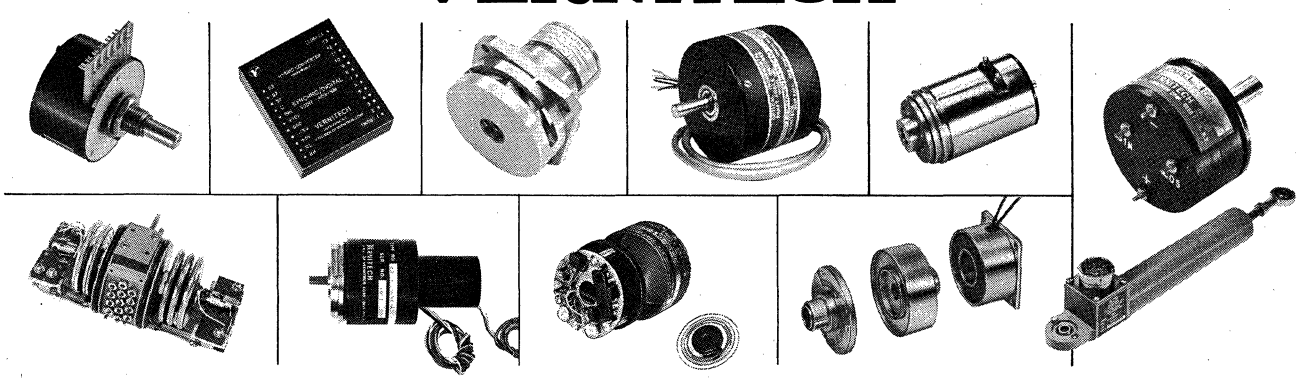
PART NUMBER : SP-16
F.O.B. : Los Alamitos, CA via U.P.S.
AVAILABILITY : Normal Shipment is Next Day
TERMS : 30 Days Upon Approval

If you want to move it, control it, sense it, stop it, or scan it, call Vernitech.

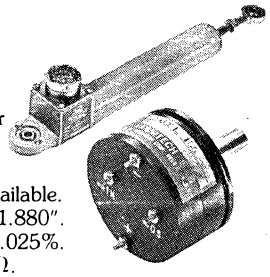
That is, if you're looking for instrument motors, optical and contacting shaft angle encoders, rotary and linear potentiometers, potentiometric pressure transducers, industrial precision brakes or clutches, or laser scanning motors, we'll probably have just what you're looking for. Just look on the opposite page. And if you *don't* find what you want, call Vernitech, give us the particulars, and we'll make it for you.

VERNITECH



VERNITECH, a division of Vernitron Corp., 300 Marcus Blvd., Deer Park, NY 11729 • 516-586-5100 • TWX 510-227-6089

POTENTIOMETERS



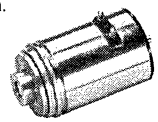
employing Vernitech's unique conductive film and precious metal wipers...respond to wiper motions as small as .000005".

Rotary Single Turn
Linear, non-linear, sine/cosine available.
Sizes 0.5", L 0.5" to Dia 5.0", L 1.880".
Linearity or conformity ±2% to 0.025%.
Resistance range 1KΩ to −250KΩ.

Rotary Multi-Turn
10 to 100 turns available.
Sizes Dia 0.5", L 1.5" to Dia 2.0", L 2.625".
Linearity or conformity ±0.5% to 0.015%.
Resistance range 1KΩ to 500KΩ.

Linear Motion
Electrical stroke lengths 1" to 60".
Linearity or conformity ±0.2% to 0.01%.
Resistance range 250Ω/in to 250KΩ/in.

CLUTCHES AND BRAKES
(electromagnetic)



hundreds of models and sizes available from stock.

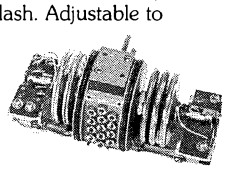
Precision Instrument Type
Sizes 5, 8, 11, 13, 15, and 18.
Standard length and wafer types. Spring and magnetic.
Meet MIL-E-5272C. Zero backlash.
Torque 5 to 150 oz. in. Response time 5 to 142 ms.

Industrial Types — open frame
Sizes 8, 12, 17, 22, 26. Torque to 75 in. lb.
Response time 6-30 ms at rated voltage.

Industrial Types — enclosed frame
Hybrid or special units designed for particular applications when MIL-SPECS and close tolerances are not essential, but where having a complete "self-contained" unit is desirable: cassette tape decks, analog devices actuators, etc.

Fail Safe
Braking action occurs 10 ms after coil is de-energized or power fails. Sizes 8, 17, 30, and 45.
Torque up to 50 in. lb. Zero backlash. Adjustable to compensate for wear.

PRESSURE TRANSDUCERS
potentiometer type,



featuring infinite resolution, long life, and high reliability through the use of conductive film resistance elements, multiple wipers, and direct coupling of pressure sensing element to potentiometer wipers.

Pressure ranges from 0.1 to 10,000 psi in gage, absolute and differential types.

Linearity to ±0.3%. Air speed, altitude and low cost types available.

LINEAR ENCODERS
BINARY, GRAY OR B.C.D. OUTPUT CODES
1", 2", 4", 8", 12", 24", 36" and 48" STROKE LENGTHS
RESOLUTIONS TO 12 BITS.

VERNITECH

MOTORS

Over 1500 Standard Designs or Custom Designed to your requirements.

Synchronous — for laser scanning
Sizes 5, 8, 11, 15, 18, 20, 25, 35.
Speeds 100 to 48,000 rpm.
5 through 1600 Hz. 2, 4, 8, 12 poles.

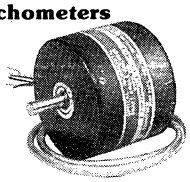
Servo
Viscous damped — sizes 8, 10, 11, 15, 18.
Speeds 3000 to 10,000 rpm.
Inertially damped — sizes 8, 11, 15, 18.
Speeds 3000 to 9500 rpm.

Stepper
Sizes 5, 8, 11, 15. Stepping angles 7.5°, 15°, 45°, 90°.
Stepping rates 100, 110, 125, 130, 175, 180, 225, 240, 260, 400, 725, 800, 1000 pps.

Precision Motor Generators Sizes 8, 10, 11, 15, 18, 23.

Integrating and Computer Motor Tachometers
Sizes 8, 10, 11, 15, 18, 23.

SHAFT ANGLE ENCODERS



featuring precision chrome on glass discs for highest accuracy.

Optical Incremental
VOE 005 — Dia. 0.500", 0.510" L. To 256 pulses (modular)
VOE 05 — Dia. 0.500", 0.820" L. To 256 pulses
VOE 11 — Dia. 1.062", L. 1.80". To 1024 pulses
VOE 015 — Dia. 1.510", L. 0.88". To 1024 pulses (modular)
VOE M15 "Dial Coder" — panel mounted, 1.500" dia., L. 1.08" 127-256 pulses
VOE 023 — Dia. 2.25", L. 80". To 1250 pulses (modular)
VOE 23 — Dia. 2.250", L. 1.875". To 1250 pulses (available sealed)
VOE L23 "Thrift-Line" Dia. 2.250" L. 1.875". To 600 pulses
VOE 25 — Dia. 2.500", L. 2.500". To 3000 pulses (available sealed)

Optical Absolute
VOE 23: Binary, Gray or BCD to 512 counts per turn. Counting speed: 3000 rpm.
VOE 30: Single or multi-turn; Binary, Gray or BCD. To 1024 counts per turn. Max count (2^{19}) in 512 turns. Counting Speed: 30KHz.

Contacting Absolute
Sizes 11, 18, 23, & 31. Binary, Gray, and BCD. Single or multi-turn. Max count (2^{19}) in 2048 turns. 64 to 1024 counts per turn. Operating speed 200 rpm max.

SYNCHRO CONVERTER MODULES

Tracking Synchro-to-Digital and Resolver-to-Digital Converters
Economy Series VSD/VRD. Precision Series VSDH/VRDH Compact, solid state, high performance converters employing type 11 servo loops for lag free tracking at rates to 3600°/sec. Resolution 10 bits, 12 bits, or 14 bits.

Digital-to-Synchro and Digital-to-Resolver Converters Series VDS/VDR:Accept shaft angle data in digital form for conversion to analog at accuracies up to ±4'.

Tracking Synchro-to-Linear DC Converter Module
Series VSDCH/VRDCH:Accept 3-wire synchro or 4-wire resolver input data, convert it to DC analog voltage proportional to synchro angle of input. Accuracy ±6' (typ.).

Tracking Angle Position Indicator
VNST-104: Tracking Synchro-to-Digital Converter, can also be used as a control element. Four decade 0.8" red LED display. Display accuracy ±6' arc (typical). Tracking rate 3600°/sec max. Parallel binary or BDC output. Self contained line operated power supply.

Custom designs available to your specifications.

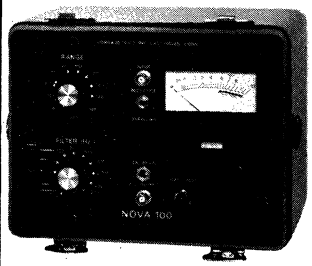
VERNITECH, a division of Vernitron Corp., 300 Marcus Blvd., Deer Park, NY 11729 • 516-586-5100 • TWX 510-227-6089

Vibra• Metrics INC.

1-800-352-2001

VIBRA•METRICS • 1014 SHERMAN AVENUE, HAMDEN, CT 06514 • (203) 288-6158 • TWX 710-465-0169

NOVA 100 PORTABLE MACHINERY VIBRATION ANALYZER



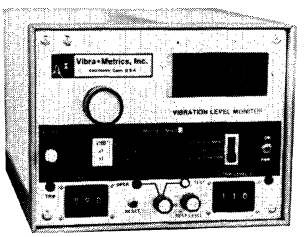
Machine Defects Unbalance, Bearings, Gears, Misalignment, looseness
Frequency Range: 300 CPM (5HZ) to 480,000 CPM (8KHZ) (12 KHZ Upper Limit)
Amplitude: 60 Vdb (.001 in/sec) 150 Vdb (30 in/sec)
Case: Rugged Sealed Alum.
Weight: 10 lbs.
Power: NICAD Batteries
SENSOR
Type: Heavy duty low impedance accelerometer
Material: Stainless Steel
Ground: Isolated
Mount: ¼-28 Stud or Magnet
OPTIONS:
Balance: TI 59 Calculator Program
Sound: Head Set

M8D DIGITAL VIBRATION METER [Battery Operated]

Metric scale optional

Functions: Velocity, Acceleration and displacement.
Ranges [Decade]: Velocity-Full scale .02 to 200 in/sec (PK)
Acceleration .002 to 20 g
Displacement to 2000 mils (PP)
Output: 2 Volts (Full scale) AC/DC Recorder option
Frequency Range [3db]:
Accel. 2HZ - 15KHZ
Vel. 5HZ - 3KHZ
Disp. 5HZ - 1KHZ
Accelerometer Power: 2 ma, 15 Volts (DC) from input connector
Filters [Front Panel Selectable]: Plug in optional High pass, low pass or band pass
Accelerometer: 7 - 14 mv/g
70-140 mv/g

M9D VIBRATION METER/MONITOR



Specifications same as M-8D with the following additions

Accelerometer: 100 mv/g

Trip Alarms: One or two

Set Points: Digital 0-200% of Full scale selected.
Outputs: Relay contacts NO/NC BCD (Option)
2 Volts (Full scale) DC Recorder option

VM-350 PREDICTIVE MAINTENANCE VIBRATION METER

An accurate solid-state instrument for use in predictive maintenance and quality assurance

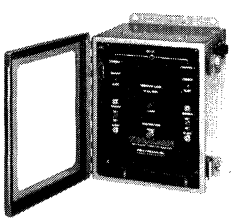
Velocity Ranges: 0.1 to 30 (I.P.S.)
Frequency Range: 3HZ-5 KHz
Input: Low impedance accelerometer included in vibration probe (VP 300) or individual sensor
Power: Battery
Size: 7" long x 2½" deep x 4" wide

SEISMIC VIBRATION METER SYSTEM

Consists of **M8DSP** Meter and 1030 Seismic Accelerometer

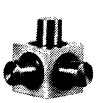
Most Sensitive Full Scale Range:
20 Micro g
200 Micro in/sec
20 Micro in (PP)

MACHINERY VIBRATION MONITORS



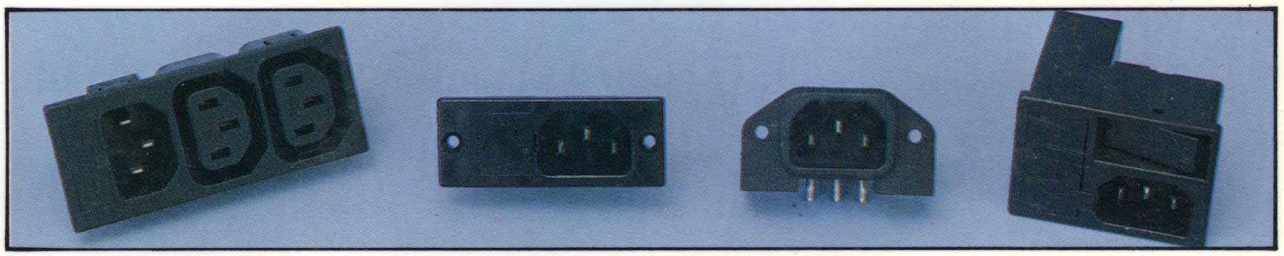
VIBRAMITE ACCELEROMETER WITH "BUILT-IN" ELECTRONICS

LOW IMPEDANCE SPECIAL "OEM" DESIGNS

	MICROMITE	MINIATURE	TRIAXIAL	GENERAL PURPOSE	HIGH OUTPUT	INDUSTRIAL	5 VOLTS
							
	0.7 GRAM	1.8 GRAM	10 GRAM			RUGGED	SEISMIC
MODEL	9001	1000/1001	3000	1018/1019	1020/1021	6022	1030
Sensitivity mv/g	7	10	10	10	100	100	5 Volt
Frequency Range [±5%]	5-10K	3-10K	3-10K	3-10K	2-10K	3-5K	.01-200
Noise g(rms)	.004	.0015	.0015	.0015	.00015	.00015	5X 10-6
Iso Shield	NO	YES/NO	YES	YES/NO	YES/NO	YES	YES
Pre-filter Option	NO	NO	NO	NO	YES	YES	YES
Temperature [F]	250	250	250	250	250	250	250
Weight [gms]	0.7	2/1.8	10	15	50	60	485
Dimensions [in]	.25 H x .25D	.4H x .25D	.75H X .5D	.75H x .5D	1.2H x .75D	.2H x .8D	2.5H X 2.5D

MORE THAN 30 MODELS AVAILABLE FROM STOCK. MODELS MEETING API 678 SPECIFICATIONS NOW AVAILABLE!

IEC CONNECTORS
Standard and Power Entry Modules



COMBINATION
Input/Output Module

Single male outlet may be combined with 1 to 6 female outlets. Rated 6 amp. Simple snap-in mounting. Solder or faston terminals.

Approvals: UL, CSA

POWER ENTRY MODULES
(Fused, with On/Off, Snap Action Power Switches)

Single and double pole switch configurations. Accepts American 3AG or European 5 x 20mm fuses for max. flexibility. Single or double Fuse holders. Integral voltage selector. Solder or faston terminals.

Approvals: UL, CSA, VDE, SEV

PRINTED CIRCUIT

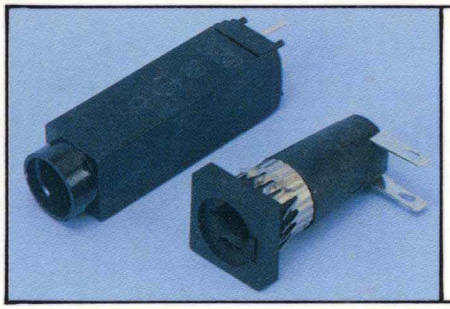
General purpose Power Cord Connector with PRINTED CIRCUIT TERMINALS. Rated 6 amp. Designed for automated assembly operation. Four color options. Conforms with all International safety requirements.

Approvals: UL, CSA, VDE

FUSED
(With Voltage Selector Switch)

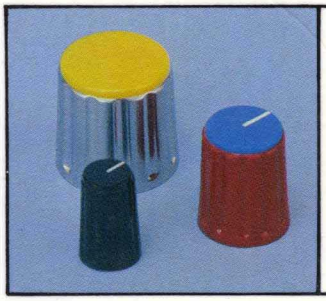
Switch voltages changed by rotating snap-in cartridge (100/120/220/240V). Accepts American 3AG or European 5x20mm fuses for max. flexibility. Rated 6 amp. Screw or Snap-in mount configurations. Four color options.

Approvals: UL, CSA, VDE



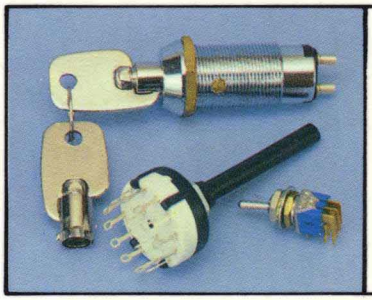
FUSE HOLDERS & FUSES

- Combination Fuse Holders accept Domestic and European Fuses for maximum versatility.
- Printed circuit and Solder terminations.
- Shock-safe Fuse Holders.
- TR3 and Microfuse Holders.
- Fuse Blocks.
- Standard and Sub-Miniature Fuses.
- Approvals: UL, CSA, VDE



KNOBS
(COLLET, SET SCREW, & PUSH-ON)

Designed for function, styling and labor saving assembly. The most complete line of Knobs and Accessories. Also available with aluminum or matte finishes. 70 different color options. NEW Knurled design now available.



MINIATURE and SUB-MINIATURE SWITCHES

PRINTED CIRCUIT
ROTARY
KEYLOCK
TOGGLE
SLIDE

LCD CONNECTORS

Triple supports provide minimum plug-in pressure and positive contact at top and bottom of LCD. Four pin lengths. Molded shoulders prevent longitudinal movement under the most severe shock and vibration conditions. (No epoxy or bezel required for LCD retention). Also available for Flat Cable Connections.

.05 and .10 PIN SPACING

COMPONENTS OF QUALITY WITH DELIVERY FROM STOCK!

Quality, delivery, price, service, engineering assistance — all combine to make PDI your dependable source of supply.

Samples and Engineering Handbooks available from:

Power Dynamics, Inc.

P.O. Box 539, 59 Lakeside Avenue, West Orange, New Jersey 07052
Phone: (201) 736-5722 • TWX: 136567 (PDI) • Intl. Telex 666173 (PDI)